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## BMW Maintenance System

The maintenance jobs apply up to model year 93. Refer to inspection sheet as of model year 94.

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## BMW Maintenance System – USA

The scope of maintenance work remains valid until model year 93. From model year 94, refer to inspection sheet.

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# Foreword

This Repair Manual is intended as an aid in ensuring all necessary maintenance and repair work is carried out expertly and professionally. It therefore supplements the practical and theoretical training received by our managers and technicians in our service training centers.

As of model year 1985, Repair Manuals are subdivided into:

- Repair Manuals for the specific series

The Repair Manual (series 3, 5, 6, 7 and 8) describes removal and installation or replacement of components in the vehicle.

- Assembly Repair Manual for BMW automobiles

The assembly Repair Manual (main groups 11, 12, 13, 23, 24 and 33) describes the removal and installation or replacement of assemblies and removed equipment. The Assembly Repair Manual also includes notes on testing as well as troubleshooting tables.

The Technical Data microfiches is available as a reference for Technical Data (tightening torques, settings etc.)

The Repair Manual (microfiche) illustrates repair and maintenance jobs which can only be carried out on standard, i.e. not subsequently modified, vehicles.

The structure of the Repair Manual corresponds to the numbering system of the Fiat Rates Catalogue (FRU numbers).

Cross references to other FRU numbers are intended only as an aid and should not be construed as an extension to the specified working time.

The page numbering 64 – 11/8 means for example:

- 64 - Main group
- 11 - Subgroup
- 8 - Consecutive page number

All special tools referred to in the Repair Manual are listed in the special tools microfiche, Order number 01 99 9 699 422. The use of special tools is illustrated where necessary in the relevant steps.

Generally, only the removal of components is described within the individual working steps in this Repair Manual, installation takes place in the reverse order of removal. If it is necessary to observe special procedures during installation, reference is made to them in the form installation notes.

Deviating from this procedure, both removal and installation are described separately for complicated jobs.

Service information bulletins will keep you updated with any improvements and modifications. As an additional source of information, we recommend the clearly illustrated parts microfiches.

**BAYERISCHE MOTOREN WERKE AG**  
**CENTRAL SERVICE DEPARTMENT - TECHNICAL**

## GENERAL INFORMATION

### PRECAUTIONS FOR WORKING WITH PARTS CONTAINING ASBESTOS

Inhaling fine asbestos dust could impair health.

Conform with these safety precautions when working with asbestos parts.

- Only work outdoors or in well ventilated rooms.
- Only use manually operated or slow running equipment, with dust extracting equipment if necessary! Only operate fast running equipment with dust extracting attachments.
- Moisten parts prior to machining whenever possible.
- Never blow out brake and clutch parts.
- Moisten dust, fill in containers which can be sealed perfectly and dispose in a manner which prevents danger.
- Asbestos waste and scrapped parts must be collected in perfectly sealed containers marked accordingly and then eliminated without danger for human beings or the environment.

**Important when disconnecting battery!**

To disconnect the battery, disconnect the negative lead from the ground connection. Disconnecting the battery will cancel fault memories of control units. Use tester to read out fault memories and print out data on any errors prior to disconnecting battery.

Work on components, terminal connections, etc. could result in errors being stored in the fault memories of the affected control units. If disconnection of the battery is specified in the Repair Manual for the carrying out of repairs, there must always be conformance with this in the interests of safety.

**Windshield wipers (wiper motor):**

If a fault occurs, the intermittent wipe and wiper stage 1 are switched off with a block protection feature. This block protection feature remains effective even after the fault has been rectified. To cancel the block protection, switch off the ignition (terminals IS and R) for 3 minutes.

**Wipers (CPA motor) CPA = Contact Pressure Adjustment:**

If a fault occurs, the CPA motor is switched off by a block protection feature. This block protection feature remains effective even after the fault has been rectified. To switch off the block protection:

1. Disconnect the battery for 30 seconds (caution: cancels fault memories in all control units!) or
2. Automatic cancellation while vehicle is in motion.

**Vehicle with interlock system:**

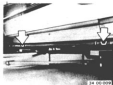
If a component of the interlock system was removed and installed or if the installation position of the interlock cable was altered, the following function check must be performed:

1. Move selector lever on automatic transmission to "P".
2. Remove ignition key
3. Press locking button on selector lever
4. If the selector lever can be moved out of "P" setting, the interlock cable must be adjusted, refer to Gr. 25.
5. Switch on ignition
6. Press locking button on selector lever
7. If it is not possible to move the selector lever out of setting "P", the interlock cable must be adjusted, refer to Gr. 25.

## GENERAL INFORMATION

## LIFTING VEHICLE ON A LIFTING PLATFORM

Before driving a car on the platform, make sure that there is sufficient clearance between the lifting platform and vehicle (if applicable, spoilers or splash guards, etc.).



Lifting platforms must conform with local and national legislative measures concerning accident prevention and maintenance. Arms of a lifting platform must always be applied only on the reinforced points of the frame members.

Ensure that undercoating is not damaged.

## Front:

Apply rubber block or lifting arm on the front perpendicular reinforcement of the frame member, which is also provided for application of the car's jack.

Note embossed arrows on M 5 cars.

## Rear:

Apply rubber block or lifting arm on the rear perpendicular reinforcement of the frame member, which is also provided for application of the car's jack.

Ensure that bottom of fuel tank is not damaged.

Note embossed arrows on M 5 cars.

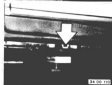
## LIFTING VEHICLE ON A WORKSHOP TROLLEY JACK

A workshop trolley jack may also be only applied for lifting the vehicle on the same take-up points described for the lifting platform.

A suitable liner (rubber, wood or plastic) must be used between the jack and vehicle to avoid damaging the undercoating, frame members or floor plate.



Front Take-up Point

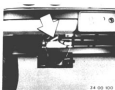


Rear Take-up Point

**Towing**

Please respect any prevailing legislation concerning the towing of vehicles.

**Caution!**  
Follow instructions in the relevant Owner's Manual.



Front towing eye



Rear towing eye

BMW MAINTENANCE SYSTEM	General Information					Important Information!
	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	
00 00 009 Pre-delivery inspection						
Interrogate fault memories in diagnosing system.						Refer to operating instructions for BMW diagnosing system.
Brief test.						Connect BMW service tester. Further instructions appear on monitor.
Check / correct engine oil level.				Gr. 11	-	Approved oil only!
Check fuel pipes, tank and hoses for correct routing, condition and leaks.						Visual inspection.
Check connections and pipes of brake system for leaks, correct position and damage.						
Check / adjust parking brake lever travel.	Gr. 34					
Check wheel bolt tightening torque.		Gr. 36				
Check rim size, tire size and type as well as tire inflation pressure (including spare wheel).		Gr. 36	Gr. 36			

## BMW MAINTENANCE SYSTEM

## General Information

## 00 00 000 Pre-delivery inspection

Check function of windshield wipers/washer and aiming of water spray nozzles; remove protective sleeves from wiper blades.

Check acid level and charged condition of battery under rear seat or in trunk and add distilled water if necessary. Charge battery if necessary.

Check lights: headlights/additional headlights, parking lights, brake lights, turn signals, tail lights, backup lights, rear fog lights, license plate lights, passenger compartment lights, glovebox light, engine compartment light and trunk light.

Check horn, headlight flasher and hazard warning lights.

Check instrument and sign lights.

Check control and warning lamps in instrument cluster and check control (incl. ABS, airbag).

Check heating, ventilating and blower.

Check function of headlight cleaners and central locks.

Insert and check function of cigar lighter.

Repair  
ManualTechnical  
DataService  
InformationOperating  
FluidsOwner's  
Manual

Important Information!

Gr. 00

Gr. 64

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## BMW MAINTENANCE SYSTEM

## General Information

00 00 009 Pre-delivery inspection	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	Important Information!
<p>Check function of other special equipment.</p> <p>Initialize sender of remote control system.</p> <p>Check data plate, vehicle identification number and engine number.</p> <p>Compare ordered car equipment against delivered car equipment.</p> <p>Tune in radio station and check for interference with engine running by switching electric equipment on and off.</p> <p>Mount hub caps, if applicable wheel rings and tailpipe extension.</p> <p>Place spits in toolbox and secure jack and wheel bolt wrench.</p> <p>Paste BMW emergency service label on lid of toolbox.</p> <p>Place owner's manual/service booklet, list of BMW service stations and BMW emergency service points, spare keys and key holder in glovebox.</p> <p>Stamp and make entries in service booklet.</p>					*	



## BMW MAINTENANCE SYSTEM

## General information

	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	Important Information!
<p>00 00 009 Pre-delivery inspection</p> <p>Check function of engine, clutch, transmission, final drive, steering, foot and hand operated brakes. In cars with rear disk brakes: break in parking brake. In cars with ABS (ASC): check function of control lamps.</p> <p>Check function of speedometer with odometer and daily trip recorder, tachometer (economy control), clock, temperature gage and fuel gage.</p> <p>Check engine, transmission, steering, final drive, drive shaft boots, fuel system, clutch and brakes for leaks.</p> <p>Remove seat and other protective covers.</p> <p><i>Important!</i> Reset service indicator only in cars up to production date of 3/90.</p>						

BMW Maintenance System	General Information					Important Information
	Repair Manual	Technical Data	Service Info	Consumables	Owner's Manual	
00 00 210 BMW break-in period inspection (at 2000 km)						
Caution! The break-in period inspection is not required for cars with M50 engines.						
Interrogate fault memory in diagnostic system.						
Brief test.						See Operating Manual BMW Service Test.
Change engine oil and oil filter with engine at operating temperature.	Gr. 11			Gr. 11	+	Use approved oils only. Caution! Build up oil pressure with engine running at idle.
Check valve play and adjust if necessary (only M20, M30 and S38 engines).	Gr. 11	Gr. 11				
Change oil in manual transmission at operating temperature (only S35 and M3).	Gr. 23			Gr. 23	+	Always use approved grades of oil.
Change oil in rear axle differential at operating temperature. Caution! On rear axle differential with black, chromated identification plate and letter "R" on top, perform oil change at 1st engine oil service.		Gr. 33	Gr. 33	Gr. 33		Note Service Information for special oil grade.
Change oil in transfer box and front axle differential at operating temperature (S25 (X-Drive)).	Gr. 23/31			Gr. 23/31		Always use approved grades of oil.
Final inspection with check for road safety, brakes and steering, indicator and hazard warning lights as well as Check Control messages.					+	

BMW MAINTENANCE SYSTEM	General Information					Important Information!
	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	
00 00 220 BMW Inspection I						
Interrogate fault memories in diagnosing system.						Refer to operating instructions of BMW diagnosing system.
Brief test.						Refer to operating instructions of BMW service tester.
Replace engine oil and oil filter at operating temperature.	Gr. 11	Gr. 11		Gr. 11	+	Use approved oil. <i>Important!</i> Only build up oil pressure with engine idling.
Check / adjust valve clearance (M20, M21, M30 and S38 engines).	Gr. 11	Gr. 11				
Replace spark plugs (not for M40, M50 and M60 engines).		Gr. 12				
Check coolant hoses for leaks; check / correct coolant level and antifreeze concentration.				Gr. 17	+	Replace coolant at least every 2 years.
Check tension and condition of all drive belts, tightening if necessary (not M50, M51 and M60 engines). If necessary replace and invoice separately.	Gr. 12/13/14					
Drain water trap of fuel filter (M21 and M51 engines).	Gr. 13					
Check routing and condition of fuel pipes, tank and hoses as well as for leaks.	Gr. 13/15					
Check condition, routing and suspension of exhaust system as well as for leaks.						

BMW Maintenance System	General Information					Important Information
	Repair Manual	Technical Data	Service Info	Consumables	Owner's Manual	
00 00 020 BMW Inspection I						
<p>Check power steering/level control for leaks and correct oil level, topping up if necessary.</p> <p>Ensure that steering is free of play, inspect tie rods and front axle joints.</p> <p>Inspect steering unit: steering transmission, linkages, flexible coupling and sleeves.</p> <p>Check all gear units for leaks.</p>				Gr. 22		Visual inspection
<p>Check oil level in manual transmission and top up if necessary (cars with M21 engine).</p>	Gr. 23			Gr. 23		Use approved oil only
<p>Removing and installing front and rear disk brake linings, checking overall thickness. Replace linings when necessary. Check surface condition of brake disks. Check brake caliper dust covers for leaks. Grease wheel centering on disk wheels.</p>	Gr. 34/36					Wheels: Check tightening torque
<p>Check connections and leads on brake system for leaks (and also check for damage) and correct position. Check that handbrake cables move freely.</p>	Gr. 34					Caution! Use approved brake fluid.
<p>Check / adjust handbrake lever travel.</p>	Gr. 34					Change approved grade of brake fluid in accordance with specified Service Interval display or clock symbol, but no later than every 2 years. See 51 Gr. 00
<p>Check / top up fluid level in expansion tank for brake and clutch hydraulic systems.</p>				Gr. 34		
<p>Check / correct tire pressure (including spare tire). Check tire condition (if wear pattern is uneven, an optional alignment check can be carried out together with wheel alignment; this is a separate invoice item).</p>	Gr. 32	Gr. 36	Gr. 36			Measure depth of tread

## BMW MAINTENANCE SYSTEM

00 00 200 BMW Inspection I	General Information					Important Information!
	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	
<p>Check function of parking lights, turn signals, tail lights, brake lights, backup lights, rear fog lights, license plate lights, passenger compartment lights, glovebox light, engine compartment light and trunk light.</p> <p>Check function of headlights and additional headlights.</p> <p>Check horn, headlight flasher and hazard warning lights.</p> <p>Check instrument and sign lights.</p> <p>Check acid level in battery and add distilled water if necessary.</p> <p>Check charged condition of battery (high current test).</p> <p>Replace microfilter for heater or heater/air conditioner. Shorten replacement intervals if car is operated in extremely dusty regions.</p> <p>Check condition and function of seatbelts.</p> <p>Lubricate locks of doors, engine hood and trunk lid with oil or grease and check function. Lubricate all hinges with oil or grease.</p> <p>Check / correct level and antifreeze concentration of washing fluid in supply tanks for windshield and headlights. Check / correct intensive cleaning fluid level in tank if applicable.</p> <p>Check windshield wipers/washer, wiper blades and aiming of water spray nozzles.</p> <p>Inspect entire body – not cavities – for rust damage. Repair and invoice separately (enter inspection and repairs in Service Booklet).</p>	<p>Gr. 61</p> <p>Gr. 64</p> <p>Gr. 72</p>	<p>Gr. 00</p> <p>Gr. 64</p>		<p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p>	<p>Check data plate in glovebox and Service Information.</p> <p>Models since 5/90. At latest after 2 years.</p>	

## BMW MAINTENANCE SYSTEM

## General information

00 00 020 BMW Inspection I

Repair  
ManualTechnical  
DataService  
InformationOperating  
ProceduresOwner's  
Manual

Important Information!

Final inspection with safety test (check ABS and airbag control lamps), cars with rear disk brakes: break in parking brake, check steering, clutch or automatic transmission, springs and shock absorbers visually and check function of power steering. Check control and warning lamps in instrument cluster as well as mirrors and heater blower.

Check messages in check control.

**Important!**

Reset service indicator after inspection I:

Switch off all electrical equipment.

Switch on ignition – do not run engine.

Plug SI-R\* with adapter in diagnosis socket.

Push in and hold recessed, red INSPECTION button – green lamp (function control) comes on.

Red lamp also comes on after approx. 3 seconds and goes out after approx. 12 seconds.

Release inspection button – green lamp goes out.

The time-dependent inspection interval is due when the clock symbol lights up together with the INSPECTION sign and has no influence on the green light emitting diodes. If the load and time-dependent inspections occur simultaneously, resetting must be repeated after 10 seconds to have the clock symbol and INSPECTION sign lights go out.

**Important!**

When the clock symbol lights up in cars since 5/90 only the brake fluid has to be changed.

**Checking Service Indicator:**

All five green light emitting diodes must come on. Yellow and possibly red light emitting diodes as well as INSPECTION sign light must go out.

SI-R = Service indicator resetter, Order No. 62 1 190.

Adapter, Order No. 62 1 140.

BMW Maintenance System	General Information					Important Information
	Repair Manual	Technical Data	Service Info	Consumables	Owner's Manual	
00 00 330 BMW Inspection II - Inspection I - following work						
Check pulley tension (only M40 engine). Check / adjust pulley tension (only M21 engine).	Gr. 11 Gr. 11/13	Gr. 11	Gr. 11			
Replace spark plugs (M40, M50 and M60 engine).	Gr. 12	Gr. 12	Gr. 12			
Replace main fuel filter (only cars with diesel engine) If diesel fuel is poor quality, shorten the interval between filter changes.	Gr. 13					
Air cleaner: Replace air filter insert. Shorten intervals accordingly for cars operated in dusty regions.	Gr. 13					
538 Motor: Replace all Vee belts.	Gr. 12/32/64		Gr. 00			
Change oil in manual transmission at operating temperature (except in cars with M40, M50, M61 and M60 engines).	Gr. 23			Gr. 23		Use approved oil only
Change oil in automatic transmission at operating temperature (not on 540).	Gr. 24			Gr. 24		Use approved oil only
Change oil in transfer box and front axle differential at operating temperature (525iX/ touring).	Gr. 27/31			Gr. 27/31		Use approved oil only
Change oil in rear axle differential at operating temperature.	Gr. 33			Gr. 33		Use approved oil only
Check rubber gaiters on output shafts.						Visual inspection
Check thickness of parking brake linings. (if necessary, replace - separate invoice item).	Gr. 34	Gr. 34				
With ASC-T: Replace filter insert in inlet.	Gr. 34					
Check park heating.	Gr. 64					

BMW Maintenance System	General Information					
00 00 230 BMW Inspection II = Inspection I + following work	Repair Manual	Technical Data	Service Info	Consumables	Owner's Manual	Important Information
Perform at every 2nd Inspection II:						
Replace toothed drive belt (separate invoice item).	Gr. 11					or every 4 years
Replace main flow fuel filter (cars with gasoline engines).	Gr. 13					
Check clutch drive plate for wear.	Gr. 21					
Change oil in manual transmission at operating temperature (in cars with M40, M50, M51 and M50 engines).	Gr. 23			Gr. 23		Use approved oil only
<p><b>Caution!</b> After Inspection II, reset Service Interval display unit. Switch off all electrical equipment. Switch on ignition. Do not run engine. Fit SiR* into diagnosis receptacle with adapter. Depress and hold recessed, red INSPECTION button - green lamp (function control) lights up. Red lamp also lights up after about 3 seconds and goes out again after about 10 seconds. Release INSPECTION button; green lamp goes back out.</p>						
<p>Time-dependent inspection interval is indicated by a lighted clock symbol in addition to the INSPECTION sign and has no influence on the green diode lights. When load and time dependent inspection intervals coincide, the resetting procedures must be repeated after 10 seconds to cancel the clock symbol and the INSPECTION sign.</p>						
<p>Checking service indicator: All five green diode lights must light up. Yellow (or red) LEDs and INSPECTION legend should go out.</p>						
<p>* SiR = Service Indicator Resetter, Order No. 62 1 100 Adapter Order No. 62 1 140</p>						





## BMW MAINTENANCE SYSTEM

## General Information

00 00 245 BMW Annual Check

Repair  
ManualTechnical  
DataService  
InformationOperating  
FluidsOwner's  
Manual

Important Information!

**Important!**

Reset service indicator for annual check (INSPECTION and Clock Symbol):

Switch off all electrical equipment.

Switch on ignition – do not run engine.

Plug Si-R<sup>1</sup> with adapter<sup>2</sup> in diagnosis socket.

Push in and hold recessed, red INSPECTION button – green lamp (function control) comes on.

Red lamp also comes on after approx. 3 seconds and goes out after approx. 12 seconds.

Release inspection button – green lamp goes out.

**Service Indicator with Clock Symbol and Red LED:**

The time-dependent inspection interval is due when the clock symbol lights up together with the INSPECTION sign and has no influence on the green light emitting diodes. If the load and time-dependent inspections occur simultaneously, resetting must be repeated after 10 seconds to have the clock symbol and INSPECTION sign lights go out and activate the green light emitting diodes.

**Checking Service Indicator:**

The number of green light emitting diodes does not change by resetting the time-dependent inspection service indicator. The INSPECTION sign and clock symbol lights must go out.

<sup>1</sup> Si-R = Service Indicator Reseter, Order No. 62 1 100.

<sup>2</sup> Adapter, Order No. 62 1 140.

New Si-R = Order No. 62 1 115.

## BMW MAINTENANCE SYSTEM

## General information

00 00 249 BMW Engine Oil Service	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	Important Information!
<p>Replace engine oil and oil filter at operating temperature.</p>	Gr. 11			Gr. 11		Use approved special oil.
<p><i>Important!</i> Rear axle final drive with black chrome-plated data plate and letter "B" on it.</p>	Gr. 33					
<p>Replace oil in rear axle final drive at operating temperature (only at 1st Engine Oil Service).</p>	Gr. 33		Gr. 00	Gr. 33		Use approved oil.
<p>Cars with M51 engines: replace oil in rear axle final drive at 1st Engine Oil Service.</p>	Gr. 33		Gr. 00	Gr. 33		<p><i>Important!</i> Only build up oil pressure with engine idling.</p> <p>Use approved oil.</p>
<p><i>Important!</i> Reset service indicator after Oil Service: Switch off all electrical equipment. Switch on ignition – do not run engine. Plug "Si-R" with adapter in diagnosis socket. Push in and hold recessed, yellow OIL SERVICE button** – green lamp (function control) comes on. Yellow lamp also comes on after approx. 10 seconds and goes out after approx. 3 seconds. Release oil service button – green lamp goes out.</p>						
<p>Checking Service Indicator: All five green light emitting diodes must come on, yellow and possibly red light emitting diodes as well as OIL SERVICE sign light must go out.</p>						
<p>* Si-R = Service Indicator resetter, Order No. 62 1 100. Adapter, Order No. 62 1 140.</p> <p>New Si-R = Service Indicator resetter, Order No. 62 1 110.</p>						
<p>** <i>Caution!</i> Resetting with the wrong button cannot be corrected. Service intervals would be mixed up – also refer to BMW Technik Information for Group 62.</p>						

## BMW MAINTENANCE SYSTEM

## General Information

00 00 259 BMW Safety Test	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	Important Information!
Interrogate fault memories in diagnosing system.						Refer to instructions of BMW diagnosing system.
Brief test.						Refer to instructions of BMW Service Tester.
Steering Test: Steering gear, linkage, coupling, connections, leaks, oil volume and condition of power steering.	Gr. 32			Gr. 32		Use approved oil only.
Brake Test: Brake pads (remove and install wheels, remove pads), brake disks, pipes, hoses, connections, brake fluid level, parking brake cables, parking brake, break in parking brakes.	Gr. 34					
Important! Replace brake fluid every 2 years at latest.				Gr. 34		Use approved brake fluid.
Tire and Wheel Rim Test: Condition, tire pressure, specified size, tread depth, tire wear pattern (including spare wheel).		Gr. 36		Gr. 36		
Light Test: Headlights, fog lamps (also aiming), parking lights, tail lights, backup lights, license plate lights, instrument and sign lights, control and warning lamps.	Gr. 63				+	
Warning Appliance Test: Horn, headlight flasher, turn signals, hazard warning lights, brake lights, tail fog lights, burglar alarm.					+	
Windshield Wipers/Washer and Headlight Cleaners: Wiper blades, washer (windshield, if applicable headlights and intensive cleaning), supply tank (fluid level/antifreeze), spray nozzle aiming (windshield, if applicable headlights).			Gr. 60	Gr. 60	+	
Seat Belts: Condition and function.	Gr. 72					
Remarks: Invoice repairs and adjustments separately.						

## BMW MAINTENANCE SYSTEM

## General Information

00 00 009 Exchange Engine inspection after 1,000 km	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	Important Information!
Replace engine oil and oil filter at operating temperature.	Gr. 11			Gr. 11	+	Use approved oil, important! Only build up oil pressure with engine idling.
Check coolant hoses for leaks; check / correct coolant level and antifreeze concentration.				Gr. 12	+	Use long-term antifreeze and corrosion inhibitor.
Check / adjust valve clearance (only M30 engines).	Gr. 11	Gr. 11				
Check / correct tension of all drive belts (only M30 engines).	Gr. 12/32/64					

## BMW Maintenance System - USA

## General Information

## 00 00 009 Pre-Delivery Inspection

**Caution!**  
With effect from 1993 model, proceed in accordance with Quality Certification 1.

Interrogate fault memory in diagnosis system.

Brief test.

Check engine oil level (check tube oil for thinning), if necessary, change oil and oil filter.

Check gasket on filter cover.

Check coolant hoses for leaks and routing.

Check mounting of hose clips.

Check/correct coolant level and concentration.

Check acid level of battery and top up with distilled water if necessary. Check mounting of battery terminals.

Check spark plugs, replace or clean if required and adjust electrode clearance.

Check mounting and leaktightness of fuel lines, fuel tank and cover and fuel filter. Check fuel injection system is securely mounted. Check for leaks.

Check routing of exhaust system.

Repair Manual

Technical Data

Service Info.

Consumables

Owner's Manual

Important Information

Gr. 00

see 01 00 24 02 (3600)

See operating instructions  
BMW diagnosis system  
Connect up BMW Service Tester  
For further instructions,  
refer to screen display.

Gr. 00

Gr. 11

+

Use approved oil only

Visual inspection

Gr. 00

Gr. 17

+

Long-term anti-rust and  
corrosions protection agent

Gr. 12

Gr. 12

Visual inspection

Visual inspection.

## BMW MAINTENANCE SYSTEM — USA

## General Information

00 00 009 Pre-delivery Inspection	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	Important Information!
Tighten nuts and bolts of steering gear, joint disc, tie rods and front axle. Check whether cotter pins are missing.		Gr. 32/34				Check locks and cotter pins.
Check power steering for leaks.	Gr. 38					Visual check, use approved brake fluid, use specified torque.
Check / adjust parking brake lever travel.		Gr. 34	Gr. 00	Gr. 34		
Check level of fluid in tank for brakes and clutch.						Visual inspection.
Check connections and pipes for brake system for leaks, damage and correct position.					+	
Check condition of tires, tire size and type as well as tire pressure (including spare wheel).		Gr. 36	Gr. 36			
Check tightening torque of wheel bolts.		Gr. 36				
Check wheel rim size and type.						
Check parking lights, turn signals, brake lights, high and low beam headlights, side marker lights, fog lights, backup lights, license plate lights, passenger compartment lights (also delay system), glovebox light, trunk light and engine compartment light, sun visor mirror lamp, front and rear map reading lamps.	Gr. 63				+	
Check / adjust aiming of headlights.					+	
Check horn, headlight flasher and hazard warning lamps as well as control lamps.					+	
Set clock.					+	
Program on-board computer and check function of keys and remote control.						

## BMW Maintenance System - USA

## General Information

## 00 00 000 Pre-Delivery Inspection

Check lighting of instrument panel and title block.  
Check intensity of lighting.

Check control and warning lights, clock, warning buzzer and Check-Control: Check alternator, oil pressure, coolant temperature, indicator lights, brake linings/brake fluid level, fog lamps, Lambda probe, safety belt, ignition key warning buzzer, full beam lamps, fuel gauge, ABS and Airbag, Check-Control, gear display.

Fill tank on screen-wash unit and check anti-freeze concentration.

Fill tank on intensive cleaning unit.

Check wash/wipe system and spray jet setting.  
Remove protective sleeves from wiper blades.

Check function of intensive cleaning unit.

Check function of rear screen heating.

Check function of cigarette lighter.

Check function of headlight cleaning system.

Radio: check aerial and tuning, adjust radio, check for suppression when engine running and switch all electrical consumers on in sequence, check function of cassette player.

Check function of any other optional extras: electrical window regulators, front and rear, sliding/tilting sunroof through all settings, fog lights and setting, electric radio aerial and regulator unit, Check function of other items of equipment fitted by dealer.

## Repair Manual

## Technical Data

## Service Info.

## Consumables

## Owner's Manual

## Important Information

•

Gr. 00

•

If necessary, add anti-freeze fluid.

•

•

Gr. 00



## BMW Maintenance System - USA

## General Information

## 00 00 009 Pre-Delivery Inspection

## Repair Manual

## Technical Data

## Service Info.

## Consumables

## Owner's Manual

## Important Information

Check wing mirror.

Check function of central locking system.

Check seat adjustment by hand electrically.

Check safety belts.

Check license plate number, chassis number and engine number.

Check goods received against order items.

Fit hub caps and, where applicable, decorative wheel trim and exhaust trim.

Place tools in on-board tool kit; secure car jack and lug wrench.

Paste BMW Emergency Service telephone number label and annual change of brake fluid.

Place Owner's Manual, directory of BMW service stations, spare key and key wallet in glove box.

Battery and accessories warranty certificates.

If applicable, operating instructions for radio.

Factory invoice (Money sticker).

Cleaning kit for cassette player.

## BMW MAINTENANCE SYSTEM — USA

## General Information

00 00 000 Pre-delivery inspection	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	Important Information!
<p><b>Road test:</b></p> <p>Check acceleration, coasting and brakes (before and during road test).</p> <p>Check idling speed (rpm).</p> <p>Check function of Motronic.</p> <p>Check car for rattling and grinding noise.</p> <p>Check driving behavior and wheel balance.</p> <p>Check function of engine, clutch, transmission, final drive, steering (wheels pointing straight ahead); cars with rear brake discs: break in parking brake.</p> <p>Check heating, ventilating and air conditioning.</p> <p>Check function of instruments.</p> <p>Check function of cruise control.</p>	Gr. 24					<p>Caution! Stronger braking effect from systems with Politec brake pads.</p>

## BMW MAINTENANCE SYSTEM — USA

## General Information

00 00 009 Pre-delivery inspection	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	Important Information!
<p>After Road Test:</p> <p>Check engine, transmission, steering, final drive, boots on drive shafts, fuel system, clutch, brakes and cooling system for leaks.</p> <p>Inspect and clean passenger compartment.</p> <p>Car washed and polished. Underside without damage. Car without scratches or damage.</p> <p>Remove protective covers from seats and inside of car.</p> <p>Important! Always reset the service interval indicator after the pre-delivery inspection: Switch off all electric consumers. Switch on ignition. Do not run engine. Use SI-R* with adapter and plug in diagnosis socket. Push in and hold recessed, red INSPECTION button – green lamp (function control) lights up. Red lamp also lights up after about 3 seconds and goes out after about 12 seconds. Release INSPECTION button – green lamp goes out.</p> <p>Checking Service Interval Indicator: All five green diode lights must light up. Yellow and possibly red diode lights as well as INSPECTION sign should go out.</p> <p>* SI-R = Service Interval Resetter, Order No. 62 1 100 Adapter, Order No. 62 1 140</p>						<p>Visual inspection.</p> <p>Visual inspection.</p>

## BMW Maintenance System - USA

## General Information

00-00-010 BMW Pre-delivery inspection at 1000 miles

**Caution!**

From 1993 model, proceed in accordance with Quality Certification 8.

Interrogate fault memory in diagnosis system.

Brief test.

Replace oil and oil filter with engine warm.

Check / adjust valve clearance (only M20 and M30 engines).

Change oil in manual transmission at operating temperature (except for 525i).

Change oil in rear axle differential at operating temperature.

Repair Manual

Technical Data

Service Info.

Consumables

Owner's Manual

Important Information

Gr. 00

See SI 00 24 02 (2MS2)

See Operating Manual  
BMW Diagnosis System,  
Connect up BMW SII (PASC)  
TEST unit. For additional  
instructions, refer to  
screen display.

Gr. 11

Gr. 00

Gr. 11

+

Use approved oil only

Gr. 11

Gr. 11

Gr. 23

Gr. 00/23

+

Use approved oil only

Gr. 33

Gr. 00

Gr. 33

Use approved oil only

## BMW Maintenance System - USA

## General Information

00-00-020 BMW Inspection I

Interrogate fault memory in diagnosis system.

Brief test.

Replace oil and oil filter with engine warm.

Check / adjust valve clearance (only M20, M20 and S38 engines).

Clean joints and bearing points on throttle valve actuating mechanism and oil and grease.

Check fuel tank, cover, pipes and connections for leaks.

Check cooling system and all connections and heating hoses for leaks; check coolant level and concentration and top up if necessary.

Change every 2 years.

Check condition, routing, mounting and leaktightness of exhaust unit.

Check oil level in manual transmission and top up if necessary.

Check all transmissions for leaks.

Check power steering for leaks and check/oversee fluid level.

Check condition of wheel suspension, track rods, front axle joints, drag-arm and flexible coupling.

Check steering for clearance in straight-ahead setting.

Repair Manual

Technical Data

Service Info.

Consumables

Owner's Manual

Important Information

Gr. 11

Gr. 00

Gr. 11

-

Gr. 11

Gr. 11

Gr. 18

Gr. 23

Gr. 00

Gr. 23

Gr. 32

Gr. 00

Gr. 32

Gr. 21/24/26

Gr. 32

Refer to operating instructions BMW Diagnosis System. Connect up BMW Service Tester. For additional information, refer to screen display.

Use only approved grades of oil.

Use Molykote Longterm, MWB Order No. 91 22 9 427 007

Visual inspection

Caution!  
Coolant must be fully drained and changed every 2 years (from date of manufacture).

Use approved oil only

Visual inspection

Use correct tightening; Visual inspection of cotter pins, fuses etc.

BMW Maintenance System - USA	General Information					
50 50 230 BMW Inspection I	Repair Manual	Technical Data	Service Info	Consumables	Owner's Manual	Important Information
Check/correct oil level in rear axle differential.			Gr. 00	Gr. 30		Use approved grades of oil only.
Remove/install front and rear disk brake linings. Check total thickness. Replace linings when necessary. Check brake disk surface condition.	Gr. 34	Gr. 34	Gr. 34			
Lubricate wheel hubs.						
Check/correct fluid level in expansion tank for brake and clutch hydraulic fluid.	Gr. 34		Gr. 00	Gr. 34		Use approved brake fluid only.
Caution! Change brake fluid every 2 years at the latest.						
Check brake calipers and dust covers for leaks. Check brake connections and pipes for leaks, damage and correct location.	Gr. 34 Gr. 34					Visual inspection
Check parking brake cable for ease of movement. Adjust parking brake.						
Check/correct tire pressure (including spare wheel). Check trunk for fuel vapor (fumes).			Gr. 30		+	
Check condition of tires.						
Unven tire wear (recommend alignment check using computer tester, to be invoiced separately)	Gr. 02					

## BMW Maintenance System - USA

## General Information

## 00 00 120 BMW Inspection I

Level control system: check hydraulic fluid level in laden vehicle. If necessary, top up hydraulic fluid (not required from G3 model onwards).

Tighten locks on doors, hood and trunk lids, oil, grease and perform a function check.  
Oil or grease all hinges.

Check electrolyte level in battery; top up with distilled water if necessary.

Function check air-conditioning system and flow of refrigerant.

Replace microfilters in air-conditioning unit.  
Shorten interval accordingly for cars operated in dusty regions.

Check function of following equipment:

Lighting system: headlights, parking lights, reversing lights, license plate light, interior light with delay system, glove box light, engine compartment and trunk lighting.

Warning equipment: indicator lights, hazard warning lights, brake lights horn, headlight flash and dip switches.

Check correct beam alignment of headlights.

Check function of Check-Control; control lamps for ABS and Airbag.

## Repair Manual

## Technical Data

## Service Info

## Consumables

## Owner's Manual

## Important Information

Gr. 37

Gr. 37

Gr. 64

Gr. 64

Gr. 63

## BMW Maintenance System - USA

## General Information

## 90 00 020 BMW Inspection I

## Repair Manual

## Technical Data

## Service Info.

## Consumables

## Owner's Manual

## Important Information

Top up supply tank for windshield wash unit/check anti-freeze concentration. If necessary, top up fluid for interleave cleaning.

Check function of wash/wipe unit and check setting of spray jets.

Check condition and operation of seat belts.

Final inspection and test run with inspection of operating safety:  
Brakes, steering, clutch, automatic transmission and mirrors;  
Break in parking brake.

Gr. 34

Check all transmissions for leaks.

**Caution!**

After inspection I, reset Service Interval Indicator.

Switch off all electrical equipment.

Switch on ignition. Do not run engine.

Use SA-R\* with adapter and plug in diagnostic

socket. Push in and hold down the red INSPECTION button - green lamp (function check) lights up. Red lamp also lights up after about 3 seconds and goes back out after about 12 seconds. Release inspection button - green lamp goes out -.

## Checking service indicator:

All five green diode lights must light up. Yellow and possibly red diode lights as well as INSPECTION sign should go out.

**Caution!**  
Power-assisted braking action of units fitted with P-Steer brake linkage. Break in parking brake, see 34 10 014 in the repair manual.  
Visual inspection

\* SA-R = Service Indicator Resetter, Order No. 62 1 100

Adapter Order No. 62 1 140

new SA-R=Service Indicator Resetter, Order No. 62 1 110



## BMW Maintenance System - USA

	General Information					Important Information
	Repair Manual	Technical Data	Service Info.	Consumables	Owner's Manual	
00 00 201 BMW Inspection II - Inspection I - following supplementary procedures						
Check tension and condition of all V-belts and retighten if necessary (except M50, M50i engines). If necessary, replace and invoice separately.	Gr. 12/32/64					
Replace all V-belts on G38 engines and invoice separately.						
Replace spark plugs.		Gr. 12	Gr. 12		*	
Air cleaner: Replace air filter insert. Shorten interval accordingly for cars operated in dusty regions.	Gr. 13					
Replace fuel filter. If dirty fuel is used, shorten interval accordingly. (Recommended in California; mandatory in all other States).	Gr. 16				*	
Check clutch drive disk for wear.	Gr. 21					
Change oil in manual transmission at operating temperature (only G38, M5).		Gr. 23	Gr. 00	Gr. 23		Use approved oils only
Change oil in automatic transmission at operating temperature.	Gr. 24	Gr. 24	Gr. 00	Gr. 24		Use approved oils only
Perform oil change on rear axle differential at operating temperature.		Gr. 33	Gr. 00	Gr. 33		Use approved grades of oil only.
Check condition on bellows on output shafts.						
Rear disk brakes: Check thickness of parking brake linings.	Gr. 34	Gr. 34				
ASC + T: Replace filter insert in inlet.	Gr. 64					

## BMW Maintenance System - USA

## General Information

00 00 231 BMW Inspection II = Inspection I + following supplementary procedures

Repair Manual

Technical Data

Service Info.

Consumables

Owner's Manual

Important Information

Every 2nd inspection II:

Replace toothed belt (no later than every 50 000 miles),  
invoice as separate item.

Gr. 11

Change oil in manual transmission at operating temperature,  
(only 525iIT).

Gr. 23

Gr. 00

Gr. 23

Use approved oils only

Check entire body for rust damage in accordance with  
warranty terms (at least once every two years).

**Caution!**

Reset Service Interval Indicator after inspection II:

Switch off all electrical equipment.

Switch on ignition. Do not run engine.

Use **SA-R\*** with adapter and plug in diagnostic socket.

Press and hold down red **INSPECTION** button - green lamp  
(function check) lights up. In addition, the red lamp lights  
up after about 3 seconds and goes back out after about  
12 seconds. Release inspection button - green lamp goes out.

**Checking service indicator:**

All five green diode lights must light up. Yellow and possibly  
red diode lights as well as **INSPECTION** sign should go out.

\* **SA-R** = Service Indicator Reseter, Order No. 62 1 100  
Adapter Order No. 62 1 140

new **SA-R**: Service Indicator Reseter, Order No. 62 1 110

## BMW Maintenance System - USA

## General Information

00 00 240 BMW Annual Inspection (at 11-12 month intervals)

Caution!  
Change brake fluid every 2 years at the latest.

Check master cylinder and servo for correct operation (function check) and leaks. Check/correct beam settings of headlights and fog lamps.  
Check steering angle of lock; screw connections, servo assistance.

Caution!  
Completely drain coolant every two years (from date of first registration) and check anti-freeze (invoice separately).

Check body for damage, refer to BMW 5 year warranty against rust damage.

Repair Manual

Technical Data

Service Info.

Consumables

Owner's Manual

Important Information

Gr. 34

Gr. 00

Gr. 34

Use approved brake fluid

Gr. 00

Gr. 17

Use approved anti-freeze.

Record inspections and/or repair work in the operating manual.

## BMW MAINTENANCE SYSTEM — USA

00 00 249 BMW Engine Oil Service	General Information					Important Information!
	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	
<p>Replace engine oil and oil filter at operating temperature.</p> <p>Reset the service interval indicator after Oil Service:  Switch off all electric consumers.  Switch on ignition.  Do not run engine.  Use SI-R* with adapter and plug in diagnosis socket.  Push in and hold yellow OIL SERVICE*** button – green lamp (function control) lights up.  Yellow lamp also lights up after about 10 seconds and goes out after about 3 seconds.  Release OIL SERVICE button – green lamp goes out.</p> <p>Checking Service Interval Indicator After About 10 Seconds:  All five green diode lights must light up.  Yellow and possibly red diode lights as well as OIL SERVICE sign should go out.</p> <p><i>Important!</i>  Do not reset the service interval indicator if the oil is changed additionally (between normal intervals) on request of the customer.</p> <p>*** <i>Caution!</i>  Resetting with the wrong button cannot be corrected.  Service intervals would be mixed up – also refer to BMW Technik Bulletin of Group 62 for information.</p> <p>* SI-R = Service Indicator Reseter, Order No. 62 1 100 Adapter, Order No. 62 1 140  New Service Indicator Reseter, Order No. 62 1 110</p>			Gr. 00	Gr. 11		Use approved oil only.

## BMW MAINTENANCE SYSTEM — USA

68 00 155 Extra Recommended Service Invoiced Separately	General Information					Important Information!
	Repair Manual	Technical Data	Service Information	Operating Fluids	Owner's Manual	
<p><b>Steering Test:</b> Steering gear, linkage, coupling, connections, leaks, oil volume and condition of power steering.</p> <p><b>Brake Test:</b> Brake pads (remove and install wheels), brake discs, pipes, hoses, connections, brake fluid level, parking brake. <i>Important!</i> Replace brake fluid every 2 years at latest (beginning from date of manufacture).</p> <p><b>Tire and Wheel Rim Test:</b> Condition, tire pressure, specified size (including spare wheel).</p> <p><b>Light Test:</b> Headlights, fog lamps (also aiming), parking lights, tail lights, backup lights, license plate lights, instrument and sign lights, glove box light, engine compartment light, trunk light, control and warning lamps, Check Control, ABS and airbag warning lamps.</p> <p><b>Warning Appliance Test:</b> Horn, headlight flasher, turn signals, hazard warning lights, stop lights.</p> <p><b>Windshield Wipers/Washer and Headlight Cleaners:</b> Wiper blades, washer (windshield, if applicable headlights and intensive cleaning), supply tank (fluid level and filter), spray nozzle aiming (windshield, if applicable headlights), if applicable level of intensive cleaning fluid.</p> <p><b>Seat Belts:</b> Condition and function.</p> <p>Clean cassette player head and align rollers every 50 to 100 hours or more often in case of poor sound quality.</p> <p><b>Final inspection and road test with traffic safety check:</b> brakes, steering, clutch or automatic transmission and mirrors.</p> <p><b>Remarks:</b> Invoice repairs and adjustments separately.</p>	Gr. 32		Gr. 00	Gr. 32		Use approved oil only.
	Gr. 34		Gr. 00	Gr. 34		Use approved brake fluid only.
		Gr. 36		Gr. 36		
	Gr. 63					
			Gr. 00	Gr. 00		
	Gr. 72					
						<i>Caution!</i> Stronger braking from systems with Polaris brake pads.

## BMW Maintenance System

## General Information

## BMW Lambda oxygen sensor service

Repair Manual

Technical Data

Service Info.

Consumables

Owner's Manual

Important Information

## Please remember!

Replace Lambda sensor every 50 000 miles

Every 3 years, from date of manufacture:

## BMW Airbag system (SRS) inspection

## Visual inspection to ensure that:

All airbag (SRS) components are still in original condition (no change in shape or location).

No unauthorized wiring changes, no additional cables or connections on airbag cable harness. The airbag trim and ripcords are not cut, torn or damaged in any way. The airbag must never be treated with cleaning, lubricant or protective agents. Ensure that the correct labels are pasted to (2) the front axle beam and glove box.

## 11 Engine

Engine M20 .....

Engine M21 .....

Engine M30 .....

Engine M40 .....

Engine M43 .....

Engine M50 .....

Engine M51 .....

Engine M60 .....

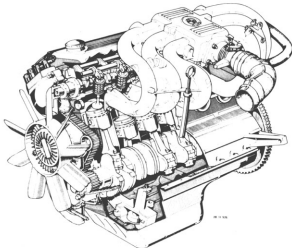
Engine S38 .....

# 11 Engine M20

11 00 039	Compression – check .....	11- 00/2.2
11 00 050	Engine – remove and install .....	11- 00/2.2
11 11 160	Bearing for oil pump drive shaft – replace .....	11- 11/2.1
11 12 000	Cylinder head cover – remove and install .....	11- 12/2.1
11 12 100	Cylinder head – remove and install .....	11- 12/2.1
11 31 110	Timing belt – replace .....	11- 31/2.1
11 40 000	Engine oil pressure – check .....	11- 40/2.1
11 78 . . .	Oxygen sensor – check .....	11- 78/2.1

For further jobs refer to "Assembly Repair Manual".





06 11 120

BMW 520i - M 20 B 20 M  
BMW 525i - M 20 B 25 M

M 20 = Small 6 cylinder  
B = Gasoline  
20 = Displacement x 100  
M = Meticulous

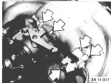


## 11 00 039 CHECKING COMPRESSION

Take off cover on electric box (in engine compartment at right rear).  
Pull off master relay (2).



Unscrew all spark plugs.  
Press down on accelerator pedal and operate starter until pressure stops rising.  
Specifications: 10 to 11 bar (143 to 156 psi) / max. deviation between cylinders = 0.5 bar (7 psi).  
Installation:  
Tightening torque for spark plugs = 25 Nm (18 ft. lbs.).



## 11 00 050 REMOVING AND INSTALLING ENGINE

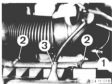
Remove transmission - see Gr. 23/24.  
Disconnect battery.  
Cars with Power Steering:  
Unscrew power steering pump (hoses remain connected).

Cars with Air Conditioning:  
Unscrew compressor (refrigerant pipes remain connected).  
Installation:  
Check tightness of drive belt with Special Tool 11 5 000.

Unscrew plug and drain coolant.  
Remove radiator - see 17 11 000.  
Remove fan - see 11 52 000.

Disconnect cables and unscrew holders.

## 11-00/2.3



Loosen clamp (1).  
Disconnect hose in holder on air cleaner  
housing and remove.  
Open straps (2) and pull off plug (3).



Loosen clamp (1) and pull off hose.  
Loosen nuts (2) and remove air cleaner.



Disconnect radiator hose (1) and fuel hoses  
(2 and 3).  
Caution!  
Don't mix up hoses (2 and 3).



Pull off plug on idle speed control.  
Cut off wire strap and pull off vacuum hose  
for brake booster.



Disconnect heater hoses (1 and 2) and pull  
off vacuum hose (3).



Unscrew coolant pipe.



Pull off ignition leads on ignition coil.  
Pull off plug (1) on oil pressure switch.  
Lift out electric lead clut underneath  
distributor and place leads aside to the left  
of the engine.  
If applicable, disconnect pipes (2) for oil  
cooler.



Disconnect connecting lead on starter.  
Take off cover (1) and disconnect connecting  
lead on alternator.  
Disconnect plug (2).

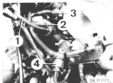
## 11-00/2.4



Pull off plugs (1 and 2).  
Note:  
Plug 1 = reference mark sender  
Plug 2 = cylinder identifying sender



Attach Special Tool 11 0 020 on front and rear ends of engine and take out engine.



Pull off hose (1) and plugs (2 and 3).  
Disconnect plug (4).



Unscrew nuts and place engine wire harness aside.



Unscrew ground strap (1).  
Unscrew engine mounts (left from above,  
right from below).

Installation:  
Guide gaskets into bore in axle carrier.  
Tightening torque for engine mounts =  
45 Nm (32.5 ft. lbs.).

## 11-11/2.1



### 11 11 180 REPLACING BEARING FOR OIL PUMP DRIVE SHAFT

Remove oil pump — see 11 41 000.  
Unscrew bolt (1) and lift off cover (2).



Remove gear wheel (3).  
*Installation:*  
Open end of gear wheel shaft faces down.  
Check seal (4), replacing if necessary.

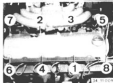


Drive out needle bearing from bottom to top with Special Tool 11 1 310.



*Installation:*  
Lubricate needle bearing with grease.  
Drive in needle bearing against stop with Special Tool 11 1 300.

## 11-12/2.1



### 11 12 000 REMOVING AND INSTALLING CYLINDER HEAD COVER

Take off support and venting hose.

Unscrew nuts (1 ... 8) and take off cover.

Installation:

Check gasket, replacing if necessary.

Tighten nuts in order of 1 through 8.

Tightening torque = 9 Nm (6.5 ft. lbs.).



### 11 12 100 REMOVING AND INSTALLING CYLINDER HEAD

Disconnect battery – see Gr. 00.

Unscrew exhaust pipes on exhaust manifold

and loosen clamp of holder on transmission.

Installation:

Replace gaskets and self-locking nuts.

Coat studs with copper paste\*\*.

Tightening torque = 50 Nm (36 ft. lbs.).

Drain coolant on engine and radiator.

Drain engine oil.

Installation:

Fill and bleed cooling system – see Group 17.

Disconnect cables and unscrew holder.

Loosen hose clamp and pull off intake air hose on air cleaner.

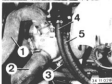
Pull off plug on air flow sensor.

\*\* Source of Selenia: HNS

## 11-12/2.2



Pull off plug on idle speed control.  
Cut off wire strap and pull off vacuum hose for brake booster.



Disconnect radiator hoses (1 and 2), heater hose (3) and fuel hoses (4 and 5).  
Installation:  
Don't mix up fuel hoses (4 and 5).



Pull off hose (1) and plug (2 and 3).  
Disconnect plug (4).



Unscrew knurled nut and take off plug.  
Unscrew nuts and take wire connector plate off of intake manifold.



Remove fan — see 11 02 000.  
Loft out expansion rivets at left and right top on fan cover and remove fan cover.  
Installation:  
Check for correct seating of bottom guide.



Loosen clamp and take off preheating hose.  
Unscrew guide tube for oil dipstick on manifold.  
Remove toothed drive belt — see 11 31 110 (conform with specifications in regards to replacing the toothed drive belt).



Disconnect heating hose on cylinder head.  
Remove cylinder head cover — see 11 12 000.



Press down on venting pipe and arrest with Special Tool 11 1 290.  
Installation:  
Check seal, replacing if necessary.  
Check for correct seating of venting pipe after removal of Special Tool 11 1 290.

## 11-12/2.3



Release cylinder head bolts working from outside to inside in sequence 14 ... 1.  
Remove cylinder head.



### Installation note:

There must be no bolt in the blind holes (risk of cracking, incorrect tightening values).

Clean sealing surfaces.

Fit cylinder head gasket in position.

Replace cylinder head bolts.

Firmly tighten cylinder head bolts with special tool 11 2 110 or 00 9 120 in the sequence 1 ... 14.

For tightening torque, refer to Technical Data 11 12 2AZ.



## 11 31 110 REPLACING TOOTHED DRIVE BELT

### Important!

Always replace an used toothed drive belt with a new belt each time the tensioning roller is loosened, regardless of the number of kilometers or miles used.

Unscrew distributor cap (1) and distributor rotor (2).  
Remove cover (3).  
Unscrew bolts (4).

Set cylinder number 1 to TDC by turning the crankshaft (arrow on camshaft sprocket face mark on cylinder head).  
Remove vibration damper – see 11 23 010.

Pull off plugs (1) and (2) on engine harness plate.  
Pull off plug on oil pressure switch.

Lift out wire dust (underneath distributor) and place electric leads aside.

Take off rubber guard (1).  
Unscrew nut (2) and take off cover (3).

Unscrew clamp (1).  
Unscrew screw (2) and take off cover (3).

Loosen bolts (1 and 2).  
Press in tensioning roller.  
Tighten bolt (2).  
Take off toothed drive belt.



## 11-31/2.2



### Installation:

Install toothed drive belt, starting on the crankshaft sprocket and continuing in opposite direction of engine's rotating direction.

### Toothed Drive Belt Layout:

- 1 Camshaft sprocket
- 2 Tensioning roller
- 3 Crankshaft sprocket
- 4 Intermediate shaft sprocket
- 5 Toothed drive belt

### Tightening Toothed Drive Belt:

- Loosen bolt (2) (it should be possible to move the tensioning roller with spring force).
- Crank engine once in running direction up to the TDC mark (toothed drive belt tightens itself).
- Check timing (mark on camshaft sprocket must be precisely aligned with mark on cylinder head when crankshaft is in TDC position).
- Mount tensioning tool (tighten bolt 2 first and then bolt 1).

Install label with date and mileage on cylinder head cover after finishing work.



## 11-40/2.1



### 11 40 000 CHECKING ENGINE OIL PRESSURE

Remove splash guard.  
Pull off plug on oil pressure switch (underneath right engine carrier) and remove oil pressure switch.

Apply Special Tool 11 4 000 with a seal and connect on BMW Service Tester.

Check oil pressure.

At idle speed: 0.5 to 2 bar (7 to 29 psi)

Max. pressure: 4 to 6 bar (57 to 85 psi)

Installation:

Tightening torque for oil pressure switch = 25 Nm (25 ft. lbs.).



32 11 1

## 11 78 ... CHECKING OXYGEN SENSOR

## A. Check Heating:

Disconnect plug for oxygen sensor.  
 Connect ohmmeter on jacks 3 and 4  
 (toward oxygen sensor) and measure  
 resistance (nominal value: < 5 ohms).

1 = Plug for sensor voltage -

2 = Plug for sensor voltage +

3 = Jack for sensor heating

4 = Jack for sensor heating

## B. Check Signal Voltage:

Perform "Oxygen Sensor Voltage"

status call in scope of DME self-diagnosis.

Value is measured at idle speed with

connected oxygen sensor and switched

on oxygen sensor control (about 1 to 3

minutes after starting the engine) and

should be between 0.92 and 0.95 V.

If a constant voltage of 0.45 V is measur-

ed, the oxygen sensor is not working

(oxygen sensor or power supply lead

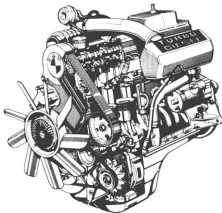
faulty).

# 11 Engine M21

	Notes .....	11- 00/1.1
11 00 038	Compression – check .....	11- 00/1.2
050	Engine – remove and install .....	11- 00/1.3
11 11 160	Bearing for oil pump drive shaft – replace .....	11- 11/1.1
11 12 000	Cylinder head cover – remove and install .....	11- 12/1.1
100	Cylinder head – remove and install .....	11- 12/1.1
11 13 000	Oil pan – remove and install .....	11- 13/1.1
11 65 015	Exhaust turbocharger – check bearing play .....	11- 65/1.1
018	Exhaust turbocharger – check boost pressure .....	11- 65/1.1
020	Exhaust turbocharger – remove and install .....	11- 65/1.2
059	Control valve – check and adjust .....	11- 65/1.3
060	Control valve – remove and install .....	11- 65/1.3
...	Boost pressure sensor – check .....	11- 65/1.4
11 66 000	Vacuum pump – remove and install/check .....	11- 66/1.1

For further jobs refer to "Assembly Repair Manual".

- M 21
  - D
  - 24
  - W
  - A
- Small 6 cylinder
  - Diesel
  - Displacement x 100
  - Seal chamber
  - Supercharging



M21 11 191

**WORKING INSTRUCTIONS**

**in Reference to Cleanliness on Fuel System**

- Clean area around repair point thoroughly (for example, before loosening pipes, hoses, switches, etc.).
- Place removed parts on clean surfaces only and cover with plastic sheet (never use cloths losing lint!).
- Cover or install plugs in open ends of pipes/hoses or openings in components.
- Only install cleaned parts.  
Take new parts out of their packaging only immediately before installation.
- Keep diesel fuel off of coolant hoses - rinse off with water immediately, if necessary.

## 11 00 039 Checking compression

**Measuring conditions:**  
 Battery in perfect working order, check acid density if necessary.  
 Max. constant temperature 35° C.



**Note:**  
 Special tool 11 0 160 can be re-used.



Open cover of 8-box.  
 Disconnect main relay (1) and plug connector (2) from glow plug timer.

Remove glow plugs with special tool 12 2 100.



**Installation note:**  
 Thoroughly coat thread of glow plugs with copper paste "CPG", see BMW Parts Service.  
 For tightening torque refer to Technical Data 12 23 1A2-2A2

Fully screw in special tool 11 0 222 and tightly tighten by hand.  
 Compression tester: Fit special tool 11 0 221, operate starter until pressure no longer increases.  
 For compression pressure, refer to Technical Data.  
 All cylinders approx. same value.







## 11 00 050 REMOVING AND INSTALLING ENGINE

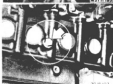
Disconnect battery.  
Remove transmission — see Cr. 23 or 24.  
Unscrew power steering pump (hoses remain connected).

Installation:  
Check drive belt tightness with Special Tool 11 5 026.



Cars with Air Conditioner:  
Unscrew compressor (refrigerant hoses remain connected).

Installation:  
Check drive belt tightness with Special Tool 11 5 026.



Unscrew plug and drain coolant.  
Remove radiator — see 17 11 000.



Pull off plug (1).  
Unscrew nuts (2) on left and right sides.  
Disconnect hoses (3 ... 5) and remove coolant expansion tank.



Disconnect heater hoses.  
Cars with Automatic Transmission:  
Disconnect oil pipes on engine.



Loosen hose clamps (1 and 2) and pull off hoses.  
Unscrew nut and remove air cleaner.



Loosen clamp and pull hose (1) off of cylinder head cover.  
Pull off vacuum hose (2).



Unscrew bolt (1) and take off oil pipes (plug open pipes and openings in crankcase).  
Unscrew nuts (2), take off filter housing off of body and suspend from engine on a piece of wire.  
Installation:  
Check O-rings, replacing if necessary.  
Tightening torque for bolt (1) = 22 Nm (16 ft. lbs.).



Disconnect fuel pipes (1 and 2).  
 Unscrew nut (3) and take off electric lead.  
 Pull off vacuum hose (4).  
**Installation:**  
 Check seals, replacing if necessary.  
 Bleed fuel system – see 13 61 329.



Pull off plug (1) on charge air temperature sensor.  
 Loosen clamp (2).



Disconnect connecting leads on starter and alternator.



Cut through connecting lead for oil pressure switch.  
**Installation:**  
 Solder ends of lead together or install a plug connector.



Disconnect plug (1) for injection pump.  
 Cars with Automatic Transmission:  
 First unscrew holder (2).



Disconnect plugs (1 ... 3).  
 If applicable, separate rear connection for oil level switch.



Loosen clamp (1).  
 Pull off plug (2 and 3) on temperature sensor.  
 Disconnect all electric leads on glow plugs.  
 Cut off wire straps and take wire harness off of engine.



Unscrew ground strap (6) and both engine mounts.  
**Installation:**  
 Insert guide (1) into bore in axle carrier.  
 Tightening torque for engine mounts =  
 45 Nm (32.5 ft. lbs.).

**11-00/1.5**



Attach Special Tool 11 0 020 on engine and lift out engine.

## 11-11/1.1

### 11 11 160 REPLACING BEARING FOR OIL PUMP DRIVE SHAFT

Remove oil pump — see 11 41 000.  
Remove injection pump — see 13 51 000.  
Unscrew console.

Lift out seal (1).  
Remove gear wheel (2).  
*Installation:*  
Open end of gear wheel shaft faces down.  
Check bearing in cover (1) and seal (3),  
replacing if necessary.

Drive out needle bearing from bottom to  
top with Special Tool 11 1 310.

*Installation:*  
Lubricate needle bearing with grease.  
Drive in needle bearing against stop with  
Special Tool 11 1 300.





**11 12 000 REMOVING AND INSTALLING CYLINDER HEAD COVER**

Disconnect hoses (1 ... 3).



Loosen screws of cover.  
**Installation:**  
 Tighten cylinder head cover first and then protective cover.

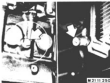


Unscrew oil trap (7).  
 Unscrew screws in sleeves and take off cylinder head cover.

**Installation:**  
 Install screws in sleeves with wash.  
 Check seal on oil trap, replacing if necessary.  
 Tightening torque = 15 Nm (11 ft. lbs.).



**Installation:**  
 Check cylinder head cover gasket (8) and rubber ring (9), replacing if necessary.  
 Insert rubber ring (9) in cover and lubricate with oil.



**11 12 100 REMOVING AND INSTALLING CYLINDER HEAD**

Disconnect battery.  
 Drain engine oil.  
 Drain coolant at engine block and radiator.  
**Installation:**  
 Fill and bleed cooling system – see G, 17.



Pull off plug (1).  
 Unscrew nuts (2) on left and right sides.  
 Disconnect hoses (3 ... 5) and remove coolant expansion tank.



Loosen clamp and pull off vacuum hose.  
 Remove turbocharger – see 11 85 000.



Remove fan – see 11 52 000.  
 Disconnect coolant hoses on thermostat housing.



Loosen hose clamp and pull off coolant hose (1).  
Pull off leak hose (2) and disconnect on injection pipe.



Pull off vacuum hose (1) and plug (2).  
Loosen clamp (3).  
Unscrew support (4) on manifold and loosen on engine block.



Loosen hose clamps and pull off hoses.



Pull off plugs (1 and 2) on temperature sensor.  
Unscrew holders (3 and 4) on cylinder head.  
Disconnect all electric leads on glow plug.



Unscrew oil trap (13).  
Pull off hose (14).  
Installation:  
Check seal, replacing if necessary.



Unscrew injection pipes on injection nozzles and injection pump with Special Tool 13 5 020.  
Install protective caps.  
Remove cylinder head cover - see 11 12 000.  
Installation:  
Tightening torque = 20 to 25 Nm (15 to 18 ft. lbs.).  
Bleed fuel system - see 13 51 220.



Turn cylinder number 1 to TDC - cylinder number 6 overlaps.



Hold crankshaft with Special Tool 11 2 300.  
Caution!  
Remove special tool before operating engine.

## 11-12/1.3



Disconnect hose (3) and unscrew protective cover.

**Installation:**

First tighten cylinder head cover screws and then the protective cover screws.



Loosen screws (1) and (2) and nut (3). Loosen toothed belt and take it off of the camshaft sprocket.

**Installation:**

Install and tighten toothed belt - refer to 11 21 100 in Construction Group Repair Manual.



Unscrew bolts in sequence of 14 to 1 and remove cylinder head.

**Installation:**

Keep oil out of holes (danger of cracking head, falsified torque values).

Clean cylinder head bolts.

Give threads and head bearing surfaces of bolts a light coat of oil.

Replace cylinder head gasket.

Measure piston protrusion - refer to 11 12 101.



Tighten bolts in sequence of 1 to 14 in three steps.

Adjust valve clearance - refer to 11 34 004.

Check static adjustment of injection pump - refer to 12 01 005.

In the third step (cylinder head cover removed again after engine ran warm) tighten the cylinder head bolts regardless of the engine temperature using Special Tool 11 2 110.

\* Refer to Specifications

## 11-13/1.1



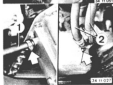
### 11 13 000 REMOVING AND INSTALLING OIL PAN

Remove splash guard.  
Unscrew reinforcement plate.



Unscrew bolt and pull out guide tube for oil dipstick from above.  
Loosen clamp and pull off venting hose.

*Installation:*  
Replace O-ring on guide tube.



Drain engine oil — see 00 11 209.  
Disconnect hose (1).  
Cars with Automatic Transmission:  
Also unscrew oil pipes (2) on oil pan.  
Unscrew oil pan.



Unscrew oil pump and remove oil pan.  
*Installation:*  
Install oil pump drive shaft — see 11 41 000.  
Replace gasket.



*Installation:*  
Clean sealing surfaces.  
Apply a coat of brush-on universal sealing compound\*\* on joints between timing case cover and end cover.

\*\* Source of Supply: HVB





### 11 65 015 CHECKING BEARING PLAY OF TURBOCHARGER

Excessive bearing play could be the cause for excessive oil in the turbocharger (which will be noticed by blue smoke) or noise.  
 Nominal axial play: max. 0.15 mm (0.006").  
 Apply dial gage on turbocharger shaft and move shaft from stop to stop without turning.  
 Turn turbocharger shaft and repeat step.



Nominal radial play: max. 0.8 mm (0.031").  
 Mount dial gage on turbocharger shaft.  
 Move turbocharger shaft simultaneously on both sides from stop to stop and turn.

### 11 65 018 CHECKING CHARGE PRESSURE OF TURBOCHARGER

Checking on Dynamometer:  
 Check with help of DDE self-diagnosis (all status lights).

Run car in load range.  
 Read charge pressure (absolute value including atmospheric pressure) from charge pressure sensor display.  
 Nominal value: max. 1950 + 50 mbar.



Checking in Road Test:  
 Connect pressure tester 13 5 000 between intake manifold and charge pressure sensor, and place in passenger compartment.  
 Be careful that hose is not clamped.  
 Operate car in load range (braking) to check the charge pressure.

Nominal Value:  
 Measured charge pressure + atmospheric pressure (see 11 65 . . . ) = max. 1950 + 50 mbar.

- Possible Faults for Incorrect Charge Pressure:
- Bypass regulator (see 11 65 056).
  - Charge pressure sensor (see 11 65 . . . ).
  - Hose connections (check for leaks with spray).
  - Turbocharger (shaft hard to turn, bypass).



### 11 65 020 REMOVING AND INSTALLING TURBOCHARGER

The turbocharger receives oil from the engine oil circuit. Conform with the following points to guarantee sufficient lubrication for the fast running turbocharger.

- Engine oil circuit in perfect condition (specified engine oil, oil level, crankcase breather, etc.).
- Never race engine before the engine oil pressure has been built up (control lamp). Also never stop engine while running at fast speed (turbocharger runs on).
- Never start engine immediately after replacing oil, build up oil pressure first by cranking engine with the starter (disconnect lead for fuel shutoff - see 11 00 030).
- Excessively old engine oil could produce carbon on turbocharger. Carbon will be seen on the turbocharger shafts after taking off the oil pipe. In this case the engine oil and oil filter have to be replaced.

#### Working On Turbocharger:

- Even minute particles of dirt could lead to destruction of the turbocharger, so that the engine must never be operated without the air cleaner.
- If the hose on the regulating valve is disconnected, this could lead to overcharging and destruction of the engine with the throttle wide open.

No repairs are approved on the turbocharger.



Loosen hose clamps (1 and 2) and pull off hoses.

Unscrew nut and remove air cleaner.

Unscrew nuts (1 and 2).

Disconnect oil pipe (3) and hose (4) on turbocharger.

Installation:

Replace self-locking nuts.

Coat studs with copper paste\*\*.

Tightening Torque:

Nuts (1 and 2) = 30 Nm (22 ft. lbs.) initial

and 50 Nm (36 ft. lbs.) final torque.

Oil pipe (3) = 22 Nm (16 ft. lbs.).

Unscrew oil pipes.

Installation:

Check O-ring, replacing if necessary.

Tightening Torque:

Bolt (1) = 22 Nm (16 ft. lbs.).

Pipe (2) = 40 Nm (29 ft. lbs.).

Tighten holder (3) last.

Unscrew bolts and remove turbocharger.

Installation:

Check levelness of sealing surface!

Tightening torque = 25 Nm (18 ft. lbs.).

\*\* Source of Supply: HVB

## 11 65 059 CHECKING AND ADJUSTING CONTROL VALVE

The control valve governs the charge pressure.  
A control valve opening too early will be noticed on a drop in engine power and an excessively rich mixture (soot in exhaust).  
A bypass valve opening too late will result in excessive charge pressure.

Pull off hose (1) and connect Special Tool 11 7 010.  
The control valve begins to open at a pressure of 1120 + 20 bar (15930 + 427 psi) — the regulating rod of a closed control valve must bear without tension on pin (2).

Unscrew nut (2).  
Take circlip off of pin (3).  
Adjust opening begin of control valve as described above.

**Note:**  
One turn of the rod is equal to 0.55 bar (8.7 psi) pressure.

**Installation:**  
Lock nut (2) with marking paint\*\*.

The regulating rod of a turbocharger installed standard is locked and therefore cannot be turned.  
These control valves with lock regulating rods must be replaced when the begin of opening is not correct — see 11 65 060.

## 11 65 060 REMOVING AND INSTALLING CONTROL VALVE

Remove circlip (1) and disconnect rod.  
Pull off hose (2).  
Unscrew bolts (3).

**Installation:**  
Replace bolts (3).  
Adjust control valve — see 11 65 059.



\*\* Source of Supply: HWB  
HWB No. 81 22 9 407 404

**11 65 ... CHECKING CHARGE PRES-  
SURE SENSOR**

The charge pressure sensor is tested with DDE self-diagnosis by calling the status list.

With the engine stopped the charge pressure sensor should indicate the actual atmospheric pressure.

The following table only contains reference values. These values must be allowed a tolerance of ± 10 mbar due to fluctuations in the weather.

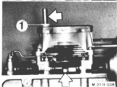
Height Above Sea Level In meters	Atmospheric Pressure In mbar
0	1000
500	950
1000	900
1500	850
2000	800

## 11-66/1.1



### 11 66 000 REMOVING AND INSTALLING/ CHECKING VACUUM PUMP

Remove cylinder head cover — see 11 12 000.  
Turn cam for vacuum pump down.  
Unscrew nuts and take off vacuum pump.



#### Installation:

Mount vacuum pump that pipe adapter is at rear and cam runs in opening of plunger.  
Insert seal (1).

#### Caution:

Never run engine without the vacuum pump  
— loose cam ring.



#### Checking Vacuum Pump Pressure and

#### Drift:

Connect BMW SERVICE TESTER on the  
drift and measure vacuum with the engine  
running.

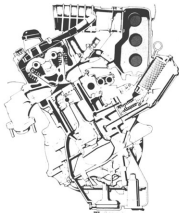
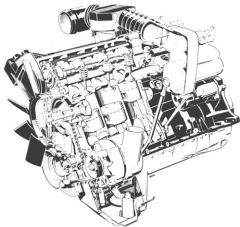
Vacuum: at least 530 mbar.

# 11 Engine M30

	Engine views (cross sectional view) .....	11- 00/3.1
11 00 038	Compression of all cylinders – check .....	11- 00/3.2
050	Engine – remove and install .....	11- 00/3.2
11 12 000	Cylinder head cover – remove and install .....	11- 12/3.1
100	Cylinder head – remove and install .....	11- 12/3.1
11 13 000	Oil pan – remove and install .....	11- 13/3.1
11 78 012	Oxygen sensor – replace .....	11- 78/3.1
...	Oxygen sensor – check .....	11- 78/3.2

For further jobs refer to "Assembly Repair Manual".

- M 30
  - B
  - 35
  - M
- Large 6 cylinder
  - Gasoline
  - Displacement x 100
  - Motronic



## 11-00/3.2



### 11 55 039 CHECKING COMPRESSION OF ALL CYLINDERS

Pull off relays (1 and 2).

**Note:**  
Do not pull off master relay (2) in cars with EML (electric throttle valve drive).



Loosen hose clamp and unscrew nut. Remove air cleaner.

**Note:**  
Also disconnect terminal 1 on the ignition coil in cars with EML.

Unscrew all spark plugs. Press down on the accelerator pedal and operate the starter motor so long, until the pressure starts rising. Specifications: 10 to 11 bar (142 to 156 psi), max. deviation between cylinders = 0.5 bar (7 psi).

**Installation:**  
Tightening torque for spark plugs = 25 Nm (18 ft. lbs.).

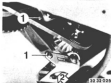


### 11 55 050 REMOVING AND INSTALLING ENGINE

Disconnect battery – see Group 55. Remove transmission – see Group 23 or 24. Unscrew splash guard. Remove radiator – see 17 11 600. Unscrew bolt and drain coolant.

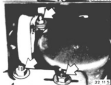


Unscrew nuts and take transmission oil pipes off of the oil pan.



Loosen bolts (1) and nuts (2). Turn the tensioning pinion and take off drive belt. Unscrew bolts and take off power steering pump. Hoses remain connected.

**Installation:**  
Tighten drive belt and check tightness with Special Tool 11 5 620.



**Cars with Air Conditioner:**  
Unscrew compressor. Refrigerant hoses remain connected.

**Installation:**  
Tighten drive belt and check tightness with Special Tool 11 5 620.



## 11-00/3.3



Pull off plug (1) and unscrew nuts (2) on left and right sides.  
Disconnect overflow hose (3), compensation hose (4) and coolant hose (5).



Disconnect coolant hose on heater valve (1) and heater (2).



Pull off plug (1) on ignition coil.  
Loosen clamp (1), unscrew nut (3) and remove air cleaner.



Loosen clamps (1) and pull off hoses.  
Pull off plug (2).  
Loosen nut (3) and pull idle speed control valve out of intake air hose.



Pull off clamps (1 ... 3).  
Remove air flow sensor, pulling vacuum hose off of crankcase breather at same time.

Note:

Picture shows a removed part, since part is covered in installed state.



Disconnect throttle cable (1) and cruise control cable (2) on throttle valve.  
Unscrew bolts (3).

Adjustments:

Adjust throttle cable - see Group 35.

Adjust cruise control cable - see Gr. 65.



Disconnect plugs (1 and 2).  
Disconnect connecting leads on starter.

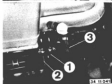


Disconnect oil level switch plug (1).  
Disconnect connecting leads on alternator.

## 11-00/3.4



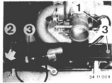
Pull off plug (1) on tank venting valve and hose (2) on carbon canister.  
Loosen clamp (3) and pull coolant hose off of alternator.



Loosen hose clamps and pull off fuel hoses (1 and 2).  
Lift vacuum hose (3) out of brake booster.  
Installation:  
Don't mix up hoses.  
1 = Feed  
2 = Return



Pull off all plugs on temperature sensors and electric lead plate.



Pull off plug (1) on throttle valve switch and plug (2) on air pressure switch.  
Lift out caps (3) and take off electric lead plate.

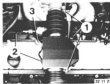


Unscrew ground strap (1).  
Unscrew nut (2) for engine mounts on left and right sides.  
Installation:  
Tightening torque for engine mounts = 45 Nm (32.5 ft. lbs.).



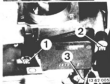
Attach Special Tool 11 0 020 and lift out engine.  
Note:  
Use Special Tool 11 0 009 additionally on the front end.

## 11-12/3.1



### 11 12 000 REMOVING AND INSTALLING CYLINDER HEAD COVER

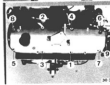
Loosen clamps (1).  
Pull off plug (2).  
Loosen nut (3) and pull idle control valve out of intake air hose.



Pull off clamps (1 ... 2).  
Remove air flow sensor, pulling vacuum hose off of crankcase breather at same time.  
*Note:*  
Picture was taken on removed part, since part cannot be seen when installed.



Pull off ignition leads on ignition coil and spark plug.  
Unscrew nuts and place ignition wire harness aside.



Unscrew nuts and bolt, and take off cylinder head cover.  
*Installation:*  
Check gasket, replacing if necessary.  
Check for correct seating of gasket.  
Tighten nuts and bolt in order of 1 through 9, mounting the idle speed control valve with nut (2).  
Tightening torque = 10 Nm (7 ft. lbs.).



### 11 12 100 REMOVING AND INSTALLING CYLINDER HEAD

Disconnect battery – see Group 00.  
Remove splash guard.  
Drain engine oil.  
Drain coolant at radiator and engine.  
*Installation:*  
Fill and bleed cooling system – see Group 17.



Unscrew exhaust pipes on exhaust manifolds and pipe clamps on transmission.  
*Installation:*  
Coat top of flanges with copper paste "ORC"™.  
Torque nuts (1) uniformly to 10 Nm (7 ft. lbs.) to flatten springs (2) and then loosen nuts one and one half turns.  
Tighten pipe with compensator (corrugated pipe section) last.



Remove fan – see 11 52 000.  
Remove expansion rivets on fan cowl at top left and right.  
*Installation:*  
Check for correct seating of top and bottom guides.



Loosen hose clamp, unscrew nut and remove air cleaner.

## 11-12/3.2



Loosen clamps (1) and pull off hoses.  
Pull off plug (2).  
Loosen nut (3) and pull idle speed control valve out of intake air hose.



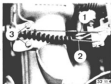
Pull off clamps (1 ... 3).  
Remove air flow sensor, pulling vacuum hose off of crankcase breather at same time.  
*Note:*  
Picture was taken on removed part, since it cannot be seen when installed.



Pull off plug (1) and unscrew nuts (2) on left and right sides.  
Disconnect overflow hose (3), compensating hose (4) and coolant hose (5).



Disconnect coolant hose on heating valve (1) and heater (2).



Disconnect throttle cable (1) and cruise control cable (2) on throttle valve.  
Unscrew bolts (3).

*Installation:*  
Adjust throttle cable – see Gr. 35.  
Adjust cruise control cable – see Gr. 65.



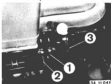
Pull off plug (1 ... 4).  
Loosen clamps (5 and 6) and pull off coolant hoses.



Disconnect plugs (1 and 2).  
Disconnect lead (3) on starter.



Pull off plug (1) and hose (2) on tank venting valve.

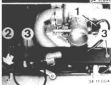


Loosen hose clamps and pull off fuel hoses (1 and 2).

1 = Fuel

2 = Return

3 = Return



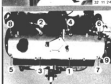
Pull off plug (1) on throttle valve switch and plug (2) on oil pressure switch.

Lift out caps (3) and unscrew electric lead plate.



Pull off ignition leads on ignition coil and spark plug.

Unscrew nuts and place ignition leads aside.



Unscrew cylinder head cover.

Installation:

Check gasket, replacing if necessary.

Check for correct seating of gasket.

Tighten bolts in order of 1 through 9,

mounting the idle speed control with bolt (2).

Tightening torque = 10 Nm (7 ft. lbs.).



Set cylinder number 1 to TDC.

Remove upper timing case cover — see 11 14 100.

Remove piston for chain tensioner — see 11 31 090.

Unscrew sprocket.



Installation:

Mount timing chain that dowel pin (1) is at bottom left when tapered bore is perpendicular to the engine.

Tightening torque = 30 Nm (22 ft. lbs.).



Disconnect hose.



Unscrew support.

## 11-12/3.4



30 13

Unscrew cylinder head bolts in order of 14 through 1 (see next picture).  
Insert Special Tools 11 1 063 as shown in picture to prevent displacement or turning of rocker arm shafts.  
Lift off cylinder head.



30 14

**Important:**  
Replace cylinder head gasket – see 11 12 101.

Mount cylinder head and tighten bolts (washed and lubricated with oil) in order of 1 through 14 in three steps.

Step 1:

Tighten bolts 1 through 6 first, then remove Special Tools 11 1 063 and tighten bolts 7 through 14 afterwards.  
Tightening torque = 60 Nm (43 ft. lbs.).  
Wait 20 minutes.

Step 2:

Tightening torque = 80 Nm (58 ft. lbs.).  
Run engine warm 25 minutes.

Step 3:

Torque angle = 35°.

**Important!**

Keep oil out of cavities in engine block (danger of cracking block, falsified torque values).



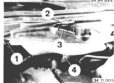
30 15

## 11-13/3.1



### 11 13 000 REMOVING AND INSTALLING OIL FAN

Remove fan — see 11 52 900.  
Lift expansion rivets out of fan cover on left and right sides and remove fan cover.  
*Installation:*  
Check for correct seating of guides.



Loosen hose clamp, unscrew nut and remove air cleaner.



Remove splash guard.  
Loosen nut (1).  
Unscrew both (2) and swing holder for power steering pump axle.



Unscrew nut and take off oil pipes with holder.



Drain engine oil.  
Disconnect plug for oil level switch.



Unscrew exhaust pipe holder.



Unscrew ground strap (1).  
Unscrew nut (2) for engine mount on left and right sides.  
*Installation:*  
Tightening torque for engine mounts = 40 Nm (29.5 ft. lbs.).

## 11-13/3.2



Apply Special Tool 00 0 200.  
Attach chain and chocks of Special Tool  
11 0 020 on engine and lift engine.



Unscrew oil pan bolts and take off oil pan.



Installation:  
Clean sealing surfaces.  
Replace oil pan gasket.  
Coat joints on timing case cover and ...



... and cover with brush-on universal sealing  
compound (Three Bond 1203\*\*).  
Tightening torque = 10 Nm (7 ft. lbs.).

\*\* Source of Supply: Hilti





## 11 78 012 REPLACING OXYGEN SENSOR

Disconnect plug for oxygen sensor.



Unscrew nuts and take off electric lead holder.



Cars with Automatic Transmission:  
Unscrew nuts and lift out holder (1).

Installation:

Tightening torque = 22 Nm (16 ft. lbs.).



Support exhaust assembly with Special Tool 00 2 020.

Lift out rubber holders on left and right sides.

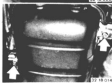


Loosen nuts on connections between exhaust pipes and exhaust manifold several turns.



Installation:

Torque nuts (1) uniformly to 16 Nm (12 ft. lbs.) to flatten spring (2) and then loosen nuts again by one and one half turns. Tighten pipe with compensator last.



Unscrew nut on holder for final muffler. Lower exhaust assembly slowly far enough that the oxygen sensor is accessible.



All Models:

Unscrew oxygen sensor (1).

Installation:

Coat threads with Anti-Seize\*\*.

Torque oxygen sensor to 55 Nm (40 ft. lbs.).

Note:

- Never clean oxygen sensors and never let them have contact with lubricants.
- Cover oxygen sensor when undercoating car.

\*\* Source of Supply: HFB

## 11-78/3.2



### 11 78 ... CHECKING OXYGEN SENSOR

#### A. Checking Heating:

Disconnect plug for oxygen sensor.

Connect ohmmeter on jacks 3 and 4 (toward oxygen sensor) and measure the resistance (nominal value < 5 ohms).

1 = Plug for sensor voltage -

2 = Plug for sensor voltage +

3 = Jack for sensor heating

4 = Jack for sensor heating



32 11 9 |

#### B. Checking Signal Voltage:

Perform the "Oxygen Sensor Voltage" status call within the scope of DME self-diagnosis. This value is measured at idle speed with the oxygen sensor connected and oxygen sensor control switched on (about 1 to 2 minutes after starting the engine) and should be between 0.02 and 0.85 V.

If a constant voltage of 0.45 V is measured, the oxygen sensor is not working (oxygen sensor or power supply lead faulty).

# 11 Engine S38

11 00 050	Engine – remove and install .....	11- 00/8.1
11 12 500	Cylinder head – remove and install .....	11- 12/8.1
11 34 004	Valve clearance – adjust .....	11- 34/8.1
11 53 000	Coolant thermostat – remove and install or replace .....	11- 53/8.1
11 62 140	Exhaust manifolds, both – remove and install/seal or replace .....	11- 62/8.1

For further jobs refer to "Assembly Repair Manual".

## 11 00 050 REMOVING AND INSTALLING ENGINE

### Note:

If jobs have to be performed on a removed engine, which make it necessary to unscrew the central vibration damper mounting bolt, it must be loosened prior to removal of the engine.

### Reason:

This bolt is torqued with about 800 Nm (578 ft. lbs.) and therefore too difficult to loosen on a removed engine.

Tighten the central bolt after installation of the engine to these procedures (loosening is in reverse order).

Crank the engine until the TDC mark faces down perpendicularly.

### Unscrew pulley.

Apply Special Tool 11 2 240 that the lever arm faces down perpendicularly. Mount special tool with all of the bolts. Bolt size: 8 x 20 mm.

### Note:

The hole pattern in the flange is asymmetric. All bolts can only be screwed in in this position.

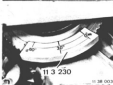
Have Special Tool 11 2 240 bear on the right-hand side of the engine carrier. Apply Special Tool 11 3 230.



Tighten central bolt with a torque wrench and wrench socket.

### Procedures:

- Step 1 = 80 Nm (43 ft. lbs.) torque
- Step 2 = 90° torque angle
- Step 3 = 80° torque angle again
- Step 4 = 30° torque angle again





**REMOVING AND INSTALLING ENGINE**

Disconnect battery ground lead.

**Removing Transmission**

See Group 33.

**Note:**  
Always use Special Tool 23 1 330 for removal of the transmission.

**Removing Engine Hood**

See Group 41.

**Note:**  
Supply lines of windshield spray jets do not have connection points, so that the windshield washing hose and wire harness for spray jet heating have to be removed prior to removal of the engine hood.

**Removing Radiator with Engine Oil Cooler and Fan Cool**

See Group 17.

Drain remaining coolant on engine block.



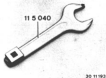
**Removing Fan**

Counterhold on pulley with Special Tool 11 5 030 and unscrew coupling nut (1).

**Important!**  
Left-hand threads = turn clockwise to unscrew.

**Installation:**  
Tightening torque\*.

Tighten fan with Special Tool 11 5 040, 40 Nm (29 ft. lbs.) tightening torque is equal to 30 Nm (22 ft. lbs.) setting on a torque wrench.



**Removing Air Guide for Alternator**

Unscrew air guide.  
Loosen hose clamps.  
Take off air guide together with connectors.



**Removing Power Steering Pump**

Loosen bolts (1) and nut (2).  
Turn tensioning pinion and take off drive belt.  
Unscrew bolts and take off power steering pump.  
Hoses remain connected.

\* See Specifications



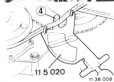


11 5 020

11 38 000



11 38 000



11 5 020

11 38 000



11 38 000

**Installation:**

Tighten drive belt.  
Tighten toothed element with torque of 8 to 8.5 Nm (5.8 to 6.1 ft. lbs.) and lock.  
Check drive belt tightness with Special Tool 11 5 020, correcting if necessary.  
Hook (4) bears on tip of a tooth.

**Important!**

Remove the tester to tighten the belt and apply it again only after tightening has been completed.

**Removing A/C Compressor**

Loosen air pump bolts.  
Turn tensioning pinion and take off drive belt.

**Installation:**

Tighten drive belt.  
Tighten toothed element with torque of 8 to 8.5 Nm (5.8 to 6.1 ft. lbs.) and lock.  
Check drive belt tightness with Special Tool 11 5 020, correcting if necessary.  
Hook (4) bears on tip of a tooth.

**Important!**

Remove the tester to tighten the belt and apply it again only after tightening has been completed.

Unscrew compressor.  
Refrigerant hoses remain connected.



11 38 000



11 38 000



11 38 000



11 38 000

**Unsecuring Engine Mounts**

Unsecure left and right engine mounts.  
Unsecure ground strap on engine carrier.

**Removing Air Cleaner and Air Flow Sensor**

Take off cover for headlights.  
Pull off plugs.  
Loosen nuts.  
Loosen hose clamps.  
Lift out air cleaner with air flow sensor.

Pull off intake air temperature sensor plug.

**Disconnecting Throttle Cable and Cruise Control Cable**

Unscrew holder.  
Unclip cables on throttle valve lever.

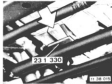


**Disconnecting Coolant Hoses**

Disconnect hoses and plug on expansion tank.  
Remove expansion tank.



Disconnect coolant hoses on heater and heater valve.



**Note:**  
Tilt engine forward as far as possible by inserting a wooden wedge in addition to Special Tool 23 1 330.



**Disconnecting Vacuum Hose for Brake Booster**

Pull connector out of the brake booster.



**Disconnecting Air Pump Supply Hose**

Loosen hose clamps.  
Disconnect supply hose on air cleaner.



**Disconnecting Fuel Pipes and Hoses**

Disconnect feed and return pipes.

- 1 = Feed
- 2 = Return



**Arrangement of Fuel Pipes on Tank Pipes**

- 1 = Feed
- 2 = Return



Disconnect tank venting hose on valve.

## 11-00/8.5



Disconnecting Engine Wire Harness in Car

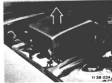
Lift out covers.  
Unscrew starter lead on connection point.



Lift out cover.



Remove covers.



Unscrew cover on electronic box.



Pull off ignition leads on ignition coil.  
Lift off cap.



Unscrew leads (1 and 15) on ignition coil.  
Unscrew electric lead on ground connection point.



Unscrew holder.  
Remove all electric lead straps.



Pull off plug on control unit.  
Disconnect plugs (1 and 2).



## 11-00/8.6



Unscrew electric lead on positive (+) connection point.  
Lift out relays (1 ... 3) with sockets.  
Disconnect plugs (4 and 5).  
Pull off plug on temperature sensor (6).



Unscrew relay holder.



Lift out control unit located underneath.  
Pull off plug.



Unscrew holder for rubber grommets.

Installation:  
Insert remaining pin in provided bore.



Pull out wire harness with rubber grommet.

Note:  
Suspend the wire harness remaining in the car on the engine compartment wall with a piece of wire.



Unscrew diagnosis socket.  
Disconnect engine wire harness plug (bayonet connection).



Unscrew holder.



Loosen electric lead straps.  
Pull out wire harness.

## 11-00/8.7



Attach Special Tool 11 0 020 on engine.  
Lift out engine.



**Important!**  
Guide the rear chain between the  
intake neck and check valves.

**Installation:**  
Check power steering hose routing.



**Installation:**  
Check air conditioner hose routing.

## 11-12/8.1

### 11 12 500 REMOVING AND INSTALLING CYLINDER HEAD

The engine has to be removed to carry out repairs correctly.

Remove engine – see 11 60 050.

Remove and disassemble cylinder head – see Group 11 in the Construction Group Repair Manual.

## 11-34/8.1



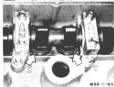
### 11 34 054 ADJUSTING VALVE CLEARANCE

Remove fan cover and fan - refer to 11 32 000.  
Remove cylinder head cover - refer to 11 12 000.

Crank engine using Special Tool 11 3 020.



Measure valve clearance with cams facing up.  
Compare measured valve clearance with specified valve clearance\*.



Measured Valve Clearance Outside of Specifications:  
Turn opening of tappet as shown.



Use Special Tool on MSB engines or Special Tool 11 3 170 on S38 engines, guide in appropriately to camshaft "A" or "B" and press down on the tappet.

A = Exhaust  
B = Intake



Note:  
Plastic cover and wiring holder must be removed for adjustment of intake valves in cyl. no. 6.



Cut off cable strap and remove holder.

\* Refer to Specifications

## 11-34/8.2



Press wire harness aside.



Blow out valve shim with air pressure.



MSB 11 108

Measure the removed valve shim.  
Install shim in correct thickness with the  
lettering facing down.

## 11-53/8.1



### 11 53 000 REMOVING AND INSTALLING OR REPLACING COOLANT THERMOSTAT

#### Note:

Procedures are shown on a removed engine in some cases for better understanding.

Drain coolant.



11 53 007

Disconnect coolant hoses on thermostat housing to the coolant pipe.



11 53 041

Unscrew bolts.  
Lift off thermostat housing.



11 53 042

Pull thermostat out of housing.

Installation:  
Replace rubber seal on coolant port.  
Check installed direction of thermostat.

11 53 043

## 11 62 140 REMOVING AND INSTALLING/ SEALING OR REPLACING BOTH EXHAUST MANIFOLDS

M 5 Models:

Note:  
Some of the procedures are shown on a removed engine for better understanding.

Remove exhaust assembly - see 18 00 020.

Drain some of the coolant.

Unscrew right engine mount and ground strap.

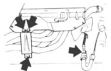
Unscrew air injector bolt.  
Unscrew holder for heat shield.



11 38 007



11 38 020



11 38 044



11 38 009



11 38 023



11 38 040

00 0 200



11 38 046

Remove fan cover.

Remove coolant expansion tank.

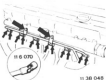
Remove filter housing for air pump.

Apply Special Tool 00 0 200.  
Lift engine out of the right engine mount as far as possible.



11 38 047

Unscrew and remove heat shield.



11 38 048

Unscrew air injection pipe.

Note:  
Use Special Tool 11 6 070.



11 38 049

Important!  
Unscrew mounting tab on exhaust manifold at cylinder no. 1.



11 38 050

Installation:  
Replace gaskets.



11 38 051

Unscrew coolant pipe.



11 38 052

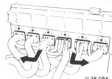
Installation:  
Replace seals.



11 38 053

Unscrew both exhaust manifolds on cylinder head.

Note:  
Use Special Tool 11 6 070.

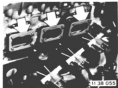


11 38 054

Lift both manifolds off of staybolts.  
Push back the rear exhaust manifold as far as possible.  
Pull out the front manifold forward.  
Remove the rear manifold.



## 11-62/8.3



### Installation:

Graphite surfaces of gaskets face the cylinder head.

Use new self-locking nuts.

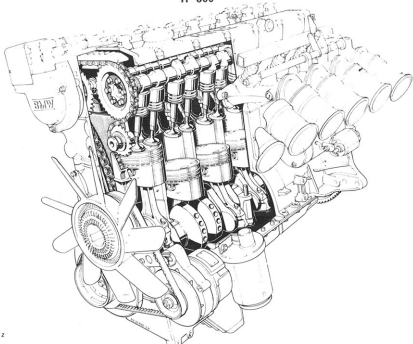
Tightening torque =  $10 \pm 3$  Nm  
( $7.5 \pm 0.5$  ft. lbs.).

# 11 Engine

## Engine BMW M6

11 00 039	Compression of all cylinders – check .....	11- 801
050	Engine – remove and install .....	11- 801
091	Engine – exchange .....	11- 804
11 12 000	Cylinder head cover – remove and install .....	11- 804
080	Timing case – remove and install .....	11- 805
100	Cylinder head – remove and install .....	11- 806
101	Cylinder head gasket – replace .....	11- 807
595	Valve guide – check for wear (valve removed) .....	11- 808
600	Valve guide – ream (valve removed) .....	11- 808
607	Valve seats and valves – machine (valves removed) .....	11- 808
719	Cylinder head sealing surface – grind (cylinder head disassembled) .....	11- 809
729	Cylinder head – check for cracks in water test (cyl. head disassembled) .....	11- 809
11 13 000	Oil pan – remove and install .....	11- 810
11 14 105	Radial oil seal in distributor case – replace .....	11- 812
110	Timing case cover, lower – remove and install/seal .....	11- 812
141	Radial oil seal in timing case cover – replace .....	11- 814
605	Radial oil seal in clutch end cover – replace .....	11- 814
11 21 000	Crankshaft – remove and install .....	11- 815
501	Crankshaft – replace (crankshaft removed) .....	11- 816
531	Crankshaft main bearing shells – replace (engine disassembled) .....	11- 816
571	Pilot bearing in crankshaft – replace .....	11- 817
11 22 000	Flywheel – remove and install .....	11- 818
541	Starter gear ring – replace .....	11- 818
11 23 000	Vibration damper and hub – remove and install .....	11- 819
010	Vibration damper – replace .....	11- 819
031	Vibration damper hub – replace .....	11- 819
11 24 521	Connecting rods – replace (pistons removed) .....	11- 820
571	Conrod bearing shells – replace (engine disassembled) .....	11- 820
11 25 000	Piston – remove and install (engine removed) .....	11- 821
651	Piston rings of one piston – replace .....	11- 822
11 31 000	Camshaft – remove and install .....	11- 823
051	Timing chain – replace .....	11- 826
...	Tensioning rail, upper – remove and install .....	11- 826
061	Timing chain sprocket set – replace (timing chain removed) .....	11- 827
060	Chain tensioner piston – remove and install .....	11- 828
11 34 004	Valve clearance – adjust .....	11- 829
509	Valves – check for leaks .....	11- 829
550	Valves – remove and install (cylinder head removed) .....	11- 830
11 40 000	Engine oil pressure – check .....	11- 831
11 41 000	Oil pump – remove and install .....	11- 831
151	Oil pump drive chain – replace .....	11- 832
11 42 021	Full flow oil filter – replace .....	11- 833
11 43 101	Oil dipstick guide tube – replace .....	11- 834
11 51 000	Water pump – remove and install .....	11- 834
11 52 000	Fan – remove and install .....	11- 835
020	Fan clutch – replace .....	11- 835
11 53 000	Coolant thermostat – remove and install .....	11- 835
180	Coolant pipe on cylinder head – detach and attach .....	11- 836
11 62 140	Exhaust manifold – remove and install .....	11- 836
11 76 010	Catalytic converter – remove and install .....	11- 837
11 78 510	Oxygen sensor – replace .....	11- 838

11-800



## 11 00 039 CHECKING COMPRESSION OF ALL CYLINDERS

Pull off master relay (1) in glow box.



Unscrew ignition lead tube.  
Pull off spark plug connectors.



Unscrew spark plugs with Special Tool 12 1 160.

Installation:  
Tightening torque\*\*\*.



Measure compression pressure\*.



\* See Specifications

\*\*\* See Specifications of Gr. 12

## 11 00 050 REMOVING AND INSTALLING ENGINE

Disconnect ground lead.  
Remove engine hood - see 41 61 000.  
Remove fan - see 11 02 000.



Unscrew plug and drain coolant.  
Remove radiator - see 17 11 000.  
Installation:  
Fill in coolant\*\*\*.



Unscrew power steering pump - hoses remain connected.

Installation:  
Tighten drive belt and check tightness with Special Tool 11 5 021.



Cars with Air Conditioning:  
Unscrew compressor - refrigerant hoses remain connected.  
Installation:  
Tighten drive belt and check tightness with Special Tool 11 5 021.



\*\*\* See Service Information of Gr. 00



Remove transmission - see 11 00 000.  
 Unscrew pulley/vibration damper - see 11 23 010.  
 Unscrew cross member and heat shield.



Pull off plug (1) and lift out filter.  
 Loosen hose clamp (2).  
 Unscrew nut (3) and remove air cleaner with air flow sensor.



Pull off belt.



Pull off hoses (4) and (5).  
 Disconnect cable (6).  
 Lift out hose (7).  
 Unscrew manifold.  
 Installation:  
 Check O-rings, replacing if necessary.



Pull off plug on control unit in glove box and guide leads into the engine compartment.  
 Pull off lead (4) and disconnect the ignition coil.  
 Disconnect the wire harness.



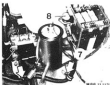
Disconnect fuel hose (5).  
 Pull off vacuum hose (6).



Disconnect plugs for reference mark and speed sender.  
 Installation:  
 Connect the grip plug with the plug, which is marked with a ring.



Disconnect hoses on expansion tank.



Pull off plug (7).  
Lift out diagnostic socket (B).  
Disconnect leads.



Disconnect heater hoses.



Unscrew fuel pipe.  
Unscrew oil pipes.  
Counterhold while loosening and  
tightening.  
Installation:  
Tightening torque\*.



Disconnect positive lead on starter and  
loosen the lead straps.

\* See Specifications



Attach Special Tool 11 0 020 on engine.



Unscrew ground lead.  
Unscrew engine mounts.  
Left – loosen at bottom  
unscrew at top  
Right – unscrew at bottom  
loosen at top  
Installation:  
Tightening torque\*.



Lift out engine.  
Installation:  
Adjust engine idle speed and check CO level  
– see 13 00 054.

\* See Specifications

## 11-804



### 11 00 051 EXCHANGING ENGINE

Remove engine - see 11 00 050

Exchange Engine Identification on Crankcase

1 = Type designation\*\*\*

2 = "A" for exchange or "N" for new part

3 = Manufacturing month

4 = Manufacturing year (1984)

Die stamp the engine number (5).

Drive in the supplied oil dipstick guide tube (see 11 42 101) and transfer parts from old engine to exchange engine.

Pour in engine oil\*\*\*

Adjust engine idle speed and check CO level

- see 12 00 054.



### 11 12 000 REMOVING CYLINDER HEAD COVER

Unscrew ignition lead tube (1)

Disconnect hose (2) and pull out spark plug connectors



Unscrew cylinder head cover

Installation

Check gaskets, replacing if necessary

Tightening torque\*\*

\*\*\* See Service Information of Gr. 00

\*\* See BMW Technik and Service Information of Gr. 11

\*\* See Specifications

### 11 12 980 REMOVING AND INSTALLING TIMING CASE

Unscrew timing case only when engine is cold  
(coolant temperature max. 35° C/95° F).  
Disconnect battery ground lead.  
Unscrew plug and drain coolant.  
Installation:  
Pour in coolant\*\*\*.

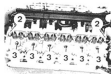
Unscrew timing case.



Modell 11 004

Disconnect radiator hose (1).  
Remove camshaft – see 11 31 000.

Installation:  
Replace O-rings (2) in oil bore.  
Check O-rings (3), replacing if necessary.  
Coat sealing surfaces with Silastic\*\*.  
Tighten bolts uniformly.  
Tightening torque\*.



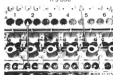
Modell 11 00

Pull out cam followers and place them on the  
tray, Special Tool 11 3 000.

Installation:  
Install cam followers in the same positions.

Measuring Cam Follower Clearance:  
Measure diameter of cam followers with a  
micrometer.

11 3 000



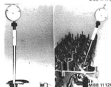
Modell 11 00

Unscrew pipe.  
Remove bolts.

Set internal calipers on the micrometer to zero  
with the measured cam follower diameter.  
Measure the cam follower bore diameter\*.  
Compare the measured cam follower clearance  
with the specified cam follower clearance.



Modell 11 00



Modell 11 000

\*\*\* See Service Information of Gr. 86

\* See Specifications.  
\*\* See Source (HBM).



Modell 11 004



Modell 11 004



Modell 11 000





### 11-12-100 REMOVING AND INSTALLING CYLINDER HEAD

The cylinder head is removed together with the isolated exhaust manifold.  
 Remove engine hood — see 41 81 000.  
 Disconnect battery ground lead.  
 Pull off plug (1) and lift out head.  
 Loosen hose clamp (2).  
 Unscrew nut (3) and take out air cleaner with air flow sensor.

Pull off hose.  
 Installation:  
 Replace hose.



Pull off hoses (4 and 5).  
 Disconnect accelerator cable (6).  
 Lift out hose (7).  
 Unscrew manifold.  
 Installation:  
 Check O-ring, replacing if necessary.



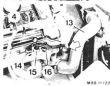
Unscrew plug and drain coolant.  
 Installation:  
 Pour in coolant\*\*\*.  
 Replace engine oil\*\*\*.



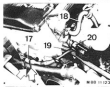
\*\*\* See Service Information of Gr. 00



Remove exhaust assembly — see 18 00 020.  
 Unscrew heat shields (9 ... 10).  
 Unscrew cross member (11) and stabilizer (12) on the engine carrier.



Disconnect radiator hose (13).  
 Pull off plugs (14 ... 16).  
 Pull off fan belt.  
 Disconnect wire harness.



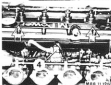
Loosen straps and disconnect plug (17).  
 Unscrew fuel pipe (18).  
 Disconnect hose (19).  
 Pull off plug (20).



Pull off plug on throttle bypass valve.  
 Disconnect hose (21) and unscrew throttle bypass valve (22).  
 Disconnect hose (23).  
 Unscrew holder.



Unscrew fuel pipe (1).  
Pull off hose (2).  
Disconnect hose (3).



Pull off plug (4) and take electric lead plate off of fuel injectors.  
Remove timing case - see 11 12 000.



Unscrew bolts.



Unscrew cylinder head bolts in order of 14 through 1 and lift off cylinder head.

Installation:

Check O-ring, replacing if necessary.

Coat pipe with Silastic\*\*.

Clean cavities in crankcase/cylinder head bolts

- and lubricate cylinder head bolts with oil.

Replace cylinder head gasket - see 11 12 101.

When mounting the cylinder head,

- pull out the timing chain from above,

- press in the tensioning rail and

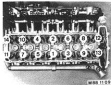
- place the timing chain on the missing sprocket.

Tighten bolts in order of 1 through 14.

Tightening torque\*.

Adjust engine idle speed and check CO level -

- see 13 00 054.



#### 11 12 101 REPLACING CYLINDER HEAD GASKET

Remove cylinder head - see 11 12 100.

Clean sealing surfaces on cylinder head and crankcase thoroughly - using a gasket remover\*\* and a hard wood scraper.

Check levelness with a standard steel ruler, grinding the cylinder head sealing surface if necessary - see 11 12 979.

Installation:

Only use original cylinder head gaskets, which have openings to match the cooling system.

Stamped Identification:



Type	Code	Bore Diameter
M6	3.5 M 88.3	83.4 mm (3.2871")

\* See Specifications.

\*\* Source: Hilti.

### 11 12 585 CHECKING VALVE GUIDE FOR WEAR

— Valve Removed —

To measure, install a new valve that the end of the valve stem is flush with the valve guide. Mount dial gage and measure the tilt play. Max. permissible tilt play<sup>1</sup>.



### 11 12 607 MACHINING VALVE SEATS AND VALVES

— Valve Removed —

The valve must be replaced, if ground to less than the minimum edge thickness A<sup>2</sup>.

After machining the valve seat angle<sup>3</sup>, produce valve seat diameter V<sup>4</sup> and valve seat width B<sup>5</sup> by machining the correction angle<sup>6</sup>. Grind in valves with grinding paste and check for leaks — see 11 34 509.



### 11 12 608 REAMING VALVE GUIDE

— Valve Removed —

The valve guide must be reamed out and a ream valve with oversize stem diameter S<sup>7</sup> installed, if there is excessive clearance between the valve guide and valve stem — see 11 12 595.

The valve seat must also be machined in conjunction with this operation — see 11 12 607.

Press guide pad (1) on the valve seat and ream out the valve guide from the combustion end — turning down the reamer once.



<sup>1</sup> See Specifications.

<sup>2</sup> See Specifications.

## 11-809

### 11 12 719 GRINDING CYLINDER HEAD SEALING SURFACE Cylinder Head Disassembled

The grinding of cylinder heads is not yet approved.  
The cylinder head can be cleaned by applying a surface plate.

Mod 11 027

### 11 12 729 CHECKING CYLINDER HEAD FOR CRACKS IN WATER TEST Cylinder Head Disassembled -

Bolt on Special Tool 11 1 011.  
Use bolts 11 1 012.

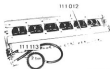


Mod 11 028

Bolt on Special Tools 11 1 012.  
Mount Special Tool 11 1 012.  
Supply air pressure to cylinder head - testing pressure = 2 bar (29 psi) - and check head for cracks in a water bath.

Note:

Relax the water bath with a detergent if necessary.



Mod 11 024



### 11 13 000 REMOVING AND INSTALLING OIL PAN

Disconnect ground lead.  
Pull off plug (1) and lift out leads.  
Loosen hose clamp (2).  
Unscrew nut (3) and remove air cleaner with air flow sensor.  
Unscrew fan cover.  
Drain engine oil.  
Installation:  
Pour in engine oil\*\*\*.



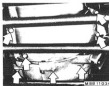
Take off alternator drive belt.  
Loosen and swing alternator to the side.  
Loosen bolt (1).  
Remove bolt (2).  
Unscrew bolts (3) partially.  
Installation:  
Tighten drive belt and check tightness with Special Tool 11 5 020.



Take off power steering pump drive belt.  
Unscrew power steering pump and remove bolts (4).  
Installation:  
Do not stretch the console during installation – see spacer (5), see 22 41 131.  
Tighten drive belt and check tightness with Special Tool 11 5 020.



Cars with Air Conditioner:  
Unscrew bolts (6) and nut (7).  
Remove holder toward the inside.



Unscrew reinforcement plate.  
Unscrew oil pan bolts.



Unscrew engine mounts.  
Disconnect lead (8).  
Installation:  
Tightening torque\*.



Attach Special Tool 11 0 020 on engine and lift engine.



Swing out and suspend console on a piece of wire.  
Unscrew the remaining oil pan bolts.

\*\*\* See Service Information of Gr. 00

\* See Specifications

Turn crankshaft to have connecting rods on cylinders 5 and 6 at their highest point.  
Remove the oil pan.



Installation:  
Clean sealing surfaces.  
Replace oil pan gasket.  
Apply a coat of brush on universal sealing compound\*\* on joints of the timing case cover and ...



... and cover.



### 11 14 105 REPLACING RADIAL OIL SEAL IN DISTRIBUTOR HOUSING

Unscrew upper lead cable.

Take off distributor cap (1).  
Unscrew distributor rotor (2).  
Unscrew adapter (3).  
Remove cover (4).

**Attention:**  
Check O-ring (5), replacing if necessary.  
Tightening torque\*



Unscrew distributor housing.  
**Attention:**  
Check O-ring, replacing if necessary.



Lift out radial oil seal.  
Drive in a new radial oil seal with Special  
Tool 00 5 550.  
Lubricate sealing lip with oil.



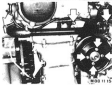
00 5 550

\* See Specifications.



### 11 14 110 REMOVING AND INSTALLING/ SEALING LOWER TIMING CASE COVER

Disconnect battery ground lead.  
Pull off plug (1) and lift out lead.  
Loosen hose clamp (2).  
Unscrew nut (3) and remove air cleaner with  
air flow sensor.  
Remove vibration damper with hub — see  
11 23 000.



Unscrew pipe.  
Unscrew pulley on water pump.



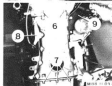
Loosen and swing alternator aside.  
Loosen bolt (1).  
Remove bolt (2).  
Unscrew bolts (3) partially.



Unscrew power steering pump and remove  
bolts (4).  
**Attention:**  
Do not stress the console during installation  
— use spacer (5), see 32 41 131.



Swing the console aside and suspend it on a piece of wire.  
 Drain engine oil.  
 Unscrew oil pan bolts.  
 Installation:  
 Pour in engine oil \*\*\*



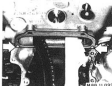
Unscrew bolts (6 and 7).  
 Loosen remaining oil pan bolts.  
 Unscrew timing case cover bolts.  
 Installation:  
 Mount TDC sensor (8) and suspension eye (9) - check length of bolts.  
 First tighten bolts (6).



Loosen oil pan gasket on the timing case cover carefully with a screwdriver.  
 If the oil pan gasket is damaged, remove oil pan and replace the gasket - see 11 13 003.



Take off the timing case cover.  
 Installation:  
 Break the upper edges with a file.  
 Coat mating surfaces with Three Bond Silicone 1207\*\*.



Installation:  
 Replace gaskets, coating them with Three Bond Silicone 1207\*\* and cutting them off on the web.  
 Coat mating surfaces with Three Bond Silicone 1207\*\*.  
 Guide in cover uniformly.







#### 11 14 161 REPLACING RADIAL OIL SEAL IN TIMING CASE COVER

Remove vibration damper with tool - see 11 23 000.  
Lift out radial oil seal with a screwdriver.



Lubricate sealing lip of radial oil seal with oil.  
Press in the radial oil seal with Special Tools 11 1 272 and 11 1 273.



#### 11 14 605 REPLACING RADIAL OIL SEAL IN CLUTCH END COVER Transmission Removed

Remove flywheel - see 11 22 000.  
Drain engine oil.  
Loosen oil pan.  
Loosen gasket at end cover/oil pan joint carefully with a knife.  
Unscrew end cover.  
Press radial oil seal out of end cover.  
Installation:  
Replace gasket.  
If oil pan gasket was damaged, remove oil pan - see 11 13 000.

Apply coat of Three Bond Silicone 1207\*\* on end cover/oil pan joint.  
Use Special Tool 11 1 273 to avoid damaging the radial oil seal.  
Pour in engine oil\*\*\*.



Use Special Tools 11 1 260 and 00 5 500 to press in the radial oil seal.  
Press in the new radial oil seal to a depth of approx. 1 to 2 mm (0.039 ... 0.079"), in contradiction to the standard seal which had been pressed in flush.  
Lubricate sealing lip with oil.

00 11 007

\*\* Source: HWB

\*\*\* See Service Information of Gr. 00

### 11 21 000 REMOVING AND INSTALLING CRANKSHAFT

Remove engine — see 11 00 050.  
First remove the rear and then the front exhaust manifold.  
Installation:  
Replace gaskets.  
Tightening torque\*.

Unscrew right engine bracket and mount engine on Special Tool 00 1 490 with Special Tool 11 0 120.

Installation:  
Tightening torque\*.

Remove clutch — see 21 25 000.  
Remove cylinder head — see 11 12 100.  
Remove timing chain — see 11 31 001.  
Remove oil pump — see 11 41 000.  
Measure axial play\* prior to removing the crankshaft.  
Check or replace thrust bearing shells, if the maximum permissible play is exceeded.

Remove flywheel — see 11 22 000.  
Unscrew end cover.  
Installation:  
Replace gasket.  
Use Special Tool 11 2 213 to avoid damaging the radial oil seal.  
Cut off gasket on the oil pan sealing surface.

\* See Specifications.



Unscrew cone of bearing caps.  
Installation:  
Replace the conical bearing shells and measure the conical bearing play — see 11 24 571.



Unscrew crankshaft bearing caps and lift out the crankshaft.  
Installation:  
Bearing cap no. 1 is on the sprocket end. Mount the oil pump console with thrust bearing cap (4).  
Install bearing shells and measure the bearing play — see 11 21 531.  
Installation:  
Measure axial play with the crankshaft installed — loosen bearing cap no. 4 again. Apply knocks from a plastic hammer on the rear and front ends of the crankshaft to center the thrust bearing.  
Tighten thrust bearing cap to specified torque\*. Measure the axial play\*.

Clean oil and water boots again thoroughly to remove cutting sand, if the crankcase is replaced.



Check thrust:  
Install bearing shells 1 and 2.  
Apply dial gage on the center bearing and measure the removal\* while turning the crankshaft.

\* See Specifications.

### 11 21 501 REPLACING CRANKSHAFT — Crankshaft Removed —

Take out woodruff key (1).  
Pull off sprocket with Special Tool 11 2 000  
Instructions.  
Heat sprocket to max. 200° C (390° F) for  
installation.



28 11 02

#### Crankshaft Identification:

Engine	Stroke (mm)	Code
5.98 2	66	M



M 88 11 044

There are two crankshaft versions because of  
main bearing journal tolerances.  
— Double classification: red/blue  
— Triple classification: yellow/green/white  
The original version should be avoided again.  
It is absolutely mandatory to measure the  
bearing play — see 11 21 521.

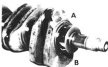


28 11 167

Crankshafts are surface treated and may  
only be reground in the plant.  
Reground crankshafts are marked with  
stripes of paint.

Conrod Bearing Journal (A):  
1 paint stripe Size 1"  
2 paint stripes Size 2"  
Main Bearing Journal (B):  
1 paint stripe Size 1"  
2 paint stripes Size 2"  
Install pilot bearing for cars with a manual  
transmission — see 11 21 571.

<sup>A</sup> See Specifications



28 11 167

### 11 21 531 REPLACING CRANKSHAFT MAIN BEARING SHELLS Engine Disassembled —

There are two versions of bearing shells.  
— Double classification: red/blue  
— Triple classification: yellow/green/white  
1 = Bearing shell 1-2-3-5-6-7  
2 = Bearing shell 4 (thrust bearing)  
Check ground size of main bearing journals.



M 88 11 059



M 88 11 060

Bearing shells are installed in the crankcase  
according to the crankcase paint mark.  
If paint mark has been washed off of the  
crankcase, install both bearing shells to the  
crankshaft paint mark.  
If bearing shells supplied with a replacement  
crankshaft do not conform with tolerances  
(color code) of the crankcase, they must be  
exchanged in Parts.  
Bearing shells are installed in the bearing caps  
according to the crankshaft paint mark.



M 88 11 061

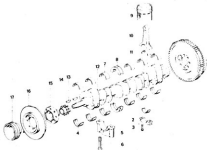
Place Type GP-1 Plastigage on crankshaft  
wiped clean of oil and tighten bearing cap  
bolts with correct tightening torque\*.  
Don't turn the crankshaft.  
Source for Plastigage:  
CARTEOL  
Alfred Brühm Str. 5  
D-8070 Inghedast



M 88 11 062

Unscrew and remove bearing caps.  
Check bearing play<sup>\*\*</sup> by measuring width of  
flattened Plastigage with help of the supplied  
scale.  
Correct bearing play by installing new bearing  
shells, bearing shells with different machined  
size or with different color code.

<sup>\*\*</sup> See Specifications



## CRANKSHAFT DRIVE SURVEY

- |                         |                             |
|-------------------------|-----------------------------|
| 1 Flywheel              | 10 Connecting rod           |
| 2 Conrod bearing cap    | 11 Conrod bearing shell     |
| 3 Conrod bolt           | 12 Crankshaft               |
| 4 Main bearing shell    | 13 Woodruff key             |
| 5 Main bearing cap      | 14 Timing chain sprocket    |
| 6 Main bearing cap bolt | 15 Hub for vibration damper |
| 7 Main bearing shell    | 16 Vibration damper         |
| 8 Pilot bearing         | 17 Pulley                   |
| 9 Piston                |                             |

11 21 571 REPLACING PILOT BEARING  
IN CRANKSHAFT

Remove clutch — see 21 21 000.  
Pull out ball bearing with Special Tool 11 2 010.



Installed Order:  
Ball bearing (1)  
Cover (2)  
Felt ring (3)  
Capsule (4)  
Install cover (2) with embossment facing out.



Pack bore in crankshaft with approx. 1 gram  
of lubricating grease.  
Dress in the pilot bearing with Special Tools  
11 2 000 and 00 5 500.



### 11 22 000 REMOVING AND INSTALLING FLYWHEEL

Remove clutch - see 21 21 000.  
Hold flywheel with Special Tool 11 2 160.  
Unscrew bolts and take off flywheel.

**Installation:**  
Clean the tappet bore.  
Use washer (1).  
Replace and install expansion bolts with Loctite No. 270\*\*.  
Tightening torque\*.

MB 11 024



Check flywheel for axial runout\*.

The friction surface may be ground to minimum distance A\*.  
If grinding the friction surface reduces distance "h" to zero, the flange surface must be machined.

MB 11 020



### 11 22 541 REPLACING STARTER GEAR RING

Drill a 6 mm (Ø 236) diameter hole approx. 8 mm (Ø 315)\*1 deep below a tooth gap to make breaking the gear ring easy.



Break gear ring at drilled point with a chisel.



**Installation:**  
Heat the new starter gear ring to 200 ... 230° C (395 to 440° F)1, checking the temperature with a thermochrome pencil.  
Tooth level faces the engine end.  
Knock on the starter gear ring to fit snug with brass mallet.

\* See Specifications

\*\* Source: Hilti



### 11 23 000 REMOVING AND INSTALLING VIBRATION DAMPER WITH HUB

Remove radiator 17 11 000  
Remove fan 11 52 000  
Unscrew brace

Hold flywheel with Special Tool 11 2 100.



Take off drive belts on alternator, power steering pump and, if applicable, compressor for air conditioner.

Unscrew nut (1) with Special Tool 11 2 180.

Installation:

Tightening torque\*  
Tighten drive belts and check tightness with Special Tool 11 5 020.



Pull off vibration damper with hub.

Installation:

Check for correct installed position of key (2).

Check seal, replacing if necessary.

If hub is worn, install seal approx. 1 to 2 mm (0.039 to 0.079") deep.

\* See Specifications



### 11 23 000 REPLACING VIBRATION DAMPER

Remove fan coil

Take off drive belts on alternator, power steering pump and, if applicable, compressor for air conditioner.

Unscrew gully and remove vibration damper. Installation:

- Dowel pin (1) to bore (2)
- Bore (3) to bore (2)

Vibration Damper Identification:

Type	Dist.(mm)	BMW Number	Color Code
S 38 2	245	1 309 230	blue

Tightening torque\*.

Tighten drive belts and check tightness with Special Tool 11 5 020.

### 11 23 031 REPLACING HUB OF VIBRATION DAMPER

Remove vibration damper with hub 11 23 000. Unscrew gully and remove vibration damper. Installation:

- Dowel pin (1) to bore (2)
- Bore (3) to bore (2)

Tightening torque\*.



Mod 11 040

\* See Specifications

11 24 521 REPLACING CONNECTING  
RODS

Piston Removed

Only install connecting rods of same weight class in one engine.

The weight class can be identified on the number and color of dots on the connecting rod stem.

Connecting rods may not be machined.



M88 11046

Piston pins must slide through the conrod bushing under light pressure. Install conrod bearing shells - see 11 24 571.



M88 11045

11 24 571 REPLACING CONROD BEARING  
SHELLS

Engine Disassembled

Place conrod bearing shells in connecting rods and bearing caps.

(Check machined size (bore) bearing diameter.)



M88 11046

Place Plastigage (Type PG-1) on conrod bearing journals wiped clean of oil in BDC position.

Mount conrod bearing caps - pairing codes and grooves of bearing shells are on the outside.

Source for Plastigage:

Carlisle

Alfred Buehn Str. 5

D-9070 Ingolstadt/West Germany



M88 11046

Tighten bolts to correct torque\* (use old conrod bolts).

Don't turn the crankshaft.

Remove bearing caps.

Check conrod bearing play\* by measuring width of the flattened Plastigage with help of the supplied scale.



M88 11046

Correct the bearing play by installing new bearing shells, bearing shells of different machined size or with different color codes. Use new conrod bearing cap bolts for final installation.



M88 11047

\* See Specifications.

### 11 25 000 REMOVING AND INSTALLING PISTON

Engine Removed

Remove cylinder head 11 12 100

Remove oil pump 11 43 000

Take off connecting rod bearing caps and press out piston with connecting rod upwards for installation

Install connecting rod 11 24 521

Remove circlip (1)

Press out piston pin

Installation

Piston pins and pistons are matched and must not be mixed up

Installation

Press codes and grooves of bearing shells are on exhaust side

Install circlip (1) with gap facing down

Only install a piston of same make and same weight class.

Weight class is stamped with "A" or "B" on piston crown. Identification:

Engine	E*	Clas. in mm
S 38 2	9.8	93.4

\* Check machined size (piston diameter)\*.

\* See Specifications.

Measuring Piston Installed Clearance

Measure piston diameter\* at measuring point "A" with a micrometer

Engine	Make	Measuring Point "A" in mm
S 38 2	Mahle	6 (ø 236*)

Set internal calipers to zero on micrometer with the measured piston diameter.

Measure cylinder bore with internal calipers at bottom, center and top in forward and rotational directions

Compare measured piston installed clearance with specified piston installed clearance\*\* Max. permissible wear clearance\*

Bolt Special Tool 11 2 060 on connecting rod. Lubricate piston and piston rings with oil.

Offset piston rings and gaps by 120° Compress piston rings with Special Tool 11 2 270

Install piston that arrow faces timing chain.

Turn pinless connecting rod bearing journal to BDC to install piston.

\* See Specifications



MEB 11 040



MEB 11 040



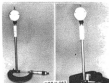
MEB 11 040



MEB 11 040



MEB 11 051



MEB 11 051



MEB 11 053



MEB 11 054





MSB 11020

### 11 25 851 REPLACING PISTON RINGS OF ONE PISTON

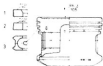
Piston Removed

Remove piston rings with a piston ring compressor plate.

#### Installation:

Install piston rings with "TOP" facing the piston crown.

- 1 Plain compression ring
- 2 Taper face ring
- 3 Beveled ring with lead spring



MSB 11051

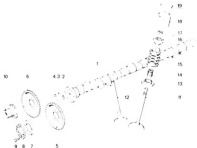
Measure side clearance\*



MSB 11052

Measure end clearance\*\*

\* See Specifications.

**Valve Timing:**

- 1 Camshaft 248<sup>0</sup> - 5 38 Z
- 2 Plug for camshaft oil bore
- 3 Conip
- 4 Cylindrical pin - different for intake and exhaust sprockets. New standard pin for "B" and "A" can be installed retroactively.
- 5 Sprocket - intake "B"
- 6 Sprocket - exhaust "A"
- 8 Lockplate
- 9 Bolt M 6 x 10
- 10 Adapter for distributor rotor
- 11 Intake valve - 37 mm (1.457") diameter  
Oversize valves with larger stem diameter are available.
- 12 Exhaust valve - 32 mm (1.260") diameter  
Oversize valves with larger stem diameter are available.
- 13 Spring retainer, lower
- 14 Valve stem seal
- 15 Valve spring - 42.5 mm (1.673") long  
Double spring set can be installed retroactively together with new spring retainers
- 16 Spring retainer, upper
- 17 Valve collars
- 18 Tappet
- 19 Shim: from 3.00 to 4.25 mm (0.118 to 0.167")

**11 31 000 REMOVING AND INSTALLING CAMSHAFT**

- Remove cylinder head cover 11 12 000
  - Remove fan cover and fan 11 52 000
  - Remove distributor cap (1)
  - Unscrew distributor rotor (2)
  - Unscrew adapter (3)
  - Remove cover (4)
- Installation:**
- Check O-ring (5), replacing if necessary.
  - Tightening torque\*

- Take off distributor housing and cover.
- Installation:**
- Check O-ring, replacing if necessary.

- Unscrew and cover.
- Installation:**
- Replace gasket.

- Unscrew guide rails.

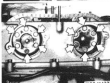
\* See Specifications.

**Installation:**

Center guide rail with a feeler gage blade.



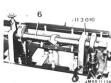
Turn crankshaft with Special Tool 11 3 020 to set cylinder 1 to TDC – cyl. 6 overlaps. **Caution!** Never crank the engine after removing the timing chain.



Remove chain tensioner – see 11 31 099. Open lockplates and unscrew sprockets.



Mount Special Tool 11 3 010 on timing case. Turn shaft 180 up to the stop – camshaft is held down for removal of bearing caps. Unscrew camshaft bearing caps.



Release arrest and relax the camshaft. Remove Special Tool 11 3 010.

Mark camshafts "E" / "A" and remove.

**Installation:**

Intake and exhaust camshafts are identical. Used camshafts must be installed in the same position.

**Installation:**

Turn camshaft to TDC. Install camshaft that one each groove faces up and in – TDC position.



Mount Special Tool 11 3 010 on timing case. Hold camshaft in TDC position with Special Tool 11 3 020 and turn shaft 180 up to the stop – camshaft is held down for installation of bearing caps.



Install camshaft bearing caps on timing case according to the lettering. Tightening torque\*

\* See Specifications.



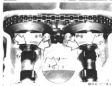
Tighten the timing chain in opposite direction of engine rotation and place on the intake sprocket "E" first.  
Install lockplate and tighten sprocket.  
Tightening torque\*



Installation:  
Install exhaust sprocket "A"  
Insert adapter (D)  
Install lockplate and tighten sprocket.  
Tightening torque\*



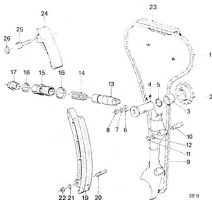
Install chain tensioner - see 11 31 000  
Crank engine once in direction of rotation and recheck the timing:  
- Crankshaft on TDC  
- One each camshaft groove faces in  
- One each camshaft groove faces out from bearing cap



Lock sprocket mounting bolts with the lockplates.  
Adjust valve clearance - see 11 34 004

\* See Specifications

<sup>1</sup> See Specifications



### Valve Timing

- |                          |                            |
|--------------------------|----------------------------|
| 1 Timing chain           | 14 Spring                  |
| 2 Sprocket (guide wheel) | 15 Cylinder                |
| 3 Needle sleeve          | 16 Seal                    |
| 4 Shaft                  | 17 Plug                    |
| 5 O-ring                 | 18 Seal                    |
| 6 Shim                   | 19 Tensioning rail (lower) |
| 7 Spring washer          | 20 Bearing pin (hollow)    |
| 8 Nut                    | 21 Lock washer             |
| 9 Guide rail             | 22 Retainer                |
| 10 Bearing pin           | 23 Guide rail              |
| 11 Lock washer           | 24 Tensioning rail (upper) |
| 12 Shim                  | 25 Bearing pin             |
| 13 Retax                 | 26 O-ring                  |

### 11 31 061 REPLACING TIMING CHAIN

Remove lower timing case cover 11 14 110.  
Remove sprockets on camshafts, see 11 31 000.  
Remove water pump 11 51 000.



Unscrew bolts (1) and (2).  
Unscrew screw (21) and timing guide rail side.  
**Installation:**  
Place timing chain on crankshaft sprocket and reversing wheel before swinging on the guide rail.

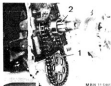


Unscrew bolt (11) and take off guide rail.  
Remove timing chain.  
**Installation:**  
Timing chain is pre-stretched.  
Use washers (13).



### 11 31 ... REMOVING AND INSTALLING UPPER TENSIONING RAIL

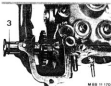
Remove timing chain – see 11 31 051.  
Loosen bolts (11) and screws in Special Tools 11 3 040, 11 3 042 and 11 3 042.  
Knock out shaft.  
**Installation:**  
Check O-Ring, replacing if necessary.



MOB 11 1001

### 11 31 061 REPLACING SPROCKET SET Timing Chain Removed

Remove cot pin 11 13 000  
Remove sprocket (1) on oil pump  
Take off chain  
Lift out woodruff key (2).



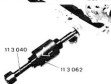
MOB 11 1170

*Installation:*  
Replace O ring (3)  
Drive in shaft (with bore facing up) partially  
Push on guide wheel sprocket  
Drive in shaft against stop



MOB 11 081

Pull off sprocket with Special Tool 11 3 000  
*Installation:*  
Heat sprocket to max. 200° C (390° F) for installation  
Tighten oil pump chain, see 11 41 000.



MOB 11 150

Apply Special Tools 11 3 040 and 11 3 062  
on shaft of chain guide wheel  
Knock out shaft



*Installation:*  
Check needle sleeve in sprocket, replacing if necessary.

← Forward direction and pressing  
in direction for needle sleeve



### 11-828-1 REMOVING AND INSTALLING PISTON FOR CHAIN TENSIONER

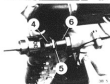
Unscrew plug (1)

Take off damper housing (2)

Installation

Replace seal (3)

Tightening torque = 25 - 3 Nm (18 - 2 ft. lbs.)



Unscrew connector (4)

Caution\*

Strong spring pressure

Remove spring and piston

Installation

Replace seal (5)

Tightening torque for connector (4) = 48 - 3 Nm (29 - 2 ft. lbs.)

Tightening torque for cylinder (6) =

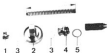
58 - 3 Nm (36 - 2 ft. lbs.)

Installation

Check length of spring

Nominal value: 158 - 0.5 mm (6.200 - 0.020")

Concavely wound end of spring from the connector



11-828-3

Piston and cylinder are matched\* with each other - marked 1 or 2.

Only install parts with same marks

Install cylinder with groove facing back (as seen looking forward in coil) and piston with groove facing up.



11-828-4

\* See Specifications



Guide piston opening into tensioning coil  
Piston is operated by engine oil pressure

**11 34 000 ADJUSTING VALVE CLEARANCE**

Remove fan coil and fan — see 11 52 000.  
Remove cylinder head cover — see 11 12 000.  
Crank engine with Special Tool 11 3 020.

Measure valve clearance with cam facing up.  
Compare measured valve clearance with the specified valve clearance\*.

Turn opening of tappets as shown in the picture, if the measured valve clearance is not within specified valve clearance tolerances.

Guide in Special Tool 11 3 170 in accordance with camshaft "A" or "B" and press tappets down.

\* See Specifications



Blow out the valve stem with compressed air.



Measure thickness of removed valve shim.  
Install shim of required thickness with the inner facing down.

11 3 100

**11 34 500 CHECKING VALVES FOR LEAKS**  
— Cylinder Head Removed —

Spark plugs remain screwed in.  
Fill combustion chamber with gasoline outdoors or indoors with conformance of fire prevention regulations.

If gasoline runs past valve/heads, valves and valve seats must be inspected.

Remove valves — see 11 34 500.

Machine valve seats — see 11 12 607.

11 3 500



## 11 34 550 REMOVING AND INSTALLING VALVES

— Cylinder Head Removed

Mount cylinder head on Special Tool 11 1 055 with Special Tool 11 1 054

Bolt down Special Tool 11 1 055 ...

... and 11 1 051.  
Mount Special Tool 11 1 060 with Special Tools 11 1 052 and 11 1 067.

Unscrew spark plug.

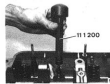
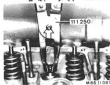
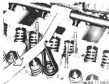
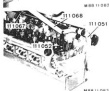
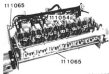
Installation:

Tightening torque\*.

Place Special Tool 11 1 053 (tray) in assembly fixture.

Compress valve springs and remove valve collars.

\* See Specifications of Group 12.



Remove upper spring retainers and valve springs.

Take tray out of assembly stand and pull out valve.

Installation:

Lubricate valve guide and valve stem with oil. Double spring set can be installed retroactively together with the new spring retainers.

Pull off valve stem seal with Special Tool 11 1 250.

Check valve guide for wear — 11 12 995.

Install valves and place Special Tool 11 1 053 (tray) in fixture.

Use Special Tools 11 1 260 (inserts) to avoid damaging the valve stem seal.

Lubricate valve stem seals (2) with oil and metal.

Source for Sleeves:

Carlson

Alfred Dehler-Str. 5

D-8070 Ingolstadt

Press on valve stem seal against stop with Special Tool 11 1 200.

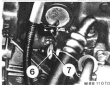
New, improved valve stem seals with grooves on their seats are pressed on by hand with Special Tool 11 1 200.

Special Tool 11 1 200 has two diameters — for 7 mm (0.276") and 8 mm (0.315") valve stem seals.



#### 11 40 000 CHECKING ENGINE OIL PRESSURE

Pull off plug (1) and lift out leads.  
Loosen hose clamp (2).  
Unscrew nut (3) and remove air cleaner with an flow meter.



Pull off plug on oil pressure switch.  
Unscrew oil pressure switch (5).  
Installation:  
Check oil (7), replacing if necessary.



Screw in Special Tool 11 4 06 00.  
Connect the 10 bar (142 psi) pressure tester of the BMW Service Tester.  
Install air cleaner.  
Measure oil pressure\*.



#### 11 41 000 REMOVING AND INSTALLING OIL PUMP

Pull out oil dipstick.  
Remove oil pan - see 11 13 000.  
Unscrew nut (1) and take off sprocket.  
Unscrew bolts (2).



Unscrew holder (3) and remove oil pump.  
Installation:  
Mount holder without tension.



Installation:  
Slide on sprocket with the oil pump mounted.  
Tightening torque\* of nut.



Installation:  
Adjust tightness of chain with shims (4 and 5) in such a manner that chain can be pressed in with light thumb pressure.  
Shims (4 and 5) must have the same thickness.

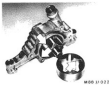
\* See Specifications



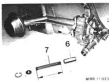
**Checking and Servicing:**  
Check whether the oil pump moves easily by turning the drive shaft.



Disassemble the oil pump and clean oil filter screen (5).



Check oil pump for wear:  
— scoring on case  
— worn rotors.



The pressure control valve is located in the main oil bore and regulates the engine oil pressure\* — see 11 40 000.  
Check that piston (6) moves easily.  
Check length of spring (7) = 68 mm (2.677").

MOB 11 023

\* See Specifications



MOB 11 024

The 8 bar (114 psi) pressure safety valve regulates the oil pressure in front of the oil filter and prevents oil filter leakage.  
Check piston seat (8).  
Check length of spring (9) = 44 ± 0.4 mm (1.732 ± 0.016").



MOB 11 025

**Installation:**  
Press in spring (9) and washer (10) with a wrench socket and metal strip (11).



MOB 11 026

#### 11 41 151 REPLACING OIL PUMP DRIVE CHAIN

Remove oil pan — see 11 10 000.  
Remove timing chain — see 11 21 001.  
Unscrew nut (1) and take off the sprocket.  
**Installation:**  
Adjust tightness of chain — see 11 41 000.  
Chains with a green color code are longer than those with red color code.  
Tightening torque\*.

\* See Specifications

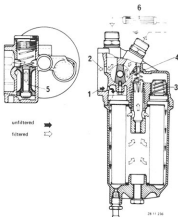
# 11-833

## 11 42 021 REPLACING FULL FLOW OIL FILTER

Unscrew oil drain plug (1) and drain oil.  
Unscrew both (2).  
Replace oil filter (5).

### Installation:

Check seals (3) and (4), replacing if necessary.  
Mount oil filter housing that the arrow faces forward (if ROPS).  
Tightening torque\*.  
Pour in engine oil\*\*\*.



- 1 Feed from the oil pump
- 2 Return to the main oil bore
- 3 Bypass valve - opening pressure 2.5 ± 0.25 bar (36 ± 3.5 psi)
- 4 Return shutoff valve - opening pressure 0.1 ± 0.05 bar (1.4 ± 0.7 psi)
- 5 Thermostatic regulator to switch in the oil cooler
- 6 Oil cooler

\* See Specifications.

\*\*\* See Service Information of Gr. 00



#### 11 43 001 REPLACING GUIDE TUBE FOR OIL DIPSTICK

Install guide tube with Loctite No. 270\*\* and down it in against the stop.



#### 11 51 000 REMOVING AND INSTALLING OR REPLACING WATER PUMP

Unscrew plug and drain coolant.  
Remove fan coral and fan - see 11 52 000.  
Installation:  
Pour in coolant\*\*\*.



Pull off plug (1) and lift out leads.  
Loosen hose clamp (2).  
Unscrew nut (3) and remove air cleaner with air flow sensor.



Take off drive belt and unscrew the pulley.  
Pull off hoops (4 and 5).  
Installation:  
Tighten drive belt and check tightness with Special Tool 11 5 020.



Unscrew suspension eye (6) and water pump.  
Installation:  
Replace gasket.

\*\* Source: HNB

\*\*\* See Service Information of Gr. 00



### 11 52 000 REMOVING AND INSTALLING FAN

Hold pulley with Special Tool 11 5 0 00 and unscrew clamping nut (1).

*Angular fan?*

Left hand threads → turn the nut clockwise to unscrew.  
Tightening torque\*

*Angular fan*

Hold fan with Special Tool 11 5 0 00

The 40 Nm (29 ft. lbs.) tightening torque is equal to a torque wrench setting of 30 Nm (22 ft. lbs.)



### 11 52 000 REMOVING AND INSTALLING COOLANT THERMOSTAT

Open coolant partially

Unscrew cover (1)

Installation

Press in coolant\*\*\*



Remove the thermostat

Installation

Replace with (2 and 3).

Clamp on thermostat hose out.

**Checking Thermostat:**

Check whether thermostat begins to open at same temperature as in the Specifications. Check opening temperature in a hot water bath and compare with the stamped opening temperature.



\*\*\* See

\*\*\* See Service Information of Gr. 00



### 11 52 020 REPLACING FAN CLUTCH

Remove fan - see 11 52 000

Replace fan clutch if

a) hub fan speed (fan of stopped engine) cannot be turned or difficult to turn),  
b) fan clutch has excessive radial play or is tearing off

Check the wrenching points\* with a Video card\*\*\*

Unscrew fan mounting bolts and take off the fan clutch

Fan Clutch

Type	BMW Number	Fan Dia. (mm)	Number of Blades (mm)
M 88-2	1 207 816	420	6

\* See Specifications

\*\*\* See Workshop Equipment Catalog



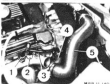


### 11 53 180 REMOVING AND INSTALLING OR REPLACING COOLANT PIPE (ON CYLINDER HEAD)

Unscrew plug and disconnect

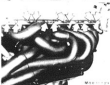
Installation:

Fill in coolant\*\*\*

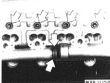


Pull off plug (1 - 3)

Disconnect hoses (4 and 5)



Unscrew coolant pipe



Installation:

Check O-rings, replacing if necessary

\*\*\* See Service Information of Gr. 60



### 11 62 180 REMOVING AND INSTALLING EXHAUST MANIFOLD

Remove coolant pipe - see 11 53 180.

Remove exhaust assembly - see 18 00 920.

Unscrew heat shields (8 - 10).

Unscrew cross member (11) and stabilizer (12)  
on the engine carrier.



Attach Special Tool 11 0020 on engine.



Unscrew right engine mount and lift the  
engine.



Unscrew exhaust manifold.

Installation:

Replace gaskets.

Tightening torque\*

\* See Specifications

### 11 76 810 REMOVING AND INSTALLING CATALYTIC CONVERTER

Disconnect plug for oxygen sensor.  
If applicable, cut off wire strap on transverse seat.

Installation:

Seat plug connection against moisture with sealing compound and insulating tape.

Unscrew front flange bolts.

Installation:

Replace gaskets and self-locking nuts.

Tightening torque\*.

Unscrew bolt (1).

Loosen bolts (2).

Installation:

First tighten bolt (1) and then bolts (2) to avoid torsion.

Unscrew rear flange bolts and take off catalytic converter.

Installation:

Replace gaskets and self-locking nuts.

Tightening torque\*.

\* See Specifications.

\* See Specifications.



## 11 75 510 REPLACING OXYGEN SENSOR

Disconnect plug for oxygen sensor.  
If applicable, cut off wire strap on transmission console.

**Installation:**  
Seal the plug connection against moisture with sealing compound and insulating tape.



28 10

Unscrew bolts on front flange of catalytic converter.

**Installation:**  
Replace gaskets and self locking nuts.  
Tightening torque\*.



28 12

Loosen bolts (2).  
Unscrew bolt (1) and lower front end of catalytic converter slightly.  
**Installation:**  
Tighten front flange bolts first, then bolt (1) and finally bolts (2).



28 13



28 14

Pull off shield (1) on oxygen sensor and unscrew oxygen sensor.



28 15

**Installation:**  
Coat threads with Aero Seize\*\* and tighten oxygen sensor with Special Tool 11 7 020. Tightening torque\*.

**Note:**  
— Do not clean or lubricate oxygen sensor.  
— Protect oxygen sensor when undercoating the car.

\* See Specifications

\* See Specifications  
\*\* Source: HMMB

# 11 Engine M40

00 00 249	BMW engine oil service .....	11- 0140.1
11 00 039	Compression of all cylinders – check .....	11- 0140.2
050	Engine – remove and install .....	11- 0140.3

For further jobs refer to "Assembly Repair Manual".

## 00 00 249 BMW Engine oil service

M40

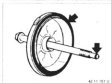
Change engine oil and oil filter



Unscrew oil filter cover

**Note:**  
Oil runs out of the oil filter housing into the oil pan.

**Installation:**  
Replace the sealing ring.  
Tightening torque 11.42 242 \*



**Installation:**  
Replace sealing ring in oil filter cover and on the screw.



Remove oil filter insert.

\* Refer to Technical Data



Once the oil has drained out of the filter housing, open the oil drain plug or draw off the oil using suction.

**Installation:**  
Replace the sealing ring.  
Tightening torque 11.12 142 \*

Pour in engine oil.

Switch on engine and run at idle speed until the oil level gauge goes out.

Switch off engine and check oil level.

**Note:**  
Park vehicle on level surface.

\* Refer to Technical Data

### 11 00 039 Checking compression of all cylinders

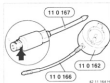
MA0

**Caution!**  
High voltage - danger to life!

Interrupt power supply to ignition coils (disconnect terminal 1 from ignition coils). Disconnect fuel pump relay, refer to Electrical Troubleshooting Manual (schematic), Series S E34 location directory for components T000.0

Installation location: Electronics box

Unscrew and remove all spark plugs, see 12 12 011



**Note:**  
Special tools 11 0 162 / 166 / 167 can be re-used.

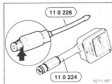


Depress accelerator pedal and operate starter until compression pressure reaches its maximum level and stops rising.

Compression pressure\*



62 11 569 02



Screw special tool 11 0 226 into tapped bore for spark plug of cylinder to be tested by hand. Connect up special tool 11 0 224 (compression tester).

**Note:**  
Check that seal is in perfect condition.

## 11 00 050 Removing and installing engine

9443

Read out error memories of all control units.  
Disconnect battery negative lead.

Remove transmission,  
refer to 23 00 022 / 24 00 025



**Caution!**  
Left-hand (cow) threads.

Brake against pulley wheel with special tool  
11 5 050.

Remove cap nut from water pump with special  
tool 11 5 040.

Remove fan wheel and fan coupling from  
water pump and remove together with fan  
shroud.

**Installation:**  
Tightening torque 11 52 142 \*

**Note:**  
Tightening torque of 40 Nm when using  
special tool 11 5 040 is equivalent to  
30 Nm on the scale of a torque wrench.

Remove radiator,  
refer to 17 11 000.

\*Refer to Technical Data



Disconnect coolant hoses on engine.



Disconnect coolant hoses from heating unit  
and heating valve.



Disconnect plug connection from volume air  
flow sensor.  
Remove upper section of air filter together  
with volume air flow sensor.



Remove vane pump for power steering from  
engine and tie back to one side.

**Note:**  
Lines remain connected.

Remove operating (blowdown) cable for accelerator control from throttle, refer to 26-41-421 Repair Manual 3 Series E26.



Remove HT lead from ignition coil.



**Caution!**  
Collect any fuel flowing out and dispose of suitably.

Remove fuel supply and return lines. Undo clip fuel lines from holder.

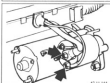
**Installation note**

- (1) Fuel supply from fuel filter  
Pipes: bare
- (2) Fuel return  
Pipes: painted black

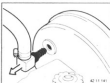
Replace fuel hoses.



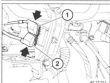
Remove electrical connections from alternator.



Remove electrical connections from starter.



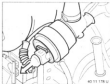
Remove connection piece from brake booster.



Disconnect both plug-and-socket connections from cable duct.

**Installation note**

- (1) Cylinder reference sensor
- (2) Pulse generator for DME



Disconnect plug connection from idle speed control valve.



Disconnect plug connection from oil pressure switch.

Note:  
Installation location on oil filter housing.



Disconnect plug connection from throttle valve potentiometer.

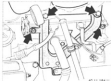


Disconnect plug connection from tank vent valve.

Remove tank vent hose from throttle body.



Loosen clip on hose to expansion tank.  
Loosen lower screw connection for manifold support.



Loosen upper screw connection for manifold support.  
Loosen screw connection on cable duct.



Disconnect both plug connections on temperature sensors on cylinder head.



Disconnect plug connection from injection valve strip.

Note:  
Plug connection on end of cable duct, near the fuel lines.

Place electric wire channel to one side.

## 11-0/40.6



Attach engine to special tool 11 0 000.



**Note:**  
Front and rear suspension arrangement.



Ground cable and engine mount, left / right:  
unscrew.

Installation:  
Tightening torque 11 61 242\*

Lift out engine.

\* Refer to Technical Data



# 11 Engine M43

11 00 050	Engine – remove and install .....	11- 0/43.1
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For further jobs refer to "Repair Manual 3 Series E36".

## 11 00 050 Removing and installing engine

### M43

Observe note on disconnecting and connecting battery, refer to General Information M012



Disconnect negative battery lead.  
Disconnect positive battery lead.  
Remove battery.



Remove battery tray.



Release plug-and-socket connections.  
Remove air cleaner with air mass meter.



Release coolant drain plug on RH side of engine block.  
Drain coolant and dispose of suitably.

Installation note:  
Fit sealing ring.  
For tightening torque refer to Technical Data 11 11 5A2

Remove radiator, refer to 17 11 000

Disconnect coolant hoses from engine, heater and heating valve.

Remove transmission, refer to 23 00 20

Remove upper section of manifold, refer to 11 01 060  
Repair Manual 3 Series E38

Remove cable duct from bottom section of manifold. Disconnect engine section of wiring harness from engine and place to one side.

Installation note:  
Plug connector assignments, refer to 61 11 061  
Repair Manual 3 Series E38

Remove bottom section of manifold,  
refer to 11 81 544  
Repair Manual 3 Series E38

Release ignition coil,  
refer to 12 13 542  
Repair Manual 3 Series E38



Attach engine to special tool 11 0 000.



**Caution!**  
Collect any fuel flowing out and dispose of suitably.

Release fuel supply and return lines.

- (1) Fuel supply  
(from fuel filter pipe: bare)
- (2) Fuel return  
(pipe: painted black)

Replace fuel hoses.



Release ground lead.  
Release upper engine mounts on left and right.  
Lift out engine.

Release power steering pump from alternator  
support bracket and tie to one side,  
refer to 32 41 060  
Repair Manual 3 Series E38

**Note:**  
Lines remain connected.



Remove front manifold support bracket with  
lifting bracket.

# 11 Engine M50

00 00 249	BMW engine oil service .....	11- 00/50.1
11 00 039	Compression of all cylinders – check .....	11- 00/50.1
050	Engine – remove and install .....	11- 00/50.2
11 13 000	Oil pan – remove and install, seal or replace .....	11- 13/50.1
	• Fan shroud – remove .....	11- 13/50.1
	• Fan – remove .....	11- 13/50.1
	• Power steering pump – remove .....	11- 13/50.1
	• Oil dipstick tube – remove .....	11- 13/50.2
	• Oil pan – unscrew .....	11- 13/50.2
	• Pickup tube for oil pump – remove .....	11- 13/50.2
11 14 110	Bottom timing case cover – remove and install, seal or replace .....	11- 14/50.1
	• Cylinder head cover – remove .....	11- 14/50.1
	• Thermostat housing – remove .....	11- 14/50.2
	• RPM sensor – remove .....	11- 14/50.2
	• Mounting bracket for tensioner pulley – remove .....	11- 14/50.3
	• Pulley for water pump – remove .....	11- 14/50.3
	• Hub for vibration damper – remove .....	11- 14/50.3
	• Timing case cover – remove .....	11- 14/50.4
11 31 001	Camshaft (M50) (inlet or exhaust end) – replace .....	11- 31/50.1
	• Camshaft – remove .....	11- 31/50.1
001	Camshaft (M50 VANOS) (inlet or exhaust end) – replace .....	11- 31/50.8
11 36 ...	Functional description VANOS (variable camshaft control) .....	11- 36/50.1
...	Control unit (VANOS) – troubleshoot .....	11- 36/50.1
000	VANOS – check function .....	11- 36/50.2
010	VANOS control unit – remove and install or replace .....	11- 36/50.3
550	4/2-way valve for VANOS – check or replace .....	11-36/50.10

For further jobs refer to "Assembly Repair Manual".

00 00 249 BMW engine oil service

M50

Refer to 00 00 249

Repair Manual 3 Series E38

11 00 039 Testing compression of all cylinders

M50



**Caution!**

High voltage - risk of fatal injury!  
Disconnect power supply to ignition coils.  
Observe notes on compression testing,  
refer to General Information MG12  
Repair Manual 3 Series E38

Disconnect fuel pump relay and DME main relay (location: E-box), refer to Electrical Troubleshooting Manual "Schematics" 3 Series E38 7000:0 Component location chart

For further procedure, refer to 11 00 039  
Repair Manual 3 Series E38

Read out defect code memory.  
Repair defect if necessary.  
Delete defect code memory.

## 11 00 050 Removing and installing engine

### MSD

Observe rules on disconnecting and connecting battery, refer to General Information MGN2 Repair Manual 3 Series R36.

Remove transmission, refer to 24 00 022 / 23 00 022 / 023 (4-wheel drive)

### Note:

Additional jobs on 4-wheel drive:  
Remove stabilizer bar, refer to 31 30 000  
Remove left and right output shafts, refer to 31 60 000

Disconnect negative battery lead.  
Disconnect positive battery lead.  
Remove battery.

Remove battery tray.



50 11 277 L

Remove covers.



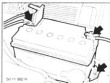
50 11 218 H

Remove intake duct for alternator cooling air.



50 11 000 H

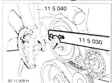
Release plug-and-socket connection.  
Release hose clip and retaining screws.  
Remove air cleaner with air mass meter.



50 11 000 H



50 11 000 H



50 11 000 H

**Caution!**  
Left-hand thread.  
Hold pulley with special tool 11 5 030 and release union nut with special tool 11 5 040 from water pump.



SO 11 500 0

**Installation note:**  
Firmly hold fan with special tool 11 5 040.  
For tightening torque, refer to Technical Data 11 52 1A2.

**Note:**  
When using special tool 11 5 040, a reading of 30 Nm on the scale of the torque wrench corresponds to a tightening torque of 40 Nm.

Lift out expanding rivet on left and right.



SO 11 500 0

Detach fan with fan clutch from water pump and lift upwards together with fan shroud.



SO 11 500 0

If necessary move protective plate.

Drain off coolant at engine block and dispose of suitably.

**Installation note:**  
Replace gasket.  
For tightening torque, refer to Technical Data 11 11 5A2.



SO 11 500 0

Remove radiator, refer to 17 11 000



SO 11 500 0

Remove coolant hoses from engine, heating valve (1) and heater (2).

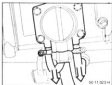
Remove throttle operating (Blenden) cable. This job is described under removing throttle body, refer to 13 04 030

Disconnect hose for tank ventilation.



SO 11 500 0

## 11-00/50.4



Disconnect hoses for throttle preheating.



**Caution!**

Collect any fuel flowing out and dispose of suitably.

- (1) Fuel return line
  - (2) Fuel supply line (from fuel filter)
- Remove fuel hoses.

**Installation note:**  
Replace fuel hoses.



Remove connection piece from brake booster.

**Caution!**

Close off connection hole.



Disconnect hoses for cylinder head ventilation.

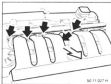


Remove injection tube, refer to 13 84 150

Undo hose for idle speed control valve from manifold.

**Note:**

Figure shows connection from below (not visible in vehicle).



Remove intake air manifold.

**Caution!**

Make sure no parts fall into the ports.



**Installation note:**  
Replace seals.

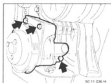


## 11-00/50.5



Disconnect engine section of wiring harness from engine.  
Release cable duct.  
Place wiring harness to one side.

**Installation note:**  
Plug connector assignments, refer to 81 11 020



Remove power steering pump.

**Note:**  
Lines remain connected.

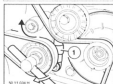


Remove cap from tensioner pulley.



Location of rear mounting.

Screw special tool 11 0 020 from above into support bracket on engine block.



Fit hexagon socket wrench in screw for tensioner pulley.  
Tensioning element (1) is pressed together by slowly turning in clockwise direction.  
Lift off drive belt.



Location of front mounting.



Location of drive belt.

**Installation note:**  
Ensure it is fitted correctly in grooves. Check drive belt for coolant and oil residue, replace if necessary.  
The drive belt must be replaced if soiled with hydraulic oil.



Attach special tool 11 0 020 to front and rear of engine.  
Tension chain.

## 11-00/50.6



Release engine mount and ground lead on right.



Release left engine mount.

Lift out engine.

## 11-13/50.1



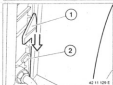
### 11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL PAN

#### o Removing Fan Cowl

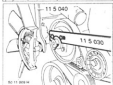
Lift left and right expansion rivets out.



Pull fan cowl out upwards.



**Installation:**  
Engage left and right tabs (1) in holders (2) when inserting the fan cowl.



#### o Removing Fan

Counterhold on pulley with Special Tool 11 5 030 and unscrew coupling nut from fan.

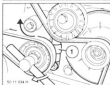
**Note:**  
Different bolt distances.

**Important!**  
Left-hand threads.



#### **Installation:**

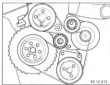
Tighten fan using Special Tool 11 5 040. 40 Nm tightening torque is equal to 30 Nm on scale of the torque wrench.



#### o Removing Power Steering Pump

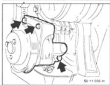
Slacken drive belt:  
Insert wrench socket into bolt for the tensioning wheel.  
Turning slowly clockwise will push tensioning element (1) together.

Remove drive belt.



#### **Installation:**

Layout of drive belt.  
Check for correct seating in the grooves.



Unscrew power steering pump from engine and suspend from car on a piece of wire. Pipes remain connected.

#### **Installation:**

Tightening torque.

\* Refer to Specifications

## 11-13/50.2



Unscrew oil drain plug and drain the oil.

**Installation:**  
Tightening torque\*

**Installation:**  
Pour in engine oil†.

Start and run engine at high speed (approx. 3500 rpm) until the oil control lamp goes out (about 5 seconds).



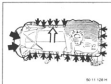
**b - Removing Guide Tube for Oil Dipstick**

Unscrew and pull guide tube out.



**Installation:**  
Replace seal.

\* Refer to Specifications



**c - Unscrewing Oil Pan**

Unscrew all bolts and lower oil pan to the front axle center.

Pull oil pan out towards the rear after removing the oil pump intake.



**Installation:**

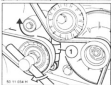
**Replace gasket.**

Fill in joints between the front end of the chain case and rear end of the end cover with permanently elastic sealing compound 2 Bond 12078 black\*\*.



**d - Removing Oil Pump Intake**

Unscrew intake pipe.



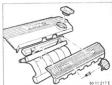
**Installation:**

Tab on gasket points to intake cage.

\*\* Source of Supply: BMW Parts

11 14 110 REMOVING AND INSTALLING,  
SEALING OR REPLACING  
LOWER TIMING CASE COVER

Remove oil pan - refer to 11 13 000.



50 11 017 E



50 11 050 E



50 11 020 E

a Removing Cylinder Head Cover

Unscrew cover for ignition coils.

**Note:**  
Lift cover horizontally, pull it forward and  
then swing it out over the oil filler neck.

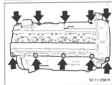
Pull plugs off of ignition coils.  
Remove plug rail complete with electric  
leads.



50 11 021 E



50 11 050 H



50 11 050 E



50 11 050 H

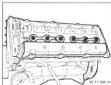
Remove ignition coils.

**Installation:**  
Place paper gasket between valve cover  
and ignition coil (for galvanic separation).

Unclip connection for cylinder head vent.

Unscrew cylinder head cover.

**Note:**  
Cylinder head cover is separated from the  
cylinder head in regards to transmission of  
oscillation by using rubber mounts and  
gaskets.  
Check arrangement of rubber elements.



**Installation:**  
Check gaskets, replacing if necessary.  
Place gaskets on cylinder head.



Unscrew suspension eye.  
Unscrew thermostat housing.



**Installation:**  
Make sure of correct sealing of gasket on  
back of cylinder head when mounting the  
cylinder head cover.



**Installation:**  
Replace gasket.



#### • Removing Thermostat Housing

Drain coolant.  
Disconnect water hoses from thermostat  
housing.



**Installation:**  
Check installed direction.  
Vent or arrow faces up.  
Replace O-ring.



Disconnect water hose behind the oil filter.



#### • Removing Speed Sender

Unscrew sender.

## o Removing Tensioning Roller Console

Take off cover.

Unscrew tensioning roller.

Unscrew console.

**Align:**  
The hydraulic belt tensioner is filled with oil, so that a removed element must always be stored standing upright. Inversely stored elements can normally be tied by compressing several times.

**Installation:**  
Check installed direction.

## o Removing Pulley for Water Pump

Hold pulley tight on the drive belt and unscrew bolts.

**Installation:**  
Tightening torque\*.

## o Removing Vibration Damper Hub

Unscrew vibration damper bolts and take off vibration damper.

**Installation:**  
Align drives pin bore in vibration damper with the dowel pin. Tightening torque\*.

Apply Special Tool 11 2 150.

Unscrew central bolt.  
Take off washer and hub.

\* See Specifications



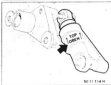
50 11 210 E



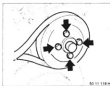
50 11 112 H



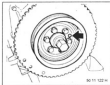
50 11 021 E



50 11 114 H



50 11 138 H



50 11 122 H



11 2 150

50 11 019 E



11 2 150

50 11 020 E



50 11 124 H

**Installation:**  
Position hub that groove and woodruff key are aligned.  
Shoulder of washer faces hub.  
Central bolt tightening torque = 410 Nm.



11 3 280

50 11 125 H

**Installation:**  
Press in new radial oil seal flush using Special Tool 11 3 280 together with the central bolt with the timing case cover mounted.

**■ Removing Timing Case Cover**

Drive out dowel pins on timing case cover toward rear (diameter of punch less than 5 mm).



50 11 211 E

Unscrew timing case cover from cylinder head.  
Pull up bolts.



50 11 212 E



50 11 213 E

Unscrew timing case cover from engine block and lift off cover.



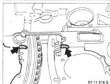
50 11 214 E

**Installation:**  
Clean sealing surfaces.  
Drive dowel pins into timing case cover that they protrude by about 2 to 3 mm.



50 11 215 E

**Installation:**  
Hold new gaskets on timing case cover with a small amount of grease.



50 11 216 E

**Installation:**  
Produce beads of permanently elastic sealing compound\* on left and right transitions to the cylinder head gasket.

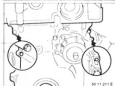
\* Source of Supply: BMW Parts



## 11-14/50.5



**Installation:**  
Mount cover and screw in screws finger tight.



**Installation:**  
Drive in dowel pins flush from front end.

**Installation:**  
Tighten bolts on cylinder head and engine block alternately and uniformly in several steps.  
Tightening torque\*.

\* See Specifications

### 11 31 001 REPLACING CAMSHAFT (MSD) (Intake or Exhaust)

**Note:**  
Intake or exhaust camshaft can be replaced in the car.

Remove fan cover.

Remove fan using Special Tools 11 5 030 and 11 5 040.

**Note:**  
Left-hand threads.

**Installation:**  
Set torque wrench to 30 Nm and tighten fan bolt using Special Tool 11 5 040.

#### • Removing Camshaft

**Caution!**  
The camshaft could be damaged or broken if it is removed / installed without use of special tools.  
Valves could also be bent through contact with the piston crowns.  
Conformance with procedures and sequence is absolutely essential.



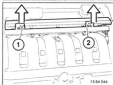
Remove covers.



**Note:**  
Lift cover horizontally, pull forward and then swing it out over the oil filler neck.



Unscrew ground strap on timing case cover.



Unscrew screws (1 and 2).  
Pull off plug rail.



50 11 007 4



11 5 040

11 5 030

50 11 008 4



50 11 500 14

13 31 073

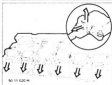
50 11 000 4

50 11 180 4

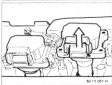
13 31 044



**Important!**  
Watch out for rubber seals.



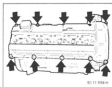
Pull plugs off of ignition coils.  
Remove plug seal together with wires.



Remove ignition coils.



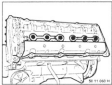
Unplug connection for cylinder head vent.



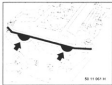
Unscrew cylinder head cover.



**Note:**  
Rubber mounts and gaskets separate the cylinder head cover from the cylinder head to prevent transmission of oscillation. Check arrangement of rubber mounts.



**Attention:**  
Check gaskets, replacing them if necessary. Place gaskets on cylinder head.



**Attention:**  
Check for correct seating of the gasket on the back of the cylinder head when mounting the cylinder head cover.

# 11-31/50.3



Remove sander.

Installation:  
Check seal, replacing it if necessary.

50 11 262 H



Remove wiring duct.

50 11 262 H



Unscrew suspension eye and upper timing case cover.

50 11 262 H



Installation:  
Replace gasket.  
Check for dowel stones.

50 11 262 H



Pull off cover.

50 11 262 H



Crank engine in its direction of rotation until the peaks of intake and exhaust cams in cylinder no. 1 face each other. Arrows on the sprockets point up.

50 11 262 E



Hold crankshaft in TDC position using Special Tool 11 2 300.

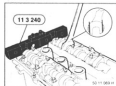
Important!  
Remove special tool before operating the engine.

50 11 262 G



Unscrew both valve cover mounting studs.

50 11 262 E

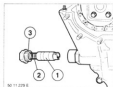


**Installation:**  
Align and hold camshaft in position using Special Tool 11 3 290. Camshafts can be turned on the hexagon using a 24 mm wrench.

**Important!**  
Don't damage the bearing strip. If necessary, machine the open-ended wrench accordingly.



**Important!**  
If the camshaft alignment has to be corrected to such an extent that valves are moved in cylinders 1 and 6, first turn the crankshaft in the engine's direction of rotation approx. 30° away from TDC and then turn the camshaft back. This prevents contact between valves and piston crowns. Install both chain tensioners after assembling has been completed. Crank engine several times in its direction of rotation. Recheck camshaft alignment.



Unscrew bolt (3).

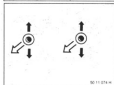
**Caution!**  
Strong spring force.

Remove spring (2) and plunger (1).

**Installation:**  
Insert chain tensioning plunger (1) in such a manner that guide tabs engage in the tensioning rail. Install spring (2) and bolt (3). Replace seal. Tightening torque\*.



Press down on upper chain tensioner and adjust it by inserting Special Tool 11 3 290.



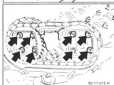
Unscrew sprockets. Lift off both sprockets together with the chain.

**Installation:**  
Arrows on the sprockets point up. Tightening torque\*.

\* Refer to Specifications



**Installation:**  
Apply pulse sender on the intake camshaft.



**Installation:**  
Tighten belts only after finishing installation of the chain system and lower chain tensioner as well as loosening the upper chain tensioner. Tightening torque:



Unscrew console for upper chain tensioner.

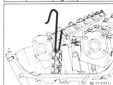


Unscrew chain guide.

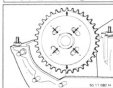
• Refer to Specifications



Lift off sprocket together with chain.

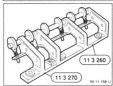


**Important!**  
Use a piece of wire to prevent the chain from sliding down.



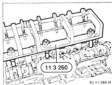
**Installation:**  
Arrow on the sprocket points up.

Mount sprocket in such a manner that the tapered bores are on the left hand side of the slots, as mounting the chain tensioner will cause the sprocket to be turned to the left.



Prepare Special Tool 11 3 260 for a six cylinder engine.

# 11-31/50.6



Unscrew spark plugs.

Apply special tool and screw into spark plug tapped bores tight. Tightening torque = 33 Nm.



Apply tension on bearing caps by turning the eccentric shaft. Unscrew all bearing cap bolts.

Installation:  
Tightening torque\*.

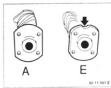


Loosen and remove special tool. Lift out bearing caps and camshaft.



Installation:  
Install camshafts that peaks of cams for intake and exhaust valves in cylinder no. 1 face each other.

\* Refer to Specifications



Installation:  
Identification of camshafts on flange for sprockets:

- E: Intake camshaft
- A: Exhaust camshaft



Identification on front end of camshafts:

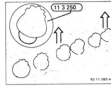
- 1st letter:
- E: Intake
  - A: Exhaust

- 2nd letter:
- A: 2.5 liter
  - B: 2.0 liter

Example:  
EB = Intake 2.0 liter



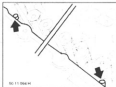
Installation:  
Bearing caps are marked A1 to A2 for the exhaust side or E1 to E2 for the intake side, whereby the marks can be read from the intake side.



Suck valve clearance compensators tight using Special Tools 11 3 270.

Lift out bearing strip complete with valve tappets.

## 11-31/50.7



### Installation:

Check for centering sleeves on mounting studs for bearings 2 and 7.



### Installation:

Bearing strips are marked with "A" for the exhaust side or "E" for the intake side.



### Installation:

Inspect bearing surfaces of valve clearance compensators for wear (scoring).



11 31 001 Replacing camshaft  
(M50 VANOS) (Intake or  
exhaust end as required)

Refer to 11 31 001 (M50 VANOS)  
Repair Manual 3 Series E38

## 11 36 . . . DESCRIPTION OF VANOS (Variable Camshaft Control)

The control unit is activated by the pertinent engine control unit. The control unit operates a regulating element via a solenoid. In this manner engine oil pressure is supplied to both sides of a hydraulic plunger.

The hydraulic plunger is held in one of both possible positions by way of mechanical stops and applied engine oil pressure. A rotating splined shaft gear is integrated in the hydraulic plunger. This splined shaft gear uses its helical bevel splines to convert the plunger stroke into rotation of the camshaft – relative to the driven chain sprocket.

Hydraulic plungers with the splined shaft gear are located in a pressure cast aluminum housing on the face end of the cylinder head, coaxial to the intake camshaft.

The nominal positions of the intake camshaft (advanced or retarded) are different for M50 B20 and M50 B25 engines. Adjustment of the camshaft is activated by the pertinent engine control unit depending on engine load, engine speed and coolant temperature.

The 4/3-way operating valve is designed in such a manner that when one pressure chamber is pressurized, the other is without pressure (feedback). As soon as the operating valve's solenoid receives current, it moves the control piston against spring force into advanced position via an armature. A coil spring is provided for return to the retarded position. Consequently the camshaft is automatically adjusted in retarded direction in case of a faulty solenoid or activation failure.

In this manner it is still possible to start the engine even when the control unit fails. It would not be possible to start the engine were the camshaft adjusted in advanced timing direction.

The control edges of the valve are designed in such a manner that the emergency operation properties of the engine are guaranteed even when the control piston would seize in an undefined intermediate position.

## 11 36 . . . TROUBLESHOOTING VANOS CONTROL UNIT

Interrogate the fault memory of the engine control unit. If no faults are stored in the memory, refer to "Checking Function of VANOS" in 11 36 900.

## M50 B20:

M50 B20 engines are fitted with an engine control unit from "Siemens". Designation: M5 80.1

Faults which could be stored in the control unit's fault memory:

- 1) Feedback of intake camshaft's position. If the camshaft is not adjusted or only adjusted inadequately after activation and triggered operation, this is stored in the fault memory.
- 2) Testing of final stages
- 3) Short to positive
- 4) Short to ground
- 5) Breaks in wiring

## M50 B25:

M50 B25 engines are fitted with an engine control unit from "Bosch". Designation: DME M 3.3.1

Faults which could be stored in the control unit's fault memory:

- 1) Testing of final stages
- 2) Short to positive
- 3) Short to ground
- 4) Breaks in wiring



### 11 36 000 Checking function of VANOS

Interrogate fault memory of the engine control unit.

The VANOS control unit plug is located behind the oil filter head back on the engine wire harness.

SA 12 081



Remove air guide for alternator.  
Disconnect plug.

SA 12 082



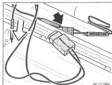
Connect special tool 61 2 050 on engine wire harness and solenoid.

SA 12 083



Switch on ignition.  
Connect special tool 61 1 476 to one pin of the 2-pin plug of special tool 61 2 050.  
Connect special tool 61 2 050 to vehicle ground.  
Switching of the solenoid must be heard and felt.  
If the solenoid valve fails to switch, refer to next page.

SA 12 084



SA 12 084



SA 12 084

Connect special tool 61 2 050 to vehicle ground and, if the solenoid valve fails to respond, special tool 61 2 050 must be inserted in the other chamber of the two-pin plug connection of special tool 61 1 476.

Again connect special tool 61 2 050 to vehicle ground.  
Switching of the solenoid must be heard and felt.

#### Dynamic Test:

Start and run engine at idle speed.  
Again connect special tool 61 2 050 to vehicle ground.  
Engine runs extremely roughly or dies.

If the solenoid is not operated in this test, another test must be carried out with special tool 12 6 410.

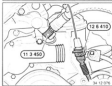


SA 12 077

Connect special tool 12 6 410 to plug of solenoid. Connect the red clip to the battery's positive connection point. Connect the black clip to vehicle ground.

#### Caution!

Reversing the terminals on the special tool will destroy the installed diode on the VANOS solenoid valve. The solenoid valve remains serviceable but current spikes can give rise to faults in the vehicle circuit.



SA 12 076

Switching of the solenoid must be heard and felt.

If the solenoid is now operated, check the wiring from the engine control unit to the solenoid.

If the solenoid is not operated, also refer to: **Electrical Troubleshooting Manual.**

### 11 36 010 Removing and installing or replacing VANOS control unit

M50

**Caution!**  
If disassembled/ assembled incorrectly, there is a danger that the valves will be bent by contact with the piston crown.  
Follow order of assembly exactly.

Remove complete air duct assy. for alternator.

**Caution!**  
Left-hand thread.  
Firmly hold pulley with special tool 11 5 030.  
Release union nut with special tool 11 5 040 from water pump.



90 11 190 0



90 11 001 4

**Installation note:**  
Set torque wrench to 30 Nm, tighten fan screw in conjunction with special tool 11 5 040.

Remove fan with fan clutch from water pump and remove together with fan shroud.

Remove cover.



90 11 024 0

Unscrew ground strap (1) on timing case cover.



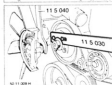
90 11 042 0



90 11 500 0

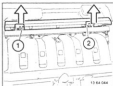


90 11 190 0



90 11 008 4

## 11-36/50.4



Unscrew screws (1 and 2).  
Pull off plug rail.



**Important!**  
Watch out for rubber seals.



Pull plugs off of ignition coils.  
Remove plug rail together with wires.

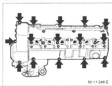


Remove ignition coils.

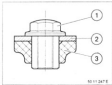
**Installation:**  
Secure ground straps on ignition coils for  
cylinder no. 3 and cylinder no. 5.



Unclip connector for cylinder head vent.

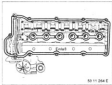


Unscrew cylinder head cover.



**Align:**  
Rubber mounts and gaskets separate the  
cylinder head cover from the cylinder head  
to prevent transmission of oscillation.

- 1 Capped nut
- 2 Washer
- 3 Rubber mount



**Installation:**  
Check gaskets, replacing them if necessary.  
Place gaskets on the cylinder head.

# 11-36/50.5



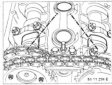
**Installation:**  
Check for correct seating of the gasket on the cylinder head's backside when mounting the cylinder head cover.



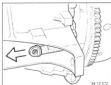
Remove electric wire duct.



Pull off plastic cover for the intake camshaft.



Crank engine in its direction of rotation until the cam peaks of the intake and exhaust camshafts in cylinder no. 1 point to each other.



Pull dust guard out of the special tool bore.



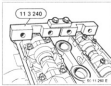
Hold crankshaft in TDC position using Special Tool 11 2 308.

**Caution!**  
Remove the special tool before operating the engine.



Unscrew bolts.

**Installation:**  
Tightening torque\*



Hold camshafts in position using Special Tool 11 2 242.

\* Refer to Specifications



Screw plugs out of the control unit.



Loosen bolts.

Installation:  
Tightening torque\*

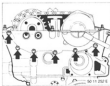


Press down on chain tensioner from above and lock using Special Tool 11 3 290.



Unscrew oil pressure pipe.  
Disconnect solenoid plug.

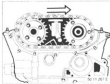
\* Refer to Specifications



Unscrew nuts.

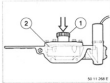
Installation:  
Tightening torque\*

Remove VANOS control unit.

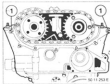


Install VANOS control unit.

Turn sprockets with mounted secondary chain clockwise as far as stop.



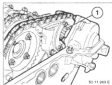
Push back control unit's splined shaft (1) into housing (2) as far as stop.



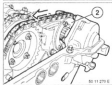
Check for dove-tailed sleeves (1).  
Apply liquid sealant Three Bond 1209\*\* on bolt corners of separating plane between cylinder head and VANOS control unit.  
Replace gasket.

\* Refer to Specifications

\*\* Source of Supply: BMW Parts

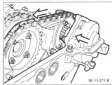


Apply VANOS control unit and turn splined shaft (1) until the splines mesh.

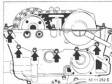


Turn sprockets with mounted chain counterclockwise by hand far enough that the splined shaft meshes in the splines of sprocket (2).

**Important!**  
It is absolutely essential to ensure that the "FIRST" adjustable tooth meshes.



Move VANOS control unit in direction of the cylinder head.  
Guiding the helical bevel splined shaft into the helical bevel splined sprocket turns the sprockets with mounted chain counterclockwise.  
Guide the chain with sprockets in counterclockwise direction by hand.

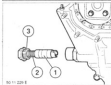


Tighten nuts.  
Tightening torque\*.

\* Refer to Specifications.



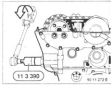
Remove Special Tool 11 3 290.



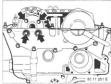
Unscrew primary chain tensioner (2).

**Caution!**  
Strong spring force.

Remove spring (2) and plunger (1).



Preload tensioning roll with help of Special Tool 11 3 290 by tightening the adjuster to 1-3 Nm using Special Tool 90 2 050 or a standard torque wrench.

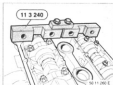


Tighten sprocket bolts of the exhaust camshaft in two steps.  
Tightening torque\*.

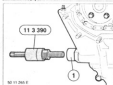
\* Refer to Specifications.



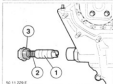
# 11-36/50.8



Remove special tool 11 3 240.



Remove special tool 11 3 390.



Install chain tensioner plunger (1) in such a manner that the guide tabs engage in the tensioning rail.

Install spring (2) and both (3) together with a new seal.

Tightening torque 11 31 1A2\*



Install plugs with new seals.  
Tightening torque 11 36 3A2\*

\* Refer to Specifications.



Check function of VANOS control unit. Mount special tool 11 3 490 together with the oil pressure pipe coupling.  
Connect up compressed air (2...3 bar).



Measure distance (Y) between secondary tensioner and edge on camshaft gear. Note the measured distance.



Connect special tool 12 5 410 to the plug of the solenoid for VANOS. Connect positive clip to battery connection point.  
Connect negative clip to vehicle ground to adjust the camshaft.

### Caution!

Reversing the terminals on the special tool will destroy the installed diode on the VANOS solenoid valve. The solenoid valve remains serviceable but current spikes can give rise to faults in the vehicle circuit.

## 11-36/50.9



Measure distance (2) between secondary tensioner and edge on sander gear. Note the measured distance.

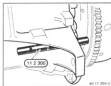
Determine control travel:

- Distance 2
- Distance 1
- = Control travel

The control travel must be at least 0.5 mm.

*Important!*

The control unit must be readjusted if the control travel is less than 0.5 mm.

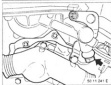


Remove Special Tool 11 2 300.

Assemble engine.



Remove Special Tools 11 3 450 and 12 6 410.



Mount oil pressure pipe with new seals. Tightening torque\*. Connect solenoid plug.

\* Refer to Specifications



11 36 500 CHECKING / REPLACING 4-WAY VALVE FOR VAMOS

Switch off ignition.  
The VAMOS control unit plug is located behind the air filter (see back on the engine wire harness).



Remove air guide for alternator.  
Disconnect plug.



Unscrew VAMOS solenoid.

Installation:  
Tightening torque\*.  
Check seal, replacing it if necessary.



Move the plunger back and forth to ensure that it moves easily.



Move plunger of the hydraulic piston back and forth.  
The hydraulic piston must be moved easily.  
The complete VAMOS control unit must be replaced if the hydraulic piston is hard to move.



\* Refer to Specifications

# 11 Engine M51

00 02 249	BMW engine oil service (changing engine oil and oil filter) .....	11- 00/51.1
11 00 039	Compression – check .....	11- 00/51.2
050	Engine – remove and install .....	11- 00/51.3
	• Transmission – remove .....	11- 00/51.3
	• Radiator and intercooler – remove .....	11- 00/51.3
	• Remaining coolant from engine – drain .....	11- 00/51.3
	• Exhaust manifold with intake pipe – remove .....	11- 00/51.3
	• Vacuum lines – remove .....	11- 00/51.4
	• Electrical connections – disconnect from engine .....	11- 00/51.4
	• Fuel line – remove .....	11- 00/51.5
	• Water hoses – remove .....	11- 00/51.5
	• A/C compressor – remove .....	11- 00/51.6
	• Hydraulic pump for power steering - remove .....	11- 00/51.6
	• Engine – lift out .....	11- 00/51.7

For further jobs refer to "Assembly Repair Manual".

M51 engine  
00 00 349 BMW (Engine oil service  
(changing engine oil and oil  
filter))

Refer to 00 00 349,  
Repair Manual 3 Series E36

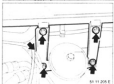
## 11 00 038 CHECKING COMPRESSION

Testing Conditions:  
 Battery in perfect condition - check acid density if necessary.  
 Engine temperature <math>\pm</math> max. 35° C coolant temperature.



SI 11 176 E

Unscrew cover for Intake manifold.



SI 11 205 E

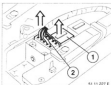
Unscrew support,  
wincip holder.

Caution!  
 Don't touch electric connections on the starter.



SI 11 208 E

Unscrew cover on electronic box.

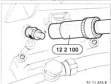


SI 11 207 E

Pull off electric fuel pump relay (1) and  
 plug on preheating time control unit (2).



SI 11 209 E

Unscrew electric connections on glow  
 plugs.

SI 11 204 E

Unscrew glow plugs using Special Tool  
 12 2 100 (also refer to Group 12).

Application:  
 Coat threads with copper paste CRC\*\*,  
 Tightening torque\*.



SI 11 206 E

Diesel Test Probe:  
 Screw in Special Tool 11 0 232 full distance  
 and tighten lightly by hand.  
 Compression Recorder:  
 Plug in Special Tool 11 0 321.  
 Operate starter so long until pressure stops  
 rising.  
 Minimum compression\*.  
 Approximately same value for all cylinders.

Use Special Tool 11 0 160.

\* Refer to Specifications  
 \*\* Source of Supply: BMW Parts

Engine MS1  
11 00 050 REMOVING AND INSTALLING ENGINE

6 Removing Transmission:

Remove transmission - refer to Group 23 or 24.

6 Removing Radiator and Charge Air Cooler:

Remove radiator and charge air cooler - refer to Group 17.

6 Draining Residual Coolant from Engine:

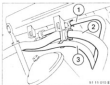
Unscrew and remove plug from engine block.  
Drain coolant.

Installation:  
Replace seal.

6 Removing Intake Manifold with Intake Pipes:

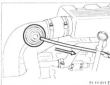
Unscrew covers for intake manifold.

Unscrew supports.  
Unclick holders.



Unclick hoses from holders.

- 1 = Vacuum hose for brake booster
- 2 = Coolant hose to heater
- 3 = Fuel hose to injection pump



Pull vacuum hose off of EGR vacuum unit.



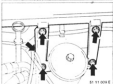
Pull temperature sensor plug off of intake manifold.



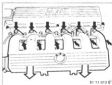
Unscrew EGR pipe.

Installation:  
Tightening torque\*.

\* Refer to Specifications



## 11-00/51.4

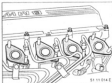


Unscrew intake manifold.



o Disconnecting Electric Leads from Engine:

Lift cover for electric connections off of alternator.  
Disconnect leads from alternator.



Installation:  
Replace gaskets.



Unscrew leads from starter.



o Disconnecting Vacuum Pipes:

Unlig vacuum pipe on brake booster.



Lift lead cover off of alternator.  
Unscrew connections.

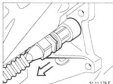


Pull EGR and radiator shutter control hoses off.



Unscrew connections for temperature sender and glow plugs.





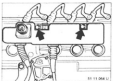
Disconnect speed sender plug.



Pull plug off of oil pressure switch.



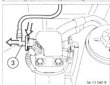
Disconnect injection pump central plug and connections for shut-off and solenoid.



Unscrew electric lead channel from engine.



Unscrew ground strap from right carrier member.



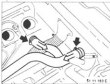
o Disconnecting Fuel Pipe:

Press retainer downwards and pull connector (3) out of filter housing.

Installation:  
Pay attention to seal.



Disconnect return pipe at injection pump.



o Disconnecting Water Hoses:

Disconnect water hoses to heater, on engine and on heater separating wall.

## 11-00/51.6



### a Removing A/C Compressor:

Loosen bolt and slacken multi-tooth belt.



**Installation:**  
Turn tensioning roller counterclockwise using a torque wrench applied in the hexagon socket.

Tensioning procedures - refer to Group 64.



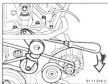
Remove multi-tooth belt.

**Installation:**  
Make sure that multi-tooth belt is placed precisely in grooves.



Unscrew A/C compressor from console and suspend from car on piece of wire. Lines remain connected.

**Installation:**  
Pay attention to dowel sleeve.



### b Removing Power Steering Pump:

Remove ribbed drive belt.  
Slacken the automatic belt tensioner with a suitable lever (e.g. thick screwdriver) and remove ribbed drive belt.



**Important!**  
Pay attention to arrangement of belt.  
Place multi-tooth belt in grooves correctly.

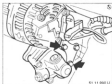


Hold pulley tight with help of ribbed drive belt.  
Unscrew bolts.



Unscrew bolts on face.

## 11-00/51.7



UnscREW bolts on back.

Remove power steering pump and suspend from car on piece of wire. Lines remain connected.

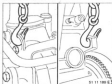
51 11 000 L1



6 Lifting Engine Out:

Attach Special Tool 11 0 020 on engine.

51 11 000 G



Arrangement of suspension at front and rear

51 11 000 G



UnscREW engine mount at right top and loosen nut at bottom.

Installation:  
Tightening torque\*

51 11 000 G

\* Refer to Specifications



UnscREW engine mount at left top and loosen nut at bottom.

Installation:  
Tightening torque\*

51 11 000 G

Lift engine out.

*Important!*

A removed engine with installed hydraulic valve clearance compensators must not be left standing on its end for longer than 10 minutes, as otherwise oil would run out of the compensators so that they will no longer function.

\* Refer to Specifications

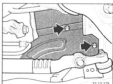
# 11 Engine M60

11 00 050	Engine – remove and install .....	11- 00/60.1
11 12 004	Cylinder head covers, both – remove and install/seal .....	11- 12/60.1
	Cylinder head cover, left – remove .....	11- 12/60.1
	Cylinder head cover, right – remove .....	11- 12/60.2
005	Cylinder head cover, left – remove and install/seal .....	11- 12/60.5
006	Cylinder head cover, right – remove and install/seal .....	11- 12/60.5
105	Cylinder head, left – remove and install .....	11- 12/60.5
106	Cylinder head, right – remove and install .....	11- 12/60.5
107	Cylinder heads, both – remove and install .....	11- 12/60.5
110	Cylinder head gasket, left – replace .....	11- 12/60.5
111	Cylinder head gasket, right – replace .....	11- 12/60.5
112	Cylinder head gaskets, both – replace .....	11- 12/60.5
11 13 010	Oil pan upper section – remove and install or replace .....	11- 13/60.1
020	Oil pan lower section – remove and install or replace .....	11- 13/60.4
11 14 080	Upper timing case cover, left – remove and install, seal or replace .....	11- 14/60.1
085	Upper timing case cover, right – remove and install, seal or replace .....	11- 14/60.3
141	Radial oil seal in lower timing case cover – replace .....	11- 14/60.5
151	Crankshaft radial oil seal (transmission end) – replace .....	11- 14/60.6
11 22 500	Flywheel – remove and install or replace .....	11- 22/60.1
11 23 010	Vibration damper – remove and install or replace .....	11- 23/60.1
031	Hub for vibration damper – remove and install or replace .....	11- 23/60.2
11 28 010	Alternator drive belt – replace .....	11- 28/60.1
11 31 010	Camshaft timing – adjust .....	11- 31/60.1
011	Camshaft, left – replace .....	11- 31/60.1
015	Camshaft, right – replace .....	11- 31/60.1
11 41 000	Oil pump – remove and install or replace .....	11- 41/60.1
11 42 020	Full flow oil filter, complete – remove and install, seal or replace .....	11- 42/60.1
11 51 000	Water pump – remove and install or replace .....	11- 51/60.1
011	Pulley on water pump – replace .....	11- 51/60.2
11 53 000	Coolant thermostat – remove and install or replace .....	11- 53/60.1
325	Coolant manifold – remove and install or replace .....	11- 53/60.2
11 61 050	Intake air manifold – remove and install .....	11- 61/60.1
11 62 142	Exhaust manifolds, left, both – remove and install or replace .....	11- 62/60.1
143	Exhaust manifolds, right, both – remove and install or replace .....	11- 62/60.3

For further jobs refer to "Repair Manual 7 Series E38".

## 11 00 000 REMOVING AND INSTALLING ENGINE

Interrogate fault memories.  
 Disconnect battery ground lead.  
 Remove manual transmission (refer to Gr. 13) or automatic transmission (refer to Gr. 14).  
 Remove radiator - refer to 17 11 000.



Unscrew left and right heat shields on front axle carrier.



Remove complete coolant expansion tank.



Remove poly-V-belt.

**Installation:**  
 Check poly-V-belt for signs of coolant and oil, replacing it if necessary.

**Important!**  
 Always replace a poly-V-belt drenched with hydraulic oil.



Unscrew tensioner for poly-V-belt.  
 Unscrew bolts (1) and (2).  
 Remove alternator - refer to 12 21 000.  
 Unscrew power steering pump - refer to Group 32.  
 Pipes remain connected.



**Installation:**  
 Preload holder for tensioner on hexagon (1) up to end of slot (2).  
 Tighten nut (3).



Remove left and right engine mounts.  
 Remove ground strap from engine support arm.



Disconnect plug on oil level switch and remove wiring guide.



Remove upper section of air cleaner together with air mass meter.



Remove complete throttle operating (Bowden) cable assembly at throttle body.



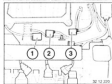
Remove vacuum line at brake booster.



Disconnect tank ventilation hose at throttle body.



Remove right and left cylinder head cover.  
Disconnect plug-and-socket connections on right and left ignition coils.

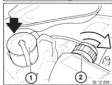


Disconnect cables from starter and alternator at battery (-) terminal point.  
Disconnect all plug-and-socket connections at cable duct on right.  
3 = TDC sensor  
1 and 2 = Knock sensors

**Caution!**  
Interchanging plug-and-socket connections 1 and 2 causes engine damage!  
Observe notes on knock sensors, refer to 12 14 610

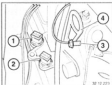


Disconnect all cables at right cable duct.  
1 = intake air temperature  
2 = Throttle potentiometer  
3 = idle actuator



Disconnect all cables at rear right cable duct.  
1 = Unclip diagnosis socket from holder.  
2 = Engine plug connector.

## 11-00/60.3

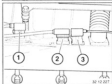


Unscrew common ground lead of ignition coils in area of rear engine mount (4).



Disconnect plug-and-socket connections of temperature sensors.

- 1 = Coolant temperature sensor for remote thermometer (black)
- 2 = Coolant temperature sensor for digital engine electronics control unit (white)



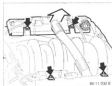
Disconnect all plug-and-socket connectors at left cable duct.

- 1 = Camshaft sensor
- 2 and 3 = Knock sensors

**Caution!**  
Interchanging plug-and-socket connections 2 and 3 causes engine damage!  
Observe notes on knock sensors, refer to 12 14 611



Disconnect plug-and-socket connection of oil pressure switch.  
Remove wire from holder.



Disconnect all cables at front left cable duct.  
Remove left and right cable duct from retaining fixture and fold back.

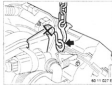


**Caution!**  
Collect any fuel flowing out and dispose of suitably.  
Disconnect fuel supply and return lines at injection tube.

**Installation note:**  
Replace plastic hose.

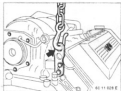


Disconnect all coolant hoses at coolant accumulator.



**Caution!**  
Lift engine only at the lifting lugs provided for this purpose.  
Location of front engine lifting point.

## 11-00/60.4



Arrangement of Rear Engine Suspension



Lift out engine using Special Tool 11 0 000.  
Clean engine.





**11 12 004 REMOVING AND INSTALLING / SEALING BOTH CYLINDER HEAD COVERS**

**Left Cylinder Head Cover:**

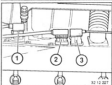
Remove caps from collector, remove clips and unscrew screws.



Remove cap from cylinder head cover, remove clips and unscrew screws.

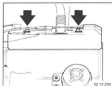


Disconnect plugs on ignition coils.

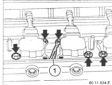


Disconnect all plugs on left-hand wiring duct.  
 1 = Camshaft sender  
 2 and 3 = Knock sensors (refer to Gr. 12)

**Important!**  
 Mixing up plugs 2 and 3 would lead to engine damage!  
 Also refer to information in Group 12!



Unscrew nuts of wiring duct holders.

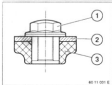


Unscrew all ignition coil nuts.

**Installation:**  
 Secure ground strap (1) to ignition coils of cylinders 3 and 2.



Unscrew cylinder head cover screws.

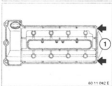


**Installation:**  
 Arrangement of cylinder head cover installation:  
 1 = Nut  
 2 = Washer  
 3 = Rubber mount

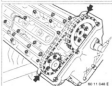


**Installation:**  
Check gasket, replacing it if necessary.

Coat outer and inner grooves as well as sealing surfaces of cylinder head cover and cylinder head all around with rubber lubricant, e.g. glycerine or similar. Press inner gasket into cylinder head cover groove free of distortion, beginning at the four corners.



**Installation:**  
Align the outer gasket loosely on the cover groove. Locate gasket in the cover groove beginning at the rear corner radii (1) and press into groove free of tension.



**Installation:**  
Coat joint surfaces with liquid sealant Hylomar 512 or Spectral\*\*.



**Installation:**  
Check for correct seating of gasket. Install two nuts at opposite points without preloading them. Align the cover. Tighten nuts diagonally from inside to outside.



**Right Cylinder Head Cover:**

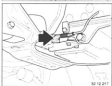
Remove caps from collector, remove clips and unscrew screws.



Remove cap from cylinder head cover, remove clips and unscrew screws.

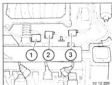


Disconnect plug on ignition coils.



Disconnect plug on oil level switch. Remove wiring guide.

\*\* Source of Supply: BMW Parts



Disconnect all plugs on right-hand wiring duct.  
1 and 2 = Knock sensors (refer to Gr. 12)

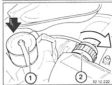
**Important!**  
Mixing up plugs 1 and 2 could lead to engine damage!  
Also refer to information in Group 12!

- 3 TDC sender (pulse sender on vibration damper)



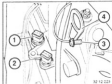
Disconnect plugs.

- 1 Intake air temperature sensor
- 2 Throttle valve potentiometer
- 3 Idle speed control



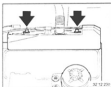
Disconnect plugs.

- 1 Diagnosis plug (unclip from holder)
- 2 Engine plug

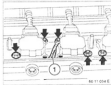


Close to Rear Engine Suspension Eye:

- 1 Temperature sensor for temperature gage (black)
- 2 Temperature sensor for Digital Motor Electronics (white)
- 3 Ground lead of ignition coils



Unscrew nuts of wiring duct holders.

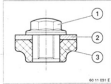


Unscrew nuts on all ignition coils.

**Installation:**  
Secure ground strap (1) to ignition coils for cylinders 3 and 7.



Unscrew cylinder head cover screws.

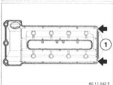


**Installation:**  
Arrangement of cylinder head cover installation:  
1 = Nut  
2 = Washer  
3 = Rubber mount



**Installation note:**  
Check gasket and replace if necessary.

Coat outer and inner groove as well as sealing surface of cylinder head cover all round with rubber lubricant, e.g. glycerine or similar. Starting from the four corner points, evenly (i.e. without tension) press inner gasket into groove in cylinder head cover.



**Installation note:**  
Align outer gasket on groove in cylinder head cover. Starting at the rear corner radii (1) fit gasket in groove in cylinder head cover and evenly press in free of tension.



**Installation note:**  
Coat joint areas of parting line with liquid testing compound Hylomar 90 32 Special\*\*.



**Installation note:**  
Check gasket is fitted correctly. Tighten two nuts at opposite points without pretension. Align cover. Firmly tighten nuts crosswise working from inside to outside.

\*\* Source of supply: BMW Parts Service

## 11 12 005 Removing and installing / sealing left cylinder head cover

This job is described under job instructions 11 12 004.

## 11 12 006 Removing and installing / sealing right cylinder head cover

This job is described under job instructions 11 12 004.

## 11 12 105 Removing and installing left cylinder head

Refer to 11 12 105  
Repair Manual 7 Series E38

## 11 12 106 Removing and installing right cylinder head

Refer to 11 12 106  
Repair Manual 7 Series E38

## 11 12 107 Removing and installing both cylinder heads

Remove engine, refer to 11 00 050  
Further procedure, refer to 11 12 105/106  
Repair Manual 7 Series E38

## 11 12 110 Replacing left cylinder head gasket

Refer to 11 12 105  
Repair Manual 7 Series E38

## 11 12 111 Replacing right cylinder head gasket

Refer to 11 12 106  
Repair Manual 7 Series E38

## 11 12 112 Replacing both cylinder head gaskets

Remove engine, refer to 11 00 050  
Further procedure, refer to 11 12 105/106  
Repair Manual 7 Series E38

# 11-13/60.1



## 11 13 010 REMOVING AND INSTALLING OR REPLACING UPPER SECTION OF OIL PAN

Remove caps from collector.



Remove clips on radiator from above.



Unscrew fan using Special Tools 11 5 040 and 11 5 050.



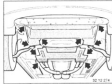
Unscrew screw for oil dipstick guide tube.

Installation:  
Tightening torque\*.

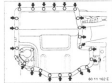
\* Refer to Specifications



Installation:  
Replace O-ring.



Remove rear engine splash guard (not T35A).



Remove complete lower section of oil pan - refer to 11 13 003.

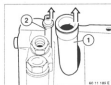


Unscrew bolts of left and right engine mounts at bottom.

Installation:  
Secure ground strap on engine mount.  
Tightening torque\*.

\* Refer to Specifications

Unscrew power steering pump at holder.  
Unscrew oil pipes for automatic transmission at power steering pump.



**Pull**  
1. pull oil pipe and  
2. pull oil pipe  
out of crankcase.

Unscrew oil return pipe from oil filter at oil pan.



**Installation:**  
Check seal, replacing it if necessary.  
Lubricate seal lightly with oil.

**Important!**  
Don't damage seal on edge of the case.

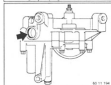
Unscrew sprocket bolt.  
Remove sprocket together with chain.



**Installation:**  
Install pure oil pipe in crankcase.  
Check seal, replacing it if necessary.

**Installation:**  
Tightening torque\*.

Unscrew oil pump bolts.  
Remove oil pump.



**Installation:**  
Check seal in oil pump, replacing it if  
necessary.

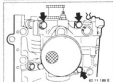
\* Refer to Specifications



60 11 184 E



60 11 187 E



60 11 186 E

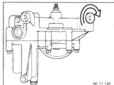
60 11 186 E

60 11 186

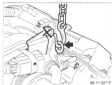
60 11 187

60 11 186

## 11-13/60.3

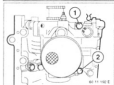


**Installation:**  
Screw hexagon adapter back into oil pump as far as stop.



Attach Special Tool 00 0 200 in front engine suspension eye and lift engine.

**Caution!**  
Observe distance between engine and frame while tilting the engine.



**Installation:**  
Mount oil pump and tighten bolts (1 and 2).



**Installation:**  
Mount sprocket together with chain and tighten central nut.

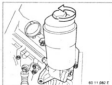


**Installation:**  
Adjust chain sag (10 or 2 mm) by turning hexagon adapter in oil pump. Install and tighten bolt. Tightening torque\*.

\* Refer to Specifications

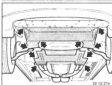


## 11-13/60.4

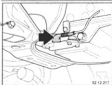


### 11 13 000 REMOVING AND INSTALLING OR REPLACING LOWER SEC- TION OF OIL PAN

Unscrew cover for oil filter to have the  
engine oil run back into the oil pan.  
Drain engine oil.

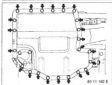


Unscrew front engine splash guard.



Disconnect oil level switch plug.  
Unscrew screws.

Installation:  
Replace O-ring.  
Tightening torque\*.



Unscrew bolts for lower section of oil pan.

Installation:  
Clean sealing surfaces.  
Replace gasket.  
Tightening torque\*.

\* Refer to Specifications

**11 14 060 REMOVING AND INSTALLING OR REPLACING LEFT UPPER TIMING CASE COVER**

Remove left cylinder head cover - refer to 11 12 005.  
Remove alternator - refer to 12 31 020.

Unscrew cover of oil filter.

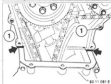
Unscrew return pipe at oil filter housing.

Installation:  
Tightening torque\*\*.

Unscrew full flow oil filter housing nuts.

Installation:  
Tightening torque\*\*.

\* Refer to Specifications



Unscrew battery positive wire on alternator.  
Unscrew protective tube mounting screws.  
Place wire aside.

Unscrew timing case cover bolts.

Installation:  
Tightening torque\*\*.

Installation:  
Check for correct seating of dowel sleeves (1).  
Cool corners of joint surfaces between cylinder head and cylinder head gasket with liquid sealant Hylomar 50 33 Special\*\*.

Installation:  
Clean seating surfaces to remove oil.  
Replace gasket.

Important!  
Pull off protective sheet.

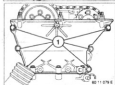
\* Refer to Specifications  
\*\* Source of Supply: BSHF Parts

## 11-14/60.2

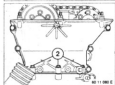


**Installation:**  
Check for correct seating of gaskets.  
Mount timing case cover together with inserted bolt.

**Important!**  
Bolt cannot be guided in subsequently.



**Installation:**  
Install all bolts.  
Screw in bolts (1) until cover contacts cylinder head free of play, but do not yet tighten bolts.



**Installation:**  
Tighten timing case cover bolts (2) in two steps and then tighten bolts (1) in two steps.  
Tightening torque\*.

\* Refer to Specifications

**11 14 005 REMOVING AND INSTALLING OR REPLACING RIGHT UPPER TIMING CASE COVER**

Remove right cylinder head cover - refer to 11 12 005.

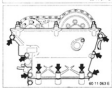
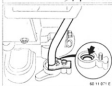
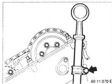
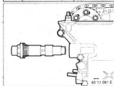
Remove air cleaner upper section together with mass air flow sensor.

Remove chain tensioner.

Installation:  
Replace gasket.  
Tightening torque\*.

Unscrew camshaft sensor screw.

\* Refer to Specifications



Unscrew screw for oil dipstick guide tube.

Unscrew nut.  
Replace O-ring.

Unscrew timing case cover bolts.

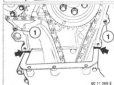
Installation:  
Clean sealing surfaces.  
Remove protective sheet on gaskets!

## 11-14/60.4



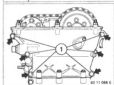
### Important!

Replace seal of oil supply for hydraulic tensioning element in timing case cover. Only use original BMW parts for replacements.



### Installation:

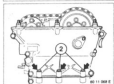
Check for correct seating of dowel sleeves (1).  
Coat corners of joint surfaces between cylinder head and cylinder head gasket with liquid sealant Hyomar 50 32 Special\*\*.



### Installation:

Check for correct seating of gaskets. Free tensioning roll inwards firmly. Mount timing case cover. Install all bolts.

Screw in bolts (1) until cover contacts cylinder head free of play, but do not yet tighten bolts.



### Installation:

Tighten timing case cover bolts (2) in two steps and then tighten bolts (1) in two steps. Tightening torque\*.

\* Refer to Specifications

\*\* Source of Supply: BMW Parts

11 14 143 REPLACING RADIAL OIL SEAL  
IN LOWER TIMING CASE  
COVER

Remove hub for vibration damper - refer to  
11 23 031.



Press out radial oil seal using Special Tool  
11 2 380 (contains Special Tool 11 2 383).



Installation:  
Install radial oil seal in timing case cover  
flask using Special Tool 11 1 230 and  
central bolt.

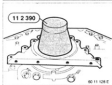
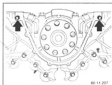
11 14 151 Replacing Radial seal on Crankshaft (transmission end)

Removing flywheel, see 11 22 005.

Removing part of the oil pan screws.

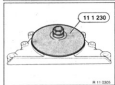
Rear end cover, unfasten screws.

Installation instruction:  
Drive radial seal into end cover using special tools 00 5 500 and 11 1 230.



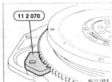
Installation instruction:  
Clean sealing face and replace gasket.  
Check that bushes are correctly located.

Installation instruction:  
Fit special tool 11 2 390 on crankshaft.  
Coat sealing lip of radial seal with oil.  
Slide on cover and tighten down.



## 11 22 506 Removing and installing or replacing flywheel

(Remove clutch)



Block flywheel with special tool 11 2 070.



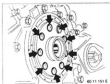
M50-3.0 litre up to 11.93

**Caution!**  
Release and tighten flywheel (dual mass flywheel) only with special tool 11 3 380.  
For tightening torque, refer to Technical Data 11 22 1A2

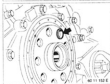


All M50 4.0 litre and M50 3 litre after 11.93

**Caution!**  
Release and tighten flywheel (dual mass flywheel) only with special tool 11 4 180.  
For tightening torque, refer to Technical Data 11 22 1A2



**Installation note:**  
Clean thread for flywheel bolts in crankshaft.



**Installation note:**  
The flywheel (DM5) has a special (shorter) fitted sleeve.

**Caution:**  
Replace only by original BMW spare part.



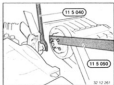
**Installation note:**  
The position of the fitted sleeve (1) in the dual mass flywheel is marked by two notches next to the bolt hole.



**Caution!**  
Flywheel bolts are a component part of the flywheel.  
Do not fit flywheel bolts with bolt sealing compound.  
Lightly oil thread of bolts.  
Only tighten to specified tightening torque.  
Overtightened flywheel bolts can cause the special tool to break during subsequent disassembly.

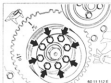


11 23 010 Removing and installing or replacing vibration damper



**Caution!**  
Left-hand thread.  
Remove fan, use special tools 11 5 040 and 11 5 050 for this purpose.

Remove drive ball for alternator, refer to 11 28 010



Release vibration damper bolts.



**Installation note:**  
Align fitted hole in vibration damper with fitted locating pin.  
Fit vibration damper bolts.

For tightening torque, refer to Technical Data 11 23 042



Release pulley on water pump.  
Hold water pump pulley with drive belt and release screws.

**11 23 031 Removing and installing or replacing hub for vibration damper**

Remove vibration damper, refer to 11 23 010

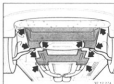


**Installation note:**  
Fit special tool 11 3 460 on special tool 11 2 450. Special tool 11 3 460 is magnetic.

Remove protective plate at front.



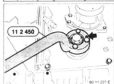
Select 0° position and mark on socket.  
Firmly tighten central bolt with joint torque and torquing angle.  
For tightening torque, refer to Technical Data 11 23 242



Remove cooling air duct for alternator at engine mount.



Observe fitted locating pin!  
Secure special tool 11 2 450 to hub for vibration damper.  
Release central bolt.

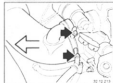




30 21 040 8

**11 28 010 REPLACING DRIVE BELT FOR ALTERNATOR**

Remove caps from collector and clips.  
Unscrew screws.



30 10 213

Disconnect intake hose between throttle valve assembly and mass air flow sensor.



30 12 061

Unscrew fan using Special Tools 11 5 040 and 11 5 050.

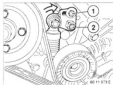


30 11 070 8

Remove ribbed drive belt.  
Note arrangement of ribbed belt drive.

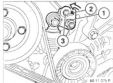
**Installation:**  
Check ribbed drive belt for traces of coolant and oil, replacing it if necessary.

**Important!**  
Always replace ribbed drive belt if it is dented with hydraulic oil.



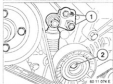
30 11 070 8

Loosen nuts (1) and (2) to slacken the drive belt.



30 11 070 8

**Installation:**  
Insert ribbed drive belt and check for correct fit on the pulleys.  
Preload the adjusting plate up to the end of slot (2) by turning hexagon (1).  
Tighten nuts (3).



30 11 070 8

Unscrew nuts (1) and bolt (2).  
Remove complete belt tensioner.

## 11 31 010 Adjusting camshaft timing

Refer to 11 31 010  
Repair Manual T Series E28

## 11 31 011 Replacing left camshaft

(intake or exhaust end as required)  
(cylinder row 5-8)

Refer to 11 31 011  
Repair Manual T Series E28

## 11 31 015 Replacing right camshaft

(intake or exhaust end as required)  
(cylinder row 1-4)

Refer to 11 31 015  
Repair Manual T Series E28



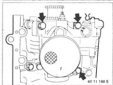
60 11 190 E

### 11 41 000 REMOVING AND INSTALLING OR REPLACING OIL PUMP

Remove complete oil pan lower section - refer to 11 53 020.  
Unscrew sprocket bolts.

Installation:  
Tightening torque\*.

Remove sprocket together with chain.



60 11 190 E

Unscrew oil pump bolts.

Installation:  
Tightening torque\*.

Remove oil pump.



60 11 190 E

Pull  
1 whitened oil pipe and  
2 pure oil pipe  
out of crankcase.



60 11 190 E

Installation:  
Check seal, replacing it if necessary.  
Lubricate seal lightly with oil.

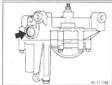
Important!  
Ensure that seal is not damaged on edge  
of case.

\* Refer to Specifications



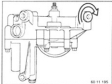
60 11 190 E

Installation:  
Install pure oil pipe in crankcase.  
Check seal, replacing it if necessary.



60 11 190 E

Installation:  
Check seal in oil pump, replacing it if  
necessary.



60 11 190 E

Installation:  
Turn back hexagon adapter into oil pump  
as far as stop.



60 11 190 E

Installation:  
Mount oil pump and tighten bolts (hand 2),  
tightening torque\*.

\* Refer to Specifications

## 11-41/60.2

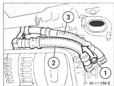


**Installation:**  
Mount sprocket together with chain and tighten central nut.  
Tightening torque\*.



**Installation:**  
Adjust chain sag ( $\pm 2$  mm) by turning hexagon adjuster in oil pump.  
Install and tighten bolt.  
Tightening torque\*.

\* Refer to Specifications



**11-42-020 REMOVING AND INSTALLING, SEALING OR REPLACING FULL FLOW OIL FILTER**

Remove alternator - refer to 12-31-000. Disconnect oil hoses at carrier. Unscrew bolt (1). Lift out hoses upwards.

**Installation:**  
Check seals, replacing them if necessary. Check arrangement of oil hoses.  
2 Used oil  
3 Pure oil

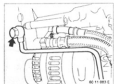


Unscrew bolt and nuts. Remove oil filter.

**Installation:**  
Tightening torque\*.



**Installation:**  
Screw back adjusting hexagon into oil filter as far as possible using a hexagon socket key.



Unscrew oil drain pipe at oil filter.

**Installation:**  
Check seal, replacing it if necessary. Tightening torque\*.



**Installation:**  
Mount on upper timing case cover with both nuts.



Unscrew oil drain pipe at oil pan.

**Installation:**  
Check seal, replacing it if necessary. Tightening torque\*.



**Installation:**  
Turn adjusting hexagon with help of hexagon socket key until there is contact on the alternator free of play, but "do not preload".

\* Refer to Specifications

\* Refer to Specifications

## 11-42/60.2

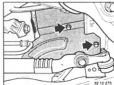


### Installation:

Install bolts and tighten bolt and both nuts.  
Tightening torque\*

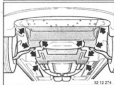
\* Refer to Specifications



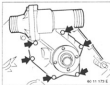


**11 51 900 REMOVING AND INSTALLING OR REPLACING WATER PUMP**

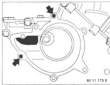
Unscrew heat shields at left and right hand sides of front axle carrier.



Unscrew front and rear engine splash guards.



Unscrew bolts and remove water pump.



**Installation:**  
Check for correct seating of dowel sleeves.  
Clean sealing surfaces.  
Replace gasket.

Drain coolant - refer to Group 17.  
Remove vibration damper - refer to 11 25 010.  
Disconnect coolant hose at cover of thermostat housing.  
Remove thermostat housing cover together with thermostat.  
Disconnect coolant hose at thermostat housing.



Hold water pump pulley tight with help of ribbed drive belt and unscrew bolts.

**Installation:**  
Tightening torque\*.

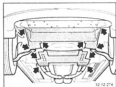
\* Refer to Specifications

11 51 011 Replacing pulley on water pump

Remove drive belt for alternator, refer to 11 20 010



Hold water pump pulley with drive belt and retaine screws.



**11 53 000 REMOVING AND INSTALLING  
OR REPLACING COOLANT  
THERMOSTAT**

Remove from engine splash guard.



Remove air-cleaner upper section together  
with mass air flow sensor.

Disconnect coolant hose at cover of ther-  
mostat housing.  
Unscrew bolts of thermostat housing cover.  
Remove thermostat housing together with  
bolts.

Installation:  
Tightening torque\*

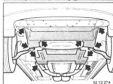
Replace gasket.  
Fill cooling system - refer to Group 17.  
Bleed and check cooling system for leaks -  
refer to Group 17.

\* Refer to Specifications

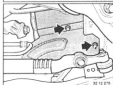


### 11 53 323 REMOVING AND INSTALLING OR REPLACING COOLANT COLLECTOR

Remove caps from collector and clips.  
Unscrew bolts.



Remove front and, if applicable, rear engine splash guards.



Unscrew heat shields at left and right hand sides of front engine carrier.



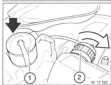
Drain coolant - refer to Group 17.  
Remove complete coolant expansion tank.



Place coolant expansion tank aside.



Disconnect plugs of wiring on back of right wiring duct.



Unclip diagnosis socket (1) in holder.  
Disconnect engine plug (2).



Disconnect all coolant hoses at coolant collector.  
Unscrew coolant collector screws on back of cylinder head at left and right hand sides.

Installation:  
Tightening torque\*

\* Refer to Specifications.

## 11-53/60.3



Unscrew coolant collector bolts.

Installation:  
Tightening torque\*



Unscrew coolant collector bolts.

Installation:  
Clean sealing surfaces.  
Replace gaskets.  
Tightening torque\*



### 11 61 050 Removing and installing intake manifold

Check defect code memory.  
Switch off ignition.  
Unclip screw caps on covering for cylinder head cover.  
Release screws.  
Remove covering for cylinder head cover.



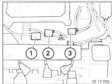
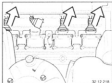
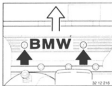
Remove hose clips at idle actuator and throttle body.



Release plug-and-socket connection on air mass meter.



Release clips.  
Remove upper section of air cleaner together with air mass meter.



Unclip screw caps.  
Release screws.  
Remove covering for right cylinder head cover.

Jack up vehicle.  
Disconnect plug-and-socket connection at oil level switch.

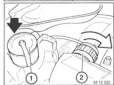
Disconnect plug and socket connections at ignition coils.

Disconnect plug-and-socket connections.  
1 Knock sensor cylinders 3 and 4  
2 Knock sensor cylinders 1 and 2  
3 Pulse generator (on vibration damper)

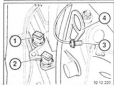
**Caution!**  
Interchanging the plug-and-socket connections 1 and 2 causes engine damage!  
Observe notes on knock sensors, refer to 12 14 010



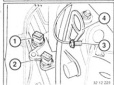
- Disconnect plugs.**
- 1 Intake air temperature sensor
  - 2 Throttle valve potentiometer
  - 3 Idle speed control



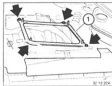
- Disconnect plugs.**
- 1 Diagnosis plug (unclip in holder)
  - 2 Engine plug



- Unscrew mutual ground wire of ignition coils (3) close to rear engine suspension eye (4).**



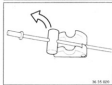
- Disconnect plugs of temperature sensors.**
- 1 Temperature sensor (black) for temperature gauge
  - 2 Temperature sensor (white) for digital engine electronics (DME)



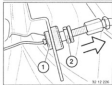
- Unscrew screws of holder (1) for collector cover.**



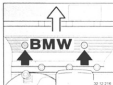
- Disconnect throttle cable.**  
Compress nipple mounts on both retainers and press out of operating lever.



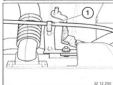
- Press nipple out of nipple mounts.**  
Take cable out of nipple mounts.



- Take cable (2) out of rubber mount (1).**  
Take rubber mount (1) out of holder.  
Remove throttle cable.



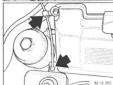
Remove covering for left cylinder head cover (cylinder row 5-6).



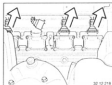
Remove throttle operating (Bowden) cable from holder (1).



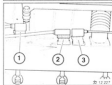
For cruise control (Tempomat):  
Run temporary operating cable (1) under throttle operating cable (2).



Arrangement of temporary operating cable on cylinder head cover.



Disconnect plug-and-socket connections of ignition coils.



Disconnect plug-and-socket connections.  
1 Camshaft sensor  
2 Knock sensor cylinders 5 and 6  
3 Knock sensor cylinders 7 and 8

Caution!  
Interchanging plug-and-socket connections 2 and 3 causes engine damage!  
Observe notes on knock sensors, refer to 12 14 811



Disconnect plug-and-socket connection (1).  
Disconnect overflow hose (2).  
Release screws on left and right and place expansion tank to side.



Coolant expansion tank





Disconnect plug-and-socket connection at oil pressure switch.



Disconnect wire of oil pressure switch.



Release screw fittings of cable ducts on cylinder heads.



Remove vacuum lines at radiator.  
Release hose clip.



- 1 Tank ventilation
- 2 Vacuum supply for brake booster



Disconnect vacuum hose at brake booster



Disconnect tank ventilation hose at throttle body

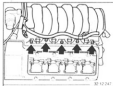


Remove fuel supply and return lines.  
Installation note:  
Replace plastic hoses.

## 11-61/60.5



Disconnect hose (1) from end cover (2) on rear of manifold.

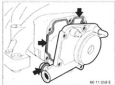


Release bolts on right and left.  
Remove manifold by pulling upward.

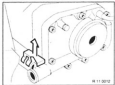


Note:  
Version 1  
Ventilation pipe fitted.  
Release screws.

Caution!  
Pull end cover for pressure control valve straight back to ensure ventilation pipe (1) is not damaged.



Installation note:  
Check sealing ring and gasket, replace if necessary.



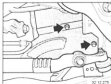
Note:  
Version 2  
Ventilation pipe and end cover connected with clip.  
Remove clip and pull engine ventilation pipe forward.

Installation note:  
Check seal, replace if necessary.

Read out defect code memory.  
Check stored defect codes.  
Repair defect, delete defect code memory.

**11 62 142 REMOVING AND INSTALLING OR REPLACING BOTH LEFT EXHAUST MANIFOLDS**

Remove exhaust assembly - refer to Gr. 18.  
 Remove alternator - refer to Group 12.  
 Remove left cylinder head cover - refer to 11 12 005.



If applicable, unscrew bolts of center of gravity mount to front axle carrier.  
 Unscrew left heat shields on front axle carrier.



Remove complete air cleaner upper section together with mass air flow sensor.

Unscrew manifold bolts.

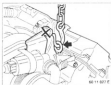
Installation:  
 Tightening torque\*.

Remove manifolds downwards.



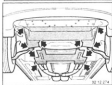
Unscrew bolts of left and right engine mounts at bottom.

Installation:  
 Tightening torque\*.

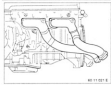


Installation:  
 Lift and lower engine using Special Tool 60 5 290 attached at front eye.

Important:  
 Ensure clearance between engine and fire-well.



If applicable, remove rear engine splash guard.



Check for correct installed position of manifolds.

\* Refer to Specifications

\* Refer to Specifications

11-62/60.2

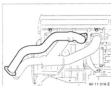


Installation:  
Replace gaskets.  
Gasket beads face exhaust manifold!

60 11 001 E

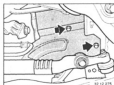
## 11 62 162 REMOVING AND INSTALLING OR REPLACING BOTH RIGHT EXHAUST MANIFOLDS

Remove exhaust assembly - refer to Cr. 16.



Remove manifolds upwards.

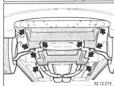
**Important!**  
Remove manifold for cylinders 2&4 first!



Remove right heat shields on front axle carrier at left and right hand sides.



**Installation:**  
Replace gaskets.  
Gasket beads face exhaust manifolds!



If applicable, remove rear engine splash guard.

Remove washing fluid tank.  
Unsetcrew manifold bolts.

**Installation:**  
Tightening torque\*.

\* Refer to Specifications

# 12 Engine electrical system

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## INSTRUCTIONS FOR WORKING ON IGNITION SYSTEM, DME (DIGITAL MOTOR ELECTRONICS) AND ENGINE ELECTRICAL EQUIPMENT

### Precautions:

- Always switch off ignition before working on ignition system. Never touch components under voltage while engine is running. **Dangerous high voltage!**
- Always remove DME master relay for the compression test to avoid activation of ignition coils by ignition final stages of the DME control unit. **Dangerous high tension!**
- Always switch off ignition before connecting / disconnecting Service Tester, other testers and adapters or replacing components!
- Secondary (high tension) side of Ignition system must be loaded with at least 4 k-ohms.
- Never start engine after removing distributor cap or disconnecting wire (terminal 4) on ignition coil (terminal 4).
- Never connect a shielded capacitor or test lamp on ignition coil terminal 1.
- Never connect ignition coil terminal 1 wire to ground or B+. Consequently terminal 1 wire may not be used to interlock starting when service installing a burglar alarm system.

### Direct Ignition System (Without Distributor):

- Engine must never be started after disconnection of the secondary circuit, i.e. disconnection of connectors on spark plugs and ground connection (terminal 4a).
- There is dangerous high tension in or on ignition leads, spark plug connectors, spark plugs, ignition coil terminal 4 (Caution/ approx. 40 kV high tension) and terminal 1 wire from ignition coil to DME control unit (Caution/ approx. 300 V high tension at terminal 1).
- Battery as well as wires on alternator and starter may not be disconnected on a running engine.

### Disconnecting Battery

#### Important!

Disconnecting the car battery will erase the fault memories of control units. Consequently always interrogate fault memories and have faults printed with help of a BMW Service Tester before disconnecting the battery.

#### Investigate stored faults.

The radio can only be operated after disconnection of the battery by entering the radio code again, so that the customer should first be asked for his radio code card.

Note stored stations so that they can be stored again after connection of the battery.

The stored data of the on-board computer and clock will also be lost.

If car is fitted with an infrared locking system, all keys must be recorded.

Refer to Car Electric/Electronic Test Plan for additional information.

## INSTRUCTIONS FOR REMOVING AND INSTALLING ELECTRONIC CONTROL UNITS

Ignition must always be switched off before disconnecting or connecting control unit plugs.

Removal and installation of components, relays, fuses, etc. could cause the storage of faults in fault memories of control units capable of self-diagnosis.

Consequently fault memories must always be interrogated after working on the electrical system.

Stored faults must be investigated and cancelled.

### Note When Replacing DME (Digital Motor Electronics) Control Unit:

Each control unit is programmed with certain basic values, which serve as mean values. The control unit receives different input values, depending on engine condition, which are compared with the stored values.

The adaptive system compares the input values with the stored map values.

Appropriate correction commands are sent to the concerned drive elements.

If, for example, the DME control unit would be without current for a long time (more than one hour), its adaptive system would lose the stored values.

After re-operation of a computered or installation of a new control unit the input values of a pertinent engine must be read in and stored for the adaptive system.

This procedure could lead to erratic idling and disturbed overrunning of the engine after starting.

Depending on the engine it could require some time before all values are adapted to the engine condition.

Consequently there must be conformance with the following procedures before replacing a DME control unit or operating a control unit which had been disconnected.

Install control unit and drive car at least 5 minutes while changing the engine speed.

Interrogate fault memories and have faults printed with help of a BMW Service Tester.

Investigate stored faults.

## CHECKING COMPONENTS

**Note:**

Refer to Construction Group Repair Manual.  
Always conform with safety precautions and accident prevention regulations whenever carrying out tests or work on engine electric and electronic components.

Always disconnect plugs of control units or components before checking electric wires.

**Testing Aids:**

Concerned wiring diagrams and current flow diagrams can be found in the binders for "Car Electric/Electronic Test Plan - 3 Series 6.36".

Only use appropriate test leads, adapter leads (refer to concerned repairing instructions), terminals and test clips.

Test values for checking components are contained in the Car Electric / Electronic Test Plan.

Also refer to the Technical Data microfiche for other specifications.

## OUTSIDE STARTING AID

Do not start the engine with help of starting sprays.

**Preparations:**

Conform with the following when starting engine with starting cable.  
Ensure that starting cable wires are of appropriate cross section size.  
Only use fuse-protected starting cables.  
Check whether the current supplying battery has 12 V voltage.  
If engine is started from battery of another car, ensure that there is no contact between the bodies of both cars.

**Caution!**

Never touch ignition system components under current - dangerous high tension!

**Procedures:**

Always conform with the procedures to avoid injury to persons or damage to parts.  
Select range P in cars with an automatic transmission and apply the parking brake.  
Move the shift lever of cars with manual transmission into neutral and apply the parking brake.  
Ensure that the starting cables cannot get caught in rotating parts, e.g. fan.  
First connect both positive poles of the batteries with one starting cable (red).  
Use the positive connection point in the engine compartment for cars with the battery in the trunk.  
Then connect the second starting cable (black) between the negative pole of the current supplying battery and engine or body ground of the car to be started.

**Caution!**

Never connect the second starting cable (black) on the negative pole of the battery in the car to be started. Produced gas could be ignited by sparks - danger of explosion!

If the battery in the car supplying power is weak, start the engine of this car and let it run at idling speed.

After the engine of the car to be started has started up, first disconnect the starting cable on the negative pole / ground connection. Then remove the starting cable from the positive poles.

## OUTSIDE STARTING AIR AND CAR TELEPHONE

**Siemens C 3:**

When starting the engine with help of the battery in a different vehicle ensure that the Siemens C 3 telephone is not damaged through overvoltage.  
Disconnect the sender and receiver from the electrical system prior to starting the engine with outside help.

**Siemens C 3 and Motorola C 451:**

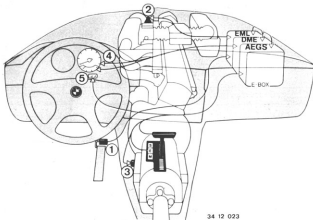
Senders and receivers of Siemens C 3 and Motorola C 451 car telephones have over-voltage protection, but calls may not be made while starting the engine with outside help.

Always refer to the pertinent operating instructions of other type and other make car telephones.

If in doubt, disconnect the sender/receiver from the electrical system.



## DME SURVEY



34 12 023

- 1 Pedal valve sender
- 2 Throttle valve drive motor
- 3 Rayonet connector for transmission control
- 4 Speed signal/consumption display
- 5 Program display

- |      |   |
|------|---|
| EML  | = Electronic engine power control             |
| DME  | = Digital motor electronics                   |
| AEGS | = Independent electronic transmission control |
| S    | = Sport                                       |
| E    | = Economy                                     |
| M    | = Manual                                      |

12-0/4



**Note:**  
Troubleshooting engine electric/  
electronic system since introduction of  
M 1.1 – see electric/electronic test plan.

Can be recognized on the increment  
wheel (1) for sender-type Motronics.

## 12-11/1



### 12 11 001 REPLACING DISTRIBUTOR CAP

Take off cover.

Installation:  
Engage cover in holder.

Pull off shielded plug connector.

Installation:  
Numbering of electric leads and cap (e.g. 5) must be identical.  
ZS = Ignition coil  
Applicable for M 20 and M 30 engines.

Note:  
M 20 / M 30: 1 - 5 - 3 - 6 - 2 - 4



Unscrew fan - left-hand threads!  
Use Special Tools 11 5 800 / 040.  
Unscrew and push up fan cover.



Unscrew bolts and take off distributor.

Caution!  
Danger of cutting hands on radiator fins.



Installation:  
Check seal, replacing if necessary.



### 12 11 111 REPLACING DISTRIBUTOR ROTOR

Remove distributor cap – see 12 11 091.

*Caution:*  
Danger of cutting hands on radiator fins.



Unscrew screws with a 3 mm socket head key.

*Installation:*  
Tightening torque\*.

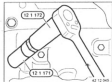
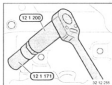


*Testing:*  
Measure resistance\*.  
Inspect surface and cast compound for cracks and traces of burning.

## 12 12 011 REPLACING SPARK PLUGS

**M20 / M20:**  
Remove spark plug connectors.  
Unscrew spark plugs using standard plug wrench.

**Installation:**  
Tighten spark plugs using plug wrench and Special Tool 12 1 200.  
Refer to tightening torque\* when working without Special Tool 12 1 200.

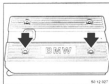


**M40:**  
Remove spark plug connectors.  
Unscrew spark plugs using Special Tool 12 1 171.

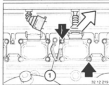
**Installation:**  
Tighten spark plugs using Special Tools 12 1 171 and 12 1 200.  
Refer to tightening torque\* when working without Special Tool 12 1 200.

**S28:**  
Remove spark plug connectors.  
Unscrew spark plugs using Special Tool 12 1 171.

**Installation:**  
Tighten spark plugs using Special Tools 12 1 171 and 12 1 172.  
Refer to tightening torque\* when working without Special Tool 12 1 172.



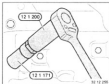
**M53 / M50:**  
Unscrew cover on cylinder head cover.



Unscrew ignition coils.



**Installation:**  
Ground straps of cylinder head cover must be secured on ignition coils of cylinders 3 and 6.  
Tightening torque\*.

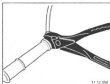


Unscrew spark plugs using Special Tool 12 1 171.

**Installation:**  
Tighten spark plugs using Special Tools 12 1 171 and 12 1 200.  
Refer to tightening torque\* when working without Special Tool 12 1 200.

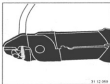
\* Refer to Specifications

\* Refer to Specifications



### 12 12 032 REPLACING ONE SPARK PLUG CONNECTOR

Cut off ignition lead close to the connector.



Strip ignition lead 6mm (1/4") with a stripping pliers\* (1.5 mm / 0.059" lead cross section size).



Place coupling on ignition lead and squeeze on wire and first with Special Tool 12 1 066091.



Place connector flush with pliers and squeeze on.



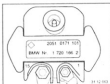
Place ignition lead in Special Tool 12 1 096 and slide into spark plug connector until the coupling is heard to engage.  
If applicable, spray with lubricant (Special Tool 12 1 096).

\* Source of Supply: HWB

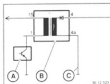
### 12 13 009 CHECKING IGNITION COIL (M30, M30, M40)

#### Multimeter Test (M 06)

Measure resistance of primary coil between terminals 1 and 15 = 0.5 k $\Omega$   $\pm$  10 % and resistance of secondary coil between terminals 15 and 4 = 6 k $\Omega$   $\pm$  10 %.

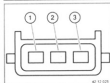


Check the cast compound of the primary coil carrier for hairline cracks. If gray material has run out at the edges of the coil carrier, this is indication for a faulty ignition final stage in the DME control unit.



Wiring Diagram of Ignition Coil in Direct Ignition System:

- A Primary coil activation of ignition coil (by DME)
- B Ignition coil
- C Secondary coil ground connection



Ignition Coil Plug Pin Connections

- 1 Terminal 15
- 2 Terminal 6a
- 3 Terminal 1

#### Resistance Test:

Primary coil specification = 0.4 ... 0.8  $\Omega$ .  
Resistance of the secondary coil cannot be measured.

Check the cast compound of the primary coil carrier for hairline cracks. If gray material has run out at the edges of the coil carrier, this is indication for a faulty ignition final stage in the DME control unit.



### 12 13 ... CHECKING SECONDARY VOLTAGE USING TEST ADAPTER KIT 12 7 040

The following tests can be carried out with the adapter kit:  
 Secondary voltage test  
 Different make ignition coil comparison  
 Ignition coil faults  
 Spark plug faults  
 Injection system faults

#### Caution!

Refer to precautions on page 12-0-1.



Special Tool 12 7 042 for BMW Service Tester.

The high tension clip must be unscrewed from the service tester lead for connection to the Service Tester.

If a BMW Service Tester is not available, a common workshop oscilloscope with test leads may be used.  
 Special Tool 12 7 042 is then replaced by a test lead of the oscilloscope.  
 Triggering is then accomplished externally via the induction clip with primary voltage coming from cylinder no. 1.



Connect Special Tool 12 7 042 to Special Tools 12 7 041 and Special Tool 12 7 042 for the BMW Service Tester.

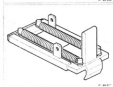
Connecting Lead 12 7 042



M 50:

Refer to precautions on page 12-0-1.  
 Switch off ignition.  
 Unscrew ignition coil cover.

Firing order = 1-5-3-6-2-4.



Special Tool 12 7 041 for installation on the ignition coil.



Mount Special Tool 12 7 041 on ignition coils and connect using Special Tool 12 7 042.





Fig. 60.

Refer to precautions on page 12-5/1.  
Switch off ignition.  
Unscrew ignition coil cover.

Firing order = 1-5-4-6-3-7-2.

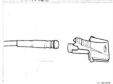


Mount Special Tool 12 7 041 on ignition coils and connect using Special Tool 12 7 042.



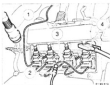
Note:

Use the long connecting lead of Special Tool 12 7 042 for connection of adapters between cylinder banks 1 - 4 and 5 - 8.



Connect BMW Service Tester as follows.

Unscrew high tension clip from the connecting lead of the BMW Service Tester.  
Connect Special Tool 12 7 043 to the high tension connecting lead of the BMW Service Tester.



Connect BMW Service Tester to diagnosis socket (1) in the car.  
Connect Special Tool 12 7 042 (2) to high tension connecting lead (3) of the BMW Service Tester.  
Connect trigger clip (4) of the BMW Service Tester to power supply lead of the ignition coil for cylinder no. 1.



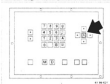
BMW Service Tester

Select Test Step 01 (engine) and afterwards select Test Step 10 (mixture, exhaust).

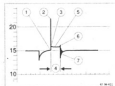
Enter the number of cylinders.



Apply the parking brake and move the manual transmission shift lever to neutral or the automatic transmission selector lever to "N".



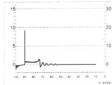
Select the type of display of secondary voltage on the oscilloscope with key "DISP".  
Display of voltage (parallel, in series, superposed).



#### NORMAL OSCILLOGRAPH

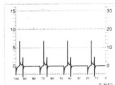
- 1 Beginning of ignition voltage peak
- 2 Ignition voltage peak
- 3 Sparkling voltage peak
- 4 Sparkling period
- 5 Sparkling voltage line
- 6 Beginning of dying-out process
- 7 Dying-out

Parallel display.  
Evaluation of sparking voltage line and dying-out process.  
Idling speed.



Series display.  
Idling speed.

Greater differences can be recognized in the ignition voltage displays.  
Allocation of a recognized fault to a particular cylinder must be made with help of the type of display (in series, parallel).

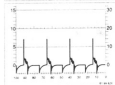


The display of ignition voltage peaks is about 20 to 25 % lower than the actual value.

The uniformity of all cylinders to each other is more important than the height of ignition voltage peaks.

Differences of 2000 to 4000 V are acceptable.

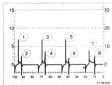
Refer to "fault displays" on the following pages in case of greater differences.



Display with speed increased to approx. 2000 rpm.  
Evaluation of ignition voltage peaks.

### OSCILLOGRAPHS FROM DIFFERENT MAKE IGNITION COILS

Evaluation of ignition voltage peaks and dying-out process at idling speed.



Make: Bremi

- 1 Normal ignition voltage peak (5000 to 8000 V)
- 2 Normal

Make: Beru

- 3 Normal ignition voltage peak
- 4 Higher beginning of dying-out process

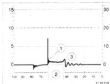
Make: May & Christie

- 5 Normal ignition voltage peak
- 6 Lower beginning of dying-out process

Make: Bosch

- 7 Lower ignition voltage peak
- 8 Lower beginning of dying-out process

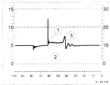
Note:  
As compared with other makes of ignition coils the ignition voltage peaks will be shortened very strongly at higher speeds.



Evaluation of sparking voltage peaks at engine speed increased to approx. 2500 rpm.

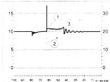
Make: Bremi

- 1 Normal building-up of sparking voltage line
- 2 Normal sparking period
- 3 2 to 4 dying-outs



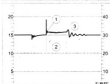
Make: Beru

- 1 Normal building-up of sparking voltage line
- 2 Normal sparking period
- 3 At least 3 dying-outs



Make: May & Christie

- 1 No building-up of sparking voltage line
- 2 Normal sparking period
- 3 At least 3 dying-outs



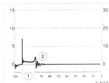
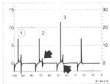
Make: Bosch

- 1 Normal building-up of sparking voltage line
- 2 Long sparking period
- 3 At least 3 dying-outs

## IGNITION COIL FAULTS

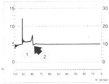
Evaluation of ignition voltage peaks and dying-out process at idling speed.

- 1 Beginning of dying-out processes with normal peaks upwards and downwards
- 2 Beginning of dying-out processes strongly shortened ignition coil is defective!
- 3 Beginning of dying-out processes downwards missing ignition coil is defective!  
Note: Higher ignition voltage peak is not always available.

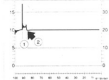


Evaluation of sparking voltage line at idling speed.

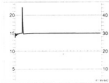
- 1 Normal sparking period
- 2 Normal dying-outs to sparking voltage line  
ignition coil is okay.



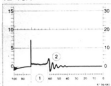
- 1 Shorter sparking period
- 2 Dying-outs to sparking voltage line available only weakly  
ignition coil is defective!



- 1 Much shorter sparking period
- 2 Dying-outs to sparking voltage line missing  
ignition coil is defective!

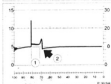


No sparking voltage line.  
ignition coil is defective!

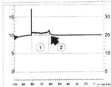


Evaluation of sparking voltage line at engine speed increased to approx. 1500 rpm.

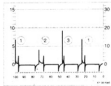
- 1 Normal sparking period
- 2 Normal dying-out to sparking voltage line  
Ignition coil is okay.



- 1 Shorter sparking period
- 2 Dying-out to sparking voltage line  
available only weakly  
Ignition coil is defective!

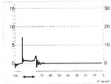


- 1 Normal sparking period
- 2 Dying-out to sparking voltage line  
missing  
Ignition coil is defective!



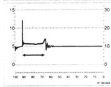
#### SPARK PLUG FAULTS

- 1 Normal ignition voltage peak  
Spark plug is okay.
- 2 Low ignition voltage peak  
Small electrode gap
- 3 High ignition voltage peak  
Large electrode gap

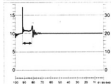


Evaluation of sparking period at idling speed.

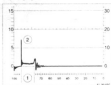
Normal sparking period.  
Spark plug is okay.



Long sparking period.  
Small electrode gap.



Short sparking period  
Large electrode gap.



#### OTHER FAULT DISPLAYS WITH EVALUATION

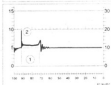
Evaluation of sparking period and ignition voltage peaks at idling speed.

- 1 Normal sparking period
- 2 Normal ignition voltage peak  
Ignition system is okay.

Ignition Voltage Too High:

Electrode gap  
Compression  
Fuel/air mixture  
Electrode temperature  
Electrode condition  
Ignition lead

Large  
High  
Lean  
Low  
Burnt  
Interrupted



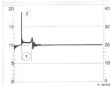
Long sparking period (1) with low ignition voltage peak (2).

Indicates low compression.  
Fluctuating sparking period:  
Indicates contamination on spark plug (shunt).

Ignition Voltage Too Low:

Electrode gap  
Compression  
Fuel/air mixture  
Electrode temperature  
Electrode condition

Small  
Low  
Correct  
High  
New

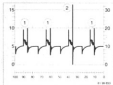


Short sparking period (1) with high ignition voltage peak (2).

Constant but short sparking period:  
Indicates defective ignition lead.

Note:

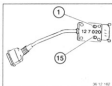
The sparking voltage line could sometimes be missing completely and the ignition voltage peak could rise very high.



### Fault in Injection System

Evaluation of ignition voltage peak in response to sudden accelerator loads

- 1 Beginning of dying-out process is not much higher than ignition voltage peak. Injection system is OK.
- 2 Beginning of dying-out process is considerably higher than ignition voltage peak. Fault in the injection system.
  - a) Lean mixture
  - b) Defective injection valve
  - c) Low compressions



### Additional fault notes for troubleshooting

For troubleshooting on the primary side of a single ignition coil, use adapter for primary current measurement - special tool 12 7 020.

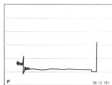
If terminal 1 signal is not present on pin 1 in the diagnosis plug, the external trigger signal for the Service Tester can be prepared with the help of special tool 12 7 020.

Connect BMW Service Tester.  
Select Engine Test Step 05.

Enter number of cylinders (four).  
Connect universal adapter to tester.  
Connect brown clip to car's ground. Attach black terminal to terminal 1 of special tool 12 7 020.

If there is no trigger signal in the diagnosis box for a 6-cylinder engine, preselect a two-cylinder on the Service Tester.

The red inductive clip is not used as only one cylinder is being tested.  
Consequently the engine speed display will be too low by factor 4.  
Connect special tool 12 7 020 to the ignition coil being tested and the car's cable harness.



Produce a stationary signal on the oscilloscope by pressing key R.

Note:

The sparking voltage line on the oscilloscope will be very nervous, as the fuel-air mixture swirl of a 4-valve engine will be greater than that of a 2-valve engine.



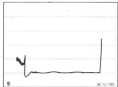
**Examination of secondary  
signal for passive ignition  
distribution  
(special tool 12 7 630)**

**Engine Test Step 10**

Remove ignition coil.  
Clip special tool 12 7 630 on permanent ignition  
coil to be tested.  
Clip high tension clip around ignition lead.



Connect ground lead of adapter to vehicle  
ground and ignition coil. Connect up diag-  
nostic plug.  
If trigger signal is not present, (terminal 1),  
connect black terminal of universal adapter  
cable to Pin 1 of the primary adapter cable.



Produce a stationary signal by pressing key R  
on the tester.

**Note:**

Neighboring ignition leads could produce in-  
terference on the screen of the oscilloscope.

Refer to the fault memories of engine control  
units for additional troubleshooting.  
Interrogate fault memory and its fault reports -  
refer to Electrical Troubleshooting Manual.



### 12 13 011 Replacing ignition coil (M 30, M 30, M 40)

#### Caution!

Only work on the ignition unit with the ignition switched off - dangerous high tension voltage.  
Note working instructions for ignition unit - see Page 12 - 00.



Remove protective cap and ignition lead (term. 4).  
Unfasten connections (terminals 1 and 15).  
Tightening torque 12 13 14Z\*  
Unfasten bracket and remove ignition coil.

90 12 003 01



Remove oil filler cover.  
Unlock cover on retaining screws.  
Unscrew bolts.

90 12 004



Remove cylinder head gasket.

#### Caution!

Ensure that no dirt falls into the open oil filler neck.  
Close oil filler neck once cover has been removed.

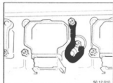
90 12 004



Unlock plug.  
Pull off plug.

90 11 000 11

\* Refer to Specifications



Unscrew bolts.  
Pull out ignition coil.

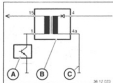
**Installation instruction:**  
Ground straps of the cylinder head cover must be secured on the ignition coils for cylinders 3 and 5.



**Caution!**  
Mutual ground connection of ignition coils (point 4a) is screwed on front end of the cylinder head.

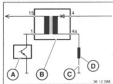


**Caution!**  
To avoid destruction of the fault memory in a Siemens MS 40 engine control unit, only ignition coils from "May & Christle" may be used.



**Bosch DME:**

- A Primary coil of ignition coil is controlled by the DME
- B Ignition coil
- C As a mutual ground connection on the secondary coils of the ignition coils



**Siemens MS 40:**

- D Measuring resistance installed in the mutual ground connection for ignition coils. The measuring resistance is required for fault recognition in the secondary circuit of the ignition coils. The fault is stored in the engine control unit of the Siemens MS 40.

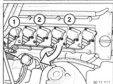


### 12 13 011 Replacing ignition coil (538 834)

Unfasten screws.  
Remove ignition coil cover.



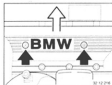
Disconnect plug from ignition coils.



Unfasten ground connection (1) on the ignition coil of the 8th cylinder.

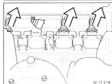


Unscrew nuts.  
Remove ignition coils.

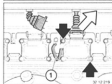


### 12 13 011 Replacing ignition coil (M 80)

Unclip and remove cover on screws in cylinder head cover.  
Unscrew bolts.  
Remove cover from cylinder head cover.



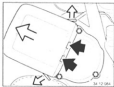
Unfasten plug connections on ignition coils.



Unfasten screws on the ignition coils.

#### Installation instruction:

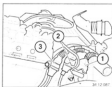
On the ignition coils for cylinders 2 and 8, the ground straps (1) for the cylinder head cover must be secured to the ignition coil screw connections.



### 12 14 150 Replacing sensor for cylinder recognition (M 20, M 30, S38 B36)

Remove cover.

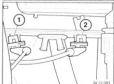
Sensor is fitted to ignition lead No. 5.  
Disconnect suppressor plug from ignition lead.  
Disconnect sensor from ignition lead.



S 38 B36

Unfasten plug (1).

TDC sensor on vibration damper (2).  
Magnetic coupling on air pump (3).



M 20

Disconnect plug connection (2) - remove cable. Fit new sensor.

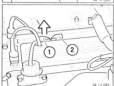
1 = Inductive impulse sensor

2 = Cylinder recognition sensor

Removing fan and fan shroud including cover, see Gr. 17.

Note:

Unfasten water pipe.



M 30

Disconnect plug connection - remove cable (2). Fit new sensor.



Installation instruction:

Fit suppressor plug.

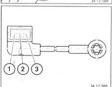
See Construction Group, Pos. 12 12 072



S 38 B36

Unfasten screw.

Remove cap.



Check sensor:

Measure resistance of coil between leads 1 and 2.

• Refer to Specifications



### 12 14 150 Replacing sensor for cylinder recognition (536 636)

Switch off ignition.  
 Untasten screw, remove cover.



Disconnect plug (3).

TDC sensor on vibration damper (2)  
 Magnetic coupling for vibration damper (1)



Remove screw.

Installation instruction:  
 Replace O-ring.

Read fault memory.  
 Check stored faults.  
 Cancel fault memory.

### 12 14 150 Replacing sensor for cylinder recognition (camshaft sensor M 50)

Function description, Bosch DME:

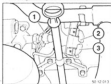
- Design: Inductive sensor
- Only recognizes speed of camshaft.
- Different coding on sensor plug connection to prevent mistaken identity with the sensor on Siemens MS 40 engine control unit.
- Fault memory in DME control unit.
- Troubleshooting - refer to Electrical Troubleshooting Manual.

Description for Siemens MS 40 Control Unit:

- Design: Angle impulse sensor
- The speed and position of the camshaft is recognized.
- Position of camshaft is recognized even at speed 0.
- The sensor is supplied with high frequency by the control unit. Phase displacement is evaluated by the control unit.
- Fault memory in MS 40 control unit.
- Troubleshooting - see Electrical Troubleshooting Manual.



Remove screw.



Mark plug (2) on cable harness and disconnect it.



Remove sender.

Installation instruction:  
Check it is correctly seated on the rubber seal.



M 90 TQ (VANOS = Variable Camshaft Control)  
Disconnect plug connection on VANOS adjustment unit.



Unscrew solenoid.  
Tightening torque\*



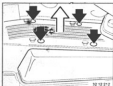
Check gasket, replacing if necessary.



Remove screw.



Mark plug (2) on cable harness and disconnect it.



### 12 14 150 REPLACING CYLINDER IDENTIFYING SENDER (Crankshaft Sender) (M62)

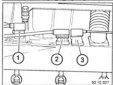
Interrogate fault memories.  
Switch off ignition.  
Unclip caps on screws of cover for cylinder head cover.  
Unscrew screws.  
Remove cover.



Note:  
Routing of wiring on injection pipe.



Disconnect plug (1).



Disconnect plug (1).



Unscrew screw.

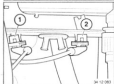


### 12 14 155 Replacing impulse sensor (M 20, M 30, M 40, S28 B36)

Check that impulse sensor is firmly seated and not damaged.

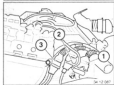


M 40  
Disconnect plug connection.



M 20, M 30  
Disconnect plug connection (1).

Note:  
Remove protective rail from side.



S28 B36  
Disconnect plug (2).



### 12 14 155 Replacing impulse sensor (S28 B36)

Switch off ignition,  
Remove screw, remove cover.



Disconnect plug (2).



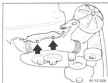
Remove screw.  
Tightening torque 12 14 242\*  
Interrogate fault memory.  
Check faults stored in memory.  
Cancel fault memory.



### 12 14 155 REPLACING PULSE SENDER (MS9)

#### Description of Bosch DME:

- Design: inductive sender.
- Different coding of sender plug connection to avoid mixups with sender of Siemens MS 40 engine control.
- Fault memory in DME control unit.
- Troubleshooting - refer to Car Electric / Electronic Test Plan.



Unscrew screws.  
Remove cover.



Unscrew screw.

**Installation:**  
Ensure that the sender wire does not scrape on the increment gear after installation.

#### Description of Siemens MS 40:

- Design: angle pulse sender.
- Sender receives high frequency power from the control unit. Phase displacement between input and output signals is evaluated in the control unit.
- Fault memory in MS 40 control unit.
- Troubleshooting - refer to Car Electric / Electronic Test Plan.



MS 50 TO VANOS (= Variable Camshaft Control)

Unscrew oil pipe at VANOS control unit.

**Installation:**  
Check seals, replacing them if necessary. "tightening torque".

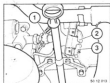
Disconnect plug (3).



Unscrew suspension eye bolts.

**Installation:**  
Check connection of ground strap (1).

\* Refer to Specifications





Unscrew pulse sender screw.

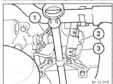
**Installation:**

Ensure that the sender wire does not straddle on the increment gear after installation.

\* Tightening torque\*

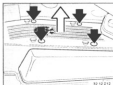


Remove wiring duct.



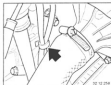
Mark location on wire harness and disconnect plug (2).

## 12-14/8

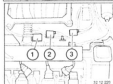


### 12 14 150 REPLACING PULSE SENDER (R00)

Interrogate fault memories.  
Switch off ignition.  
Unflip caps on screws of cover for cylinder head cover.  
Unscrew screws.  
Remove cover.



**Note:**  
Check for correct routing of wiring at water pump.



Disconnect plug (3).



Pulse sender is located close to increment gear.



Unscrew screw (1).



#### Checking Increment Gear

##### M 30

1. TDC mark must be found at middle of a tooth.
2. Gap must be found after 9 teeth from the TDC mark in the engine's direction of rotation.

If not, replace vibration damper.



##### M 30

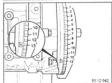
1. TDC mark must be found at middle of a tooth gap.
2. Large gap must be found after one tooth from the TDC mark in the engine's direction of rotation.

If not, replace vibration damper.



##### S 38

1. TDC mark must be found at beginning of the 12th tooth.
2. Large gap must be found after 11 teeth from the TDC mark in the engine's direction of rotation.



##### M 58

1. TDC mark must be found at middle of a tooth gap.
2. Large gap must be found after 13 teeth from the TDC mark in the engine's direction of rotation.

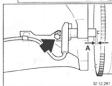
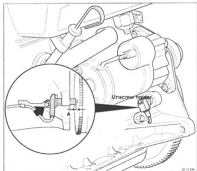


##### M 40

1. TDC mark must be found at middle of a tooth gap.
2. Bore for the dowel pin must be found after 11 teeth from the TDC mark in the engine's direction of rotation.

12 14 166 REPLACING AND ADJUSTING  
SPEED SENDER (M 21)

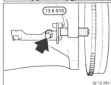
Disconnect plug; unscrew lead.



**Adjusting:**  
Turn crankshaft 40 mm (1.575") further than the TDC mark.  
Check whether dowel pin of the flywheel can be seen through take-up bore of the speed sender.

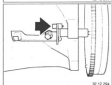


Mount Special Tool 12 6 010 on the holder. Mount holder on the crankcase and push forward against the stop. This automatically adjusts the distance (A) required between the pin on the flywheel and speed sender (Special Tool 12 6 010 is 1.2 mm / 0.051" longer than the speed sender).  
Tighten the holder.

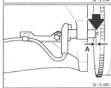


Unscrew Special Tool 12 6 010 on the holder and pull it out.

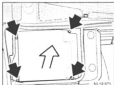
**Important!**  
Holder must no longer be unscrewed on the engine block; only unscrew and pull out the special tool.



Slide speed sender into holder.  
Screw speed sender.

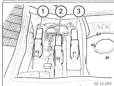


Distance A: clearance between pin on the flywheel and speed sender.



### 12 14 550 REPLACING CONTROL UNIT FOR DIGITAL ENGINE ELECTRONICS (DME)

Interrogate fault memories.  
Switch off ignition.  
Unscrew screws of cover.  
Remove cover.



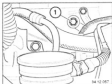
Remove control unit (1).

**Note:**  
Location of control units could differ depending on version date of the model.  
In case of doubt, remove concerned control unit and check the part number.

12 14 600 REPLACING KNOCK SENSORS (800)

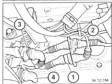
Interrogate fault memory of engine control unit.  
Switch off ignition.  
Remove complete collector - refer to Cir. 11.

**Caution!**  
Mark plugs of knock sensors on the wire harness!  
Mixing up plugs of knock sensors would lead to engine damage!

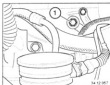


Knock Sensor (1) for Cylinders 1 to 3

**Location:**  
Below temperature senders close to ventilating neck of alternator.



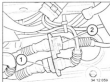
Plug is located below idle speed control (idle speed control not shown here).  
Mark plugs of knock sensors on wire harness!  
Disconnect plug (1).



Unscrew bolt (1).  
**Installation:**  
Tightening torque\*.

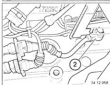


**Installation:**  
Bearing surface of knock sensor on engine block must be clean.



Knock Sensor (2) for Cylinders 4 to 6

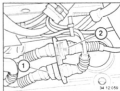
**Location:**  
Above starter.



Unscrew screw (2).  
**Installation:**  
Tightening torque\*.

\* Refer to Specifications

## 12-14/13



Plug is located below idle speed control  
(idle speed control not shown here).  
Mark plugs of knock sensors on wire  
harness!  
Disconnect plug (2).



Installation:  
Bearing surface of knock sensor on engine  
block must be clean.







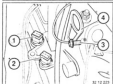
Disconnect plugs.  
 1 Intake air temperature sensor  
 2 Throttle valve potentiometer  
 3 Idle speed control



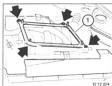
Disconnect plugs.  
 1 Diagnosis socket (unclip from holder)  
 2 Engine plug



Unscrew mutual ground wire of ignition coils (3) close to rear engine suspension eye (4).



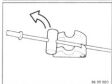
Disconnect plugs of temperature sensors.  
 1 temperature sensor (black) for temperature gage  
 2 temperature sensor (white) for digital engine electronics (DME)



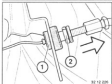
Remove holder (1) for cover of collector. Unscrew screws.



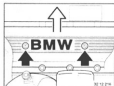
Disconnect throttle cable. Compress nipple mounts at both retainers and press out of opening lever.



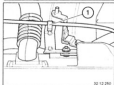
Press nipple out of nipple mounts. Take cable out of nipple mounts.



Take cable (2) out of rubber mount (1). Take rubber mount (1) out of holder. Remove throttle cable.



Unscrew cover of cylinder head cover at left-hand side (cylinder bank 5 - 8).



Routing of Throttle Cable

Take out of holder (1).



Cars with Cruise Control:

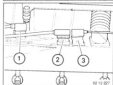
Route cruise control cable (1) underneath throttle cable (2).



Routing of Cruise Control Cable on Cylinder Head Cover



Disconnect plugs on ignition coils.



Disconnect plugs.

- 1 Camshaft sender
- 2 Knock sensor for cylinders 5 and 6
- 3 Knock sensor for cylinders 7 and 8

*Caution!*

Mixing up plugs of knock sensors would lead to engine damage!



Disconnect plug (1).  
Pull off spill hose (2).  
Unscrew screws at left and right hand sides and place expansion tank aside.



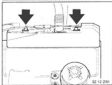
Coolant Expansion Tank



Disconnect plug on oil pressure switch.



Remove pipe of oil pressure switch.



Unscrew screws of wiring ducts on cylinder heads.



Disconnect vacuum hoses on radiator. Loosen hose clamp.



- 1 Tank vapor vent
- 2 Vacuum supply for brake booster



Disconnect vacuum hose at brake booster.

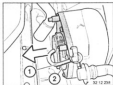


Disconnect tank vapor ventilation hose at throttle valve assembly.



Disconnect fuel feed and return pipes.

## 12-14/18



Pull hose (1) off of end cover (2) on back of manifold.

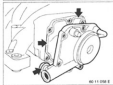


Unscrew bolts.

Installation:  
Tightening torque\*

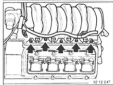
Important!

Pull off end cover together with pressure regulating valve straight back to avoid damaging vent pipe (1).



Installation:

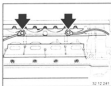
Check seal and gasket, replacing them if necessary.



Unscrew bolts.  
Remove manifold upwards.

Installation:  
Tightening torque\*

\* Refer to Specifications



Knock sensor 1 for cylinders 1 and 2  
Knock sensor 2 for cylinders 3 and 4

Unscrew screws.

Installation:

Tightening torque\*

Caution!

Mixing up plugs of knock sensors would lead to engine damage.  
Routing of wires and connection of plugs must conform with original installation in car to avoid mix-ups.

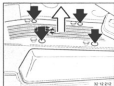
Interrogate fault memories.

Investigate stored faults.

Eliminate faults.

Erase fault memories.

\* Refer to Specifications



### 12 14 601 REPLACING KNOCK SENSORS On LEFT-hand SIDE (Cylinders 5 - 8, M50)

Interrogate fault memories.  
Switch off ignition.  
Unclip caps on screws for cover of cylinder head cover.  
Unscrew screws.  
Remove cover from cylinder head cover.



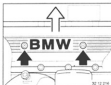
Loosen hose clamps on idle speed control and throttle valve assembly.



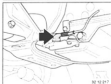
Disconnect plug on mass air flow sensor.



Unclip and remove air cleaner upper section together with mass air flow sensor.



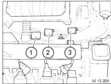
Unclip caps on screws.  
Unscrew screws.  
Remove cover from cylinder head cover at right-hand side.



Oil can.  
Disconnect plug on oil level switch.



Disconnect plugs on ignition coils.

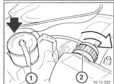


Disconnect plugs.  
1 Knock sensor for cylinders 3 and 4  
2 Knock sensor for cylinders 1 and 2  
3 Pulse sender (on vibration damper)

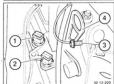
**Caution!**  
Mixing up plugs of knock sensors would lead to engine damage!



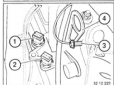
- Disconnect plugs.
- 1 Intake air temperature sensor
  - 2 Throttle valve potentiometer
  - 3 Idle speed control



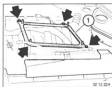
- Disconnect plugs.
- 1 Diagnosis socket (unclip from holder)
  - 2 Engine plug



- Unscrew mutual ground wire of ignition coils (3) close to rear engine suspension eye (4).



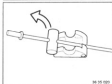
- Disconnect plugs of temperature sensors.
- 1 Temperature sensor (black) for temperature gauge
  - 2 Temperature sensor (white) for digital engine electronics (DEE)



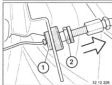
- Remove holder (1) for cover of collector. Unscrew screws.



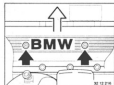
- Disconnect throttle cable. Compress nipple mounts at both retainers and press out of operating lever.



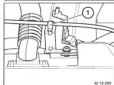
- Press nipple out of nipple mounts. Take cable out of nipple mounts.



- Take cable (2) out of rubber mount (1). Take rubber mount (1) out of holder. Remove throttle cable.



Unscrew cover of cylinder head cover at left-hand side (cylinder bank 5 - 8).



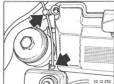
Routing of Throttle Cable

Take out of holder (1).

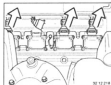


Cars with Cruise Control:

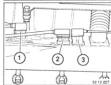
Route cruise control cable (1) underneath throttle cable (2).



Routing of Cruise Control Cable on Cylinder Head Cover



Disconnect plugs on ignition coils.

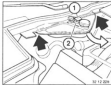


Disconnect plugs:

- 1 Camshaft sender
- 2 Knock sensor for cylinders 5 and 6
- 3 Knock sensor for cylinders 7 and 8

Caution!

Mixing up plugs of knock sensors would lead to engine damage!



Disconnect plug (1).

Pull off spiral hose (2).  
Unscrew screws at left and right hand sides and place expansion tank aside.



Coolant Expansion Tank





Disconnect plug on oil pressure switch.



Remove pipe of oil pressure switch.



Loosen screws of wiring ducts on cylinder heads.



Disconnect vacuum hoses on radiator.  
Loosen hose clamp.



- 1 Tank vapor vent
- 2 Vacuum supply for brake booster



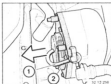
Disconnect vacuum hose at brake booster.



Disconnect tank vapor ventilation hose at throttle valve assembly.



Disconnect fuel feed and return pipes.



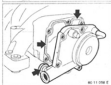
Pull hose (1) off of end cover (2) on back of manifold.



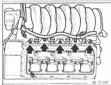
Unscrew bolts.

Installation:  
Tightening torque\*

Important!  
Pull off end cover together with pressure regulating valve straight back to avoid damaging vent pipe (1).



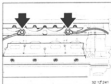
Installation:  
Check seal and gasket, replacing them if necessary.



Unscrew bolts.  
Remove manifold upwards.

Installation:  
Tightening torque\*

\* Refer to Specifications



Knock sensor 1 for cylinders 1 and 2  
Knock sensor 2 for cylinders 3 and 4

Unscrew screws.

Installation:  
Tightening torque\*



Knock Sensors for Cylinders 5 - 8

Drain coolant.



Remove water port on back of cylinder heads.  
Unscrew bolts.

Installation:  
Replace gaskets.  
Tightening torque\*  
Refer to Group 18 for additional information!



\* Refer to Specifications



**Knock Sensor 3**

Unscrew screw.

Installation:  
Tightening torque\*.



**Knock Sensor 4**

Unscrew screw.

Installation:  
Tightening torque\*.

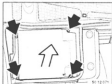
**Caution!**

Mixing up plugs of knock sensors would lead to engine damage.

Routing of wires and connection of plugs must conform with original installation in car to avoid misfire.

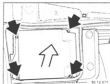
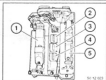
Interrogate fault memories.  
Investigate stored faults.  
Eliminate faults.  
Erase fault memories.

\* Refer to Specifications

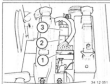

**ENGINE WIRE HARNESS RELAYS**  
 (MSB, M30, M40, M50)

Unscrew screws.  
Remove cover.

- 1 Engine control unit (Bosch DME or Siemens MS 40)
- 2 Engine control master relay
- 3 Electric fuel pump relay
- 4 Oxygen sensor heating relay (not installed with Siemens MS 40)
- 5 ABS control unit


**ENGINE WIRE HARNESS RELAYS**  
 (MS11)

- 1 Preheating relay
- 2 Fuel transfer pump relay
- 3 DDE (Digital Diesel Electronics) master relay



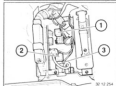


### Relay allocation on engine cable harness (M 60)

Unfasten screws.  
Remove cover.



- 1 Control unit for Digital Engine Control
- 2 Control unit for Automatic Transmission
- 3 Control unit for ABS



- 1 Main relay for engine control unit
- 2 Relay for electrical fuel pump
- 3 Relay for Lambda oxygen sensor heating

#### Note:

Depending on the model of the car, the installation location for the relays can differ. In cases of doubt, extract different relays to check whether the desired function interrupt has been achieved.

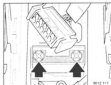
### 12 21 900 REMOVING AND INSTALLING OR REPLACING RELAY FOR GLOW PLUGS

Interrogate fault memory.  
Disconnect battery ground lead.  
Remove insulation sheet.

Unscrew bolts.  
Remove cover.

Remove control unit (1).

Press retaining hook back and pull control  
unit out.  
Disconnect plug.



Check 80 ampere fuse.  
Replace if defective.  
Unscrew screws.  
Tightening torque\*.  
If fuse has failed, always check for cause  
of fault.  
Continue with checking glow plugs - refer  
to 12 23 900.



Unscrew positive lead.  
Tightening torque\*.

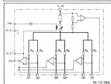


Removing the control unit will be easier, if  
the screws of the equipment carrier are  
loosened first.

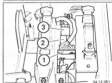
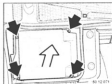
**Note:**  
Relay is activated directly from control unit  
of Digital Diesel Electronics.

#### Wiring Diagram:

G1 ... G6: Glow plugs 1 ... 6  
Term. 15: Positive switched in by ignition  
switch  
Term. 30: Battery positive  
Term. 31: Battery ground  
Usc: Control voltage  
Dis.: Diagnose Interface



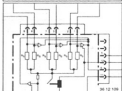
\* Refer to Specifications





36-12-104

**Plug Connections:**  
Printed on control unit.



36-12-105

Pin No.:	Wire Color:	Glow Plug Cyl.:
5	black/green	1
4	black/violet	2
7	black/yellow	3
3	black/red	4
2	black/white	5
1	black/brown	6

Continue with troubleshooting - refer to the  
Car Electric/Electronic Test Plan for Diesel  
Diesel Electronics (DDE 3).



### 12 23 000 Checking all heater plugs

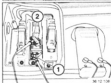
Battery voltage > 9 V.  
Switch off ignition.  
Remove cover on control units.



Disconnect plug connections from control unit (5).



Remove cover from positive battery terminal.

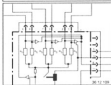


Connect measuring cable (special tool numbers 81 1 473 and 81 11 475) to ammeter. Connect up ammeter between plug connection on cable harness (2) between heater plugs and positive battery terminal (1) and read off current intake level\*.

\* Refer to Specifications

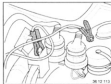


Plug Pin Connection:  
Printed on control unit.



Pin No.	Wire Colors:	Heater Plug, Cyl.
8	black-green	1
6	black-violet	2
7	black-yellow	3
3	black-red	4
2	black-white	5
1	black-brown	6

Caution!  
Never operate removed heater plugs - danger of injury and fire!



Check with Benz test tester\*

Disconnect plug on control unit.  
Connect red lead (1) of tester on battery positive.  
Connect blue lead (2) of tester on battery ground.

\* Source of Supply: BMW Parts Service



## 12-23/2



Circuit diagram - see 12-23-1, install measuring cable (special tool number 81 1 472) in plug connection of heater plug being inspected.

Connect black lead on test device to measuring cable.

Wait until red lamp lights up, equipment is ready for testing.

Press start button on tester - green lamp lights up.

**Needle in green cone:**  
Heater plug in good working order

**Needle in red cone:**  
Heater plug is faulty.  
Time of test: approx. 12 seconds.

**Test completed!**  
Red lamp lights up.  
Continue with next heater plug.

### **Caution!**

**Additional troubleshooting :**  
If a faulty heater plug is found during the test, it is essential to also check the supply lead from the control unit to the heater plug.

**Example:** Tightness of screw on heater plug, continuity test of supply lead and tightness of screened connector on supply lead.

If other disturbances occur even though the heater plugs are okay, check the activation of the heater plug relay, the heater plug relay itself and the 80 amp fuse on the heater plug relay.

Also refer to the Electrical Troubleshooting Manual, Section 1045, Digital Diesel Electronics.

12 23 908 REPLACING ALL GLOW PLUGS

Interrogate fault memory.  
Disconnect battery ground lead.



Remove covers.

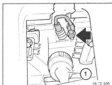


Location of glow plugs



Unscrew lead screw.  
Tightening torque\*.

\* Refer to Specifications



Unscrew lead screw.  
Tightening torque\*.



Unscrew glow plug using Special Tool  
12 2 100.  
Tightening torque\*.

\* Refer to Specifications



### 12 31 009 Checking 3-phase alternator and voltage regulator

#### Prerequisite for the inspection:

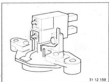
- Correct connections to charged battery
- Correct connections to alternator and starter motor
- Good ground connection between engine and body
- Taut Vee belt



If the battery charge lights intermittently:  
Remove voltage regulator and check carbon brushes, replacing if necessary 12 31 000. Minimum length "A" 5 mm.

#### Caution /

Some alternators have normal regulators and some alternators have constant voltage regulators. The regulators are coded mechanically and must not be confused!



#### Normal regulator

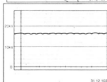


Constant voltage regulator  
Can be identified by the mechanical coding.

Under no circumstances may the constant voltage regulator be installed in vehicles with a battery in the engine compartment. This would result in damage to the battery.

#### Installation instruction:

Check scraper rings for signs of wear, precision-turning if necessary and polishing.  
Connect up **BMW SERVICE TESTER**.  
Start engine and compare readings with nominal values.



If the charge control light goes out while the engine is running and the control voltage\* is not achieved, and if the oscillogram is okay (as per illustration), the voltage regulator must be replaced 12 32 000.  
For additional oscillograms, see Electrical Troubleshooting Manual, 7 Series.



If the specified charge current is not achieved, remove and dismantle the alternator and inspect the components.  
For additional troubleshooting and instructions or disassembly of the alternator, see Construction Group Repair Manual, Group 12.

\* Refer to Specifications



### 12 31 020 Removing and installing 3-phase alternator (M 20, M 21, M 30, M 40, S 38)

Disconnect negative terminal from battery (Dr pos. terminal on the firewall).

M 21 / M 30 battery under rear bench seat on right.



M 20: Remove air filter with volume air flow sensor. Remove plug, loosen hose clip, unfasten retaining screws, lift up air filter with volume air flow sensor, unfasten retaining screws from coolant hose and lift out air filter together with volume air flow sensor.

Note:

S 38 Removing fan and fan shroud, see Gr. 17  
Removing suction filter housing, see Gr. 13.



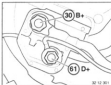
Remove coolant air hose. Loosen hose clamps.

Note:

M 30 Remove coolant hose prior to disassembly.



Alternator: remove protective cover.



Alternator:

Unfasten leads on connection B+ (term. 30) and D- (term. 61).

Tightening torque 12 31 1A2\*



Loosen upper nut and remove screw together with tensioning wheel. Loosen lower nut and remove screw (screw D- B+ removed)



Installation instruction:

Tensioning V-belt\* (SR version) see 12 31 299.

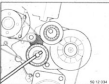


**12 31 000 REMOVING AND INSTALLING  
ALTERNATOR  
(MSO)**

Disconnect battery ground lead.  
Remove complete air cleaner.  
Remove alternator vent hose.  
Remove fan and fan cover.



**Installation:**  
Ensure that tab of the ribbed drive belt  
contacting roller engages in the opening.



Slacken and remove the ribbed drive belt.



Remove cover from connections.  
Unscrew wires.  
Tightening torque\*.



Unscrew screws.  
Remove alternator.

\* Refer to Specification

### 12 31 020 REMOVING AND INSTALLING OR REPLACING ALTERNATOR (M51)

Refer to general information on page 12-00.  
Interrogate fault memory.  
Disconnect battery ground lead.



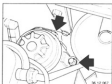
Leave short section of extension inserted between belt tensioner and coolant pipe / charge air pipe.  
Belt tensioner remains preloaded.



Unscrew cap on full flow oil filter and remove oil filter element.



Unscrew holder of engine oil pipes on alternator.



Unscrew power steering supply tank screws on engine carrier.

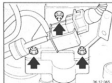


Slacken ribbed drive belt.  
Slacken the automatic belt tensioner using a suitable lever (e.g. short and long ratchet extensions).  
Apply short ratchet extension at front end.



Pull cover off of wire harness connections on alternator.  
Unscrew wires.  
Tightening torque\*

\* Refer to Specifications



Unscrew bolts of charge air cooler and EGR valve.



Uplift coolant expansion tank and lay aside.

**Important!**

Always wrap rags around ends of pipes before disconnecting engine oil pipes on oil filter, so that escaping oil will not run into and collect in the engine guard. Complaints about "oil leakage" would be the result.

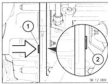


Unscrew engine oil pipe coupling on oil filter.  
Remove engine guard.  
Tightening torque\*.

\* Refer to Specifications



Unscrew alternator bolts.  
Tightening torque\*.



**Installation:**

Press bushings out on engine carrier before installing the alternator. The alternator will then be easier to install.

1 = Locations of bushings after removal  
2 = Installed position



Lower bracket.

\* Refer to Specifications

### 12 31 020 REMOVING AND INSTALLING OR REPLACING ALTERNATOR (M80)

Interrogate fault memories of control units **BE** (disconnecting the battery will erase fault memories).

Disconnect battery ground lead.  
Refer to general information on page 12-6/1.



90 11 070

Remove holder of vacuum hoses on fan cowl.



90 11 070

Remove fan.  
Unscrew fan belt using Special Tools 11 5 040 and 11 5 050.

Important!  
Left-hand threads.

Installation:  
Tightening torque\*.



90 11 070

Remove fan cowl.  
Remove clips at left and right hand sides and remove cowl upwards.

\* Refer to Specifications



90 11 070

Arrangement of Ribbed Drive Belt

Installation:  
Inspect ribbed drive belt for traces of oil/slip or oil, replacing it if necessary.



90 11 070

Loosen nuts (1 and 2) to loosen the ribbed drive belt.



90 11 070

Installation:  
Install ribbed drive belt and check for correct seating on pulleys.  
Preload adjusting plate up to end of slot (2) by turning hexagon (1).  
Tighten nuts (3).  
Tightening torque\*.

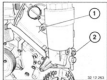


90 11 070

Unscrew nuts (1) and bolt (2).  
Remove ribbed drive belt tensioner.

\* Refer to Specifications



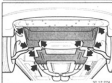


Loosen nuts (1 and 2) of oil filter so that oil filter can be pulled forward about 4 mm.



Unscrew alternator mounting bolts (1 and 2).

Installation:  
Tightening torque\*.



Lift car.  
Unscrew engine splash guards.



Disconnect vent hose of alternator at alternator.

\* Refer to Specifications



Unscrew lower alternator mounting bolt.

Installation:  
Tightening torque\*.



Pull alternator forward.  
Unclip caps on connections.  
Unscrew connections.

Installation:  
Tightening torque\*.



Lower car.  
Take radiator hose out of clamp (1).



Unclip radiator at left and right hand sides  
by pressing in retainers with a screwdriver.

\* Refer to Specifications



**Installation:**  
Insert clips in radiator and compress until engagement is heard several times.



Protect radiator with steel metal plate (1) to avoid damage while removing alternator. Unscrew water pump pulley.

**Installation:**  
Tightening torque\*.

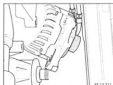


Pull oil filter forward slightly. To remove the alternator, alternator mounting lab (1) must be turned clockwise underneath oil filter mounting lab (2).



Pull alternator forward.

\* Refer to Specifications



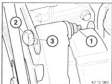
Remove alternator upwards.





**12 31 009 CHECKING AND TIGHTENING  
ALTERNATOR DRIVE BELT  
(M30, M30, M40)**

Check and, if necessary, adjust tension of the drive belt using Special Tool 11 S 020. The pulling hook must bear in the middle of the spanner.  
The tester needle must be above the green or yellow zone of the scale.



**Tightening Drive Belt:**

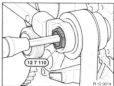
Loosen nut (1) and turn tensioning wheel (2) with approximately 7 Nm torque.

Tighten nut (1).

Recheck drive belt tension with the special tool tester and correct if necessary.

**Drive Belt Tension Tester:**  
With a "new scale" for SR drive belts,  
SR = Service reduced.

## 12-31/10



### 12 31 ... Replacing alternator pulley

Unfasten nut with special tool 12 7 110.

Grip shaft of rotor with Allen key.

Tightening torque 12 31 3A2\*

### 12 32 000 REPLACING VOLTAGE REGULATOR

Disconnect ground leads from batteries.



**Precaution:**  
Clean the contact surfaces and check tension of the spring contacts, bending to correct if necessary.  
Distance A = at least 5 mm.



Remove alternator - refer to 12 31 020.  
Unscrew cover.



Unscrew screws.  
Remove voltage regulator.



Check slip ring for wear and machine if necessary - refer to 12 31 200 in the Construction Group Repair Manual.

### 12 41 020 Removing and installing starter motor (M 20, M 21, M 30, S 38)

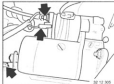
Read full memory.  
Disconnect negative battery terminal.



30 12 304

**M 21, M 30**  
Remove expansion tank - improves access to the screws.  
On M 21, remove support for manifold.

**S 38**  
Removing manifold for intake air, see Gr. 11.



30 12 305

Remove leads.



30 12 306

Remove retaining nuts.  
Tightening torque\*

Installation instruction:  
Fill with coolant\*\* and bleed cooling system - see Pas. 17 9 026.

Notes on troubleshooting and disassembly of the starter motor, see Construction Group Repair Manual Gr. 12.

\* Refer to Specifications

\*\* Refer to Consumable Specifications

### 12 41 000 Starter - Remove, install / replace (M40)

See General Data, Gr. 12 00.  
Interrogate fault memory.  
Disconnect negative terminal on battery.



**Installation instruction:**  
Check starter pinion for damage.  
Check starter gear ring for damage prior to installation of starter.

**Notes on troubleshooting and disassembling the starter motor, see Construction Group Repair Manual Gr. 12.**



Remove loads on starter motor.  
Tightening torque\*



Unscrew screws and support.  
Tightening torque\*  
Remove starter motor.



\* Refer to Specifications

### 12-41 020 Removing and installing the starter motor (M 50)

See General Data, Gr. 12 00.  
 Interrogate fault memory.  
 Disconnect negative battery terminal.  
 Remove vent hose on alternator.  
 Removing complete intake filter housing,  
 removing complete air manifold, see Gr. 13.



Installation instruction:  
 Check starter pinion for damage.  
 Check starter gear ring for damage prior to installation of starter.

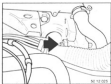
Notes on troubleshooting and disassembly of the starter motor, see Construction Group Repair Manual Gr. 12.



Remove leads from starter motor.  
 Tightening torque\*



Unscrew screws and support.  
 Tightening torque\*  
 Remove starter motor.

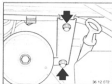


\* Refer to Specifications



### 12 41 020 Removing and installing the starter motor (MS1)

See General Data Gr. 12 00.  
Interrogate fault memory.  
Disconnect negative battery terminal.



Unscrew screw of rear support for manifold.



Unscrew oil dipstick screw.

**Caution!**  
When engine oil level is high, oil may run out of the dipstick bore.  
Remove oil dipstick.



Installation instruction:  
Check O-ring, replacing if necessary.



Unscrew wires on starter.  
Tightening torque\*



Unscrew bolts.  
Tightening torque\*  
Unfasten support (if fitted).  
Tightening torque\*



Unscrew starter below oil filter.

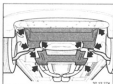


Installation instruction:  
Check starter pinion for damage.  
Check starter gear ring for damage prior to installation of starter.  
Notes on troubleshooting and disassembly of the starter motor, see  
Construction Group Repair Manual Gr. 12.

\* Refer to Specifications

### 12 41 020 Removing and installing or replacing starter motor (pl/oc)

Note General Data Group 12-0.  
Disconnect negative battery terminal.



Remove splash guard.



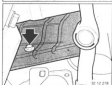
Remove heat baffle plates on right.  
Unscrew bolts.



Remove heat baffle plate from front of front axle carrier.



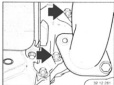
Remove heat baffle plate on starter motor.  
Unscrew bolts.



Loosen screw connection on starter motor lead.  
Tightening torque\*



\* Refer to Specifications



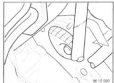
Unhook belts.  
Tightening torque\*



Remove starter motor by lifting out from back of ring gear.



Remove starter downwards.



Check pinion on starter motor and starter motor ring gear on flywheel for signs of damage.  
Notes on troubleshooting and disassembly of the starter motor, see Construction Group Repair Manual Gx 12.

\* Refer to Specifications

## 12 64 005 REPLACING FUEL HEATER

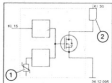
The electronics for diesel filter heating is integrated in upper section of filter.  
The heating element and water level probe are integrated in upper section of filter and can be replaced only together with the complete fuel filter.

**Caution!**

Heating element could have temperature up to 130° C – danger of injury!

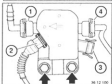
**Description of Operation:**

Heater switches on:  
terminal 15 on and  
fuel temperature less than + 2 ° C.

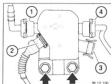
**Wiring Diagram:**

- 1 MTC sensor for temperature of supplied fuel
  - 2 PTC heating element
- Term. 15: Battery positive switched in by ignition switch  
Term. 30: Battery positive  
Term. 31: Battery ground

Heater switches off:  
fuel temperature more than + 7 ° C.  
During engine starting if system voltage drops below 7.5 V.



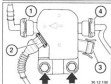
3 = Fuel heater plug



Disconnect plug (2) for water level probe and plug (3) for fuel heater.

**Plug Connections:**

- Pin 1: Terminal 30  
Pin 2: Terminal 31  
Pin 3: Terminal 15

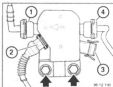


Press retainers and pull pipes (1 and 4) off.

**Caution!**  
Catch escaping fuel.

**Installation:**  
Check seals and, if necessary, replace.  
Coat seals with acid-free grease.

## 12-64/2



Unscrew bolts and remove filter.  
Tightening torque\*.

Empty filter into a suitable container.

*Installation:*

Bleed fuel system - refer to 13 51 526.

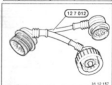
\* Refer to Specifications



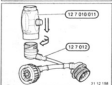
#### 12 70 500 CHECKING SAFETY PATH OF ELECTRONIC ENGINE POWER CONTROL (EML)

**Note:**  
Interrogate the fault memory of the EML control unit before installing the test adapter.

Switch ignition off.  
Disconnect EML plug.



Cars with 20 Pin EML Plug  
Use test adapter, Special Tool 12 7 010011.



Cars with 25 Pin EML Plug  
Special Tool 12 7 012 (adapter) must be used between the EML wire harness and Special Tool 12 7 010011 (test adapter).

Connect the BMW Service Tester (to measure speed).

**Testing Procedures:**  
Regulate test adapter 12 7 010011 to middle position "0".

Take test gear (neutral).  
Start engine.

Regulate idling speed with knurled wheel of the test adapter to at least 2500 rpm.  
Now operate brake pedal immediately.  
The engine speed must "immediately" drop to idling speed.

If yes, the safety path is OK.  
Repeat this test with the clutch pedal in cars with a manual transmission.

Refer to the Car Electric/Electronic Test Plan for troubleshooting instructions.

Switch ignition off.  
Remove adapters.  
Connect plug.

**Note:**  
Interrogate the fault memory, investigate the stored faults and eliminate the faults.  
Cancel the fault memory.



### Installing Pedal Value Sender:

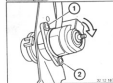
Picture shows the opening in the pedal console.



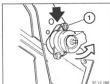
Turn pedal value sender until mounting tabs (1 and 2) are located above the mounting base of the pedal console.



Then tilt the pedal value sender upwards at an angle until it can be put through the opening in the pedal console.



Insert pedal value sender fully.



Turn pedal value sender until eye (1) can be put through the oval opening of the pedal console.



Eye (1) mounted in pedal console.



Turn pedal value sender until eye (2) can be put through the oval opening of the pedal console.  
Screw on pedal value sender.

Mount plug.  
Adjust pedal value sender and check function – see Adjusting Accelerator in 12 72 ...  
Check safety path – see 12 70 500.

**12 72 520 REMOVING AND INSTALLING OR REPLACING PEDAL VALUE SENDER**

Turn ignition off.  
Remove trim panel for the dashboard at bottom left – see 51 45 180.

Unscrew nut and pull lever off of the pedal value sender.

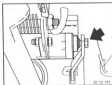
*Installation:*  
Adjust accelerator – see 12 72 ...

Unscrew both bolts.  
Disconnect plug.

*Installation:*  
Use spacers between the sender and pedal console.

**Removing Pedal Value Sender:**

Turn pedal value sender until eye (2) can be taken out through the opening.



52 12 194



52 12 192



52 12 190



52 12 188

Turn pedal value sender until eye (1) can be taken out.



52 12 186

Tilt pedal value sender until the clips of the cover can be taken out of the opening first.  
Remove pedal value sender.



52 12 193

Turn pedal value sender until eyes are again aligned with the hole pattern of the holder.





### Installing Pedal Value Sender:

Picture shows the opening in the pedal console.



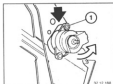
Turn pedal value sender until mounting tabs (1 and 2) are located above the mounting holes of the pedal console.



Then tilt the pedal value sender upwards at an angle until it can be put through the opening in the pedal console.



Insert pedal value sender fully.



Turn pedal value sender until eye (1) can be put through the oval opening of the pedal console.



Eye (1) mounted in pedal console.



Turn pedal value sender until eye (2) can be put through the oval opening of the pedal console.  
Screw on pedal value sender.

Mount plug.  
Adjust pedal value sender and check function – see Adjusting Accelerator in 12 72 ...  
Check safety path – see 12 70 500.

## 12 72 ... ADJUSTING ACCELERATOR PEDAL WITH ELECTRONIC ENGINE POWER CONTROL

### 1. Idle Position

Loosen hexagon nut (1) on pedal value sender.

Produce a gap A of 3 mm (0.118") or 2 mm (0.079") for S24 id below, the accelerator pedal shaft and idle stop (2).

Tighten hexagon nut (1) on pedal value sender to correct figure\*.

Support lever on pedal value sender while tightening.

### 2. Full Load Position

#### a) Manual Transmission

Operate accelerator pedal to kickdown pressure point in the pedal value sender. Turn knurled head screw (3) to bear on the accelerator pedal in this position and lock.

#### b) Automatic Transmission

Operate accelerator pedal to kickdown pressure point in the pedal value sender. Adjust knurled head screw (3) in this position to have a distance of 8 mm (0.236") between the knurled head screw and accelerator pedal. Lock the knurled head screw.

#### Important!

Check pedal value sender with a diagnosis tester after adjusting. Connect tester, turn on ignition and press accelerator pedal to the full load stop. Compare actual voltage value displayed on the tester with the nominal value, correcting the adjustment if necessary.

Idle = min. 350 mV

Idle = max. 450 mV

Note:

No safety path test for S24 id.

Specifications:

a) Manuals = 3.15 ... 3.3 V

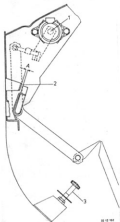
b) Automatics = 3.7 ... 3.8 V

Check safety path - see 12 70 500 in Construction Group Repair Manual.

Note:

Read DML fault memory before installation of the testing adapter.

\* See Specifications



12 72 723

## On-board Diagnosis

The DME control unit recognizes exhaust relevant faults and displays them by lighting up the "Check Engine" control lamp continuously. Check Engine control lamp – see Group 62. The fault lamp comes on after turning on the ignition and goes out when the engine runs. It is on continuously while the engine is running, if there is a fault.

Flashing codes help in locating faults precisely and eliminating them.

## Fault Output:

Activate flashing code output: ignition ON, operate full load contact 5 times within 5 seconds. Fault output begins. See sample fault: faulty MTC coolant – code 1223.

1 = Start of fault code

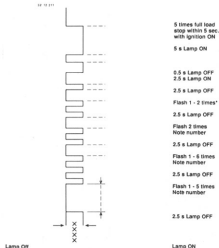
2 = End of fault code

## Note:

Each additional call must be activated again.

Code 3444 - fault no longer stored.  
Code 3000 (long dark phase) - after fault output = end of output.

Sample Fault Code: MTC Coolant  
Code 1223



\* Two times for M 70  
Left cylinder bank

## FAULT CODE TABLE

Code	Faulty Component
x211	Control unit (self-test)
x215	Air flow sensor
x221	Oxygen sensor
x222	Oxygen sensor control stop
x223	NTC coolant (see sample fault)
x224	NTC air
x231	Battery voltage monitor
x232	Idle speed switch
x233	Full load switch
x251	Fuel injector final stage 1
x252	Fuel injector final stage 2
x261	Fuel pump relay final stage
x262	Idle control final stages
x263	Tank venting final stage
x264	Relay 3 final stage (oxygen sensor heating)

Table 1: CARB Flashing Code Scope

## Remarks:

x = 2 for M 70 control unit of left engine half (cyl. 7 ... 12)

x = 1 for M 70 control unit of right engine half (cyl. 1 ... 6) and all other engines.

Fault memory empty: Code x444

## Versions of Cancelling Fault Memories:

1. Disconnect DME control unit (permanent positive, pin 18) on power supply, e.g. by unplugging control unit.
2. With help of BMW SERVICE TESTER:  
Command: cancel fault memory (see car electric/electronic test plan).
3. Re-activation with ignition ON while flashing code output x000 is put out, close full load switch 10 seconds.

## Remarks:

FL = Fault lamp

VL = Full load

# 13 Fuel system

518i (M40), 520i (M20, M50), 525i (M20, M50), 530i (M30), 535i (M30).....

M5 .....

524d (M21), 524td (M21) .....

525td (M51), 525tds (M51) .....

530i (M60), 540i (M60) .....

# 13 Fuel system

**Models : 518i (M40), 520i (M20, M50), 525i (M20, M50), 530i (M30), 535i (M30)**

Model: 518i (M43) refer to "Repair Manual 3 Series E36"

13 00 060	Engine idle speed and CO content (M20, M30) – check .....	13-00/1
...	Engine idle speed / CO content (M20, M30) .....	13-00/2
...	Basic setting of air flow meter adjusting screw M20, M30 – check .....	13-00/2
064	Engine idle speed and CO content (M50) – check and, if necessary, adjust .....	13-00/3
060	Engine idle speed and CO content (M50) – check .....	13-00/4
060	Engine idle speed and CO content (M40) – check .....	13-00/5
	Overview of fuel filters and lines .....	13-32/1
13 32 061	Fuel filter – replace .....	13-32/1
13 41 500	Idle speed control valve (M40) – replace .....	13-41/1
500	Idle speed control valve (M20, M30) – replace (check) .....	13-41/2
500	Idle speed control valve (M50) – replace .....	13-41/3
13 51 630	Fuel pressure regulator (M50) – replace .....	13-51/1
630	Fuel pressure regulator (M40) – replace .....	13-51/2
13 54 030	Throttle assembly (M50) – remove and install/seal .....	13-54/1
030	Throttle assembly (M40) – remove and install/seal .....	13-54/2
13 61 000	Control unit – remove and install or replace .....	13-61/1
13 62 000	Air flow meter (M40) – remove and install .....	13-62/1
000	Air flow meter (M20) – remove and install .....	13-62/2
000	Air flow meter (M30) – remove and install .....	13-62/3
560	Air mass meter (M50, M50 B20 TU) – remove and install .....	13-62/4
560	Hot film air mass meter (M50 B25 TU) – remove and install .....	13-62/5
511	Intake air temperature sensor (M50) – replace .....	13-62/6
531	Coolant temperature sensor – remove and install or check .....	13-62/7
531	Coolant temperature sensor (M50) – remove and install or replace .....	13-62/8
13 64 541	Fuel injector valves, all (M20) – replace .....	13-64/1
541	Fuel injector valves, all (M30) – replace .....	13-64/2
541	Fuel injector valves, all (M50) – remove and install .....	13-64/3
13 71 000	Air cleaner (M20) – remove and install .....	13-71/1
13 72 001	Air cleaner cartridge (M20) – replace .....	13-71/1
13 71 000	Air cleaner (M30) – remove and install .....	13-71/2
13 72 001	Air cleaner cartridge (M30) – replace .....	13-71/2
13 71 000	Air cleaner (M50) – remove and install .....	13-71/3
13 72 001	Air cleaner cartridge (M50) – replace .....	13-71/3
13 90 500	Tank ventilation valve (M20, M30) – replace .....	13-90/1

For further information on troubleshooting and jobs in assembly 13 refer to:

Microfiche Assembly Repair Manual and

Electrical Troubleshooting Manual 5 Series E34

For M43 engine refer to:

For other jobs refer to "Repair Manual 3 Series E36"

**13 00 060 CHECKING ENGINE IDLING SPEED AND CO CONTENT (M20, M20i)  
- Cars with Catalytic Converter -**

**Requirements for All Adjustments:**

Engine at operating temperature, i.e. oil temperature at least 60° C.

Valve clearance correct.

Engine and ignition in perfect operating condition.

Connect BMW Service Tester to operating instructions.

Routine checking is not necessary.

**1) Engine Idling Speed**

Check engine idling speed\*\*. Refer to BMW Diagnosing System if nominal value is not reached. Check intake system for leaks.

**Note:**

There is no adjusting screw for idling speed adjustments.

**2) CO Content**

Disconnect oxygen sensor plug (not in cars prepared for catalytic converter).

Unscrew screws (1).

Connect Special Tool 13 0 100 to exhaust manifold.

Check idling speed CO content\*\*.

Switch exhaust extraction system off for time of test.

**Nominal Value Not Reached and CO Content Too High:**

Check:

- fuel injectors,
- fuel pressure and
- coolant temperature sensor.

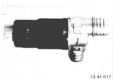
**CO Content Too Low:**

Check hoses and connections for engine idling speed control and detect air leaks.

**Important!**

Also valid for cars prepared for catalytic converter.

Adjustments may not be made on the air flow sensor adjusting screw, since this setting is the basis for oxygen sensor and idling speed control.



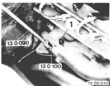
13 41 017



13 00 026



13 18 001



13 00 090

**Checking Function of Oxygen Sensor (11 78 916)**

Unscrew screw (1).

Connect Special Tools 13 0 100 to exhaust manifold.

Switch exhaust extraction system off for time of test.

Disconnect oxygen sensor plug.

Clamp vacuum hose leading to the fuel pressure regulator (not while engine is running).

Start engine - CO content rises.

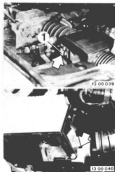
Connect oxygen sensor - CO content

should go back to the nominal value.

Remove clamp from vacuum hose.

For air flow or air volume measurements (M2) with the potentiometer the adjustment does not have influence on catalytic converter and idling speed regulation in catalytic converter operating mode.

The plug for the CO potentiometer, however, must be disconnected - refer to Gr. 12.



### 13 00 ... ENGINE RUNNING/CO CONTENT (M20, M30)

Only for cars prepared for catalytic converter operation.

If it is absolutely necessary to correct<sup>1)</sup> the CO engine running setting with the air volume sensor adjusting screw or if the adjusting screw had been turned unintentionally, the basic setting must be checked and/or restored when converting to a catalytic converter or working on the fuel/air mixture system.

- 1) Corrections may never be carried out when there is a fault in the fuel/air mixture system.  
Read the self-diagnosis, check for leaks in the intake and fuel systems, check fuel injectors, temperature sensor and fuel pressure - also refer to 13 00 060.



13 00 041



13 00 042



### 13 00 ... CHECKING BASIC SETTING OF AIR VOLUME SENSOR ADJUSTING SCREW (M20, M30)

Only for cars prepared for catalytic converter operation (anti-tamper lock in catalytic converter case).

M 1.1 and M 1.3 Motronic:  
Measure distance "A" at the adjusting screw with a depth gage and compare or adjust to the value dis-stamped in the air volume sensor.  
Install an anti-tamper lock on the air volume sensor after converting the car to catalytic converter and checking the basic setting.

Cars with Potentiometer on Air Flow or Air Volume Sensor:

The setting of the adjusting screw can be read and/or corrected via the diagnosing system of a BMW Service Tester.

When converting to a catalytic converter, the CO potentiometer plug must be disconnected (refer to Group 13). The setting of the adjusting screw is then without influence.



13 00 004 CHECKING ENGINE IDLING SPEED AND CO CONTENT (MSD)  
- Cars Prepared for Cat. Conv. -

Engine with M 3.1 Motronic:  
Requirements for All Adjustments:  
Engine at operating temperature, i.e. oil temperature at least 50 °C.  
Engine and ignition in perfect operating condition.  
Enter number of cylinders (6) for engine idling speed test step no. 5.  
Connect BMW Service Tester to operating instructions.  
Routine checking is not necessary.



If the nominal value is not reached, first make sure that there are no faults in the engine, ignition or fuel injection before correcting the CO content setting.

**CO Content Too High:**

**Check**

- fuel injectors,
- fuel pressure and
- coolant temperature sensor.

**CO Content Too Low:**

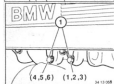
Check hoses and connections for engine idling speed control and detect air leaks. Also refer to BMW Diagnosing System.



1) Engine Idling Speed

Check engine idling speed\*\*.  
Refer to BMW Diagnosing System if nominal value is not reached.  
Check intake system for leaks.

**Note:**  
There is no adjusting screw for idling speed adjustments.  
Clicking of the idling speed control valve must be heard and felt when switching the ignition on.



2) CO Content

Connect exhaust sensor in exhaust tailpipe.  
Check idling speed CO content\*\*.  
Switch exhaust extraction system off for time of test.  
If the nominal value is not reached, the CO content\*\* of cyl. 1, 2 and 3 or cyl. 4, 5 and 6 can also be checked separately to troubleshoot.

\*\* Refer to Specifications of Gs. 11 and 13

The CO content is corrected via the M 3.1 diagnosing program with MoDiC.

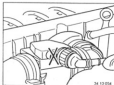


The setting of the adjusting no longer has any influence in all cars with the MSD engine.

Refer to the BMW Test Plan for further instructions.

**13 00 000 CHECKING ENGINE IDLING SPEED AND CO CONTENT (M50)**  
- Cars with Catalytic Converter -

**Requirements for All Adjustments:**  
Engine at operating temperature, i.e. oil temperature at least 60° C.  
Engine and Ignition in perfect operating condition.  
Connect BMW Service Tester to operating instructions.  
Routine checking is not necessary.



If the nominal value is not reached, first make sure that there are no faults in the engine, ignition or fuel injection before correcting the CO content setting.

Also refer to BMW Diagnosing System.

The setting of the adjusting no longer has any influence in all cars with the M50 engine.

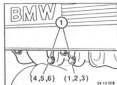
Refer to the BMW Test Plan for further instructions.

**1) Engine Idling Speed**

Check engine idling speed\*\*.  
Refer to BMW Diagnosing System if nominal value is not reached.  
Check intake system for leaks.

**Note:**

There is no adjusting screw for idling speed adjustments.



**2) CO Content**

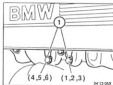
Disconnect oxygen sensor plug (not in cars prepared for catalytic converter).  
Unscrew screws (1).  
Connect Special Tool 13 0 080 to exhaust manifold.  
Check idling speed CO content\*\*.  
Switch exhaust extraction system off for time of test.

**Nominal Value Not Reached and CO Content Too High:**

- Check:**
- fuel injectors,
  - fuel pressure and
  - coolant temperature sensor.

**CO Content Too Low:**

Check hoses and connections for engine idling speed control and detect air leaks.



**Checking Function of Oxygen Sensor (11 78 0-00):**

- Unscrew screw (1).
- Connect Special Tools 13 0 080 to exhaust manifold.
- Switch exhaust extraction system off for time of test.
- Disconnect oxygen sensor plug.
- Clamp vacuum hose leading to the fuel pressure regulator (not while engine is running).
- Start engine - CO content rises.
- Connect oxygen sensor - CO content should go back to the nominal value.
- Remove clamp from vacuum hose.

\*\* Refer to Specifications

**13 00 000 CHECKING ENGINE IDLING SPEED AND CO CONTENT (M40)**  
 - Cars with Catalytic Converter -

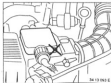
Engine with M 1.3 Motronic.

**Requirements for All Adjustments:**  
 Engine at operating temperature, i.e. oil temperature at least 60° C.  
 Engine and ignition in perfect operating condition.

Connect BMW Service Tester to operating instructions.

Routine checking is not necessary.

Enter number of cylinders (6) for engine idling speed test step no. 5.



**Important!**

Corrections cannot be carried out on the air volume sensor adjusting screw. For air volume measurements with the potentiometer the adjustment does not have influence on catalytic converter and idling speed regulation in catalytic converter operating mode. The plug for the CO potentiometer, however, must be disconnected - refer to Gz. 12.



**1) Engine Idling Speed**

Check engine idling speed\*\*. Refer to BMW Diagnosing System if nominal value is not reached. Check intake system for leaks.

**Note:**

There is no adjusting screw for idling speed adjustments.

**2) CO Content**

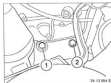
Disconnect oxygen sensor plug (not in cars prepared for catalytic converter). Unscrew screws (1). Connect Special Tool 13 0 100 to exhaust manifold. Check idling speed CO content\*\*. Switch exhaust extraction system off for time of test. Nominal Value Not Reached and CO Content Too High:

Check

- fuel injectors,
- fuel pressure and
- coolant temperature sensor.

CO Content Too Low:

Check hoses and connections for engine idling speed control and detect air leaks.



**Checking Function of Oxygen Sensor (11 76 010)**

Unscrew screws (1 and 2). Connect Special Tools 13 0 100 to exhaust manifold.

Switch exhaust extraction system off for time of test.

Disconnect oxygen sensor plug. Clamp vacuum hose (not while engine is running).

Start engine - CO content rises.

Connect oxygen sensor - CO content should go back to the nominal value.

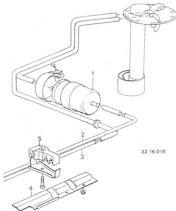
Remove clamp from vacuum hose.



\*\* Refer to Specifications of Gz. 11 and 12

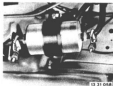
13 32 051 REMOVING AND INSTALLING FUEL FILTER

Survey of fuel filter and pipes.



32 16 018

- 1 Fuel filter
- 2 Feed pipe
- 3 Return pipe
- 4 Trim panel
- 5 Holder on floor plate



13 32 051



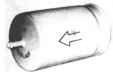
13 32 051

13 32 051 REPLACING FUEL FILTER

Disconnect pipes.

Unscrew bolts.  
Pull off filter.

Installation:  
Check direction of flow (arrow).



30 16 021



### 13 41 500 REPLACING IDLING SPEED CONTROL VALVE (IMV)

After checking engine idling speed (13 00 054 060) or function of DME (13 00 060).

Squeeze clip and pull plug (1) off.



Loosen hose straps.  
Disconnect hoses (2 and 3).



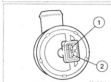
Cut wire straps off.



Push idling speed control valve through the retaining strap and remove.



Installation:  
Check code (B).  
Check idling speed\*.



Component Test:

Refer to BMW Diagnosing System to troubleshoot and check electric connection.

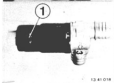
Electric Test:

Measure resistance between terminals (1 and 2).  
Specification: 0 ± 2 Ω.



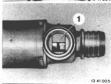
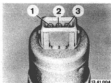
### 13 41 500 Replacing (checking) idle speed control valve (M20, M30)

Disconnect plug (1).  
Detach (press together) retaining strap (2).  
Pull idle speed control valve from hoses and remove.



Installation note:  
Note identification No. (1) \*).  
Check idle speed %.

Note:  
Operation of the idle speed control valve can be felt by touching with the hand (blocked voltage supply).



### Electrical check

Measure resistance between terminal (1) and (2), setpoint approx. 40 Ω.  
Measure resistance between terminal (2) and (1) or (2) and (3).  
Setpoint approx. 30 Ω.

### Dynamic check

Remove idle speed control valve (plug remains connected).  
Completely open or close rotary piston (1) by turning valve abruptly.  
Switch on ignition. Rotary piston must assume a position of approx. 50 % cross section opening and remain in this position.

Test:  
See BMW DIAGNOSTIC SYSTEM



13-41-054

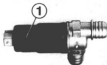
### 13-41-500 Replacing idle speed control valve (MSD)

#### Note:

When installed, operation of the idle speed control valve can be detected by touching it with the hand (clocked voltage supply).

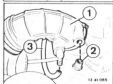
#### Test:

See BMW DIAGNOSTIC SYSTEM



13-41-058

Installation note:  
Note identification No. (1).  
Check idle speed\*.



13-41-059

Release hose clip.  
Remove garter (1).  
Disconnect idle hose (2) and hose (3).



13-41-060

Disconnect hot water hose.  
Disconnect plug (4).  
Unclip hose (5) and remove.



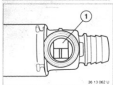
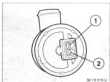
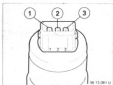
13-41-061

Disconnect vacuum hose (6).  
Slide idle speed control valve through retaining strap and remove.

**Component Test:**

**Bosch DME:**  
Double-coil rotary positioner  
Three-pin plug

Clicking of the idling speed control valve must be heard and felt when switching the ignition on.  
Refer to BMW Diagnosing System to troubleshoot and check electric connections.

**Electric Test:**

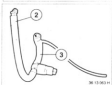
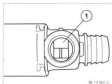
Measure resistance between terminals (1 and 3).  
Specification: 40 ± 5 Ω.  
Measure resistance between terminals (2 and 1) or (2 and 3).  
Specification: 20 ± 5 Ω each.

**Siemens MS 40, MS 40.1:**  
Single-coil rotary positioner  
Two-pin plug

**Electric Test:**  
Measure resistance between terminals (1 and 2).  
Specification: 20 ± 5 Ω.

**Mechanical Test:**

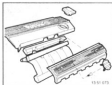
It should be possible to turn rotary piston (1) in the idling speed control valve when the valve is rotated abruptly.

**Dynamic Test:**

Switch ignition off.  
Remove idling speed control valve (plug terminals connected).  
Open or close rotary piston (1) completely.  
Switch ignition on.  
Rotary piston must move into and remain in a position of approx. 50 % of the cross section opening.

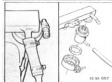
Disconnect hoses (2 and 3) to replace the valve.





### 13 51 630 Replacing fuel pressure regulator\* (MS0)

Remove covering.



Disconnect vacuum hose.



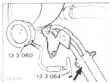
Release screw (1).  
Press off fuel pressure regulator (stiff, sealing rings hard fast).

Caution!  
Sealing ring drops out.

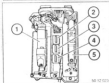


Installation note:  
Check sealing rings and replace if necessary.  
Note identification No. and nominal pressure\*

\* Refer to Technical Data



Check:  
Install pressure gauge 13 3 060 with connection line and T-piece 13 3 064 in fuel supply line (bottom line).



Unpin fuel pump relay (3).  
Connect jumper between terminal 87 and terminal 30 with special tool 81 3 056.  
Fuel injection pressure\*



If the fuel injection pressure\* drops too fast, close off return line - upper line - with tool 13 3 010 and briefly operate tool 81 3 050 again.

The pressure regulator is defective if the injection pressure is now maintained.  
If the injection pressure drops, there is a leak upstream of the pressure regulator.

\* Refer to Technical Data



### 13 51 830 Replacing fuel pressure regulator (MA0)

(After function test of digital motor electronics (DME) 13 00 902, or after testing delivery pressure of fuel pump 13 31 029)

Disconnect vacuum hose (1).

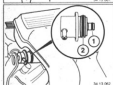


Disconnect hose (2).



Release screw (3). Remove retaining strap.

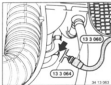
Caution!  
Thrust washer drops out.



Turn regulator and pull out.

Installation note:  
Replace sealing rings (1) and (2).  
Note identification No. and nominal pressure\*.

\* Refer to Technical Data

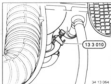


Component testing:  
Install **SAME SERVICE TESTER** on pressure gauge 13 3 060 with connection line and T-piece 13 3 064 in fuel supply line - ahead of pressure regulator.



Unplug fuel pump relay (3). Connect jumper between terminal 87b and terminal 30 with special foot 61 3 050.

Read off fuel injection pressure\*.

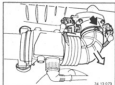


If the fuel injection pressure\* drops at too fast a rate, close off return line - upper line - with foot 13 3 015 and once again briefly operate foot 61 3 050.

The pressure regulator is defective if the injection pressure is now maintained.

If the injection pressure drops, there is a leak upstream of the pressure regulator.

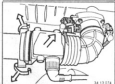
\* Refer to Technical Data



34 13 0 09

### 13 54 000 REMOVING AND INSTALLING THROTTLE VALVE ASSEMBLY (MS0)

Loosen hose strap and pull bellows off.



34 13 0 14

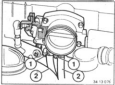
Loosen clamps and remove air volume sensor together with the bellows.



34 13 0 07

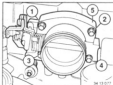
Disconnect cables (1) and if applicable (2).

Installation:  
Adjust cables - refer to pertinent Group 35 or 65.



34 13 0 06

Loosen hose straps (1) and push hoses (2) back.  
Pull plug (3) off of the throttle valve switch.

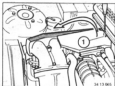


34 13 0 17

Unscrew screws (1 ... 5).  
Remove throttle valve assembly.

5 = Gasket

Installation:  
Replace gasket (5).



**13 54 030 REMOVING AND INSTALLING THROTTLE VALVE ASSEMBLY (M40)**

Unscrew screw (1) and fold plastic cap out of the way.



Unscrew screws (2 and 3).



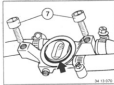
Unclip cable (or cables).  
Unscrew screws and remove holders.  
Loosen hose strap (4) and remove bellows (5).



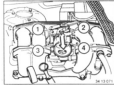
Pull plug off of the throttle valve switch.



Unscrew screws (7) and remove preheater.  
Disconnect hoses (8 and 9).



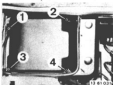
Installation:  
Check for correct seating of the preheater.  
Replace seal.



Unscrew screws (1 ... 4).  
Remove throttle valve assembly.



Installation:  
Replace gasket (6).



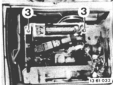
### 13 61 020 REMOVING AND INSTALLING OR REPLACING CONTROL UNIT

Unscrew screws (1 — 4).  
Remove cover.



Pull lock (1) up and disconnect plug (2).

**Caution!**  
The plug may only be disconnected or connected with the ignition switched off.



Unscrew mounting screws (3) or pull the control unit out of the spring retainers.  
Remove control unit.



**Installation:**  
Check code (1\*) and production date (2\*).

\* Refer to Specifications



**Important!**  
Bosch (DME) and Siemens (M) 40 have different control units and they must not be interchanged.  
**Danger of short circuit!**  
Plugs are also coded differently.  
Code and make information is provided on the data plate.  
Refer to **BMW Parts** for a cross reference survey of types and models.

**Important!**  
When using test adapters 61 4 410-811 there could be a mixup between Bosch (DME) and Siemens (M) 40.  
To avoid a mixup between control units and engine wire harnesses, first check whether the new control unit can be plugged on the engine wire harness.  
Test adapters 61 4 410-811 have zero coding and fit both control units even with different coding of the plugs.  
Non-performance could lead to destruction of the DME control unit and wire harness.



### 13 62 000 REMOVING AND INSTALLING AIR FLOW SENSOR (AFS)

Twist and pull multi-pin plug (1) off.



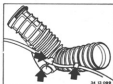
Squeeze the clip and pull the plug off of the cycling valve.  
Unscrew screw on the mounting bar.



Loosen hose strap (1).  
Pull forward off.



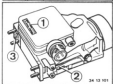
Unlatch clips (2 ... 5).  
Remove upper section of the air cleaner together with the air flow sensor.



Installation:  
Check securing of wires and hose connections.



Tighten nuts.



Installation:  
Check code (1)\*, production date (2)\*, engine idling speed\* and idling speed CO content\*.  
Replace gasket (3).



### 13 62 000 REMOVING AND INSTALLING AIR FLOW SENSOR (ACS)

Pull multi-pin plug (1) off.



Unfasten clips (3 ... 6).  
Pull upper section of air cleaner out together with the air flow sensor.



Unscrew screw (2).

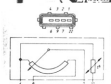


Unscrew nuts (7 ... 10).  
Remove air flow sensor.



#### Installation:

Check code (1)\*, production date (2)\*, engine idling speed\* and idling speed CO content\*.  
Check air flow sensor\*.



Wiring Diagram



### 13 62 000 REMOVING AND INSTALLING AIR FLOW SENSOR (M30)

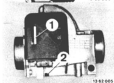
Pull multiple-pin plug (1) off.  
Loosen hose straps (2 and 3).  
Disconnect hose (4).



Press clips (1 ... 3) off.



Check and, if necessary, replace start blocks (1 ... 3).



Installation:  
Check code (1)\*, production date (2)\*,  
engine idling speed\* and idling speed CO  
content\*.  
Check air flow sensor\*.



4 3 2 1 —

Wiring Diagram



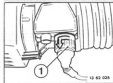


34 13 000 0

### 13 62 560 Removing and installing air mass meter (MS40, MS40 B20 TR)

#### Caution!

As of 8/91 a new motor electronics system (MS40) is phased in on vehicles in Germany identified by the hot film mass meter with small square plastic cover. The components (e.g. control unit, sensor, sending unit etc.) must not be mixed. For further information, see BMW Diagnostic System. Siemens MS40 hot film air mass meter



34 62 024

#### Bosch DME

Hot wire air mass meter  
Turn multiplug (1) and disconnect.



34 62 024

Release hose clip. Remove garter (2).



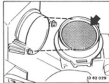
34 62 027

Release screws (3 and 4).



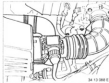
34 62 024

Turn air mass meter and remove.



34 62 024

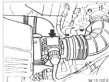
Installation note  
Only re-install undamaged screen.



34 13 000 0

#### Caution!

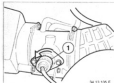
The new motor electronics system (MS 40.1) is installed on vehicles with MS40 TR 2.0 l engine. Identified by the hot film air mass meter with small square plastic cover. The components (e.g. control unit, sensor, sending unit etc.) must not be mixed. For further information refer to BMW Diagnostic System. Siemens MS 40 hot film air mass meter



34 13 000 0

Note identification No.¹ when replacing air mass meter.  
Check idle speed and CO content via BMW DIAGNOSTIC SYSTEM.

¹ Refer to Technical Data



**13 62 560 Removing and installing hot film air mass meter (M55 B25 TR)**

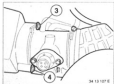
Turn multiplug (1) and disconnect.  
Cut off cable ties.

34 13 150 E



Release cable clip, remove galler (2).

34 13 150 E



Release screws (3 and 4).  
Remove air mass meter.

34 13 157 E



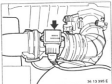
34 13 203 E



34 13 204 E

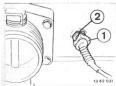
Installation note:  
Secure cable with cable ties.

Installation note:  
Only re-install undamaged screen.



34 13 205 E

Note identification No. when replacing air mass meter.  
Check idle speed and CO content with BMW DIAGNOSTIC SYSTEM



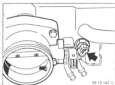
### 13 62 511 REPLACING INTAKE AIR TEMPERATURE SENSOR (MS)

(After checking function of digital engine electronics as in 13 00 000.)

Squeeze the retainer and pull off plug (1).  
Unscrew temperature sensor (2).

#### Checking:

Refer to BMW Diagnosing System.



#### Component Test:

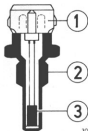
Check resistance value\* on the temperature sensor.  
Check wires from the control unit plug to the temperature sensor plug for breaks and shorts.



#### Important!

The coding of sender plugs is different for Bosch (DME) and Siemens MS 40.

\* Refer to Specifications



30 13 62 5

### 13 62 521 REMOVING AND INSTALLING / CHECKING COOLANT TEMPERATURE SENSOR

(After checking function of digital engine electronics as in 13 00 002.)

The temperature sensor measures the engine temperature and sends this information as a resistance value signal to the control unit.  
The resistance value falls with rising temperature (NTC).

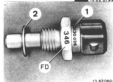
- 1 = Plug connection  
2 = Housing  
3 = NTC resistor



13 62 018



13 62 019



13 62 060

M00  
Removing and installing:  
Disconnect plugs (1 and 2).  
If applicable, tilt the fuel injector plug rail slightly.



13 62 050

Unscrew temperature gauge sender (2).  
Unscrew DME temperature sensor (1).



13 62 012



13 62 062

Installation:  
Tightening torque\*:  
Press the fuel injector plug rail onto each injector.

- (1) Temperature sensor plug  
= blue  
(2) Temperature gauge plug  
= black

M00  
Removing and installing:  
Disconnect plug (1).  
Unscrew temperature sensor.

Installation:  
Tightening torque\*:

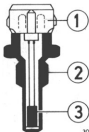
- (1) Temperature sensor plug  
= blue  
(2) Temperature gauge plug  
= black

Installation:  
Check code (1)\*.  
Replace seal (2).  
FD = Production Date.  
Fill and bleed cooling system - refer to Group 17.

Testing:  
Connect Jetronic test leads 611 440.  
Check nominal value\*\* with an ohmmeter.  
To check the entire temperature range, remove and place the temperature sensor in a water bath, heat water to testing temperature and measure the resistance\*\* with an ohmmeter.

\* Refer to Specifications

# 13-62/8



10 13 625

## 13 62 501 REMOVING AND INSTALLING / CHECKING COOLANT TEMPERATURE SENSOR (MSD)

(After checking function of digital engine electronics as in 13 00 002.)

The temperature sensor measures the engine temperature and sends this information as a resistance value signal to the control unit.  
The resistance value falls with rising temperature (NTC).

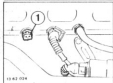
- 1 = Plug connection
- 2 = Housing
- 3 = NTC resistor

Refer to BMW Diagnosing System to check temperature sensor (coolant).



13 62 523

Removing and installing:  
Disconnect plug (1) with long wire.



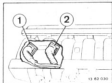
Unscrew DME temperature sensor (1).

13 62 524



10 13 063

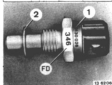
**Important!**  
The coding of sensor plugs is different for Bosch DME and Siemens MS 40.



13 62 530

Installation:  
Tightening torque\*

- (1) Temperature sensor
- (2) Temperature gage



13 62 040

Installation:  
Check code (17).  
Replace seal (2).  
FD = Production Date.  
Fill and bleed cooling system – refer to Group 17.

**Testing:**  
Check nominal value\* with an ohmmeter.  
To check the entire temperature range, remove and place the temperature sensor in a water bath, heat water to testing temperature and measure the resistance\* with an ohmmeter.

\* Refer to Specifications

# 13-64/1



## 13 64 541 Replacing all fuel injector valves (M20)

Remove retaining bracket (1).



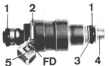
Disconnect plug-and-socket connection (2).



Disconnect plug (3) for water temperature sensor, plug (4) DME temperature sensor, pull up connector strip and remove.



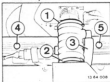
Release retaining screws (5... 8), push up injection tube until injector valves move out of guide of intake manifold. Remove fuel injector valves individually.



30 13 123

Installation note:  
Check O-rings (1), replace if necessary.  
Note identification No. (2)'.  
Observe position of plastic washer (3).  
Observe color\* of plug housing (5) or of nozzle guard (4).  
FD = Production date  
Lightly coat O-rings with Vaseline before fitting.

## 13-64/2

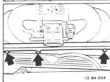


### 13 64 041 Replacing all fuel injector valves (MO3)

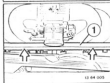
Release hose clips (1 and 2).  
Remove hose (3).  
Lift out plastic caps (4 and 5).



Release 5 mm Allen screws (1 and 2). Remove connector strip.



Release screws for injection tube (3 screws).



Push injection tube (1) upward until fuel injector valves are out of guide in intake manifold.



Disconnect plug (1).  
Lift out retainer (2) and remove fuel injector valve.



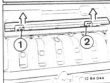
**Installation note:**  
Check O-rings (1) and replace if necessary.  
Note identification No. (2).  
FD = Production date.  
Observe position of plastic washer (3).  
Observe color\* of plug housing (4) or of jet guard (4). Lightly coat O-rings with Vaseline or transmission oil SAE 90 before fitting.

# 13-64/3

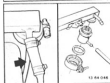


## 13 64 541 Removing and installing all fuel injector valves (M55)

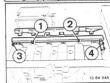
Remove covering.



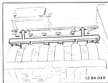
Release screws (1 and 2).  
Remove connector strip.



Disconnect vacuum hose.

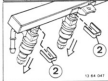


Release screws (1 and 2).  
Remove supply line (3) and return line (4).

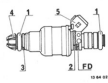


Pull injection tube with valves upward.

Installation note:  
Check sealing rings and replace if necessary.  
Check fuel line connections for leaks.



Lift out retainer (2) and remove fuel injector valve.



Installation note:  
Check O-rings (3) and replace if necessary.  
Note identification No. (2)\*.  
FD = Production date.  
Observe position of plastic washers (2).  
Observe color\*\* of plug housing (5) or of jet guard (4). Lightly coat O-rings with Vaseline or transmission oil SAE 90 before fitting.

Clean fuel injector valves, refer to Service Information No. 2 1 87 (623).

\* Refer to Technical Data





**13 71 000 REMOVING AND INSTALLING AIR CLEANER**

M 20  
Pull off multiple pin plug (1).



Loosen hose clamp (2).  
Pull off hose (3).



Unscrew nuts (4 and 5).



Pull up and remove air cleaner.



**13 72 001 REPLACING AIR FILTER CARTRIDGE**

M 20  
Pull off multiple pin plug (1).



Loosen hose clamp (2).  
Pull off hose (3).



Loosen fasteners (4 ... 7).  
Pull up and turn upper air cleaner section with air flow sensor.



Pull out filter cartridge.



**13 71 005 REMOVING AND INSTALLING AIR CLEANER**

M 30

Loosen hose clamp (1).  
Pull off hose (2).



Unscrew nut (3).



Remove air cleaner by pulling back and up.



Installation:  
Guide in intake neck.  
Have rubber mounts engage in holders.



**13 72 001 REPLACING AIR FILTER CARTRIDGE**

M 30

Loosen hose clamp (1).  
Pull off hose (2).



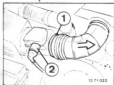
Loosen fasteners (3 ... 8).



Pull up upper air cleaner section.



Pull out filter cartridge.



### 13 71 000 REMOVING AND INSTALLING AIR CLEANER (M 50)

Loosen hose clamp (1).  
Pull off dust cover.  
Turn and pull off plug (2).



Unscrew nuts (3 and 4).



Pull out air cleaner with air mass sensor back from above.



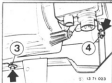
Disconnect cooling air hose.

Installation:  
Guide in intake necks.  
Have rubber mounts engage in holders.



### 13 72 001 REPLACING AIR FILTER CARTRIDGE (M 50)

Loosen hose clamp (1).  
Pull off dust cover.



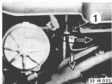
Unscrew nuts (3 and 4).  
Pull up and push back air cleaner housing slightly.



Open fasteners (3 – 8).



Pull air cleaner housing sections apart.  
Pull out air filter cartridge.



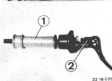
## 13 90 500 REPLACING TANK VAPOR VENTING VALVE (MOJ / MOO)

(After checking function of digital engine electronics as in 13 00 003.)

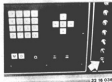
- Lift out retainer.
- Pull off plug.
- Unscrew screw (7).



- Pull off hoses.
- Lift out tank vapor venting valve.



- If Applicable, Checking:
- Connect vacuum hose (1) to 6 mm dia. adapter.
  - Supply 12 V voltage to tank vapor venting valve using Special Tool 51 1 440 (2).



- Select Multimeter Function 21 on BMW Service Tester.
- Set vacuum to 600 ± 100 mbar.
- Then switch off tester.

Vacuum must not drop by more than 50 mbar during the testing time of about 20 seconds.  
 Replace tank vapor venting valve if the vacuum drop is greater than 50 mbar.

# 13 Fuel system

## M5

13 00 60	Engine idle speed and CO content (S38 B35/B36) – check .....	13-	0/11
	Exhaust gas synchronization (S38 B35/B36) .....	13-	0/12
13 00 60	Engine idle speed and CO content (S38 B38) – check .....	13-	0/13
	Exhaust gas synchronization (S38 B38) .....	13-	0/14
	Non-return valves in idle air rail (S38 B38) – check .....	13-	0/16
13 31 029	Delivery pressure of fuel pump – check .....	13-	31/11
...	Fuel delivery quantity – check .....	13-	31/11
...	Fuel pump – remove and install .....	13-	31/11
13 41 500	Idle speed control valve – remove and install or check .....	13-	41/11
13 51 630	Fuel pressure regulator – remove and install .....	13-	51/11
13 54 030	Throttle assembly – remove and install, seal .....	13-	54/11
	Basic throttle setting .....	13-	54/13
	Hose layout diagram (for mixture control) S38 B36 .....	13-	54/16
	Resonance control – check .....	13-	54/17
13 62 560	Air mass meter – remove and install or replace .....	13-	62/11
531	Coolant temperature sensor – remove and install or check .....	13-	62/12
511	Air temperature sensor – remove and install .....	13-	62/12
13 63 544	Throttle switch – adjust .....	13-	63/11
511	Throttle switch – remove and install .....	13-	63/11
13 64 541	Fuel injector valves, all – remove and install or replace .....	13-	64/11
13 71 000	Air cleaner – remove and install .....	13-	71/11
13 72 001	Air cleaner cartridge – replace .....	13-	71/11

For further information on troubleshooting and jobs in assembly 13 refer to:  
Microfiche Assembly Repair Manual and  
Electrical Troubleshooting Manual 5 Series E34

### 13 00 080-Checking engine idle speed and CO content 538 835/836

Preconditions for all setting work:  
 Engine is at operating temperature, i.e. min. oil temperature 60° C.  
 Valve clearance correct. Engine and ignition system in technically perfect condition.  
 Air conditioning system off.  
 Convert **BMW SERVICE TESTER** in accordance with operating instructions.  
 A routine check is not necessary.

#### 1) Engine idle speed

Check engine idle speed \*\*.  
 Check intake system for leaks.  
 If the specified setpoint is not reached, see **BMW Diagnostic System**. Check function of idle speed control valve 13 41 508.

Note:  
 There is no adjusting screw for idle control.

#### 2) Exhaust emission test

Disconnect plug-and-socket connection of oxygen sensor.  
 Release screws.  
 Caution! They are very hot.  
 Connect exhaust gas probes 13 0 110 to take-off pipes.  
 Check idle CO content\*\*.  
 Switch off intake system for duration of measurement.  
 If the specified setpoint is not reached  
 if CO value too high:  
 Check injection nozzles.  
 Fuel pressure.  
 Water temperature sensor  
 if CO value too low:  
 Check hoses and connections for idle speed control and locate leakage air.  
 Exhaust emission synchronization must be carried out if the difference between the individual take-off points is greater than 0.2 vol.-%.

\*\* Refer to Technical Data



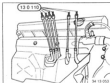
Caution!  
 The setting of the air mass meter must not be changed with the adjusting screw.

Note:  
 Check spark plugs after long idling period.

Check function of oxygen sensor (11 78 010)

Release screws.  
 Caution!  
 They are very hot.  
 Connect exhaust emission probes 13 0 110 to take-off pipe.  
 Switch off intake system for duration of exhaust emission measurement.  
 Disconnect plug from oxygen sensor.  
 Close off vacuum hose for fuel pressure regulator (not with engine running, start engine, CO value increases). Connect oxygen sensor. CO value must drop to specified setpoint\*\*.  
 Remove clips.

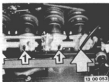
\*\* Refer to Technical Data



### Exhaust synchronization S34836 036

During routine service work, there is no need to conduct a vacuum test or exhaust synchronization test.

Synchronization is only required during repair work or if a complaint has been received (e.g. rough idle).



Engine without individual exhaust gas extraction points.

Prerequisite - pressure rod setting okay (see removing and installing throttle valve spigot 13 54 030).

Remove seal caps (1). Connect up vacuum measuring unit (BMW SERVICE TESTER M21). Measure suction pipe vacuum at all 6 throttle valve spigots and note down results. Leave sealing caps (1) on the throttle valve spigots which are not to be measured.

With screw (2/socket 7 mm WAF), set every throttle valve spigot to the same vacuum level = 300 - 50 mbar at nominal idling speed<sup>1)</sup>. Vacuum difference, max. = 5 mbar. Fit new tamper-proof device (2) once adjustment has been successfully completed. Then check engine idle speed<sup>2)</sup> and CO content<sup>2)</sup>.

<sup>1)</sup> Refer to Specifications



Engine with individual gas extraction points:  
Prerequisite - pressure rod setting okay (see removing and installing throttle valve spigots 13 54 030).

Measure and compare CO values at the extraction points.

Disconnect oxygen sensor plug.

With screw (2/socket 7 mm WAF), check CO nominal value = 0.8 - 0.4 Vol. %. Max. permitted deviation between the cylinders = - 0.2 vol. %.

Connect up Lambda oxygen sensor plug.



24 12 110

### 13-00 060 Check engine idle speed and exhaust contents 538B38

Requirements for all adjustments:  
 Engine is at operating temperature, i.e. oil temperature is min. 80°C.  
 Valve clearance is correct. Engine and ignition system in good working order.  
 Air conditioning system switched off.  
 Connect BMW Service Tester to operating instructions.

Routine checking is not necessary.

#### 1) Engine idle speed

Check engine idle speed\*.  
 Caution: If the TDC signal on the diagnosis plug (pin 1) is not allocated, use adapter set 12 7 040.

Refer to 12 13 ...

If engine idles unevenly, check air intake system for leaks.

If nominal value is not achieved, interrogate fault memory with BMW Diagnosis System, call up adaptation values. Use diagnosis diskette from 11.0.

Perform function check on idle regulation valve 12 41 000.

Note:

There is no adjusting screw for idling speed regulation.

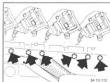
#### 2) Exhaust test

Lambda oxygen sensor remains connected. Unscrew bolts.

Caution: These get very hot.  
 Connect exhaust sensors 13 0 110 to extraction pipes.

Check the CO content\* at idle speed.

\* Refer to Specifications



24 12 110

If nominal value is not achieved with excessive CO value, check:  
 injection nozzles  
 fuel pressure  
 water temperature sensor.

If CO value is too low:  
 Check hoses and connections for idle governing and pinpoint air leak.

If the difference between the individual extraction points exceeds  $\pm 0.2$  volts, an exhaust synchronization test must be performed.

Caution:  
 Do not adjust the mass air flow sensor adjusting screw.

Note:  
 After extended period at idle speed, check spark plugs.

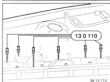


24 12 114

Perform function check on Lambda oxygen sensor (11 76 000).

Unscrew bolts.  
 Caution: These get very hot.  
 Connect exhaust sensors 13 0 110 to extraction pipes.

Disconnect oxygen sensor plug.  
 Clamp vacuum pipe to fuel pressure regulator (not while engine is running), start engine, CO value rises.  
 Connect oxygen sensor - CO value must return to nominal value\*.  
 Remove clip.



24 12 110



24 12 124

\* Refer to Specifications



**Exhaust synchronization test 530B38**

During routine service work, there is no need to conduct a vacuum test or exhaust synchronization test.

Synchronization is only required during repair work or if a complaint has been received (e.g. rough idle).



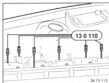
**Inspection of throttle valve kinematics:**  
Trap paper strip between 3 detent screws and the kinematic detents. Pull on paper. If it is easy to remove the paper, perform a basic setting operation (see Removing and Installing Throttle Valve Spring 13 54 030).



If none of the paper strips can be extracted easily, perform vacuum test on throttle valves. Remove seal caps (1). Connect up vacuum measuring unit (BMW SERVICE TESTER M 21). Measure suction pipe vacuum at all 6 throttle valve spigots and note down results.  
Note: Leave sealing caps (1) on the throttle valve spigots which are not to be measured.



Suction pipe vacuum 200 - 50 mbar.  
If values deviate, perform a throttle valve basic setting operation (see Removing and Installing Throttle Valves 13 54 000).



Unscrew bolts.  
Caution! These get very hot.  
Connect exhaust sensors 13 0 110 to extraction pipes.  
Measure and compare CO values\* at the extraction points.

Caution:  
Lambda oxygen sensor remains connected up.



If the difference at the individual extraction points is greater than + 0.2 vol. %, remove tamper protection. Adjust CO nominal value\* with bypass screw (2) (socket 7 mm WAF!).

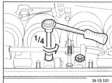


If there is a large deviation, screw all 6 bypass screws firmly home. Disconnect ignition system from DME control unit for 2 minutes. (Reset adaptation values).

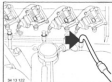
Measure CO values from cylinders 1 ... 6 again and note down values. The bypass screw from cylinder with the lowest CO value does not change throughout the entire synchronization period. This value is raised when the other cylinders are adjusted.

\* Refer to Specifications

## 13-0/15



Gradually adapt the CO values of the other cylinders in small steps (max. 1/4 turns of the bypass screw).



**Caution!** Keep repeating control check on other cylinders since all cylinders affect each other reciprocally.

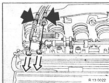
**Note:**  
After extended period at idle speed, check spark plugs.



Fit new tamper protection (2) once adjustment process has been completed.

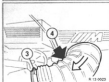
Finally, conduct final run for 15 mins at part throttle and run engine at idle speed for 10 minutes.

Then, check adaption values and interrogate or clear fault memory. Refer to BMW diagnostic system.

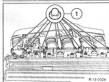


Check non-return valves in idle air strip 538836.

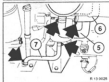
Disconnect accelerator cables.  
Remove rubber mounts.



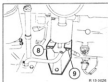
Loosen hose clamps (3 and 4).  
Remove suction hose.



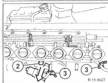
Unscrew nuts (1) from all 6 throttle valve spigots.



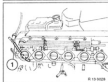
Loosen hose clamps.  
Remove idle hose (5), vent hose (6) and oil return hose (7).



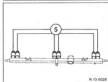
Unscrew nuts (8 and 9) from oil separator.  
Remove air manifold.  
Take care of vacuum hoses.



Remove idle speed control valve and close aperture (2). Disconnect hoses (3 and 4) or remove and seal apertures.



Remove vacuum hose (1) from fuel pressure regulator and connect up to BMW Service Test unit.



Measure vacuum with multimeter program (M21). Nominal value approx. 500 mbar.  
If the measured value greatly exceeds this, or if it falls very rapidly when the pump is switched off, remove idle strip and fit new non-return valves (2).

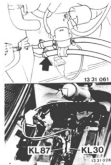
## 13-31/11



### 13 31 029 Checking delivery pressure of fuel pump

Install pressure gage 13 3 060 with connection line and T-piece 13 3 064 in fuel supply line – upper line –  
Connect fuel line to tool 13 3 010 after the T-piece.

Remove lid of control unit box. Unplug fuel pump relay (1).  
Connect jumper between terminal 87 and terminal 30 with tool 61 3 950.  
Check delivery pressure\*\*.

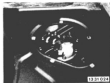


### 13 31 ... Checking fuel delivery rate

In order to also check the pressure build-up, measure the delivery rate after the pressure regulator.  
Release fuel return line – bottom line – extend with plastic hose and place in measuring glass 13 3 005.

Remove lid from control unit box.  
Unplug fuel pump relay.  
Connect jumper between terminal 87 and terminal 30 with tool 61 3 950.  
Check delivery quantity\*\*.

\* Refer to Technical Data Group 18



### 13 31 ... Removing and installing fuel pump

Remove and install fuel level sending unit and in-tank pump (M30)\*\*; refer to 15 12 005.

\*\* Refer to Technical Data Group 18  
\*\*\* Refer to Assembly 18



**13 41 500 Removing and installing / checking idle speed control valve**

**Note:**  
When installed, operation of the idle speed control valve can be checked by touching with the hand (locked voltage supply).

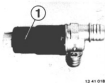


The electrical test can also be carried out at the intermediate connector with the valve installed.

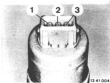
Remove idle speed control valve.  
Remove manifold refer to:  
Removing and installing throttle body  
13 41 030.



Disconnect plug (1).  
Detach (press together) retaining strap (2).  
Release hose clips.  
Pull idle speed control valve from hoses and remove.

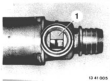


**Installation note:**  
Note identification No. (1)\*.  
Check idle speed\*.



**Electrical check**

Measure resistance between terminal (1) and (2), set points approx. 40 Ohm.  
Measure resistance between terminal (2) and (1) or (2) and (3).  
Setpoints approx. 20 Ohm.



**Dynamic check**

Remove idle speed control valve for this purpose (plug remains connected).  
Fully open or close rotary piston (1).  
Switch on ignition.  
Rotary piston must assume and maintain a setting of approx. 50 % cross section opening.

\* Refer to Technical Data



13 51 053

## 13 51 830 Removing and installing fuel pressure regulator

Disconnect vacuum hose.



13 51 054

Release screw (1).  
Pull off fuel pressure regulator.  
(Soft, sealing rings hold fast.)



13 51 055

Installation note:  
Check sealing rings (2 and 3) and replace if necessary.



13 51 051

Installation note:  
Note identification No. and nominal pressure\*.

\* Refer to Technical Data



13 51 060



13 51 058

Checking:  
Install pressure gage 13 3 090 with connection line and T-piece 13 3 064 in fuel supply line (upper line) after damper.

Unplug fuel pump relay.  
Connect jumper between terminal 87 and terminal 30 with tool 61 3 850.  
Check fuel injection pressure\*.

Note:  
If the injection pressure is too high, the pressure regulator is defective or the return line is blocked.

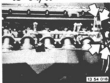


13 51 052

If the fuel injection pressure\* drops at too fast a rate, close off return line - bottom line - with tool 13 3 016 and once again briefly operate tool 61 3 050.

The pressure regulator is defective if the injection pressure is now maintained.  
If the injection pressure drops, there is a leak upstream of the pressure regulator.

\* Refer to Technical Data

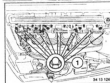


**13 54 030 Removing and installing throttle valve spigot**

Disconnect accelerator cables.  
Remove rubber mounts.



Unfasten hose clips (3 ... 4).  
Remove suction hose.



Unfasten nuts (1) from all 8 throttle valve spigots.



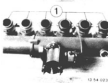
Loosen hose clamps.  
Remove idle hose (5), vent hose (6) and oil return hose (7).



Unfasten nuts (8 and 9) from oil separator.  
Remove air manifold.  
Take care of vacuum hoses.



**Installation instructions:**  
Before pressing on manifold, fit bolts (8 and 9) to the support.  
Partially fit vacuum hoses.



**Installation instructions:**  
Check O-rings (1) and replace if necessary.  
Check gaskets and hoses, replacing if necessary.  
Replace hose clips if necessary.



Remove plug strip from the injection valves.



Unfasten injection pipe mounting (1 and 2).  
Remove delivery lead (3) and return lead (4).



Installation instructions:  
Check / replace sealing rings.  
Check leads for leakage.



Remove intermediate plug for idling speed  
control valve.  
Remove vacuum hoses and idling speed  
hoses.

SC8838: Disconnect nuts and remove idling  
air strip.

Note:  
Check non-return valves, see 13 00 ...



Remove injection tube together with injection  
valves.

Installation instructions:  
Check / replace sealing rings.  
Check that sealing rings are correctly seated.



Pull off vacuum hoses.

Installation instruction:  
SC8838 see base circuit diagram.



Unfasten 8 W&F 10 nuts.



Unfasten 8 W&F 13 nuts.





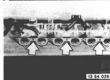
13 54 014

Unfasten connecting screws (1).



13 54 020

Remove throttle valve linkages (2 ... 4).



13 54 024

Remove throttle valve assembly.

Installation instruction:  
Replace gasket.



13 54 028

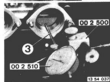
Remove connecting tubes.  
Split throttle valve assembly.  
Check / replace O-rings on connecting tubes.

**Warning:**  
The shaft is guided on needle bearings.  
Do not draw shaft through bearing while dirty.  
Do not damage shaft with tool (pliers).  
- This could damage the needle bearings.



13 54 014

Basic setting of throttle valves.  
Throttle valve linkages removed.  
Adjust idle detent:  
Loosen nut (2).  
Rotate idle stop screw (1) in direction of arrow until the throttle valve is fully closed.  
Retighten nut (2) gently.



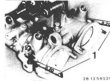
13 54 010

Fit dial gage 00 2 510 (with extension 3) and bracket 00 2 500 to throttle valve assembly.  
Gage tip rests under protrusion against lowest possible point of throttle valve.



13 54 027

Loosen nut (2).  
Screw in idle detent screw (1) until the throttle valve can just turn and no more. Adjust lower edge of throttle valve by (0.1 + 0.05 mm) (approx. 1/10 of a turn).  
Fit lock nut to idle detent screw (1) and seal with paint.



13 54 029

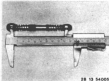
Check axial air gap:  
With throttle valve closed and at room temperature (approx. + 20° C), it must be easy to insert a feeler gage (3) blade (0.2 mm) down the left and right sides between retaining ring / throttle lever and housing (both sides at the same time).  
Check ease-of-movement of throttle valve at operating temperature.



Adjust throttle valve lever position (M85).  
Levers (1) and (2) must be flush with one another.  
Correct by adjusting the clamping pieces (3).  
Tighten screw and nut (4).



Loosen throttle valve switch.  
Do not adjust throttle valve switch until the throttle valve lever position has been adjusted.  
Adjust push rod.  
Set push rod (cylinders 5 and 6) to  $1 \pm 0.1$ ,  $2 \pm 0.4$  mm and install.



Set push rods on cylinders 1 and 2 / 3 and 4 respectively to a distance of approx. 98 mm.



Fit clamping components (2) once the push rods have been connected.



Secure dial gage (002 510) with mounting (002 503) to stud bolt.  
Fit dial gage to lever (1) with preload.  
Shorten each push rod (A) and (B) in turn until the dial gage needle starts to move.  
In this position, all 3 throttle levers about against the idle speed detents.



Set full throttle detent:  
Move cable lever (1) to full throttle position.  
Use a slide gage to check dimension (A) or (B) and note down result.  
Calculate the mean value of the 6 throttle bodies and determine the deviation from the design dimension.  
Using screw (2), adjust all 6 throttle valves simultaneously towards the design dimension.



Dimension A = 21.7 mm (design dimension).



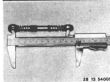
Dimension B = 22.7 mm (design dimension).



Adjust position of throttle valve lever (328838):  
Levers (1) and (2) must be aligned and flush.  
Correct by adjusting the clamping pieces (3).  
Tighten screw and nut (4).



Adjust push rod.  
Adjust push rod cylinders 5 and 6 to  
 $\varnothing = 92,5 \pm 0,4$  mm and install.



Adjust push rods on cylinders 1 and 2 / 3 and 4 respectively to a distance of  $83 \pm 0,2$  mm.



Fit clamping components (5) after the push rods have been installed.



Install push rods and shorten consecutively until all 3 throttle levers contact the idle speed detent.

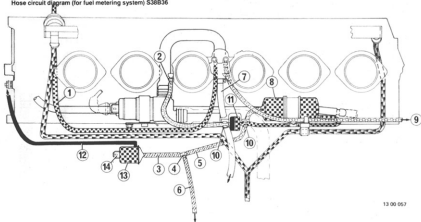
Inspection:  
Insert paper strips between the 3 detent screws and the kinematic detent points.  
When correctly adjusted, it should not be possible to remove any of the paper strips.

Set full throttle detent:  
Move cable lever (1) to full throttle position.  
Use a slide gage to check dimension (A) or (B) and note down result.  
Calculate the mean value of the 6 throttle bodies and determine the deviation from the design dimension.  
Use the screw (2) to adjust all 6 throttle valves simultaneously towards the design dimension.

Dimension A = 23,75 mm (design dimension).

Dimension B = 24,75 mm (design dimension).

Hose circuit diagram (for fuel metering system) 538B36



13 00 057

- 1 Vacuum hose to fuel pressure regulator
- 2 Vacuum hose to non-return valve
- 3 Vacuum hose to non-return valve (11)
- 4 T-piece
- 5 Vacuum hose to vacuum tank (8)
- 6 Vacuum hose from T-piece (4) to changeover valve for resonance control

- 7 Suction lead from cycle valve to intake spigot
- 8 Vacuum tank
- 9 Vacuum hose to heating regulator
- 10 Vacuum hose from vacuum tank (8) to non-return valve (11)
- 11 Non-return valve
- 12 Vacuum lead to shut-off valve for air intake
- 13 Changeover valve for air intake
- 14 Plug connector (2 pin) on changeover valve (to DME control unit)



**Check resonance control unit:**  
After an engine start, the valve should close briefly, visible by the movement of the linkage. If necessary, check the vacuum hoses, vacuum unit or changeover valve.

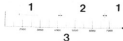


**Check changeover valve:**  
After a cold start, the changeover valve (1) responds briefly.



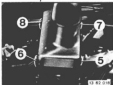
**Check control unit for resonance control (in the control unit box):**  
After ignition ON, operating voltage + is supplied to changeover valves. After the engine switches on, the changeover valve receives a brief negative charge (-) from the control unit (2).

Suction system with resonance charging.



Resonance control unit with active full throttle switch.

- 1 = R-valve closed
- 2 = R-valve open
- 3 = Engine speed in rpm



## 13 62 560 Removing and installing or replacing air mass meter

Remove air cleaner 13 71 000.  
Open clips (5...8).



**Installation note:**  
Only re-install undamaged screen.  
Check that sealing ring is fitted correctly.



Disconnect filter housing.  
Detach intake air duct.

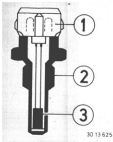
**Installation note:**  
Fit inclined section of intake air duct such that the largest possible distance to the filter housing is maintained all round.  
Completely press in intake air duct.



Release screws (1 and 2).



Remove air mass meter.



30 13 625

**13 62 531 Removing and installing / checking coolant temperature sensor.**

The temperature sensor measures engine temperature and communicates this to the control unit as a resistance value.

Resistance drops with rising temperature (NTC).

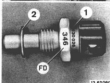
1 Plug connection

2 Housing

3 NTC resistance

Temperature sensor (water, air)

Test: see BMW diagnostic system



13 62 060

Installation instruction:  
Note untightening torque\*.

- (1) Temperature sensor plug = blue
- (2) Remove thermometer plug = black

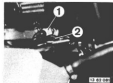
Installation instructions:

Note Des. No. (1)\*.

Replace seal (2).

FD = production date.

Fill and bleed cooling system (Dr. 17).



13 62 061

Removing and installing:  
Remove plug (1 blue and 2 black).



13 62 062

Unscrew and remove DME temperature sensor (1).



13 62 063

**13 62 511 Removing and installing air temperature sensor**

Removing and installing suction filter housing  
13 71 000.

Unscrew temperature sensor (2).

\* Refer to Specifications



### 13 63 544 Adjusting throttle valve switch

Also refer to status queries in the BMW DIAGNOSIS SYSTEM.

Check throttle valve switch.

When the throttle valve is closed, value recorded between connections 6 and 4 should be virtually 0 ohms.

When the throttle valve is fully open, the value recorded between connections 5 and 4 should be virtually 0 ohms.



### 13 63 551 Removing and installing throttle valve switch

Remove multiple plug (3).

Unscrew bolts (1).

Remove throttle valve switch (2).

Installation instruction:

Check code (10).

Adjust throttle valve switch 13 63 544.



#### Adjustment:

When the throttle valve is closed, the value recorded between connections 6 and 4 should be virtually 0 ohms.

Adjust by loosening the screws (1) and twisting the throttle valve switch. After adjustment is completed, open throttle valve - resistance value should rise straight back to - ohms.

When the throttle valve is released, the resistance value should drop back to virtually 0 ohms.

These values can also be measured using the control unit plug together with the universal adapter\*\*.

LL (6)	= 52 on the adapter
WL (5)	= 53 on the adapter
Ground (4)	= 19 on the adapter

LL = idling speed  
WL = full throttle

\*\* Sourcing Reference H9B

\* Refer to Specifications





### 13 64 541 Removing and installing or replacing all fuel injector valves.

Disconnect plug connector for idle speed control valve.



Remove connector strip.



Disconnect vacuum hose.



Release screws (1 and 2).  
Remove supply line (3) and return line (4).

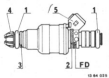


Remove ignition tube with valves by pulling upward.

**Installation note:**  
Check sealing rings and replace if necessary.  
Check fuel line connections for leaks.



Lift out retainer (2) and remove fuel injector valve.



**Installation note:**  
Check O-rings (1) and replace if necessary.  
Note identification No. (2)\*.  
FD = Production date.  
Observe position of plastic washer (3).  
Observe color\* of plug housing (2) or of jet guard (4). Coat O-rings with kerosene or transmission oil SAE 90 before fitting.

Clean fuel injector valves, refer to Service Information No. 2 1 78 (823).



## 13 71 000 Removing and installing suction filter housing

Unfasten hose clip (1).  
Pull off hose.  
Pull off plug (2).



Unfasten screws (3 and 4).



Remove filter housing with air mass sensor at rear by lifting upwards.



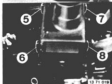
Remove plug (5).

Installation instructions:  
Insert suction pipe.  
Allow rubber mount to engage in bracket.



## 13 72 001 Replacing air cleaner filter element

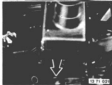
Unfasten screws (3 and 4).  
Raise filter housing and slide slightly backwards.



Open clips (5 ... 8).



Dismantle air filter housing.



Pull out filter element.

# 13 Fuel system

## 524d (M21), 524td (M21)

	Notes .....	13- 00/21
13 00 050	Engine idle speed – check .....	13- 00/22
	Layout of electronically controlled injection pump for DDE .....	13- 00/23
13 32 . . .	Layout of fuel filters .....	13- 32/21
050	Water trap in fuel filter – drain .....	13- 32/21
051	Fuel filter – replace .....	13- 32/1
13 51 000	Injection pump – remove and install .....	13- 51/21
	Installation .....	13- 51/23
005	Injection pump – adjust statically .....	13- 51/25
290	Pressure valves – replace .....	13- 51/26
300	Electric fuel cutout – check .....	13- 51/27
301	Electric fuel cutout – replace .....	13- 51/28
320	Fuel system – bleed .....	13- 51/29
13 53 320	Fuel injector combination – remove and install .....	13- 53/21
13 61 000	Control units – remove and install .....	13- 61/21
13 71 000	Air cleaner – remove and install .....	13- 71/21
13 72 001	Air cleaner cartridge – replace .....	13- 71/21

For further information on troubleshooting and jobs in assembly 13 refer to:  
Microfiche Assembly Repair Manual and  
Electrical Troubleshooting Manual 5 Series E34

**WORKING INSTRUCTIONS****in Reference to Cleanliness on Fuel Systems**

- Clean area around point of repair thoroughly prior to disconnection of pipes/hoses, switches, etc..
- Always place removed parts on a clean surface and cover with plastic sheets – never use cloths losing lint!
- Cover or insert plugs in open ends of pipes or hoses and openings in components immediately – never work with compressed air.
- Only install cleaned parts.  
Take new parts out of their packaging only immediately before installation.
- Keep diesel fuel off of coolant hoses - if applicable, rinse off with water immediately.

**EXPLANATION OF ABBREVIATIONS**

DDE	Digital Diesel Electronics
MLC	Fuel Volume, Combustion Air, Road Speed
SB	Injection Begin Related
ME	Fuel Volume Related



### 13 00 050 CHECKING ENGINE IDLE SPEED

#### Requirements:

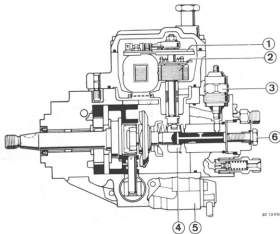
- Engine at operating temperature, i.e. oil temperature at least 60° C (140° F), Valve clearance correct.
- All electric consumers switched off.

Read engine idle speed\* from tachometer in the instrument cluster.

If value deviates from nominal value, read out fault memory of DDE self-diagnosis.

If applicable, check basic adjustment of pedal valve sender.

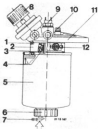
## DRAWING OF ELECTRONIC FUEL INJECTION PUMP FOR DDE



- 1 Control valve travel sender  
Potentiometer for feedback voltage
- 2 Drive for injection rate rotary magnet
- 3 Electric shutoff
- 4 Control valve
- 5 Solenoid for injection begin
- 6 Plug for high pressure chamber  
(for static adjustment with dial gage)

**DDE**  
**13 32 000 FUEL FILTER**

Note:  
 Fuel filter heating is described in Group 12.



- 1 Seal
- 2 Heating element
- 3 Seal
- 4 Heating element mounting nut
- 5 Filter cartridge
- 6 Cap
- 7 Drain valve
- 8 Manual pump
- 9 Temperature switch 5.0° C (42° F)
- 10 Bleeder screw
- 11 Filter head
- 12 Electric connection for heating element



21 12 100

**DDE**  
**13 32 050 DRAINING WATER TRAP IN**  
**FUEL FILTER**

Unscrew bleeder screw (10).  
 Push up drain valve (7) and drain until pure  
 diesel fuel runs out.

Unlock cap of manual pump (8) - turn 90°  
 and pump so long, until diesel fuel runs out  
 of bleeder screw (10).

Tighten bleeder screw (10).  
 Lock cap of manual pump (8).



21 13 100

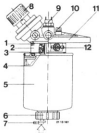
### DDE 13 32 051 REPLACING FUEL FILTER

Unscrew bleeder screw (10) and drain a small amount of diesel fuel at drain valve (7).

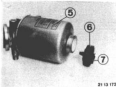
Unscrew filter cartridge (5) – using a standard tool.

Mount cap (6) and drain valve (7) on new filter.

Unlock cap of manual pump (8) by turning 90° and pump so long, until diesel fuel runs out of bleeder screw (10).  
Tighten bleeder screw (10).  
Lock manual pump (8).



- 1 Seal
- 2 Heating element
- 3 Seal
- 4 Heating element mounting nut
- 5 Filter cartridge
- 6 Cap
- 7 Drain valve
- 8 Manual pump
- 9 Temperature switch 5.5° C (42° F)
- 10 Bleeder screw
- 11 Filter head
- 12 Heating element electric connection

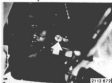


21 13 112



21 13 027





21 13 420



21 13 423



21 13 424



21 13 425

## 13 51 000 REMOVING AND INSTALLING INJECTION PUMP

**Removing:**  
Disconnect battery ground lead.

**Important!**  
Interrogate fault memories of all systems first as disconnecting the battery will erase them.

**Installation:**  
Fill with coolant\* and bleed cooling system - refer to 17 00 039.

Disconnect coolant hoses.  
Loosen and remove alternator drive belt.

**Installation:**  
Adjust drive belt tension.

Turn crankshaft to TDC mark (ignition position in cylinder no. 1).

Unscrew toothed belt guard.



21 13 422



21 13 427



21 13 428

Loosen holder for wiring.

Unscrew oil pipe holder.

Pull off leak oil hose (1).  
Unscrew return pipe (2).  
Coupling (3) is matched with injection pump.

**Installation:**  
Replace a removed leak oil hose.

\* Refer to Operating Fluids



Unscrew spacing holder of injection pipes.  
Unscrew all coupling nuts on injection nozzles.  
Plug openings in injection nozzles with caps.  
**Caution!**  
Apply tool carefully to avoid bending the injection pipes.



Unscrew coupling nuts on injection pump and pull back pipes.  
Plug openings with caps.



Unscrew connection for fuel shutoff.



Disconnect wire harness.



Counterhold on adapter and unscrew pipe with Special Tool 13 5 010.  
Plug opening with a cap.



Unscrew nut on toothed belt sprocket.  
Hold sprocket with Special Tool 13 5 340.



Ball Special Tools 13 5 041 and 13 5 010 on toothed belt sprocket.  
Loosen bolt (see arrow) completely.

Turn crankshaft further until special tool can be fitted.  
Use M 6 x 20 mm bolts.



Unscrew nuts (1 and 2)



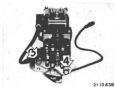
Remove bolts (6 ... 7)



Press out the injection pump shaft toward the rear with a pulling tool. Turn back the bolt again completely afterwards.



Pull wire connector out of holder. Remove injection pump. Disconnect plug of Magneto-Valve cable.



21 13 839

Installation:  
Transfer attachments - see 13 51 001.  
Loosen nuts (3 ... 4) prior to installation



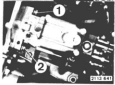
21 13 839

Move the injection pump shaft to installed position with special tool 13 5 052. The turning lever must be vertical, before the cam. (Perceptible resistance by turning the lever).



13 5 052

Insert injection pump - being careful that the woodruff key does not fall out.



21 13 841

Tighten nuts (1 ... 2) only finger tight at this stage.



Tighten holder (6) and bolt (7).

Remove Special Tools 13 5 010 and 13 5 061.

Tighten toothed bolt sprocket nut. Counterhold with Special Tool 13 5 340. Tightening torque\*.

Adjust injection pump statically — see 13 51 005.

Mount injection pipes, beginning the tightening at connection (4).

After finishing installation, bleed fuel system — see 13 51 320 and check idle speed — see 13 00 050 in Construction Group Repair Manual.

Check pipes for cylinders 1, 5, 3, 6, 2, 4 so firing order.

\* See Specifications.



21 13 848



21 13 851



21 13 849



21 13 849

**DDE**  
**13 51 009 ADJUSTING INJECTION PUMP**  
**STATICALLY**

Coolant temperature > 50° C.

Unscrew plug (1).

*Installation:*  
 Always replace seal.  
 Tightening torque\*.

Screw in Special Tool 13 5 330.  
 Apply dial gage with preload.

Turn crankshaft clockwise in direction of  
 TDC in cylinder no. 1 (about 60 to 90° be-  
 fore beginning) until gage needle remains  
 at deepest point for some time.  
 Set scale of dial gage to zero.

Pull out plug (1).  
 Turn crankshaft clockwise until Special  
 Tool 11 2 300 engages in bore in flywheel  
 at IT.

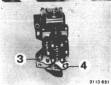
*Important!*  
 Do not turn opposite engine's direction of  
 rotation - wrong test results.

\* Refer to Specifications



21 13 848

Read travel of distributor plunger on dial  
 gage.  
 Test value: 1.05 ± 0.02 mm.



21 13 851

*Adjusting:*

Loosen screws (3 and 4).



21 13 849

Loosen nuts (1 and 2) — do not loosen too  
 much to avoid tension from the toothed  
 drive belt.



21 13 852

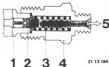
Turn injection pump until dial gage displays  
 the correct value\*.  
 Tighten nuts in sequence of 1 to 4.  
 Tightening torque\*.  
 Recheck adjustment.

\* Refer to Specifications

## 13 51 200 REPLACING PRESSURE VALVES

The pressure valve closes the injection pipe to the pump. It has the task of taking pressure off of the injection pipe after completion of the delivery phase by way of removing a defined volume of the injection pressure.

- 1 Valve carrier
- 2 Valve plunger - valve seat
- 3 Valve spring
- 4 Pressure valve holder
- 5 Injection pipe connection



Disconnect battery ground lead.

**Important!**  
Interrogate fault memories of all systems first as disconnecting the battery will erase them.

Disconnect hose.

Unscrew oil trap (2).

Remove injection pipes from injection nipples using Special Tool 13 5 023. Install protective caps.

**Installation!**  
Tightening torque = 30 to 35 Nm.

Unscrew spacing holders (3).



## 13 51 300 CHECKING ELECTRIC FUEL SHUTOFF

The shutoff receives power supply from the control unit from ignition key position DRIVE on. A loud click will be heard to indicate this.



Check power supply to the control unit, if a click is not heard.  
See self-diagnosis for other tests.



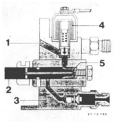
If applicable, check master relay.

- 1 Master relay (red)
- 2 Fuel filter heating relay (orange)

## 13 51 301 REPLACING ELECTRIC FUEL SHUTOFF

The diesel engine is stopped by interrupting the supply of diesel fuel. The shutoff receives power supply from ignition key position **DRIVE** on.

- 1 Fuel bore
- 2 Distributor piston
- 3 Distributor head
- 4 Magnet
- 5 High pressure chamber

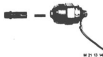


**Installation:**  
Disconnect leads on fuel shutoff.



Unscrew fuel shutoff with a 24 mm open-end wrench.  
**Caution!**  
Watch out for piston and spring - they could fall out.

Piston is moved out by force of spring when without current - fuel feed is interrupted.  
**Installation:**  
Check O-ring for correct seating.  
Tightening torque = 20 ± 5 Nm (14.5 ± 3.5 ft. lbs.).





**DDE**  
**13 51 320 BLEEDING FUEL SYSTEM**

The fuel system (324 td) does not have to be bled, since the fuel transfer pump builds up pressure in the feed pipe in ignition key position "2".



**Bleeding Injection Pump:**

Loosen plug two turns.  
Crank engine with the starter until diesel fuel runs out – then tighten plug again.  
Tightening torque = 14 + 6 Nm (10 + 4 ft. lbs.).

**Bleeding Injection Pipes:**

Loosen all coupling nuts on injection nozzles with Special Tool 13 5 020.  
Crank engine with the starter until diesel fuel runs out of the pipes – then tighten nuts again.  
Tightening torque = 20 + 5 Nm (14.5 + 3.5 ft. lbs.).



### 13 51 320 REMOVING AND INSTALLING INJECTION NOZZLE ASSY.

Loosen hose clamps.  
Disconnect intake air hose.



Unscrew oil trap.



Loosen and remove pipe spacing holders.  
Pull off leak oil hoses using a pliers.

**Installation:**  
Replace leak oil hoses after removal.



Unscrew couplings using Special Tool 13 5 020.

**Note:**  
Reposition tool in good time to prevent bending pipes.  
Plug openings with protective caps.



Unscrew coupling on injection pump.  
If necessary, counterhold on pressure valve.

**Installation:**  
Tightening torque\*.



Unscrew injection nozzle using Special Tool 13 5 320.

**Installation:**  
Bleed injection pipes - refer to 13 51 320.  
Refer to Group 13 in Construction Group Repair Manual for additional information.

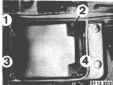


#### Components of Injection Nozzle Assembly:

- 1 Nozzle holder
- 2 Nozzle body
- 3 Feed bore
- 4 Pressure chamber
- 5 Nozzle pin
- 6 Leak oil pipe

**Important!**  
The injection nozzle with pin/leak movement sensor (wire) for cylinder no. 4 must never be disassembled.

\* Refer to Specifications



## 13 61 000 REMOVING AND INSTALLING CONTROL UNITS

Unscrew screws (1 ... 4).  
Lift cover off of electric box.



**Caution!**  
Turn off ignition before disconnecting or connecting multiple pin plug.  
Push back retainers and pull off multiple pin plug.



Unscrew nuts (5 ... 8).  
(1) SR control unit  
(2) ME control unit  
Pull out control units (1 and 2).



**Note:**  
SR Control Unit (25-pin connection) responsible for:  
— injection begin regulation,  
— self-diagnosis and  
— exhaust gas recirculation.

ME Control Unit (35-pin connection) responsible for:  
— starting volume specification,  
— volume control while driving,  
— smoke limitation,  
— fuel mass correction,  
— idle speed control,  
— road speed control,  
— automatic transmission control,  
— charge pressure control and  
— hesitation suppression.

Read out fault memories - see self-diagnosis.



## 13-71/21



### 13-71 000 REMOVING AND INSTALLING AIR CLEANER

Loosen hose clamp.  
Pull off hose (1).



Unscrew nut.



Tilt and pull out air cleaner.



Installation:  
Guide in intake neck.  
Mount housing on rubber mounts.



### 13-72 001 REPLACING AIR FILTER CARTRIDGE

Loosen hose clamp.  
Open fasteners and pull up filter.



Insert filter cartridge.  
Guide in intake neck.  
Mount cover and tighten fasteners.



Mount hose (1).

# 13 Fuel system

	<b>525td (M51), 525tds (M51)</b>	
	Notes .....	13- 00/31
13 00 050	Engine idle speed – check .....	13- 00/32
	Layout of electronically controlled injection pump for DDE .....	13- 00/33
13 31 028	Fuel supply pressure – check .....	13- 31/31
13 32 000	Fuel filter DDE .....	13- 32/31
050	Water trap in fuel filter – drain .....	13- 32/31
051	Filter element – replace .....	13- 32/32
061	Fuel filter, complete, (with water level sensor and fuel heater) – remove and install or replace .....	13- 32/32
13 51 000	Injection pump – remove and install .....	13- 51/31
005	Fuel pump – adjust statically .....	13- 51/34
...	Fuel temperature sensor – replace .....	13- 51/36
300	Electric fuel cutout – check .....	13- 51/37
301	Electric fuel cutout – replace .....	13- 51/38
320	Fuel system – bleed .....	13- 51/39
13 62 520	Pedal position sensor – remove and install or replace .....	13- 62/31
600	RPM sensor (pulse generator) (M51) – replace .....	13- 62/31
13 71 000	Air cleaner (M51) – remove and install .....	13- 71/31
13 72 001	Air cleaner cartridge – replace .....	13- 72/31

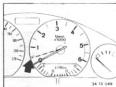
For further information on troubleshooting and jobs in assembly 13 refer to:  
Electrical Troubleshooting Manual 5 Series E34

## INFORMATION REGARDING CLEANLINESS WHEN WORKING ON FUEL SYSTEM

- Clean area around point of repair thoroughly, for example before disconnecting pipes/hoses, switches, etc.
- Place removed components only on clean surfaces and cover them with plastic sheet – never use fluffy cloths!
- Cover or insert plugs in opened pipes/hoses or components immediately – do not work with compressed air.
- Install only cleaned components.  
Take new replacement parts out of packaging only shortly before installation.
- Keep diesel fuel off of coolant hoses – if necessary wash off immediately with water.

## EXPLANATION OF ABBREVIATIONS:

DDE	Digital Meter Electronics
AS	EGR Injection begin control
MLG	Fuel rate, combustion air, road speed
SB	Injection begin relation
ME	Injection rate relation



### 13 00 040 CHECKING ENGINE IDLING SPEED

#### Requirements:

- Engine at operating temperature (oil temperature = 60° C).
- Valve clearance OK.
- All electric consumers switched off.



Read 'idling speed' from tachometer in instrument cluster.

Or read engine speed via the diagnosing system.

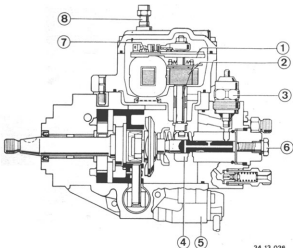
The engine speed can also be read via the diagnostic socket:

Connect BMW Service Tester.

Select engine test step no. 8 (enter number of cylinders).

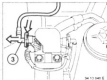
In case of deviation from specified value, interrogate fault memory of DDE (refer to DDE Test Plan).

If necessary, check basic setting of pedal value sender (refer to DDE Test Plan).

ELECTRONICALLY REGULATED INJECTION  
PUMP FOR DDE

- 1 = Control valve motion sender  
Potentiometer for feedback voltage
- 2 = Interlock for injection rate solenoid
- 3 = Electric fuel shut-off
- 4 = Control valve
- 5 = Injection begin solenoid
- 6 = Plug for high pressure chamber  
(for static adjustment with dial gage)
- 7 = Fuel temperature sensor
- 8 = Hollow union bolt or pressure valve

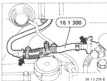




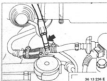
### 13 31 628 CHECKING FUEL FEED PRESSURE

Squeeze retainer (or pull out completely). Remove fuel pipe (3) behind the filter.

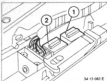
**Caution!**  
Catch escaping fuel in a suitable container.



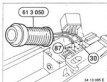
Install Special Tool 16 1 300 (adapter) between pipe (3) and filter housing.



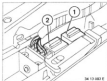
Screw 10 bar pressure connection of BMW Service Tester to Special Tool 16 1 300. Select Multimeter (Step 15 (refer to operating instructions of BMW Service Tester)).



Remove relay box cover. Remove fuel pump relay (2).



Switch ignition on. Bridge terminals 30 and 87 on the relay carrier with Special Tool 61 3 050. Operate special tool and read in-tank pump pressure\* from tester.

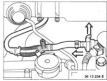


Reinstall fuel pump relay (2). Run engine at idling speed and read pressure\* from tester.



Increase engine speed to 4800 rpm and observe pressure\* on the tester.

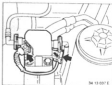
The suction effect of the injection pump should cause the feed pressure to drop considerably at high engine speed.



**Caution!**  
Catch escaping fuel in a suitable container while removing Special Tool 16 1 300.

**Installation:**  
Reconnect pipe only with seals which are in perfect condition and coat the seals with an acidless grease. Ensure that the retainer engages correctly.

\* Refer to Specifications

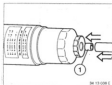


### 13 32 000 FUEL FILTER FOR DDE

#### Note:

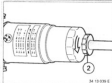
Fuel preheating is described in Group 12. The water level display is registered via the DDE control unit. Refer to BMW Diagnosing System for information about troubleshooting.

The heating element and water level probe are integrated in the upper section of the filter and may only be replaced together with the complete fuel filter.

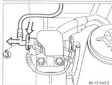


### 13 32 000 DRAINING WATER TRAP IN FUEL FILTER

Connect suitable hose to drain nipple (1), 8 mm dia., and insert other end into suitable container.



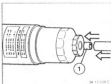
Open drain plug (2) by turning it and drain fluid until pure diesel fuel runs out.



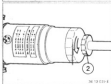
To charge and discharge, press retainer and pull pipe (3) off.

**Important!**  
Catch escaping fuel.

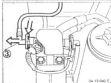
**Installation:**  
Check seals, replacing if necessary. Coat seals with acid-free grease.



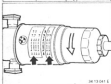
SA 13 042 E



SA 13 042 E



SA 13 042 F



SA 13 042 E

**13 32 051 REPLACING FILTER ELEMENT**

Connect suitable hose to drain nipple (1), 8 mm dia., and insert other end into suitable container.

Open drain plug (2) by turning it and drain fuel.

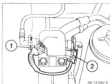
To charge and discharge, press retainer (if necessary pull out completely) and pull pipe (3) off.

**Important!**  
Catch escaping fuel.

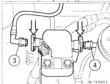
**Installation:**  
Check seats, replacing if necessary.  
Coat seats with acid-free grease.

Twist and unscrew fuel filter element.

**Installation:**  
Note instructions printed on the filter element.



SA 13 042 E



SA 13 042 F



SA 13 042 F

**13 32 051 REMOVING AND INSTALLING OR REPLACING COMPLETE FUEL FILTER (WITH WATER LEVEL PROBE AND FUEL HEATER)**

Disconnect plug (1) for water level probe and plug (2) for fuel heater.

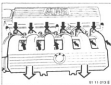
Press retainers (if necessary pull out completely) and pull pipes (3 and 4) off.

**Important!**  
Catch escaping fuel.

**Installation:**  
Check seats, replacing if necessary.  
Coat seats with acid-free grease.

Unscrew bolts (5 and 6) and remove filter.

Empty fuel from filter into a suitable container.



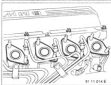
81 11 010 0

### 13 51 000 REMOVING AND INSTALLING INJECTION PUMP

Disconnect battery ground lead.

**Important!**  
Interrogate fault memories of all systems first as disconnecting the battery will erase them.

Remove engine splash guards, fan and fan cover.  
Remove intake manifold - refer to Gr. 11.



81 11 010 0

**Installation:**  
Replace gaskets.  
Replace leak off hoses after removal.



81 11 010 0

Pull off leak off hose (1).  
Disconnect return pipe (2).  
Coupling (3) is matched with injection pump.  
Disconnect fuel pipe (4).

**Installation:**  
Replace leak off hose after removal.



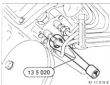
81 11 010 0

Loosen and remove injection pipes from injection nozzles using Special Tool 13 51 000.

**Important!**  
Reposition tool in good time to avoid bending the pipes.  
Plug openings of nozzles with caps.

**Installation:**  
Tightening torque\*.

\* Refer to Specifications



81 11 010 0

Loosen and remove couplings from injection pump using Special Tool 13 51 000.  
Plug openings of injection pump with caps.

**Installation:**  
Tightening torque\*.



34 10 010 0

Hold engine in TDC of cylinder no. 1 (power stroke) using Special Tool 11 2 300.



34 10 011 0

**Checking:**

Unscrew oil filter cap.  
The first cam of the camshaft must face up.



34 11 010 0

Unscrew toothed belt tensioner bolt.

**Installation:**  
Check for O-ring.

\* Refer to Specifications



Unscrew central nut.



Screw Special Tool 13 5 120 in, without pressing-out bolt.

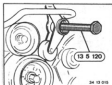


Disconnect plugs.

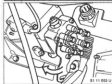


Unscrew pump mounting bolts.

Installation:  
Pay attention to washers.



Press pump out by screwing pressing-out bolt into Special Tool 13 5 120.



Remove pump.

Note:  
Turn pump clockwise so that console can pass the engine mount console.



Installation:  
Replace O-ring on pump flange.

Important!  
Leave special tool screwed until until pump is reinstalled as otherwise the sprocket would fall down and the engine would have to be disassembled.  
Unscrew pressing-out bolt of special tool completely before installing the injection pump.



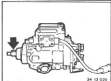
34 13 018

**Installation:**  
When replacing pump, transfer the attachments and mounting parts.



34 13 019

Bring injection pump shaft into installed position using Special Tool 13 5 062. The cranking lever must be positioned vertically in front of the noticed cam.



34 13 020

Make sure that the woodruff key does not fall out while installing the injection pump.



34 13 021

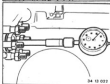
Tighten nuts (1 and 2) before unscrewing Special Tool 13 5 129.



34 13 022

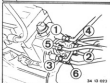
Remove Special Tool 13 5 129. Screw central nut in and tighten.

Tightening torque\*.



34 13 023

Adjust injection pump statically - refer to 13 51 056.

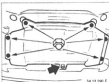


34 13 024

When connecting injection pipes, begin with connection no. 4. Note that pipes for cylinders 1, 5, 3, 6, 2 and 4 are equal to the firing order.

Starting time is longer after assembling. Bleed fuel system - refer to 13 51 320. Check idling speed - refer to 13 00 050.

\* Refer to Specifications



34 13 000 E

### 13 51 005 ADJUSTING INJECTION PUMP STATICALLY

DDE 3

Coolant temperature + 20° C.

Disconnect battery ground lead.

**Important!**

This will erase the fault memories of all systems, so that they must first be interrogated.

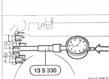
Remove engine guard and fan cowl.

Unscrew plug (1).

Installation:

Replace seal if necessary.  
Tightening torque\*.

34 13 024 E



34 13 025 E

Screw in Special tool 13 5 330.  
Secure dial gauge\* (preload).

34 13 026 E

Turn crankshaft clockwise in direction of  
TDC in cylinder no. 1 (begin about 90 ... 90°  
in advance) until the needle remains at the  
deepest point for a short time.  
Set scale of dial gauge to zero.

\* Refer to Specifications

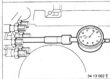


34 13 011 E

Checking TDC in cylinder no. 1 (power  
stroke).  
Unscrew oil filler cap.  
First cam of camshaft must point upwards.

34 13 027 E

Pull out plug (2).

Turn crankshaft clockwise until Special  
Tool 11 2 300 can be inserted into appropriate  
bore of flywheel.**Important!**Don't turn in opposite direction of engine  
rotation = wrong test results.

34 13 028 E

Read stroke of distributor plunger from dial  
gauge.  
Refer to adjustment value\*.

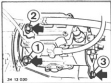
\* Refer to Specifications



Adjusting:  
Loosen bolt (1).

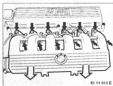


Loosen nuts (2 and 3), but do not loosen excessively in order to avoid tension from the chains.



Turn injection pump until dial gage shows the correct value\*.  
Tighten nuts and bolts in sequence of 1 through 3.  
Tightening torque\*.  
Rethink the adjustment.

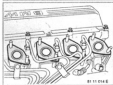




### 13 51 ... REPLACING FUEL TEMPERATURE SENSOR

**Important!**  
Ensure absolute cleanliness when working on the injection pump.

Remove intake manifold - refer to Gr. 11.

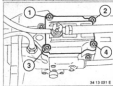


**Installation:**  
Replace gaskets.  
Replace leak oil hoses after removal.



Disconnect leak off hose (1).  
Disconnect return pipe (2).  
Hollow union bolt (3) is matched with the injection pump.  
Disconnect fuel pipe (4).

**Installation:**  
Replace leak oil hose after removal.



Unscrew bolts (1 ... 4).  
Remove injection rate control unit cover.

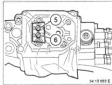
**Important!**  
Catch escaping fuel.

**Installation:**  
Tightening torque = 7 ... 10 Nm.



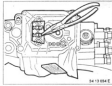
Cover injection rate control unit with clean plastic sheet.

**Important!**  
Potentiometer and slider of motion sender must not be touched or cleaned.  
Foreign particles must be kept out of the injection rate control unit.  
They would lead to serious malfunction.

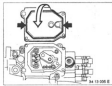


Loosen screws (5 and 6) on temperature sensor and remove screws.

**Installation:**  
Tightening torque = 0.5 ... 0.7 Nm.



Pull out temperature sensor using a pointed pliers applied on the connection lugs (not on connecting wires) and remove.  
Don't touch the slider and potentiometer surfaces.

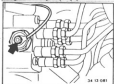


**Installation:**  
Check for correct seating and good condition of gasket when mounting the injection rate control unit cover.



### 13 51 300 CHECKING ELECTRIC FUEL SHUT-OFF

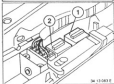
The shut-off receives voltage via the control unit as from ignition key position "ON". Switching-on will be heard by a loud click.



If a click is not heard, check power supply to the control unit.  
Other tests – refer to BMW Diagnosing System.



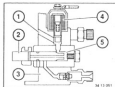
If necessary, check master relay after loosening screws (1 ... 4) and removing cover.



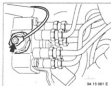
1 = Master relay (white)  
2 = Fuel pump relay (orange)

### 13 51 301 REPLACING ELECTRIC FUEL SHUT-OFF

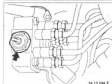
The diesel engine is stopped by interrupting the supply of fuel.  
Check fuel shut-off - refer to 13 51 300.



- 1 = Feed bore  
2 = Distributor plunger  
3 = Distributor head  
4 = Distributor head  
5 = High pressure chamber

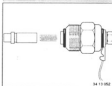


Disconnect lead on fuel shut-off.



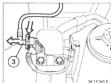
Unscrew fuel shut-off using a 24 mm fork wrench.

**Caution!**  
Plunger and spring could fall out.



Without current the plunger will be run out by spring force and the fuel feed bore shut.

Check O-ring for correct seating.  
Tightening torque = 20 ± 5 Nm.



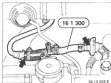
### 13 51 320 BLEEDING FUEL SYSTEM

It is not necessary to bleed the fuel system, since the transfer pump builds up pressure in the supply pipe with the ignition key turned to "2".

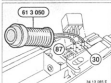
If the fuel system is drained completely or had been drained for a long time:  
Press retainer (pull out completely if necessary) and disconnect fuel pipe (3) behind the filter.

**Important!**  
Catch fuel in a suitable container.

Install Special Tool 16 1 300 (adapter) between pipe (3) and filter housing.  
Connect one fuel hose to the threaded nipple and stick other end of hose in a suitable container.



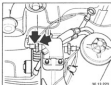
Lift relay box cover off and remove fuel pump relay (2).



Turn ignition on.  
Bridge terminals 30 and 87 on relay carrier with Special Tool 61 3 059.  
Operate tool until fuel runs out of filter.

**Important!**  
Catch fuel in a suitable container.

\* Refer to Specifications



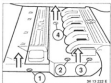
**Installation:**  
Reconnect pipe only with seals which are in perfect condition.  
Coat seals with acid-free grease.  
Have retainer engage correctly.



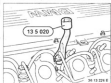
**Bleeding Injection Pump:**  
Loosen plug (1) two turns.  
Crank engine with starter until fuel runs out.

**Important!**  
Catch fuel in a suitable container.

**Retighten plug:**  
Tightening torque = 20 + 6 Nm.



**Bleeding Injection Pipes:**  
Unscrew screws (1 ... 4).  
Remove engine cover.



Loosen all coupling nuts on injection nozzles using Special Tool 13 5 020.  
Crank engine with starter until fuel runs out at pipes.  
Retighten coupling nuts.  
Tightening torque = 20 + 5 Nm.  
Remove fuel from cylinder head with rags.

**13 62 529 Removing and installing /  
replacing pedal position  
sensor**

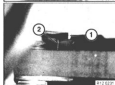
refer to 13 72 629

**13 62 600 Replacing RPM sensor  
(pulse generator) (M51)**

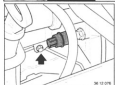
Switch off ignition.



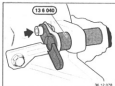
Press coolant hose to one side so that mark (1) can be seen on timing case cover.  
Mark (1) on timing case cover must be aligned flush with mark (2) on vibration damper.



Viewed from above:  
Mark (1) on timing case cover must be aligned flush with mark (2) on vibration damper.

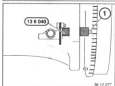


Location of RPM sensor:  
Beneath starter.  
Disconnect plug-and-socket connection.  
Remove RPM sensor together with support bracket.

**Installation note:**

Fit special tool 13 6 040 to support bracket.  
Mount support bracket with special tool on engine block and push till it comes up against the flywheel. This sets the minimum distance of the RPM sensor to the pins in the flywheel.

Firmly tighten support bracket.

**Installation note:****Principle:**

Special tool 13 6 040 rests on pin (1) of flywheel.

Unscrew special tool 13 6 040 at support bracket and remove.

**Caution!**

The support bracket on the engine block must no longer be loosened, only release and remove the special tool!

Fit RPM sensor in support bracket.

Secure RPM sensor.

Reconnect plug-and-socket connection.

Check function, refer to DIS.

Read out defect code memory of DDE control unit, check stored fault messages, repair faults, delete defect code memory.

### 13 71 000 Removing and installing air cleaner (MS1)

Remove coolant expansion tank.



Release screws. Remove upper section of air cleaner.



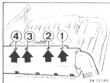
Remove air cleaner cartridge.



Unscrew air cleaner housing and lift off together with intake duct.

#### Installation note:

Check O-ring for crankcase ventilation, replace if necessary.  
Fit screws with screw sealing compound, tightening torque 6 Nm.



### 13 72 001 REPLACING AIR CLEANER FILTER ELEMENT

Unscrew screws (1 ... 4).



Pull housing cover up and tilt it out.



Pull filter element out.



Installation:  
First engage cover clips at bottom.

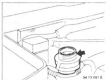


# 13 Fuel system

## 530i (M60), 540i (M60)

13 00 002	Functional check of digital motor electronics (DME) .....	13- 00/41
...	Component testing .....	13- 00/41
13 31 029	Delivery pressure of fuel pump – check .....	13- 31/41
	Overview of fuel filters and lines .....	13- 32/41
13 32 051	Fuel filter- replace .....	13- 32/41
13 41 500	Idle speed control valve – replace .....	13- 41/41
13 51 199	Fuel pressure regulator – check .....	13- 51/41
630	Fuel pressure regulator – replace .....	13- 51/42
13 54 030	Throttle assembly- remove and install/seal .....	13- 54/41
13 61 000	Control unit (for DME) – remove and install or replace .....	13- 61/41
13 62 511	Inlet air temperature sensor – replace .....	13- 62/41
531	Coolant temperature sensor – remove and install .....	13- 62/41
560	Air mass meter – remove and install or replace .....	13- 62/42
13 64 541	Fuel injector valves, all – remove and install or replace .....	13- 64/41
13 71 000	Air cleaner – remove and install .....	13- 71/41
13 72 001	Air cleaner cartridge – replace .....	13- 72/41
13 90 500	Tank ventilation valve – replace .....	13- 90/41

For further information on troubleshooting and jobs in assembly 13 refer to:  
Microfiche Assembly Repair Manual and  
Electrical Troubleshooting Manual 5 Series E34



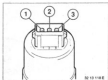
### 13 00 002 CHECKING FUNCTION OF DIGITAL ENGINE ELECTRONICS (DME)

Connect BMW Service Tester.  
 Carry out brief test.  
 Interrogate fault memories.  
 Interrogate status.  
 Refer to operating instructions of BMW Service Tester BMW Diagnosing System.

Additional information on Troubleshooting:  
 Car Electric/Electronic Test Plan and Wiring Diagram binders.

Check intake air temperature sensor.

Measure resistance<sup>1</sup> on temperature sensor.  
 Check wiring from control unit plug to temperature sensor plug for breaks or shorts<sup>\*\*</sup>.



### 13 00 003 COMPONENT TEST

Check idling speed control valve.

#### Electric Test

Measure resistance between terminals (1 and 3).

Specification: approx. 23 Ω.

Measure resistance between terminals (2 and 1) or (2 and 3).

Specification: approx. 42 Ω each.

#### Dynamic Test

Remove idling speed control valve (plug remains connected).

Open or close rotary plunger (1) fully.

Switch on ignition.

Rotary plunger must move to and remain in a position of approx. 50 % closed section opening.

Refer to BMW Diagnosing System for other tests.

<sup>1</sup> Refer to Specifications of Gr. 12 and 13

<sup>\*\*</sup> Refer to Wiring Diagrams

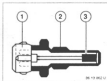


**Check coolant temperature sensor.**

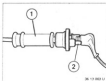
Connect Jetronic test lead, Special Tool 81 1 440.  
 Measure resistance\* with ohmmeter.  
 To check resistance in engine temperature range, remove and submerge sensor in a water bath as far as the hexagon and measure resistance\* with ohmmeter.

The temperature sensor measures the engine temperature and sends this information to the control unit as a resistance signal.  
 Resistance drops with rising temperature (NTC).

- 1 = Plug connection
- 2 = Housing
- 3 = NTC resistor



86 11 002 U



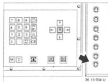
86 11 002 U

**Check tank vapor venting valve.**

Connect vacuum hose (1) from BMW Service Tester on 8 mm dia. adaptor.  
 Supply 12 V voltage to tank vapor venting valve using Special Tool 81 1 440 (2).

**Select Multimeter Function 21 on BMW Service Tester.**

Set vacuum to 600 ± 100 mbar.  
 Switch off vacuum pump.



86 11 004 U

Vacuum must not drop by more than 50 mbar during the testing time of about 20 seconds.  
 Replace tank vapor venting valve if vacuum drops by more than 50 mbar.

\* Refer to Specifications of Gr. 12 and 13

\*\* Refer to Specifications of Gr. 11 and 13  
 \*\*\* Refer to Wiring Diagrams



### 13 31 029 Checking delivery pressure of fuel pump

Remove caps (1), release nuts (2).  
Remove manifold covering.



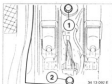
If necessary release retaining nuts (3) of coolant expansion tank and push tank to one side.



Install BMW SERVICE TESTER or special tool 13 3 080 with connection line and special tool 13 3 064 in fuel supply line upstream of pressure regulator.



Release screws.  
Remove lid for 8-bits.



Release nuts (1 and 2) of holder and pull holder upward.  
Lay plug connector and cables to one side.



Unplug fuel pump relay (orange).



Connect special tool 81 3 090 to terminal 87 and terminal 30.  
Press button and read off "delivery pressure" at pressure gauge.

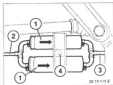
If the specified delivery pressure is not reached, close off fuel return line after the T-piece with special tool 13 3 010. Switch on ignition. Operate special tool 81 3 090.



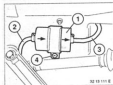
If "delivery pressure" is reached:  
Replace pressure regulator.

If "delivery pressure" is not reached:  
Check and clean plug-and-socket connection of fuel pump. Repeat test, if delivery pressure is still not reached: Replace fuel pump.

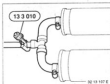
### SURVEY OF FUEL FILTER AND HOSES



- 1 Fuel filter
- 2 Fuel hoses from tank
- 3 Feed hoses
- 4 Filter holder

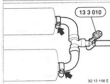


- 1 Fuel filter
- 2 Fuel hoses from tank
- 3 Feed hoses
- 4 Filter holder



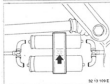
### 13 32 001 REPLACING FUEL FILTER

Loosen clamps of hoses on body as much as necessary.  
Clamp all fuel hoses using Special Tool 13 3 010.

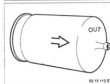


Disconnect hoses at fuel filter.

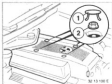
Important!  
Catch and dispose recycling fuel.



Unscrew nut and remove filter.



Installation:  
Check direction of flow (arrow) or outlet (OUT).

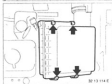


### 13 41 500 Replacing idle speed control valve

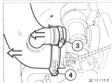
Remove cap<sup>1)</sup>, release nut<sup>2)</sup>.  
Remove manifold covering.



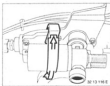
Press retaining spring and disconnect plug connector.



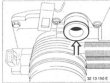
Open clips, lift off upper section of air cleaner.



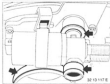
Release hose clips (3 and 4).  
Remove intake hoses together with upper section of air cleaner.



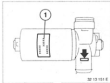
Press together mounting and detach.  
Remove idle speed control valve.



Installation note:  
First fit sealing ring in throttle flange.



Installation note:  
Ensure seals are fitted on throttle body and idle speed control valve.



Installation note:  
Note identification No. (1)\*.  
Check idle speed.

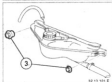
For component testing refer to 13 00 ...

\* Refer to Technical Data



### 13 51 100 CHECKING FUEL PRESSURE REGULATOR

Press off cap (1).  
Unscrew nuts (2).  
Remove cover for collector.



If applicable, unscrew coolant expansion tank mounting nuts (3) and push tank aside.



Install connector of BMW Service Tester or Special Tool 13 3 060 together with connecting pipe and Special Tool 13 3 064 in fuel feed hose.



Unscrew screws.  
Remove electronic box lid.



Unscrew plug rail nuts (1) and (2) and pull plug rail upwards.  
Place plug and wiring aside.  
Disconnect fuel pump relay (orange).



Bridge terminals 87 and 30 using Special Tools 61 3 050.  
Switch on ignition.  
Operate special tool.  
Read and check system pressure\*.



**System Pressure Drops Too Fast:**  
Disconnect diagnosis socket and clamp return hose behind pressure regulator using Special Tool 13 3 018.  
Operate Special Tool 61 3 050 again briefly.



If system pressure is not maintained, the pressure regulator is faulty.  
If the system pressure drops, there is a leak ahead of the pressure regulator (injection pipe, hose connections, fuel injectors, etc.).

\* Refer to Specifications of Gr. 16



30-13-100-E

### 13 51 430 Replacing fuel pressure regulator

Remove end caps (1), release nuts (2).  
Remove manifold covering.



30-13-101-E

If necessary, release retaining nuts (2) from coolant expansion tank and push tank to one side.



30-13-102-E

Detach diagnostic socket.



30-13-103-E

Disconnect vacuum hose.



30-13-104-E

Lift out snap-ring.



30-13-105-E

Note position of vacuum connection.  
Turn pressure regulator and pull out.

Installation note:  
Replace seals (1 and 2).



30-13-106-E

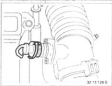
Installation note:  
Ensure legs of snap-ring engage in recesses.





**13 54 030 REMOVING AND INSTALLING / SEALING THROTTLE VALVE ASSEMBLY**

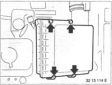
Press off cap (1).  
Unscrew nuts (2).  
Remove cover for collector.



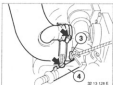
Twist and pull off mass air flow sensor plug.



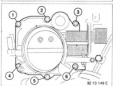
Pull plug (1) off of idling speed control valve and plug (2) off of throttle valve potentiometer.



Unclip and pull up air cleaner upper section.



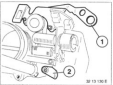
Loosen hose clamps and remove intake hoses together with air cleaner upper section.  
Disconnect throttle cable (3).  
Pull vacuum hose (4) off of throttle valve assembly.



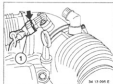
Unscrew screws (1 ... 6) and pull off throttle valve assembly.



Installation:  
Replace gasket.

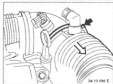


Installation:  
Attach holders (1 and 2).



Models with Anti Slip Control (ASC):

Pull off plug (1).



Loosen hose clamp and pull off below.



Unscrew screws (2 ... 4).  
Take off and place throttle valve assembly  
aside.



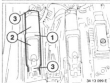
Installation:  
Replace gasket (5).



SA 13 100 0

**13 61 000 REMOVING AND INSTALLING  
OR REPLACING CONTROL  
UNIT (FOR DME)**

Unscrew electronic box lid screws.  
Remove lid.



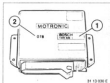
SA 13 090 0

Pull up retainer (1) and pull off plug (2).  
Unclip retainers (2) and remove control unit.



SA 13 100 0

1 = DME control unit  
2 = EGS control unit  
3 = ABS/ASC control unit



SA 13 030 0

Installation:  
Check code (1\*) and production date (2\*).



SA 13 101 0

Relays in Control Unit Electronic Box:

1 = Fuel pump relay (orange)  
2 = DME master relay (white)



### 13-62 511 REPLACING INTAKE AIR TEMPERATURE SENSOR

(After checking function of digital engine electronics (DME) as in 13-62 002.)

Press off caps (1).  
Unscrew nuts (2).  
Remove cover for collector.



Press in retainer.  
Pull off plug.



Unscrew temperature sensor.

Installation:  
Tightening torque\*.

Component Test:

Refer to 13-60 ...

\* Refer to Specifications



### 13-62 531 REMOVING AND INSTALLING COOLANT TEMPERATURE SENSORS

(After checking function of digital engine electronics (DME) as in 13-62 002.)

Detach and place diagnosis socket aside.

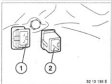


Press in retainer.  
Pull off plug (white).



Unscrew temperature sensor.

Installation:  
Tightening torque\*.



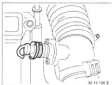
Arrangement:

- 1 Temperature sensor for DME (white)
- 2 Temperature sensor for temperature gauge (black)

Component Test:

Refer to 13-60 ...

\* Refer to Specifications



13 62 100 E

### 13 62 100 REMOVING AND INSTALLING OR REPLACING MASS AIR FLOW SENSOR

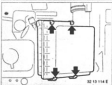
(After checking function of digital engine  
electronics (DME) as in 13 00 002.)

Twist and pull off mass air flow sensor  
plug.



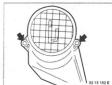
13 62 101 E

Loosen hose clamp and pull off intake  
hose.



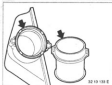
13 62 104 E

Unclip and pull off air cleaner upper sec-  
tion.



13 62 102 E

Unscrew screws.  
Twist and pull off mass air flow sensor  
housing.



13 62 103 E

Installation:  
Replace seal.  
Coat sealing lip surface on housing with a  
small amount of acidless grease.



### 13 64 541 Removing and installing or replacing all fuel injector valves

Remove end caps (1), release nuts (2).  
Remove manifold covering.



Remove retaining straps for mounting cable.  
Detach throttle operating cable at throttle level.



Remove covering for cylinder head covers on both sides.



Disconnect cable connectors from ignition coils on both cylinder heads.

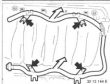


Unplug throttle operating cable (1) and place to one side.  
Remove cable ducts (2) and place to one side.  
Disconnect plug connectors from fuel injector valves.



Close off fuel supply and return lines with special tool 13 3 010 and remove.

**Caution!**  
Collect escaping fuel.

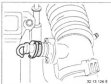


Release injection tube retaining elements.  
Remove injection tube together with fuel injector valves.



Press off clips. Remove fuel injector valves from injection tube.

**Installation note:**  
Check seals and replace if necessary. Check fuel injector valves for leaks, refer to 13 64 582. Before fitting, coat seals of fuel injector valves with acid-free grease.

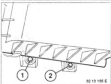


### 13 71 000 REMOVING AND INSTALLING AIR CLEANER HOUSING

Twist and pull off mass air flow sensor plug.



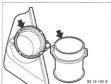
Loosen hose clamp.  
Pull off intake hose.



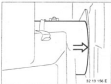
Unscrew screws (1 and 2).  
Tilt and pull out air cleaner housing.



Unscrew screws.  
Tilt and pull off mass air flow sensor housing.

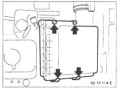


Installation:  
Replace seal.  
Coat housing at sealing lip surface with a small amount of acidless grease.



Installation:  
Guide intake neck into opening.  
Mount housing on rubber mounts.

13-72/41



13 72 001 REPLACING AIR FILTER ELEMENT

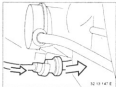
Unclip.



Lift air cleaner upper section and pull out air filter element.



## 13-90/41

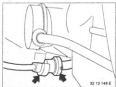


### 13 90 500 REPLACING TANK VAPOR VENTING VALVE

(After checking function of digital engine electronics (DME) as in 13 90 000.)

Tank vapor venting valve and carbon canister are located between bumper lower section and left front wheel house.

Push tank vapor venting valve out of rubber holder.  
Press in retainer and pull off plug.



Disconnect fuel hoses.

**Caution!**  
Catch escaping fuel.

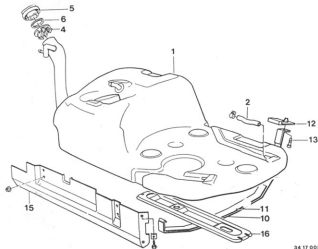
**Component Test:**

Refer to 12 90 ...

# 16 Fuel supply system

16 11	...	Overview fuel tank .....	16- 11/1
	030	Fuel tank – remove and install .....	16- 11/2
	...	Overview expansion tank with hose layout .....	16- 11/4
	120	Expansion tank for tank venting – remove and install or replace .....	16- 11/5
	...	Overview tank ventilation on catalytic converter vehicles .....	16- 11/6
16 12	000	Fuel level sending unit and in-tank pump M30 – remove and disassemble .....	16- 12/1
	...	Connector assignments in-tank pump fuel level sending unit .....	16- 12/4

## FUEL TANK SURVEY



- 1 Fuel tank
- 2 Hose
- 4 Filler pipe insert
- 5 Tank cap
- 6 Seal
- 10 Retaining strap
- 11 Liner
- 12 Welded nut
- 13 Mounting screw
- 15 Heat shield
- 16 Adapter



32 18 001

**16 11 030 Removing and installing fuel tank**

If necessary, partially drain fuel with suction pump\*\*).

**Caution!**  
Observe safety requirements and prevailing national legislation.

**Installation instruction:**  
Only use new hose clips.  
Check fuel hoses for condition and any leaks; replace if necessary.  
Also see Service Information, Gr. 16.

Removing trunk trim panel.

Unscrew belts.  
Remove cover.

Unscrew bolts.  
Remove fuel hoses.

Notes:  
1 = inlet  
2 = outlet

\*\*) Sourcing Reference HWB



34 18 001

Move slide to one side.  
Lift out plug.



32 18 004

Lift out rubber gaiter.



32 18 000

If necessary, remove wheel, see 36 10 300.  
Unfasten screw.  
Lift out trim panel.



32 18 001

Unscrew bolts.  
Remove vent hoses.



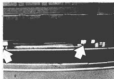
32 18 000



32 18 002

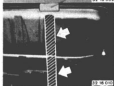


34 18 001



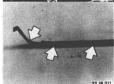
32 18 003

If necessary, support fuel tank from underneath.  
 Unscrew fast shield screws.  
 Lift out fuel tank.



32 18 002

Installation:  
 Replace plastic sheet, if necessary.



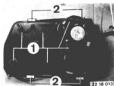
32 18 011

Installation:  
 Replace liners, if necessary.



32 18 012

Installation:  
 Check for correct seating of retaining straps.



32 18 013

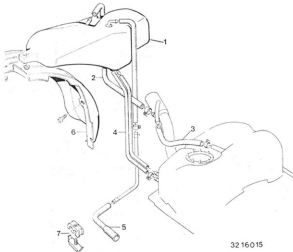
Installation:  
 Check liners (1), if installed, and edge guard (2), replacing if necessary.



32 18 014

Installation:  
 Check stops, replacing if necessary.

## EXPANSION TANK AND HOSE ROUTING SURVEY



- 1 Expansion tank
- 2 Vent hose (filter neck/expansion tank)
- 3 Vent hose (filter neck/fuel tank)
- 4 Vent pipe (fuel tank/expansion tank)
- 5 Spill pipe (expansion tank/next to differential)\*
- 6 Trim panel
- 7 Fuel pipe holder on floor plate

\* To carbon canister in cat. conv. cars



**18 11 120 REMOVING AND INSTALLING  
OR REPLACING EXPANSION  
TANK FOR FUEL TANK VENT**

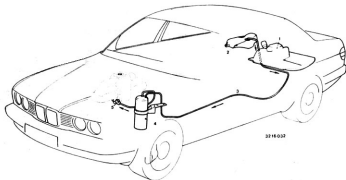
Remove rear wheel – see 26 10 300.  
Unscrew screws.  
Lift out trim panel.



Unscrew screws.  
Pull off vent hoses (see hose routing point  
no. 6).  
Unscrew screw (7).



Unscrew screws.  
Pull off vent hoses.  
Pull off tank.

16 11 ... TANK VENTING SURVEY  
(see "Note")

- 1 = Fuel tank
- 2 = Expansion tank
- 3 = Pipe
- 4 = Carbon canister
- 5 = Tank venting valve

**Note:**

Check tank venting valve - see  
13 90 500.

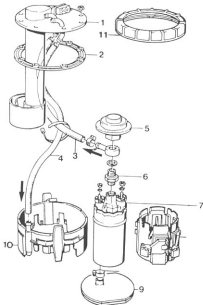
Item 4 not used on M 21 engine and  
with provisions for catalytic converter.  
Vapors are discharged outdoors via  
the expansion tank.



## 16-12/1

16 12 000 Removing and disassembling immersed tube indicator and intake pump

Summary of immersed tube indicator and intake pump



- 1 = Immersed tube indicator
- 2 = Gasket
- 3 = Inlet lead
- 4 = Return lead
- 5 = Pressure damper
- 6 = Non-return valve
- 7 = Fuel pump
- 8 = Pump carrier with damper rubber
- 9 = Fuel screen
- 10 = Pump bracket
- 11 = Union nut

Check fuel pressure and delivery rate, see Gr. 13.

Check immersion tube indicator\*, also refer to plug allocation on Page 16-12/4.

\*] Refer to Specifications



If necessary, partially remove fuel with suction pump\*\*).



Lift out luggage compartment trim panels. Unscrew bolts. Remove lid.



Move slide to one side. Pull off plugs.



Plug allocation on in-tank pump and immersion tube indicator

- |           |                                    |
|-----------|------------------------------------|
| 1 = 21    | = ground, immersion tube indicator |
| 2 = Tank  | = warning lamp                     |
| 3 = Tank  | = sensor                           |
| 4 = 21    | = ground, fuel pump                |
| 5 = EKP 1 | = fuel pump 1                      |

\*\*) Sourcing Reference HMB



Unfasten hose clips. Disconnect fuel hoses.

Note:  
Mark fuel hoses.

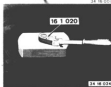
Installation instructions:  
Only use new hose clips.  
Check fuel hoses for condition and any leaks; replace if necessary.  
Also see Service Information, Gr. 15.



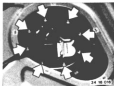
Note:  
Remove inlet lead (1)  
return lead (2).



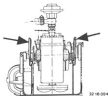
Unfasten union nut with special tool No. 16 1 020.  
Installation instruction:  
Replace sealing ring and union nut.



Special tool No. 16 1 020



M 5:  
Unscrew nuts.



Installation:  
Check for correct fit of retaining hooks.



Pull out fuel level sender.



Unscrew screws.  
Pull off hoses and electric leads.



Installation:  
Replace seal.



Installation:  
Fuel and return hoses are marked.



Drain gasoline or wear acid-proof gloves.  
Compress retaining hooks and pull out fuel pump upward.



Installation:  
Secure electric leads on a fuel hose with a strap at about the middle.

## 16-12/4



3D 16 026

Unscrew screws.  
Remove pressure damper (1) and check  
valve (2).



3D 16 029

Pull off pump holder.

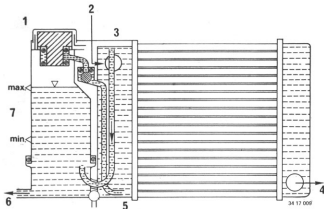


3D 16 030

Unscrew screw.  
Lift out fuel filter screen.

# 17 Cooling

	Partial flow cooling circuit M20 / M40 / M50 .....	17-	00/1
	Coolant circuit M20 (with independent heating) .....	17-	00/2
	Coolant circuit 6-cylinder M30 / M21, M5 .....	17-	00/3
	Coolant circuit M50 / M51 .....	17-	00/4
17 00 005	Coolant – drain and fill .....	17-	00/4a
009	Cooling system – check for leaks .....	17-	00/5
010	Check for leaks between cooling system and combustion chamber .....	17-	00/5
039	Cooling system – bleed and check for leaks .....	17-	00/6
17 11 000	Radiator – remove and install .....	17-	11/1
100	Coolant expansion tank – remove and install .....	17-	11/3
100	Expansion tank M20 / M40 / M50 – remove and install .....	17-	11/4
100	Coolant expansion tank – remove and install .....	17-	11/5
509	Radiator – flush .....	17-	11/6
000	Radiator M51 – remove and install .....	17-	11/31
150	Oil cooler (for engine oil) – remove and install or replace .....	17-	11/33
	M51 with intercooler .....	17-	11/33
	M51 without intercooler .....	17-	11/33
17 21 000	Oil cooler (automatic transmission) – remove and install or replace .....	17-	21/1
17 30 000	Radiator shutters – remove and install or replace .....	17-	30/31
17 32 000	Vacuum box for radiator shutters – replace .....	17-	32/31
17 40 000	Auxiliary fan, complete – remove and install .....	17-	40/1
000	Auxiliary fan (M51), complete – remove and install .....	17-	40/31
17 51 000	Intercooler – remove and install or replace .....	17-	51/31


**BYPASS COOLING CIRCUIT (M50/M40/M60)**

- 1 Cap with pressure and vacuum valves
- 2 Front engine
- 3 Vent pipe
- 4 To thermostat
- 5 Control pipe
- 6 To water pump
- 7 Level mark

The bypass principle is applied in order to have good air exclusion in the cooling circuit. Use of a cross-flow radiator permits integration of the bypass expansion tank on the side of the radiator. The tank is designed two-piece in order to have sufficient tank volume. This version permits use of transparent plastic in the area of level marks.

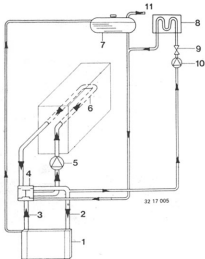
The vent pipe protrudes below the minimum level mark. In this manner air excluded from the bypass tank is prevented from flowing back into the full flow circuit when unscrewing the tank cap.

The pressure relief valve in the tank cap is activated via a control pipe by radiator feed pressure.

The cooling system is protected against excessive operating pressure by registering the radiator feed pressure. Pressure protection takes place at approximately the amount of the radiator operating pressure during the after-heating phase. This improves the operating safety of the cooling system and the boiling-over safety while after-heating.



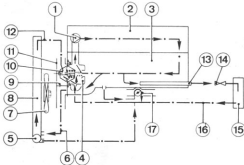
COOLANT CIRCUIT FOR 8 CYLINDER  
M 30 / M 21 / M 5



- 1 Radiator
- 2 Return
- 3 Feed
- 4 Thermostat
- 5 Water pump
- 6 Engine block/cylinder head flow
- 7 Expansion tank
- 8 Heat exchanger
- 9 Solenoid heater
- 10 Additional water pump
- 11 Split pipe



## COOLANT CIRCUIT (MSB / MB1)



- 1 Water pump
- 2 Crankcase
- 3 Cylinder head
- 4 Thermostat housing
- 5 Expansion tank
- 6 Radiator feed
- 7 Fan with visc coupling
- 8 Radiator
- 9 Vent bore
- 10 Thermostat
- 11 Thermostat cover
- 12 Radiator return
- 13 Heater feed
- 14 Heater valve
- 15 Heat exchanger
- 16 Heater return
- 17 Throttle valve heating

17 00 005 Drain off coolant and refill

Refer to Repair Manual, 3 Series E36



32 17 000

### 17 00 009 Checking cooling system for leaks

On the M40/M20/M50, a check is carried out on the integrated expansion tank on the radiator using test device 17 0 002 in conjunction with adapter 17 0 005.



32 17 004

### M30/M21M51

Fit test device 17 0 002 with adapter 17 0 005 on expansion tank and bring pressure up to 1 bar.

Cooling system does not leak if there is not a considerable pressure drop (max. 0.1 bar) after about 2 minutes.

Check cap.  
A. Check pressure relief valve.

Screw cap (1) on special tool 17 0 006 and apply air pressure slowly. Pressure relief valve should open at about 2 bar.

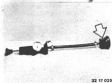


32 17 000

### Alternative:

Check connection for cooling system:

Use test device 17 0 002 in conjunction with adapter 17 0 005 and hose section 17 7 010 to check opening pressure\* (pressure valve).



32 17 000

\* Refer to Technical Data



32 17 003

Check vacuum valve:

Screw adapter onto test device 17 0 008 and slowly develop a vacuum using special tool 81 8 020 or the BMW SERVICE TESTER. Vacuum valve opens at vacuum of approx. 0.1 bar.

Check gasket.  
Gently raise vacuum valve, check that it is correctly seated and, if necessary, replace adapter.



32 17 000

### 17 00 010 Checking for leaks between cooling system and combustion chamber

"Tester for cylinder head" \*\*.

Fit and perform test.

If there is a leak, the test fluid turns yellow due to the carbon monoxide (combustion gas) entering the combustion chamber (CO).

Note:

Follow manufacturer's operating instructions.

\* Refer to Technical Data

\*\* Source of Supply: BMW Parts service

17-00/6

17 00 038 Bleed cooling system and  
check for water leaks

Refer to Repair Manual for 3 Series E38



**17 11 008 REMOVING AND INSTALLING RADIATOR**

Unscrew cap on expansion tank.  
Unscrew engine splash guard.  
Loosen drain plug and drain, catch and dispose coolant\*.

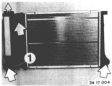
Installation:  
Fill and bleed cooling system\*\* - see 17 00 039.  
Check cooling system for leaks - see 17 00 009.



Cars with Additional Fans:  
Remove right headlight cover.



Pull off leads on temperature switch (1).



M 20 / M 50  
Disconnect coolant hoses.  
Tightening torque\*.

1 = Drain plug



Cars with Automatic Transmission:  
Unscrew transmission oil cooler pipes and plug with caps.

Installation:  
Check ATF level, correcting if necessary.  
Tightening torque\*.

Important!  
Catch oil.  
Replace seals.



M 30 / M 31 / M 5  
Disconnect spill pipe, upper and lower coolant hoses.  
Tightening torque\*.

\* See Specifications  
\*\* See Operating Fluids

\* See Specifications



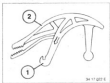
Remove expanding rivets on left and right sides (pull backwards). Remove fan shroud from retaining tabs and slide backwards over the fan.

00 11 000 14



Remove top retaining clip from radiator. Press screwdriver downwards and pull forwards, pulling radiator gently backwards at the same time.

00 11 001 4



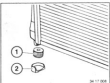
Arrow = direction of pressure or pressure point with screwdriver

1 = Retaining hook

Installation:

Press down on top of clip (2), sliding radiator forwards at the same time.

00 11 002 0



Pull radiator upwards to remove.

Installation:

Place radiator on rubber mounts precisely. Top up cooling system and bleed - 17 00 000.

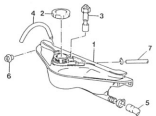
1 = Rubber mount

2 = Bracket

00 11 000 0

## 17-11/3

### 17 11 100 Removing and Installing Coolant Expansion Tank



32 17 014

#### Important!

Unscrew expansion tank cap only when engine is cold. Catch coolant and dispose of correctly.

Remove and install check level switch.

- 1 Expansion tank
- 2 Screw cap
- 3 Level switch
- 4 Vent line
- 5 Return line
- 6 Retaining nut
- 7 Inlet line

#### Installation:

Tap up cooling system\*, bleed and check for leaks, refer to 17 00 026.

\* Refer to Technical Data



Remove plug and overflow hose.



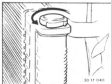
Remove inlet and return hoses. Unscrew nuts on left and right sides of expansion tank and remove container.

Remove and install level switch (check with Diagnosis Tester).

Select Check/Control with 03, 200 Status LevelCheck. Control status query coolant level. Flash, troubleshooting: refer to Gr. 02, Tightening torque\*.

Level switch (manual check)  
level switch removed, activate float by hand, use multimeter to measure throughput.  
Float at top => continuity => O.K.  
Float at bottom => no continuity => O.K.

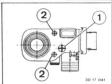
\* Refer to Technical Data



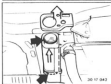
### 17 11 100 Removing and installing expansion tank M 20 M 40/M50.

**Caution!**

Unscrew expansion tank cap only when engine is cold. Drain, catch and dispose of coolant.



Loosen bleeder screw (1).  
Remove mounting screws (2) and take off upper section.



Pull out expansion tank upwards.

**Insulation:**  
Replace seals.

Fill with specified coolant \*\*, bleed  
(see 17 00 038).



Container marks indicate fluid level at approx. 20° C.

**Insulation:**  
Top up cooling system\*\*, bleed and check for leaks, refer to 17 00 038.

\*\* Refer to Operating Fluids Specification



## 17 11 100 REMOVING AND INSTALLING COOLANT EXPANSION TANK (M 5)



**Caution!**  
Only unscrew cap when engine is cold.

Drain and dispose coolant.  
Remove and check level switch.

- 1 Expansion tank
- 2 Cap
- 3 Level switch
- 4 Bleeder hose
- 5 Return hose
- 6 Mounting screw
- 7 Feed hose
- 8 Spill hose

**Installation:**  
Fill, bleed and check cooling system for leaks – see 17-00/4.



Pull off plug (1) and spill hose (2).



Disconnect feed hose (3), bleeder hose (4) and return hose (5).  
Unscrew screw on expansion tank and take out tank.



Remove and check (see BMW Diagnosing System) level switch.

**Manual Test:**  
Remove level switch.  
Operate float by hand and measure power flow with a multimeter.

**Specifications:**  
Float up = power flow  
Float down = no power flow

# 17-11/6

## 17 11 508 Flushing radiator

If oil has penetrated into the coolant circuit, the radiator and expansion tank will have to be flushed and cleaned with Solvethane™.

### Procedures:

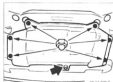
1. Remove radiator and expansion tank, refer to 17 11 000-106.
2. Fill with approx. 2 litres of Solvethane
3. Shake radiator and expansion tank thoroughly, then drain once the oil has separated.
4. Install cleaned cooler and expansion tank and connect to circuit.
5. Fill the entire circuit with hot water. Flush the circuit thoroughly by renewing the water as many times as required to ensure that any remaining cleaning residues are removed.
6. Check drained coolant for remaining oil. Repeat, if necessary.  
After the cleaning procedure, fill the coolant circuit with coolant\* and bleed the system - 17 00 508

### Note:

Solvethane attacks rubber seals, hoses, etc. and consequently must not be permitted to enter or remain in the cooling system. Always conform with safety measures for the handling of Solvethane (printed on cans).

\* Refer to Operating Fluids Specification, Gr. 17

\*\* Source of Supply: BMW Parts service



### 17 11 000 Removing and installing radiator MS 1

Unscrew cap from expansion tank.  
Unscrew and remove splash guard.  
Open drain screw and drain off coolant<sup>1</sup>, collect and dispose of correctly.

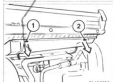
**Installation:**  
Fill cooling system<sup>2</sup> and bleed, refer to 17 00 038.  
Check cooling system for leaks, refer to 17 00 006.

34 11 000 E



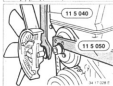
Remove gater from suction filter.

34 11 000 E



Remove expanding rivets (1) and (2) by pulling backwards, pull fan shroud upwards and detach.

34 11 021 E



Remove fan, bracing with special tool 11 5 040 against pulley wheel.

**Caution!**  
Left-hand threads. To loosen union nut from fan, turn clockwise (i.e. to right).

34 11 000 E



34 11 000 E

**Installation:**  
Tighten fan with special tool 11 5 040.  
40 Nm tightening torque is equal to 30 Nm on scale of torque wrench.



Remove fan together with fan shroud.

**Installation:**  
Attach fan shroud correctly.

34 11 000 E



Remove vacuum hose.  
Remove overflow hose (2) and upper coolant hose (3).

34 11 031 E

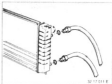


Remove lower coolant hose (4) and both inter-cooler hoses (5 and 6).

34 11 000 E

<sup>1</sup> Refer to Technical Data

<sup>2</sup> Refer to Operating Fluids Specification



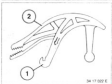
**Models with Automatic Transmission:**  
 Undo transmission oil cooler lines and seal with sealing plugs.

**Installation:**  
 Check transmission oil level and top up if necessary, tightening torque\*

**Caution!**  
 Collect oil as it escapes.  
 Replace seals.



Remove retaining clip from top of radiator.  
 Press screwdriver downwards and push forwards, pulling radiator gently backwards when doing so.



Arrow = direction of pressure of pressure point with screwdriver

1 = Retaining hook

**Installation:**  
 Press down on top of clip (2), sliding radiator forwards while doing so.



Slightly raise radiator and remove intercooler by pulling backwards.  
 Remove radiator and intercooler by pulling upwards.

**Installation:**  
 Position radiator precisely on rubber mounts.  
 Top up cooling system and bleed - 17 00 009.

\* Refer to Technical Data



### 17 11 150 Removing and installing or replacing oil cooler (for engine oil)

**ME1 with intercooler**

Remove front bumper and center radiator grill (BMW kidney grille), refer to Gr. 51.



Unfasten bracket for engine oil lines on engine mount.



Disconnect link between oil cooler lines and engine.

**Caution!**  
Catch escaping engine oil. Do not allow it to fall on the splash guard.

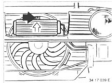
**Installation:**  
Check and correct engine oil level.



Unfasten bracket for engine oil cooler.

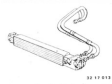


Unfasten retaining nut.



Lift engine oil cooler out of rubber mount and remove.

**Caution!**  
Catch oil as it escapes.



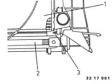
**ME1 without intercooler**

Unscrew oil lines.

**Note:**

Catch oil.

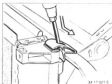
**Installation:**  
Replace gaskets.  
Top up engine oil.



1 = Radiator  
2 = Oil cooler  
3 = Retaining clip  
Open out clip 3 and lift out engine oil cooler on left side.

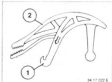
### 17 21 000 Removing and installing or replacing oil cooler (automatic transmission)

For vehicles with integrated transmission oil cooler in the water cooler, refer to 17 11 000.  
On the M51 engine without intercooler, the transmission oil cooler is identical to the one in the M51 engine with intercooler.  
Removal: refer to 17 11 150.



Vehicles with external transmission oil cooler:  
Remove complete front bumper, refer to 21 11 000.

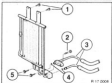
Remove retaining clip from top of radiator. Press screwdriver downwards and swirl forwards, pressing radiator slightly downwards at the same time.



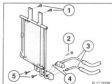
The arrow indicates the direction of pressure and the pressure point of the screwdriver.

1 Retaining hook

Installation:  
Press top of breaker (2) down, sliding radiator forwards at the same time.

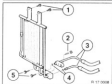


Push radiator towards engine and unfasten oil cooler screws (5).



Unfasten screw (2) and remove oil lines (3). Catch oil and dispose of it correctly.

Installation:  
Check O-rings (4) and replace if necessary. Measure and top up oil in automatic transmission.



Unfasten screws (5) and lift oil cooler out from bottom.



### 17 30 000 REMOVING AND INSTALLING OR REPLACING RADIATOR SHUTTERS

Pull expansion rivets (1 and 2) out towards rear.  
Pull fan cowl upwards and disconnect.

34 17 027 E



Remove fan, while counter-holding on pulley with Special Tool 11 5 040.

#### Important!

Left-hand threads — turn coupling nut on fan clockwise to loosen.

34 17 028 E



#### Installation:

Tighten fan using Special Tool 11 5 040.  
40 Nm tightening torque is equal to 30 Nm on scale of torque wrench.

34 17 029 E

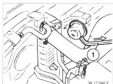


Remove fan together with fan cowl.

#### Installation:

Attach fan cowl correctly.

34 17 030 E



Pull expansion rivet (1) off.

34 17 040 E



Pull expansion rivets (3 and 4) off of radiator shutters.



34 17 041 E

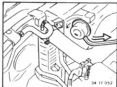


Disconnect radiator shutters by pulling up and remove.

#### Installation:

First attach radiator shutters at all four tabs.

34 17 042 E

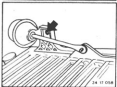


17 32 000 REPLACING VACUUM CONTROL BOX FOR RADIATOR SHUTTERS

Pull vacuum hose off.



Press toothed retainer off.



Pull expansion rivet out and remove vacuum control box.



## 17-40/1



### 17 40 000 REMOVING AND INSTALLING ADDITIONAL FAN ASSY.

Remove front bumper and center radiator grill section (BMW kidney) – see Gr. 51.  
Disconnect cooling coil and unscrew right two-tone fan.

Note:

Remove right headlight grill to improve the accessibility.



Disconnect plug.



Unscrew fan console bolts.  
Lift out additional fan downward.

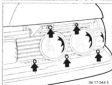
Testing:

Check power consumption and speed – see Specifications of Group 17.

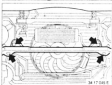


**17-40 000 REMOVING AND INSTALLING COMPLETE ADDITIONAL FAN**

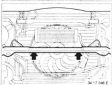
Remove from bumper and middle grill section (BMW kidney) - refer to Cr. 51.



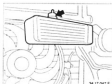
Unscrew and remove left and right headlight grills.



Unscrew oil cooler console at left and right sides.



Loosen cable straps.



Unscrew engine oil cooler.



Unscrew fan console bolts.



Disconnect plug

Note:  
Unscrew ballast resistor when replacing fan.



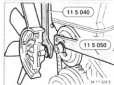
Lift fan console out together with fan.



34 17 021 E

#### 17 51 000 REMOVING AND INSTALLING OR REPLACING CHARGE AIR COOLER

Pull expansion rivets (1 and 2) out towards rear.  
Pull fan cowl upwards and disconnect.



34 17 020 E

Remove fan, while counterholding on pulley with Special Tool 11 5 050.

**Important!**

Left-hand threads — turn coupling nut on fan clockwise to loosen.



34 17 020 E

**Installation:**

Tighten fan using Special Tool 11 5 040. 40 Nm tightening torque is equal to 30 Nm on scale of torque wrench.



34 17 020 E

Remove fan together with fan cowl.

**Installation:**

Attach fan cowl correctly.



34 17 021 E

Unscrew engine splash guard at front. Disconnect left and right charge air cooler hoses.



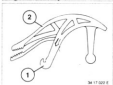
34 17 020 E

Pull vacuum hose off.



34 17 021 E

Remove clips from top of radiator. Press screwdriver down and swing it forward, while pulling the radiator back slightly.



34 17 020 E

Arrow = direction of pressure or point of pressure with screwdriver.

1 = Securing hook

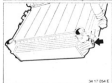
**Installation:**

Press on clip top (2), while pushing the radiator forward.



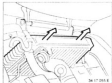
3617 052 E

Pull radiator back at bottom.



3617 054 E

Unscrew right bolt.



3617 055 E

Lift radiator as far as possible (with connected coolant hoses).



3617 056 E

Disconnect charge air cooler on left side and pull out underneath radiator.

# 18 Exhaust system

18 00 020	Complete exhaust system (M30) – remove and install .....	18-00/1
020	Complete exhaust system (M5) – remove and install .....	18-00/2
	Layout of exhaust system .....	18-00/4
	Version with catalytic converter (M51) .....	18-00/4
	Layout of exhaust system .....	18-00/5
	Arrangement without catalytic converter (M51) .....	18-00/5
020	Complete exhaust system (M51) – remove and install .....	18-00/6
020	Complete exhaust system (M40) – remove and install .....	18-00/8
18 12 012	Muffler assembly (intermediate and rear muffler) (M30) – replace .....	18-12/1
041	Front muffler (M30) – replace .....	18-12/1
...	Exhaust system (M51) – disassemble .....	18-12/2
031	Rear muffler (M51) – replace .....	18-12/3
040	Front muffler (M51) – replace .....	18-12/3
031	Rear muffler (M50) – replace .....	18-12/4
18 32 005	Catalytic converter (M30) – remove and install or replace .....	18-32/1
005	Catalytic converter (M5) – remove and install or replace .....	18-32/2

### 18 00 020 REMOVING AND INSTALLING EXHAUST ASSEMBLY

BMW 520i and 525i :

Unscrew both exhaust pipes on exhaust manifold.

Installation:

Replace self locking nuts.

Lubricate taper of flange with copper paste CRC\*\*

Flatten springs (2) uniformly by tightening nuts (1) with a torque of 50 Nm (37 ft. lbs.). Then loosen nuts (1) again by one and one half turns.

Flanges must be parallel to each other, or springs must not be preloaded flat. The pipe with compensator must be tightened last due to the danger of tension.

Unscrew exhaust carrier on transmission.

Installation:

Mount carrier without tension.

Tightening torque = 22 Nm (16 ft. lbs.).

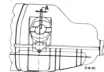
Disconnect oxygen sensor plug in cars with catalytic converter — see 18 32 600.

Cars with Automatic Transmission:

Unscrew nut (2).

Installation:

Mount exhaust carrier without tension by adjusting nut (1).



Unscrew holders for suspension on rear axle carrier.

Installation:

Adjust and bolt down holders by moving the tabs on the exhaust only after complete installation of the exhaust assembly. Tightening torque = 22 Nm (16 ft. lbs.).

Unscrew retainers.

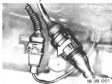
Remove entire exhaust assembly.

Installation:

Mount retainers in such a manner that rubber rings are pre-loaded.

Preload A = 7 mm (0.276").

Tightening torque = 22 Nm (16 ft. lbs.).



### 18 00 008 REMOVING AND INSTALLING EXHAUST ASSEMBLY (M 5)

Disconnect plug for oxygen sensor (bayonet retainer).



Unplug electric leads in holder on the transmission.

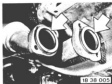


Remove cover.  
Disconnect electric leads.



Unscrew both exhaust pipes on the exhaust manifold.

Installation:  
Tightening torque = 42 Nm (30 ft. lbs.).



Installation:  
Check gaskets, replacing if necessary.

Note:  
New gaskets have a self-adhesive coat to make installation easier. Pull off plastic sheet. Install gasket with the adhesive surface facing the manifold.



Unscrew exhaust support on the transmission.

Installation:  
Mount exhaust support without tension. Loosen bolts on the transmission if necessary.



Unscrew holder for exhaust suspension on the rear axle carrier.



Installation:  
Adjust holder after installation of the complete exhaust assembly by moving the tabs on the exhaust and then bolt down with a tightening torque of 22 Nm (16 ft. lbs.).

18-00/3



Unscrew retainers.  
Remove complete exhaust assembly.



**Installation:**  
Mount retainers in such a manner that  
the rubber rings are preloaded.  
Preload distance A = 5 mm (0.197").  
Tightening torque = 33 Nm (16 ft. lbs.).



18-00/4

EXHAUST SYSTEM LAYOUT DRAWING (Version With Catalytic Converter)

18-00/5

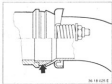
EXHAUST SYSTEM LAYOUT DRAWING (Version Without Catalytic Converter)



SA 18 043 E

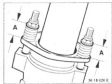
### 18 00 000 REMOVING AND INSTALLING EXHAUST ASSEMBLY - Engine MS1 -

Unscrew exhaust pipe from turbocharger.



SA 18 027 E

Installation:  
Check seat, replacing if necessary.  
Check installed position.



SA 18 028 E

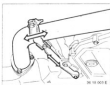
Installation:  
Lubricate seat and threads with copper paste C90<sup>1)</sup>.  
Replace self-locking nuts.  
Tighten nuts until the coil springs are compressed to distance  $A = 27 \pm 1$  mm.  
Flanges must be parallel to each other and springs must not be compressed flat.



SA 18 042 E

Unscrew exhaust pipe from transmission bracket.

<sup>1)</sup> Source of supply: BMR Paris



SA 18 000 E

Installation:  
Align support to be without tension after installation of the entire exhaust assembly.



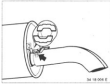
SA 18 040 E

Unscrew bracket for suspension from rear axle center.



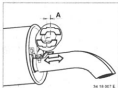
SA 18 041 E

Installation:  
Align (by moving) and tighten the bracket only after installation of the exhaust assembly has been completed.



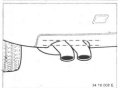
SA 18 000 E

Unscrew bracket.  
Remove exhaust assembly.

**Installation:**

Mount the bracket in such a manner that the rubber ring is preloaded in forward direction by distance A.

A = 12 mm.

**Installation:**

Check position of tailpipe in body opening. If necessary loosen flange connection and rubber suspension rings and align the exhaust assembly.

### 18 00 020 Removing and installing complete exhaust system (M40)

Disconnect rubber ring on rear axle carrier.  
 Unfasten rear suspension.  
 Remove exhaust assembly.



18 18 001 U

Disconnect plug for oxygen sensor.  
 Unclasp wires in holder.



18 18 002 U

Unfasten baffle plate.  
 Unscrew exhaust pipes on manifold.

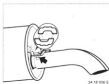
Installation:  
 Check gasket, replace if necessary.  
 Replace self-locking nuts.  
 Coat threads with copper paste CRC\*\*.



18 18 003 U

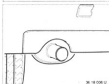
Unscrew exhaust pipe on transmission holder.

Installation:  
 Bolt holder free of tension after finishing installation of complete exhaust assembly.



18 18 004 U

Installation:  
 Pressed rubber mount in direction of travel up to end of long bars.



18 18 006 U

Installation:  
 Check position of tailpipe to body opening.  
 If necessary, loosen flange connection and rubber suspension rings and align exhaust assembly.

\*\* Source of Supply: BMW Parts service



### 18 12 012 REPLACING MUFFLER ASSY. (INTERMEDIATE AND FINAL MUFFLERS)

Unscrew muffler assembly on flange.

*Installation:*

Check gaskets, replacing if necessary.

Replace self-locking nuts.

Tightening torque = 22 Nm (16 ft. lbs.).



Unscrew holders for suspension on rear axle carrier.

*Installation:*

Adjust holders on tabs of exhaust pipe after installation of the muffler assembly and bolt down.

Tightening torque = 22 Nm (16 ft. lbs.).



Unscrew retainers.

Remove muffler assembly towards rear.

*Installation:*

Mount retainers in such a manner that the rubber rings are pre-loaded.

Preload  $A = 7 \text{ mm}$  (0.275").

Tightening torque = 22 Nm (16 ft. lbs.).



### 18 12 041 REPLACING PRIMARY MUFFLER

Unscrew exhaust pipe on exhaust manifold and exhaust pipe on flange.

*Installation:*

Replace self-locking nuts.



*Installation:*

Lubricate tapers on flanges with copper paste **GREEM**.

Flatten springs (2) uniformly by tightening nuts (1) with torque of 10 Nm (7 ft. lbs.).

Loosen nuts (1) again afterwards by one and one half turns.

Flanges must be parallel to each other or springs must not be pressed flat.

Tighten pipe with compensator last due to the danger of tensioning.



Unscrew primary muffler on flange.

*Installation:*

Replace self-locking nuts.

Tightening torque = 22 Nm (16 ft. lbs.).



Unscrew exhaust carrier on transmission and exhaust assembly.

*Installation:*

Mount carrier without tension.

Tightening torque = 22 Nm (16 ft. lbs.).



### 18 12 ... Disassembling exhaust system (MS1)

Release flange connection between front exhaust pipe and catalytic converter or heat muffler.



**Installation note:**  
Check sealing ring and replace if necessary.



**Installation note:**  
Turn flange such that the largest possible distance to neighbouring components is set. Align flanges parallel.



**Catalytic converter version:**

Release flange connection between catalytic converter and rear exhaust system.



**Note:**  
The sealing zone is formed by the pipe connection.



**Installation note:**  
Lightly grease connection with copper paste C8C\*\*.

The flanges must be set parallel with respect to each other.  
Turn flanges such that the largest possible ground clearance is obtained.

After complete installation, align exhaust system and firmly tighten all screw connections to the specified tightening torque\*.

\* Refer to Technical Data  
\*\* Source of Supply: BMW Parts Service

## 18-12/3

### 18 12 031 Replacing rear muffler (M51)

Remove complete muffler system.

Determine parting point (A) on new rear muffler (2).

Transfer determined size to installed rear muffler and mark.

Cut exhaust pipe with pipe cutter 60 2 200 and deburr.

Remove rear muffler.

Fit weld sleeve (3).

Align new rear muffler in installation position and connect with weld sleeve (3).

#### Note:

Ensure sufficient space to adjacent components.

Tack weld sleeve (3) with several weld dots.

Remove muffler system.

Completely weld sleeve (3) with inert gas welding set.

#### Installation note:

Coat stud bolts with copper paste -CRC-.

### 18 12 040 Replacing front muffler (M51)

Remove complete muffler system.

Determine parting point (B) on new rear muffler (1).

Transfer determined size to installed front muffler and mark.

Cut exhaust pipe with pipe cutter 60 2 200 and deburr.

Remove front muffler.

Fit weld sleeve (3).

Align new front muffler in installation position and connect with weld sleeve (3).

#### Note:

Ensure sufficient space to adjacent components.

Tack weld sleeve (3) with several weld dots.

Remove muffler system.

Completely weld sleeve (3) with inert gas welding set.

#### Installation note:

Coat stud bolts with copper paste -CRC-.

Location of weld connection

1 Front muffler

2 Rear muffler

3 Weld sleeve



**18 12 031 Replacing rear muffler (MS0)**

Remove center muffler together with rear muffler.

**Installation note:**

Coat stud bolts with copper paste -CWC-.

**Remove rear muffler:**

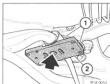
Determine parting point on new rear muffler.  
Transfer and mark determined size on installed rear muffler.

Cut exhaust pipe with pipe cutter and deburr.  
Remove rear muffler.

Fit weld sleeve

Install muffler system in vehicle.

Align new rear muffler in installation position and secure with weld sleeve. Remove muffler and completely weld welded sleeve.

**Install muffler:**

Secure vibration absorber (2) on support bracket of rear muffler with screw.

Tightening torque: 24 Nm.

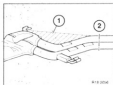
Pass arrester cable (1) around exhaust support bracket located on rear axle carrier and secure with screw to vibration absorber.

Tightening torque: 24 Nm



To avoid noises and paintwork damage, ensure sufficient space to adjacent components.

Ensure arrester cable (1) and vibration absorber (2) are fitted free moving and without tension.

**Installation note:**

Model S25A:

A vibration absorber must be installed if the reinforcement plate (1) is not installed at the center muffler on this model. Refer to next page for procedure. Set parting point (2) behind reinforcement plate.

**18 12 061 Replacing center muffler (MS0)**

This job is described in the job instructions "Replacing rear muffler", refer to 18 12 031 (MS0)



### 18 32 006 REMOVING AND INSTALLING OR REPLACING CATALYTIC CONVERTER

BMW 530i and 535i :  
Disconnect plug for oxygen sensor.



Disconnect leads on body or lift them out of holders.



Unscrew exhaust pipes on exhaust manifold.

Note:  
Replace self locking nuts.



Installation:

Lubricate taper of flanges with copper paste CIRC\*\*.

Flatten springs (2) uniformly by tightening nuts (1) with a torque of 10 Nm (7 ft. lbs.). Loosen nuts (1) afterwards by one and one half turns.

Flanges must be parallel with each other or springs must not be pressed flat.  
Tighten pipe with compressor last.

\*\* Source of Supply: Hilti



Unscrew exhaust carrier on transmission.

Installation:  
Mount carrier without tension.  
Tightening torque = 22 Nm (16 ft. lbs.).



Cars with Automatic Transmission:

Unscrew nut (2).  
Installation:  
Mount the exhaust carrier without tension by adjusting nut (2).  
Tightening torque = 22 Nm (16 ft. lbs.).



Unscrew flanges.

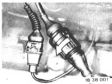
Installation:  
Check gaskets, replacing if necessary.  
Replace self locking nuts.  
Tightening torque = 22 Nm (16 ft. lbs.).



Unscrew oxygen sensor (1).

Strapping Information:  
Used catalytic converters can be returned for strapping in the same manner as warranty parts\*\*\*.

\*\*\* See Service Information



18 32 001

**18 32 005 REMOVING AND INSTALLING OR REPLACING CATALYTIC CONVERTER (M 5)**

Disconnect plug for oxygen sensor (bayonet retainer).



18 32 002

Unclip electric leads in holder on the transmission.



18 32 003

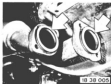
Remove cover.  
Disconnect electric leads.



18 32 004

Unscrew both exhaust pipes on the exhaust manifolds.

Installation:  
Tightening torque = 42 Nm (30 ft. lbs.).



18 32 005

Installation:  
Check gaskets, replacing if necessary.

Note:  
New gaskets have a self-adhesive coat to make installation easier. Pull off the plastic sheet. Install gasket with the adhesive surface facing the manifold.



18 32 006

Unscrew exhaust support on the transmission.

Installation:  
Mount exhaust support without tension. Loosen bolt on the transmission if necessary.



18 32 007

Unscrew muffler assembly on flanges. Take off catalytic converter.

Installation:  
Check gaskets, replacing if necessary. Replace self-locking nuts. Align flanges parallel. Tightening torque = 22 Nm (16 ft. lbs.).

Important!  
Gaskets are different. The wide gasket is located on the connection of the right pipe.



18 32 008

Arrangement of Primary and Final Muffler Connection



Unscrew oxygen sensor (1).

**Installation:**

Coat threads with Aero-Seize™.  
Tighten oxygen sensor with torque of 35 ± 5 Nm (40 ± 3.5 ft. lbs.) with Special Tool 11 7 020.

**Note:**

Never clean an oxygen sensor and never coat it with a lubricant.  
Protect the oxygen sensor while undercoating a car.

**Scraping Instructions:**

Used catalytic converters may be returned in the same manner as warranty parts\*\*\*.

\*\*\* Source of Supply: HWB

\*\*\* See Service Information

## 21 Clutch

21 00 006	Clutch – bleed .....	21- 00/1
010	Clutch disk – check for wear .....	21- 00/2
515	Clutch release travel – check .....	21- 00/3
21 21 500	Clutch – remove and install or replace .....	21- 21/1
21 51 500	Clutch release bearing/lever – remove and install or replace .....	21- 51/1
21 52 500	Clutch master cylinder – remove and install or replace .....	21- 52/1
510	Clutch slave cylinder – remove and install or replace .....	21- 52/2
502	Clutch master cylinder – overhaul .....	21- 52/3
512	Clutch slave cylinder – overhaul .....	21- 52/3
	Clutch – troubleshoot .....	21- 90/1



**21 00 006 Bleeding clutch**

Unscrew filler cap on reservoir.  
Remove float (1).  
Connect bleeding device.



Slowly open bleeder screw on clutch slave cylinder until air bubbles no longer escape. Depress clutch pedal several times.



If air is still trapped in the hydraulic system after bleeding several times, the slave cylinder must be removed from the transmission. Press push rod as far as it will go in slave cylinder and release slowly. This forces any residual air still trapped into the reservoir and achieves the maximum clutch release range. Do not press clutch pedal with slave cylinder removed.

## 21 00 010 Checking clutch disk for wear

Transmission:  
Getrag 240 S, 260 S, 260 R, 280 S

Transmission:  
S50 200G/200G, S50 260Z/310Z,  
S60 420G/560G

Remove slave cylinder, line remains connected,  
refer to 21 52 010.



Fit special tool 21 2 060, between transmission casing and slave cylinder, on piston rod of slave cylinder.

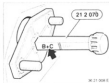


Clutch disk O.K.:

Shoulder of special tool 21 2 060 rests on housing of slave cylinder.

Clutch disk worn:

Special tool 21 2 060 cannot be pushed in so that the shoulder rests on the slave cylinder, a gap (A) of approx. 5 mm remains.



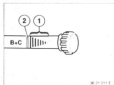
Fit special tool 21 2 070 such that the scale for the particular type of transmission can be seen from below.

Note:  
Determine type of transmission,  
refer to Technical Data Transmission Allocation PG 23.

B = S50 200G  
B = S50 260G  
C = S50 260Z  
C = S50 310Z  
D = S60 420G  
E = S60 560G



Firmly press thrust pin by hand against the clutch release lever and read off wear value.



The clutch disk must be replaced if the red area (2) can be seen.

- 1 Clutch disk O.K.
- 2 Clutch disk worn



#### 21 00 015 Determining clutch release travel

Fit test gage 21 2 060 in the recess and firmly press on piston rod of slave cylinder. Depress clutch pedal.



Remove slave cylinder from transmission - line remains connected.

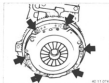


Measure marking line (M) made by test gage. If the clutch release stroke (marking line) is less than 20 mm, either there may be air in the hydraulic system or a garter sleeve may be defective.



## 21 21 500 Removing and installing or replacing clutch

(Transmission removed)



Loosen screws crosswise by one turn at a time until the clutch disk spring is released. Remove clutch and clutch disk.

### Installation note:

To avoid tension in the cover (can cause judder when starting off), fit screws by hand and then tighten crosswise by one turn at a time.

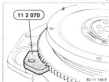
For tightening torque, refer to Technical Data 21 21 142.



Engine M30 | M31 | M40 | M50 | M52:  
Block flywheel with special tool 11 2 179.



Engine M30 | S38:  
Block flywheel with special tool 11 2 180.



Engine M50:  
Block flywheel with special tool 11 2 070.

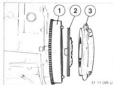


Installation note:  
Engine S38:  
Remove clamping sleeves and screws.



Installation note:  
Centre clutch disk with special tool  
21 2 100 / 120 / 130 (depending on diameter of  
transmission input shaft).

## 21-21/2

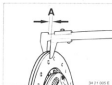


### Installation note:

- 1 Flywheel (dual mass flywheel)
- 2 Clutch disk
- 3 Clutch

### Caution!

Handle clutch disk carefully, do not touch surfaces of friction pads. Install clutch disk (2) in correct position. Observe "engine side"/"transmission side" printed on disk.



Check clutch disk for wear and damage and replace if necessary. Soiled clutch disks must always be replaced. Press together clutch disk at test point (vice, screw clamp) and measure thickness (A).

Minimum thickness, refer to Technical Data

Clean flywheel and clutch, check for wear and damage.

Replace flywheel/clutch if necessary.

### Caution!

Before installing a new flywheel and a new clutch, the anti-rust agent on the friction pads must be removed completely.

Only use cleaning agents approved by BMW for this purpose.

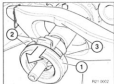
Refer to BMW Parts Service.

Check that deep-groove ball bearing in crankshaft moves smoothly and also check for leaks, replace if necessary.

Check that flywheel retaining screws are oil-tight and replace if necessary.

## 21 51 500 Removing and installing or replacing clutch release bearing / lever

(Transmission removed)

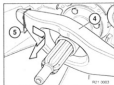


Remove release bearing (1).  
Clean all sliding surfaces on release bearing.

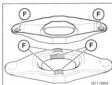
### Installation note:

Release bearing with plastic guide must not be greased on sliding surface for guide sleeve otherwise the release bearing can stick on the guide sleeves.

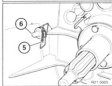
Sliding surfaces (2) of the release bearing must rest on the sliding surfaces (3) of the release lever.



Pull release lever (4) out of spring clip (5) and remove.



**Installation note:**  
Clean release lever and thinly grease on sliding surfaces (F).  
Grease, refer to BMW Fluids and Lubricants Specifications.



Check spring clip (5) and ball stud (6) for damage and replace if necessary.

### Note:

The spring clip and ball stud must always be replaced on transmission 5AS 420G.



Clean guide sleeve (7).

**Caution!**  
Do not grease guide sleeve.



12 21 015

### 21 52 500 Removing and installing or replacing clutch master cylinder

Release line (1) to slave cylinder.



12 21 016

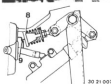
Unscrew filler cap on reservoir.  
Remove float (2).  
Drain off brake fluid in reservoir down to connection of top-up line.



12 21 017

Remove bottom left trim panel for instrument panel 91 45 190.  
Remove piston rod (3) from clutch pedal.

Installation note:  
Adjust clutch pedal with eccentric screw (7) (refer to Group 35).



30 21 007

#### Caution!

Before installing piston rod (3), engage over-center helper spring (8) in guide lug (6) on pedal assembly.



12 21 018

Remove top-up line (4). Release screws (5) and (6). Remove master cylinder.

Installation note:  
Bleed clutch 21 00 006.



30 21 016

### 21 52 510 Removing and installing or replacing clutch slave cylinder

Unscrew filler cap on reservoir.  
Remove float (2). Drain off brake fluid in reservoir down to connection of top-up line.



30 21 052

Detach slave cylinder from transmission.  
Remove slave cylinder.  
Release line (3).

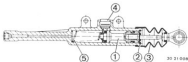
#### Installation note:

Thinly grease push rod at contact surface to release lever.

Grease, refer to BMW Fluids and Lubricants Specifications.

Bleeder screw points downward.

Bleed clutch, refer to 21 00 006.



### 21 52 502 Overhauling clutch master cylinder

(Master cylinder removed)

Clean master cylinder and inner parts with spirit.

If cylinder barrel is scored or has corrosion points, replace complete master cylinder. Install repair kit.

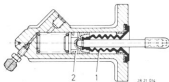
Note:

Only use repair kit of corresponding master cylinder manufacturer.

Consisting of

- 1 Piston assembly
- 2 O-ring
- 3 Dust cap
- 4 Sealing plug
- 5 Compression spring

Lightly coat cylinder barrel and grooved rings with brake cylinder paste - ATE\*\*)



### 21 52 512 Overhauling clutch slave cylinder

(Slave cylinder removed)

Clean slave cylinder and inner parts with spirit.

If cylinder barrel is scored or has corrosion points, replace complete slave cylinder. Install repair kit.

Note:

Only use repair kit of corresponding slave cylinder manufacturer.

Consisting of

- 1 Protective cap
  - 2 Grooved ring cup
- Retaining ring  
Toothed ring

Lightly coat cylinder barrel and grooved ring cup with brake cylinder paste - ATE\*\*)

## TROUBLESHOOTING CLUTCH

Condition	Cause	Correction
Clutch slips	<ul style="list-style-type: none"> <li>a) Clutch contact pressure insufficient</li> <li>b) Clutch liner wear excessive</li> <li>c) Oil on liners — transmission or crankshaft seal faulty</li> <li>d) Clutch overheat</li> <li>e) Clutch not original BMW part</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace clutch disc 21 21 . . .</li> <li>b) Replace drive plate 21 21 . . .</li> <li>c) Replace faulty seal and drive plate</li> <li>d) Replace clutch gibs 21 21 . . .</li> <li>e) Install original BMW parts</li> </ul>
Clutch grabs	<ul style="list-style-type: none"> <li>a) Liners not specified type</li> <li>b) Oil on liners</li> <li>c) Release pressure one-sidedly</li> <li>d) Pressure plate screws crooked</li> <li>e) Crankshaft not aligned with transmission input shaft</li> <li>f) Engine and transmission suspension defective</li> <li>g) Drive plate not original BMW part</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace drive plate 21 21 . . .</li> <li>b) Replace drive plate 21 21 . . .</li> <li>c) Check release lever</li> <li>d) Replace pressure plate 21 21 . . .</li> <li>e) Check centering surfaces on engine and transmission</li> <li>f) Replace engine and transmission suspension</li> <li>g) Install original BMW part</li> </ul>
Clutch will not separate	<ul style="list-style-type: none"> <li>a) Drive plate quenched excessively or liner broken</li> <li>b) Drive plate lateral runout excessive</li> <li>c) Liner rusted on flywheel</li> <li>d) Drive plate seized on transmission input shaft</li> <li>e) Pilot bearing for transmission input shaft in crankshaft faulty</li> <li>f) Air in clutch hydraulic system</li> <li>g) Tangential leaf springs of clutch bent off</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace drive plate 21 21 . . .</li> <li>b) Straighten or replace drive plate 21 21 000</li> <li>c) Clean flywheel, roughen liner with emery cloth</li> <li>d) Service drive plate on transmission input shaft, replacing damaged parts if necessary</li> <li>e) Replace pilot bearing in crankshaft 11 21 571</li> <li>f) Bleed clutch 21 00 000</li> <li>g) Replace clutch disc 21 21 . . .</li> </ul>
Clutch noise	<ul style="list-style-type: none"> <li>a) Imbalance of clutch disc and drive plate excessive</li> <li>b) Torsion damper defective</li> <li>c) Clutch release defective</li> <li>d) Pilot bearing for transmission input shaft in crankshaft faulty</li> <li>e) Rivets of clutch loose</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace clutch disc or drive plate 21 21 . . .</li> <li>b) Replace drive plate 21 21 000</li> <li>c) Replace clutch release 21 51 001</li> <li>d) Replace pilot bearing in crankshaft 11 21 571</li> <li>e) Replace clutch 21 21 . . .</li> </ul>

## 23 Manual transmission

00 11 229	Oil change in transmission .....	23-	0/1
23 00 022	Transmission – remove and install .....	23-	0/2
023	Transmission – remove and install – 4-wheel drive .....	23-	0/5
032	Exchange transmission – install .....	23-	0/9
23 12 053	Radial seal for output flange – replace .....	23-	12/1
083	Radial seal for selector shaft – replace .....	23-	12/2
	Selector transmission – troubleshoot .....	23-	90/1

For further work, refer to Construction Group Repair Manual





### 00 11 229 Oil change in manual transmission

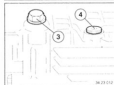
Oil should only be changed at operating temperature.  
 Unscrew drain plug (1) and filter plug (2).  
 Drain oil.

#### Caution\*

On the M 3 model:

The filler plug (3) on transmission 200 is located in the adapter case.

The opening (4) in the front section of the case is sealed with a shear-off screw and must not be used.



#### Note:

Dispose of used lubricant properly!

Clean and screw in drain plug.

Tightening torque 13 00 4A2\*

Fill new oil through filler aperture.

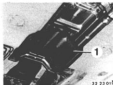
Refer to label or Consumables Specifications for grade of oil.

Volume\*

Oil must overflow through filler aperture.

Screw in filler plug (2).

Tightening torque 13 00 4A2\*



### 23 00 022 Removing and installing transmission

Disconnect negative lead from battery.

**Caution!**

First read fault memories with tester and print any faults as fault memories of control units will be cancelled by disconnecting the battery.  
Remove underbody protection.  
Remove complete exhaust unit 18 00 020.  
Model S24 sd, M2.  
Remove silencer assembly, 18 12 012.  
Remove heat baffle plate (1).

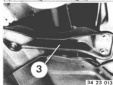
23 23 017



Model S25 14-M 51:  
Remove coolant expansion tank (1) from engine firewall.  
Coolant hose remains connected.  
Remove overflow hose from expansion tank.  
Remove assembly underbody protection.

On vehicles with 4-wheel drive, remove transfer box 27 10 010

24 23 012



Version with support.  
Remove support (2) on tunnel.  
Installation instruction:  
Tightening torque\*

34 23 013



Version with bracket:  
Remove bracket (4) from tunnel.  
Installation instruction:  
Tightening torque\*

34 23 014

\* Refer to Specifications



27 23 010



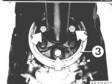
27 23 010

Remove cable from reverse gear switch.  
Support transmission from underside.  
Remove crossmember (2).

Installation instruction:  
Center transmission (see Gr. 26).  
Tightening torque\*.

Version with M 50 engine  
Remove crossmember (2).

Installation instruction:  
Tightening torque\*



27 23 010

Unscrew joint disk on transmission.

Note:

On version with vibration absorber:  
Vibration absorber (3) is secured at same time.  
Installation instruction:  
M2 model has thicker flexible coupling:  
note length of bolts.  
Models S18 | ...S20-1 = 56 mm  
M 5 = 60 mm

Installation instruction:  
Tighten nuts with 10 mm insert (standard size)  
filled to torque wrench.  
Tightening torque\*.

**Caution!**

To avoid tension stress on flexible coupling,  
only tighten nuts on the flange side.

\* Refer to Specifications



27 23 014



Version with sliding member:  
Loosen ring nut (7) a few turns.

Installation instruction:  
Tighten ring nut (7) with special tool 26 1 040 after finishing installation.  
Tightening torque\*.

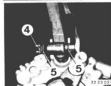


Unscrew center mount.  
Installation instruction:  
Preload center mount in direction of travel (A).  
With sliding member on center mount  
A = 4... 6 mm  
Without sliding member on center mount  
A = 2... 4 mm.  
Tightening torque\*.  
Bend flexible coupling downwards and remove from centering spigot.  
Caution!  
Don't let the propeller shaft fall into the joints. Suspend propeller shaft from car as a piece of wire.



310 i model:  
Three-section propshaft.  
Remove second center mount from rear of body.

Installation:  
Preload center mount in direction of travel  
A=2...4 mm.  
Tightening torque\*.



Lift out retaining disk (4) and remove washers (5).  
Withdraw selector rod.

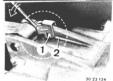
\* Refer to Specifications



Lower transmission.

Caution! Model M 6:  
To avoid distortion of the engine firewall, before draining the transmission always insert spacer plate 23 1 330 between crossmember and oil pan.

On version with M 50 engine:  
To prevent the transmission from contacting the stabilizer bar, insert space plate 23 1 330.



Lift spring (1) off of tab (2) on case using a screwdriver and leaning upwards.  
Pull out shaft.

Installation instruction:  
Lubricate shaft lightly with Molykote Long term 2.



Remove clutch slave cylinder.  
Pressure pipe remains connected.

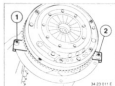
Installation instruction:  
Also secure bracket (1) for pressure lead, if fitted.  
Tightening torque\*



Unscrew transmission on engine.  
Unscrew Torx bolts with a Torx socket.  
Remove transmission toward rear.

Caution! Installation instructions:  
Washers must be used on the version with Torx bolts to avoid increasing the breaking loose torque.  
Tightening torque\*.  
310 i model  
Also secure bracket for heating connections.

\* Refer to Specifications



34 23 011 E

**Caution!**

Check that dowel sleeves (1 and 2) are not missing prior to installation of the transmission. Transfer guide sleeves from transmission or replace guide sleeves as applicable.

Coat splines and guide pins lightly with Micro-lube GL 250<sup>1)</sup> prior to installation of the transmission.

Check oil level.



34 23 012

**Caution!**

On model with M 5 engine:

The filter screw (3) on transmission 280 is located in the adapter case.

The aperture (4) in the front section of the case is sealed with a shear-off bolt and must not be used.

### 23 00 023 Removing and installing transmission - 4-wheel drive -

Unscrew negative lead from battery support point and remove.

#### Caution!

First read fault memories with tester and print any faults as fault memories of control units will be cancelled by disconnecting the battery. Removing and installing exhaust until 18 00 020

#### a Unfasten fan shroud:

Remove expanding rivets from fan shroud and lift fan shroud up slightly.



#### Installation instruction:

Connect up fan shroud on left and right and in center.



#### b Remove propshaft:

Remove heat baffle plate.



Unscrew propeller shaft on transmission.

#### Installation instruction:

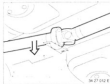
Replace stop nuts.  
Tightening torque 26 11 242



Unscrew center mount.

#### Installation instruction:

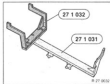
Pre-load center mount in direction of travel  
A = 2 ... 4 mm.  
Tightening torque 26 11 842



Fold propeller shaft downwards and withdraw from transmission.

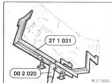
#### Caution!

Do not allow the propeller shaft to drag into the joints.  
Suspend propeller shaft from car on a piece of wire.



Pre-assemble special tools 27 1 031 and 27 1 032 to suit manual selector transmission.

\* Refer to Specifications



Support transmission on lifting fixture 00 2 030.



Screw additional bracket on to secure the transmission.



Set inclination by tightening the knurled-head bolts.



Unscrew cross-member from body and transfer box and remove.

Lower transmission.

Installation instructions:  
tightening torque 23 71 1A2 / 3A2\*

\* Refer to Specifications



Jam a block (wooden or similar material) between front axle carrier and engine oil pan (A = 50 mm).

Note:

The block prevents the engine from tipping forwards when the transmission flange is unfastened.



Installation instruction:

When lowering the transmission, the coolant air guide for the alternator can slip out. Check once the transmission has been installed.



Remove cable from reversing light switch.



Turn bayonet connection for transfer box control counter-clockwise and remove.

Installation instruction:

Fit plug in such a way that the marking grooves are aligned with one another.



Remove bracket for cable on transmission control unit.

24 07 001 5



**c** Removing clutch slave cylinder.

Unscrew clutch slave cylinder.  
Pressure pipe remains connected.

**Caution!**  
Do not actuate the clutch pedal.

24 07 001 2



**d** Remove selector arm

**Left side:**  
Insert screwdriver between spring and transmission case.  
Lift spring off lug on case and swivel upwards.  
Remove bolt.

24 05 0001



**Right side:**  
Insert screwdriver between spring and transmission case.  
Lift spring off lug on case and swivel upwards.  
Remove bolt.

24 05 0002



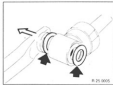
**Installation instruction:**  
Check that selector arm is in correct position in rear rubber grommet.

24 05 0003



Pull off retainer.

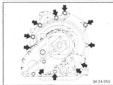
24 05 0004



Withdraw selector rod.

**Note:**  
Take care of washers.

24 05 0005



**e** Remove transmission.

Disconnect transmission flange from engine.

24 04 0003



**Installation note:**  
Note washers on Torx screws.

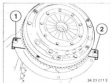
For tightening torque, refer to Technical Data 23 00 142.

Remove transmission by pulling to rear.



**Installation note:**  
Clean splines of clutch disk.  
Clean splines and guide pins of drive shaft and grease thinly.  
The amount of grease necessary for this purpose corresponds to the size of a kernel of corn (maize).  
Grease.  
refer to BMW Fluids and Lubricants Specifications.

**Installation note:**  
After installing the transmission, check oil level in manual transmission and transfer box.



**Installation note:**  
Note fitted bushes (1 - 3).  
If necessary, use fitted bushes from transmission or replace.  
Ensure covering plate is fitted in correct position.

**Installation note:**  
Remove release bearing and release lever, clean and grease at specified points, refer to 51 51 500.



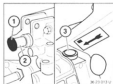
## 23 00 032 Installing exchange transmission

Removing and installing exchange transmission 23 00 032.

Transmission identification:  
BMW code\* bonded on front section of transmission.

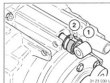
All:

Install release bearing and release lever in the new transmission; refer to 21 51 500.

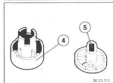


Transmission type ZF-5 5-16/S 5 D 316 Z.

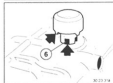
**Note:**  
Before installing transmission, fit breather (1) (see adhesive label).  
Remove breather (1) and protective sleeve (2) from gearshift shaft.  
Remove end cap (3) and install breather.



Convert shift rod joint.  
Push back retaining sleeve (1).  
Drive out parallel dowel pin (2).



**Caution!**  
New breather as of 8.85.  
Differentiating features:  
New version (4)  
Old version (5)



**Breather version (4):**  
Ensure the breather is fitted correctly (due to the increased height).  
Centre breather with plastic-headed hammer and knock in with slot (6) positioned in longitudinal direction of the transmission.  
Lug collides with casing wall.

\* Refer to Technical Data

Convert exhaust support bracket and backup light switch.

**Caution!**  
Transmissions are supplied filled with oil.  
Therefore only check the oil level after installing the transmission.

## 23-12/1



### 23 12 053 Replacing radial oil seal for output flange

From propeller shaft and center bearing

Removal, refer to 23 06 022

Lift out tab washer (1).

Installation note:

Replace tab washer.



Fit special tool 23 1 200.

Hold output flange with special tool 23 0 020.

Release flanged nut with socket 23 1 210.

Installation note:

Fit flanged nut with screw locking

compound\*\*).  
Tightening torque\*



Transmission 23 0 310 Z.

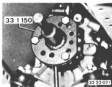
Hold output flange with special tool 23 0 020.

Release flanged nut (1) with socket 23 2 320.

Installation note:

Fit flanged nut (1) with screw locking

compound\*\*).  
Tightening torque\*



Remove output flange with special tool 23 1 150.

Installation note:

Transmission 550 316Z

Heat output flange to approx. 80°C (hot air blower).

Slide output flange onto output shaft and, if necessary, drive on as far as it will go with special tool 23 1 150.



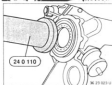
Remove radial oil seal with special tool 00 5 010.



Transmission 240, 260, 280:

Oil sealing lip of radial oil seal.

Install radial oil seal flush with special tool 23 1 380 in conjunction with 00 5 500.



Transmission 5 5 D 300 G:

Oil sealing lip of radial oil seal.

Install radial oil seal flush with special tool 24 0 110.

\*] Refer to Technical Data

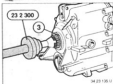
\*\*] Source of supply: BMW Parts Service

## 23-12/2



### 2F-3 S-18 Transmissions:

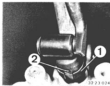
Lubricate sealing lip of the radial oil seal with oil.  
Drive radial oil seal in flush using Special Tool 23 2 160.



### S 8 D 310 Z Transmissions:

Lubricate sealing lip of the radial oil seal with oil.  
Drive radial oil seal (3) in flush using Special Tool 23 2 300.

**Important!**  
Use a plastic hammer to drive seals in.  
Check oil level, correcting if necessary.

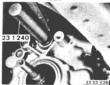


### 23 12 083 REPLACING RADIAL OIL SEAL FOR SHIFT SHAFT

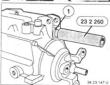
Unscrew propeller shaft - refer to 23 00 022.  
Engage 5th gear.  
Push locking sleeve (1) out of the way and drive cylindrical pin (2) out.



Lever radial oil seal out using a narrow screwdriver.



Lubricate sealing lip of the radial oil seal with oil.  
Drive radial oil seal in using Special Tool 23 1 240.  
Check oil level, correcting if necessary.



### S 8 D 310 Z Transmissions:

Drive radial oil seal (1) in using Special Tool 23 2 260.

Replacing radial oil seal for input shaft - refer to 23 12 ... in the Construction Group Repair Manual.

## TROUBLESHOOTING ON MANUAL TRANSMISSION

FAULT	CAUSE	CORRECTIVE MEASURES
Oil on clutch bell housing	a) Guide flange leaking	a) Seal guide flange
	b) Radial oil seal for drive shaft leaking	b) Replace radial oil seal 23 12 ...
	c) Gasket on end cover (crankcase leaking)	c) Replace gasket 11 14 811
	d) Radial oil seal for crankshaft leaking	d) Replace radial oil seal 11 14 811
Oil on output flange	a) Radial oil seal for output flange leaking	a) Replace radial oil seal 23 12 063
	b) Radial oil seal for gearshift shaft leaking	b) Replace radial oil seal 23 12 062
Transmission leaking between front and rear section	a) Casing leaking	a) Seal casing
Oil on breather	a) Oil level too high	a) Correct oil level
	b) Wrong oil (excessive foaming)	b) Replace oil
Gear does not lock in - jumps out	a) Sliding sleeve worn, slide rail defective, springs broken	a) Replace defective parts 23 23 ...
	b) Sliding sleeves for 1st/2nd gear and 3rd/4th gear interchanged	b) Install sliding sleeve correctly 23 21 ...
	c) Gearshift arm mounting defective	c) Check gearshift arm mounting 25 11 211
	d) Shift fork worn	d) Replace shift fork 23 21 ...
	e) Output flange loose	e) Secure output flange

## TROUBLESHOOTING MANUAL TRANSMISSION

Condition	Cause	Correction
Hard moving, hesitant shifts (sticking)	<ul style="list-style-type: none"> <li>a) Clutch disengages insufficiently               <ul style="list-style-type: none"> <li>1. Pedal travel insufficient</li> <li>2. Drive plate worn</li> <li>3. Lever seized on flywheel</li> <li>4. Drive plate seized on transmission input shaft</li> <li>5. Bearing in crankshaft for transmission input shaft faulty</li> <li>6. Air in clutch hydraulic system</li> </ul> </li> <li>b) Cold shifting force too high</li> <li>c) Excessive play in selector lever bearings</li> <li>d) Selector forks worn</li> <li>e) Sliding sleeve worn</li> </ul>	<ul style="list-style-type: none"> <li>a)               <ul style="list-style-type: none"> <li>1. Check/adjust pedal travel; remove excessively thick mats; floor clutch pedal for shifts 25 21 000</li> <li>2. Replace drive plate 21 21 000</li> <li>3. Clean flywheel; replace drive plate 21 21 000</li> <li>4. Service or replace drive plate 21 21 000</li> <li>5. Replace bearing in crankshaft 11 21 571</li> <li>6. Bleed clutch 21 00 008</li> </ul> </li> <li>b) Pour in HD engine oil SAE 20 ... 40</li> <li>c) Check selector lever bearings, replacing worn rubber mounts if necessary 25 11 211</li> <li>d) Replace selector forks 23 21 ...</li> <li>e) Replace sliding sleeve 23 23 ...</li> </ul>
Transmission scratches while shifting	<ul style="list-style-type: none"> <li>a) Clutch disengages insufficiently - see a) above</li> <li>b) Synchronizer rings worn/sliding sleeve scored</li> <li>c) Reverse gear: shifting break of 3 seconds not held</li> </ul>	<ul style="list-style-type: none"> <li>a) See a) above</li> <li>b) Check synchronization/replace damaged parts 23 23 ...</li> <li>c) Keep to specified break</li> </ul>
Transmission loud	<ul style="list-style-type: none"> <li>a) Oil level too low</li> <li>b) Transmission shaft bearings defective</li> <li>c) Damaged parts (gears)</li> <li>d) Needle bearing on output or input shaft faulty</li> <li>e) Bearing in crankshaft for transmission input shaft faulty</li> </ul>	<ul style="list-style-type: none"> <li>a) Correct oil level</li> <li>b) Replace all bearings 23 21 ...</li> <li>c) Replace pair or set of gears 23 21 ...</li> <li>d) Replace needle bearing 23 21 ...</li> <li>e) Replace bearing in crankshaft 11 21 571</li> </ul>

## 24 Automatic transmission

4 HP-22 / H + EH.....

A4S 270 R / 310 R .....

A5S 310 Z .....

A5S 300 J .....

A5S 560 Z .....

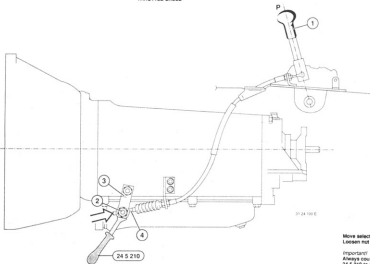
## 24 Automatic transmission

### 4 HP-22 / H + EH

24 00 006	Selector lever, throttle linkage and throttle cable – adjust .....	24- 00/1
011	Hydraulic pressure values – check .....	24- 00/4
022	Transmission – remove and install .....	24- 00/5
042	Transmission – exchange .....	24- 00/9
24 11 002	Oil sump – remove and install .....	24- 11/1
052	Transmission extension – remove and install/seal .....	24- 11/2
24 12 013	Radial oil seal for output flange – replace .....	24- 12/1
103	Radial oil seal for manual shift valve shaft – replace .....	24- 12/2
24 30 002	Valve body – remove and install .....	24- 30/1
24 31 152	Oil strainer on valve body – remove and install .....	24- 31/1
24 32 002	Centrifugal governor – remove and install .....	24- 32/1
505	Centrifugal governor – disassemble and assemble .....	24- 32/1
24 34 002	Parking lock pawl – remove and install .....	24- 34/1
102	Throttle cable – replace .....	24- 34/1
702	Throttle cable spring – replace .....	24- 34/2
851	Solenoids – replace .....	24- 34/3
...	Solenoids (for kickdown downshift lock) – replace .....	24- 34/3
860	Pressure regulator – replace .....	24- 34/4
870	Pulse sender – replace .....	24- 34/4
24 35 500	Wire harness for automatic transmission – replace .....	24- 35/1
502	Wire harness for kickdown downshift lock – replace .....	24- 35/1
24 61 500	Control unit (EH) – remove and install or replace .....	24- 61/1
514	Control unit for downshift lock – replace .....	24- 61/2
...	Control unit for kickdown downshift lock – replace .....	24- 61/2
	Automatic transmission – troubleshoot .....	24- 90/1

Refer to "Group 24 in Construction Group Repair Manual" for other jobs.

24 90 006 ADJUSTING SELECTOR LEVER,  
THROTTLE LINKAGE AND  
THROTTLE CABLE



Move selector lever (1) to "P".  
Loosen nut (2).

**Important!**  
Always counterhold bolt with Special Tool 24 S 210 to avoid deformation of the cable. Special Tool 24 S 210 can only be applied in position P.

Press lever (3) forward (park position).  
Press cable rod (4) opposite forward  
direction.  
Clamp cable rod (4) by tightening nut (2)  
(counterhold with Special Tool 24 S 210).  
Tightening torque: 10 ... 12 Nm.





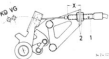
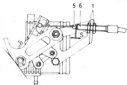
M 24 00/2

**B) Adjusting Throttle Cable:**

Requirement: correct full throttle adjustment – adjust if necessary – see 35 41 421.

**M 20 Engine:**

Adjust play (5) to  $0,50 \pm 0,25$  mm ( $0,020 \pm 0,010$ "\*) with nuts (1) in idle position.

**M 30 Engine****M 30 Engine with Passing Element in Throttle Valve Assembly:**

Requirements: throttle cable in correct installed position and connected on the throttle valve lever.

Basic distance (X) = approx. 22,5 mm ( $0,886$ "\*).

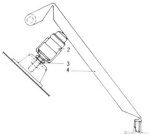
Move throttle valve to full load position.

Turn adjusting screw (1) to adjust the throttle cable without play in full load position or transmission kickdown pressure point.

Tighten lock nuts (2) in this position.

VG = Full load position

RD = Kickdown position

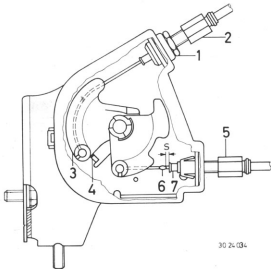
**Check kickdown stop (2).**

Loosen lock nut (3) and screw in kickdown stop (2). Operate accelerator pedal (4) up to the transmission pressure point.

Unscrew the kickdown stop in this position, until the accelerator pedal bears.

Operate accelerator pedal (4) to kickdown (final position).

Now distance (5) from lead seal (3) to end of sleeve (6) must be at least 44 mm ( $1,732$ "\*).



#### 4) Adjusting Throttle Cable (BMW 524 cc)

Version with pedal valve sender.

Requirement: correct engine idle speed.

If not, adjust engine idle speed - see 12 72 ...

Counterhold on nut (1).

Turn adjusting screw (2) until reversing lever (3) bears on stop (4).

Cable must not sag after this step.

Adjust play (5) between lead seal (6) and sleeve (7) to  $0.50 \pm 0.25$  mm (0.020 ± 0.010")

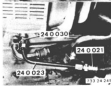
by turning adjusting screw (5).

Check full throttle stop - see 12 72 ...

Press accelerator pedal to final position (kickdown).

The distance from lead seal (6) to sleeve (7)

must now be at least 44 mm (1.732").



#### 24 00 011 CHECKING HYDRAULIC PRESSURE VALUES

Connect Special Tools 24 0 021 and 13 3 051.

Remove pertinent plugs for testing.

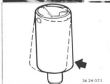
- 1 Pump pressure
- 2 Clutch A
- 3 Converter pressure

Installation:  
Tightening torque\*.

A) Pump Pressure:  
Mount Special Tool 24 0 070 with a seal on the transmission.  
Connect Special Tool 24 0 023 in conjunction with Special Tool 24 0 021.

B) Converter Pressure:  
Mount Special Tool 24 0 030 on the transmission.  
Connect Special Tool 24 0 023 in conjunction with Special Tool 24 0 021.

Test:	Pos.	Gear	Speed (rpm)	Pressure in bar (psi)
Pump pressure	D	1	700 ... 1000	6.0 ... 7.5 (85 ... 107)
		2, 3, 4	approx. 4000	4.0 ... 5.0 (55 ... 82)
	R	R	700 ... 1000	11 ... 13 (157 ... 185)
Converter pressure	D	4	Converter locked	max. 0.7 (10)



Check oil level with selector lever in P and engine running at idle speed, adding oil if necessary.

Car parked on level ground or floor. Oil level should not be below ball (1) after a test drive and an oil temperature of approx. 80° C (165° F). Oil level should be between min. and max. marks at an oil temperature of approx. 80° C (175° F). Amount of oil between min. and max. marks is approx. 0.3 ltr. (0.5 pint). Never wipe off dipstick with a cloth losing lint.

Important!  
Oil Dipstick Version with Lock!  
Oil dipstick can be pulled out only after tilting the grip.

Important!  
Oil Level Too High:  
Strong foaming, splash loss, high temperature when driving fast, oil lost via vent.

Oil Level Too Low:  
Valves rattling, foaming, engine slipping when driving in curves, general operating disturbances.

Only pour in ATF with Special Tool 24 0 080 (funnel).



30 24 000



30 24 001



30 24 026



30 24 012

## 24 00 022 REMOVING AND INSTALLING TRANSMISSION

Disconnect battery ground lead.

### Important!

Disconnecting the battery will cancel fault memories of the control units. Consequently always first read fault memories with a tester and print any faults.

**M 20 Engine:**  
Unscrew nut (1).  
Disconnect throttle cable.

**Installation:**  
Adjust throttle cable – see 24 00 006.

**M 30 Engine:**  
Unscrew nut (1).  
Disconnect throttle cable.

**M 29 Engine:**  
Disconnect throttle cable.  
Squeeze holders.  
Pull out adjusting screw with throttle cable.

Remove exhaust assembly – see 18 00 020.  
Remove heat shield (1).



30 24 014



30 24 043



30 24 026



30 24 040

Support transmission from underneath with Special Tools 24 0 120 and 00 2 020.  
Remove cross member (2).

**Installation:**  
Center transmission – see Group 20.  
Tightening torque\*.

**Version with Universal Joint:**  
Unscrew propeller shaft on transmission.

**Installation:**  
Tighten nuts with specified tightening torque\*.

**Version with Joint Disc:**  
Unscrew joint disc on transmission.

**Installation:**  
Replace stop nuts.  
Tighten nuts and bolts with a standard 17 mm wrench socket and a torque wrench.  
Tightening torque\*.

\* See Specifications



26 1040

**Version with Threaded Ring:**  
Loosen threaded ring (1) several turns.

**Installation:**  
Tighten threaded ring (1) after complete installation, using Special Tool 26 1 040. Tightening torque\*.



24 5 210

Unscrew center mount.  
**Installation:**  
Preload center mount in forward direction by distance (A).  
With slide on center mount A = 4...5 mm  
Without slide on center mount A = 2...4 mm  
Bend propeller shaft down and pull it off the transmission.

**Important!**  
Prevent the propeller shaft from falling into the joints – suspend it from car on a piece of wire.  
Tightening torque\*.



24 5 210

**Important! – Installation:**  
Check condition of O-rings (1), replacing them if necessary.

Unscrew nut (4) with selector lever in P.

**Important!**  
Always counterhold on the bolt with Special Tool 24 5 210 to avoid deformation of the cable.

**Note:**  
The special tool can only be applied with the selector lever in P.

Unscrew cable from holder.  
Pull cable out.

**Installation:**  
Tightening torque\*.  
Adjust shift - refer to 24 00 006.



24 5 210

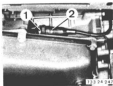


24 2 004

**Drain ATF.**  
**Important!**  
Never reuse drained ATF.  
**Installation:**  
If ATF has a burnt odor and is black, the transmission will have to be disassembled.  
**Important!**  
If transmission is faulty, clean oil cooler and pipes with compressed air and flush twice with ATF.

Remove oil filler pipe (1).  
Unscrew oil cooler pipe at transmission.  
Tightening torque\*

\* Refer to Specifications



24 5 210

Only for Version with EH Transmission or Kickdown Interlock:  
Twist bayonet interlock (1) to the left.  
Disconnect plug (2).  
Pull wire harness out of the holder.

**Installation:**  
Connect plug (2) that the marks are aligned.

\* Refer to Specifications



#### M20 and M21 Engines:

Remove reinforcement.  
Unscrew Torx bolts with a Torx wrench socket\*.

**Important!** – Installation:  
Washers must be used with the Torx bolts to avoid increasing the breaking loose torque.  
Tightening torque\*.

Remove protective grid.



Unscrew torque converter from drive plate at three points, turning the flywheel for this purpose.

**Important!**  
Only size M 10 x 16 mm bolts may be used together with spring washers.  
Non-conformance would lead to destruction of the transmission.  
Tightening torque\*.



#### M20 Engines:

Remove cap from oil pan opening (1).  
Unscrew torque converter from drive plate at three points, using Special Tool 24 1 110 and turning the flywheel for this purpose.



**Installation:**  
Install and tighten bolts using Special Tool 24 1 110 and a torque wrench.  
Tightening torque\*.

**Important!**  
Only size M 10 x 16 mm bolts may be used together with spring washers.  
Non-conformance would lead to destruction of the transmission.



Lower transmission as far as possible and unbolt it from the engine.  
Unscrew Torx bolts with a Torx wrench socket.

**Important!** – Installation:  
Washers must be used with the Torx bolts to avoid increasing the breaking loose torque.  
Tightening torque\*.



Apply and clamp Special Tool 24 4 080 on the transmission case to prevent the torque converter from sliding out.  
Pull transmission off of the engine.

**Important!**  
The special tool jack with mounted transmission may only be moved in completely lowered position.

\* Refer to Specifications  
- Source of Supply: Sahr Parts

\* Refer to Specifications



34 24 002

**Important!**

Ensure that dowel sleeves (1 and 2) are not missing prior to installation of the transmission.  
If necessary, transfer the sleeves from the transmission or install new sleeves.



32 24 021

**Important! - Installation:**

Check installed position of the torque converter — the drive ring must be located below the case edge.

**Note:**

Ensure that the converter remains in the installed position while assembling, using Special Tool 24 4 080 to prevent it from sliding out if necessary.



20 24 022

**Installation:**

Check drive plate for breaks and cracks, replacing it if necessary.

**M20 and M21 Engines:**

Hold flywheel using Special Tool 11 2 170.

**Important!**

Replace expansion bolts and install new bolts with a bolt cement\*\*.  
Only coat the threads.  
Clean the tapped bores thoroughly.  
Tightening torque\*.



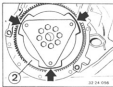
13 24 023

**M30 Engines:**

Hold flywheel using Special Tool 11 2 160.  
Unscrew expansion bolts.

\* Refer to Specifications

\*\* Source of Supply: BMW Parts



32 24 006

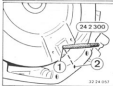
**Version with Sheet Metal Flywheel (2):****Important!**

Keep to sequence of installation.

Sheet metal flywheel (2) has three indentations to take the mounting tabs of the torque converter.

The three mounting tabs of the torque converter must be aligned with the three indentations of the sheet metal flywheel while guiding the engine and transmission together.

Non-conformance will cause follow-up damage on the automatic transmission. Cranking the torque converter or engine would no longer be possible after guiding together and leads to damage.

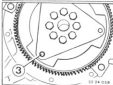


24 2 300

32 24 007

Turn the torque converter on the transmission to have hole (1) on the tab aligned with the 6 mm dia. bore (2) in the transmission case.

Screw Special Tool 24 2 300 into the tab.



32 24 008

Bore (2) on the drive plate must point to the center of the oil pan opening.



24 2 300

32 24 009

LRN the automatic transmission until bore (2) in the drive plate is reached.

Slide the transmission into bore (2) of the drive plate carefully, using Special Tool 24 2 300.

Unscrew the transmission case from the engine.

Screw Special Tool 24 2 300 out of the tab towards the front.

Secure the torque converter.

### 24 00 043 INSTALLING EXCHANGE TRANSMISSION

Remove transmission - see 24 00 022.

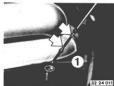
**Important!**  
Always clean off cooler and pipes with air pressure and flush twice with ATF before installing an exchange transmission. Transmission Identification\* is on the data plate.

Transfer transporting holder (1), lever (2) and bracket (3).

Transfer rubber mounts and exhaust holders.

**Important! - Installation:**  
Automatic transmissions are supplied filled with oil. Remove plug on oil sump prior to installation of the oil filter pipe. Catch escaping ATF in a clean container.

Pour in ATF again with help of Special Tool 24 0 080 (funnel) after installation of the transmission.



Check oil level with the selector lever in P, engine running at idle speed and car parked on level floor or ground, adding ATF if necessary.

Oil level should not be below ball (1) after a test drive and with a transmission oil temperature of approx. 40° C (100° F).

Oil level should be between the min. and max. marks with an oil temperature of approx. 80° C (175° F).

Amount of oil between the min. and max. marks is approx. 0.3 ltr. (0.8 pint). Never wipe off the oil dipstick with a cloth losing lint.

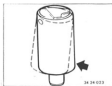
**Important!**

**Oil Level Too High:**  
Strong foaming, splash loss, high temperature when driving fast, oil lost via the vent.

**Oil Level Too Low:**  
Valves rattling, foaming, engine slipping while driving in curves, general operating disturbances.

**Important!**

**Oil Dipstick Version with Lock:**  
The oil dipstick can be pulled out only after tilting the grip.





## 24 11 002 REMOVING AND INSTALLING OIL SUMP

### Drain oil.

**Important!**  
Never reuse drained oil.

### Installation:

The transmission will have to be disassembled, if the oil smells burnt and is pitch black.

Unscrew oil filler pipe on the oil sump.  
Unscrew oil sump.

### Installation:

Tightening torque\*.

### Installation:

Mount oil sump with the brackets in such a manner that the short leg presses on the oil sump.  
Tightening torque\*.

### Important!

Both brackets with sright legs must be mounted on the sides.

### Clean oil sump.

### Important!

Place magnets (1 and 2) in the oil sump.  
Install gasket (3).



Pour in oil\*.

**Important!**  
Special Tool 24 0 080 (funnel) must always be used to pour in ATF.



Check oil level with the selector lever in P, engine running at idle speed and car parked on level floor or ground, adding ATF if necessary.

Oil level should not be below ball (1) after a test drive and with a transmission oil temperature of approx. 40° C (105° F).

Oil level should be between the min. and max. marks with an oil temperature of approx. 80° C (175° F).

Amount of oil between the min. and max. marks is approx. 0.3 ltr. (0.6 pint). Never wipe off the oil dipstick with a cloth bearing lint.

### Oil Level Too High:

Strong foaming, splash loss, high temperature when driving fast, oil lost via the vent.

### Oil Level Too Low:

Valves rattling, foaming, engine slipping and general operating disturbances.

### Important!

#### Oil Dipstick Version with Lock:

The oil dipstick can be pulled out only after tilting the grip.



\* See Specifications

\* See Specifications



#### 24 11 002 REMOVING AND INSTALLING OR SEALING TRANSMISSION EXTENSION

Unscrew propeller shaft - see  
24 00 023.  
Lift out lockplate (1).

Installation:  
Replace lockplate.



Hold output range with Special Tool  
23 1 210.  
Unscrew collar nut with Special Tool  
23 1 210.  
Pull off output range.

Installation:  
Tightening torque\*.



Support transmission with Special  
Tools 24 0 120 and 00 2 030.  
Remove cross member with rubber  
mounts.  
Lower the transmission.

Installation:  
Center transmission - see Group 26.  
Tightening torque\*.



Unscrew transmission extension.

Installation:  
Replace gasket (1).  
Tightening torque\*.

\* See Specifications

## 24-12/1



### 24 12 013 REPLACING RADIAL OIL SEAL FOR OUTPUT FLANGE

Unscrew propeller shaft — see 24 00 022.  
Lift out lockplate (1).  
Installation:  
Replace lockplate.



Lubricate sealing lip with ATF.  
Drive in radial oil seal with Special Tools  
23 1 380 and 00 5 500.



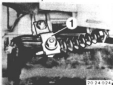
Hold output flange with Special Tool  
23 0 020.  
Unscrew collar nut with Special Tool  
23 1 210.  
Pull off output flange.  
Installation:  
Tightening torque\*.



Pull out radial oil seal with Special Tool  
00 5 010.

Replace radial oil seal for torque converter  
see 24 12 ... in Construction Group Repair  
Manual.

\* See Specifications



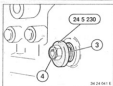
**24 12 100 REPLACING RADIAL OIL SEAL FOR MANUAL SHIFT VALVE SHAFT**

Unscrew selector lever (1) from the transmission.

Installation:  
Tightening torque\*.



Lever radial oil seal (2) out using a narrow screwdriver.



Installation:

Lubricate the sealing lip of the radial oil seal with ATF.  
Apply Special Tool 24 5 230 on the selector lever shaft.

Screw lever mounting nut (4) onto the shaft.  
Press radial oil seal (2) in using Special Tool 24 5 230 and with help of the nut.



#### 24 30 002 REMOVING AND INSTALLING VALVE BODY

Remove oil sump - see 24 11 002.  
Remove oil filter screen.

##### Installation:

Check length of bolts - 65 mm long.  
Tightening torque\*.



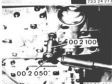
Remove valve body.  
Unscrew Torx bolts with Special Tool 00 2 100.

##### Important:

Only unscrew bolts with bolt head size **A** = 12 mm.

##### Installation:

Bolts differ in length.  
Bolt (1) = 65 mm long.  
Bolt (2) = 60 mm long.



##### Installation:

Tighten Torx bolts with Special Tools 00 2 100 and 00 2 050.  
Tightening torque\*.



##### Installation:

Mount valve body that clamp on selector valve can be connected in operating finger of pawl.  
This requires pulling the transmission cable slightly so that throttle cam (2) cannot clamp on throttle pressure valve (3).

\* See Specifications



Install valve body and screw in bolts only finger tight.  
Align valve body with Special Tool 24 3 050.

If this tool is not available, check that distance from valve body case to pin of throttle pressure piston is 11.5 mm (0.453").

Tighten valve body bolts.

Only Version with EM Transmission or Kickdown Preventer:

Turn bayonet fastener (1) to the left.  
Pull off plug (2).  
Unscrew nut (3).

##### Installation:

Connect plug (2) in such a manner that the marking lines are aligned.



Pull out socket toward inside.

##### Installation:

Check O-ring (4), replacing if necessary.  
Plug in socket with the flat side facing out.  
Tightening torque\*.



##### Note:

Also mount the pulse sender on the valve body.  
Tabs on holder (3) must engage in the groove of plug.

\* See Specifications

## 24-31/1



### 24 31 152 REMOVING AND INSTALLING OIL FILTER SCREEN ON VALVE BODY

Remove oil pump – see 24 11 052.

Remove oil filter screen.

Installation:

Clean oil filter screen.

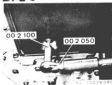
Replace an oil filter screen when it starts to gum up with a burnt brown residue.

Check length of bolts – 65 mm (2.569").

Tightening torque\*.



Check rubber ring (1), replacing if necessary.



Installation:

Tighten Torx bolts with Special Tools

00 2 100 and 00 2 050.

Tightening torque\*.

\* See Specifications



#### 24 32 002 REMOVING AND INSTALLING CENTRIFUGAL GOVERNOR

Remove transmission extension — see

24 11 062.

Pull off parking lock gear with centrifugal governor.



#### 24 32 005 DISASSEMBLING AND ASSEMBLING CENTRIFUGAL GOVERNOR

— Centrifugal Governor Removed

Unscrew parking lock gear on centrifugal governor.

Installation:

Tightening torque\*.

20 24 031



Unscrew cover (1) on case (2).

Left out circlip (3) and remove washer (4).

Remove governor piston (5), spring (6) and governor bushing (7).

Installation:

Governor piston must slide easily in governor bushing.

Remove spring clip (8) and balance weight (9).

7 0 2 24 064

**24 34 002 REMOVING AND INSTALLING  
PARKING LOCK PAWL**

Remove transmission extension – see  
24 11 002  
Loosen bolts (1).  
Swing down holder (2).

Pull off pawl (3).  
Caution!  
Spring force.

Installation:  
Check installed position of spring (4).  
It must be possible to connect end of spring  
(4) to bore (5) of pawl.

**24 34 102 REPLACING THROTTLE  
CABLE**

Engine M 20:  
Unscrew nut (1) and disconnect throttle  
cable.

Engine M 20:  
Unscrew nut (1) and disconnect throttle cable.

Engine M 21:  
Disconnect throttle cable.  
Compress retainers.  
Pull out adjusting screw with throttle cable.

Remove valve body – see 24 30 002.  
Disconnect throttle cable.

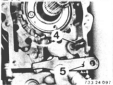
Press throttle cable out of case upwards.  
Press new throttle cable into case until  
retainers engage.



133 34 091



133 34 090



133 34 097



24 34 002



20 34 008



20 34 020



133 34 098



133 34 099





Preload spring (1) by one turn clockwise with throttle cam (2).  
Connect nipple on throttle cam.



Install valve body.  
Insert Special Tool 24 3 050 between valve body case and throttle pressure valve. Push throttle cam against throttle pressure valve.



Connect throttle cable in suspension and holder (1).  
Tighten cable.  
Squeeze loose lead seal on cable at distance (A) = 0.25 to 0.50 mm (0.010 to 0.020").  
Adjust throttle cable — see 24 00 000.  
Distance (A) of the lead seal is the same for all other models.



## 24 34 300 REPLACING SPRING FOR THROTTLE CABLE

Remove valve body — see 24 30 000.  
Disconnect selector lever (1) on transmission.  
Disconnect throttle cable.



Drive out pin (2) in position B.



Pull out selector shaft far enough that spring (3) can be removed.



Installation:  
Install selector shaft.  
Preload spring (3) by one turn anti-clockwise with throttle cam (4).  
Connect nipple on throttle cam.



133 34 283

### 24 34 851 REPLACING ALL SOLENOID VALVES (EH)

— Valve Body Removed —

Testing — see BMW test plan in Group 24.

Arrangement:

- 1 Solenoid - 1st/2nd and 3rd/4th gears
- 2 Solenoid - 2nd/3rd gears
- 3 Solenoid - converter lockup clutch
- 4 Solenoid - reverse gear lock
- 5 Pressure regulator
- 6 Pulse sender

a) Solenoid (1) - 1st/2nd and 3rd/4th Gears:

Unscrew governor housing (7).

Pull off wire plug.

Unscrew Torx bolt with Special Tool

00 2 100.

Take off holder.

Pull out solenoid.

Installation:  
Install holder with tabs facing collar on solenoid.

Arrow on housing must be between plug jacks.

Tightening torque\*.

b) Solenoid (2) - 2nd/3rd Gears:

Pull off wire plug.

Unscrew Torx bolt with Special Tool

00 2 100.

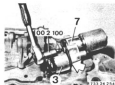
Take off holder.

Pull out solenoid.

Installation:  
Install holder with tabs facing collar on solenoid.

Arrow on housing must be between plug jacks.

Tightening torque\*.



133 34 283



133 34 283



133 34 283

c) Solenoid (3) - Converter Lockup Clutch:

Unscrew governor housing (7).

Pull off wire plug.

Unscrew Torx bolt with Special Tool

00 2 100.

Take off holder.

Pull out solenoid.

Installation:  
Install holder with tabs facing collar on solenoid.

Arrow on housing must be between plug jacks.

Tightening torque\*.

d) Solenoid (4) - Reverse Gear Lock:

Pull off wire plug.

Unscrew Torx bolt with Special Tool

00 2 100.

Take off holder.

Pull out solenoid.

Installation:  
Install holder with tabs facing collar on solenoid.

Arrow on housing must be between plug jacks.

Tightening torque\*.

### 24 34 ... REPLACING SOLENOID FOR KICKDOWN/DOWNSHIFT PREVENTER

— Valve Body Removed —

Testing — see BMW test plan in Group 24.

Pull off wire plug.

Unscrew Torx bolt with Special Tool

00 2 100.

Take off holder.

Pull out solenoid.

Installation:  
Install holder with tabs facing collar on solenoid.

Tightening torque\*.



#### 24 34 860 REPLACING PRESSURE REGULATOR

— Valve Body Removed —

Testing — see BMW test plan in Group 24.

Pull off wire plug.

Unscrew Torx bolt with Special Tool 00 2 100.

Take off holder.

Pull out pressure regulator (5).

Important! — Installation:

Arrow (7) on pressure regulator must be aligned with rib (8).

Install holder with tabs facing center on pressure regulator.

Tightening torque\*.



#### 24 34 870 REPLACING PULSE SENDER

— Oil Sump Removed —

Testing — see BMW test plan in Group 24.

Unscrew Torx bolts (1 and 3) with Special Tool 00 2 100.

Take off holder (2).

Installation:

Engage tabs on holder (2) in grooves of plug (4).



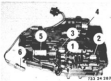
Pull out pulse sender.

Pull off plug (5).

Installation:

Tightening torque\*.

\* See Specifications



733 24 267

### 24 35 500 REPLACING WIRE HARNESS FOR EH AUTOMATIC TRANSMISSION

- Valve Body Removed -

Pull off wire harness plugs on solenoids, (1 ... 4), pressure regulator (5) and pulse sender (6).

Lift wire harness out of holders.

Installation:

Check colors of wires.

Solenoid (1) - green/violet

Solenoid (2) - green/violet

Solenoid (3) - red/violet

Solenoid (4) - orange/violet

Pressure regulator (5) - blue/violet

Pulse sender (6) - brown/brown

Push on plugs against the clips and check for tight fit.



24 24 017

### 24 35 502 REPLACING WIRE HARNESS FOR KICKDOWN DOWNSHIFT PREVENTER

- Valve Body Removed -

Pull off plug on solenoid.  
Lift wire harness out of holders.



24 24 018

Route wire harness and clamp in holders.



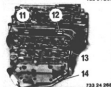
733 24 267

Route wire harness and clamp in holders (7 ... 10).



24 24 019

Turn valve body around.  
Route wire harness and clamp in holders.



733 24 268

Turn valve body around.  
Route wire harness and clamp in holders (11 ... 14).



24 61 010

### 24 61 500 REMOVING AND INSTALLING OR REPLACING CONTROL UNIT (EH)

Control unit for the EH transmission is located in the right A-pillar.

Remove glove box – see 51 16 360.  
 Unscrew cover for radio speaker.  
 Pull off electric leads for radio speaker.

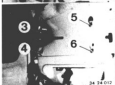


24 61 011

Pull off plug (1) on control unit, turning back spring retainer (2) for this purpose.

#### Important!

The ignition must always be turned off first prior to disconnection or connection of the plug.



24 62 012

Unscrew holder for insulation sheet. Only loosen screws (3 ... 6).



24 64 013

Lift and take out control unit toward the rear.



128 24 018

Check code letter on the data plate.  
 Refer to the Parts Catalog for a cross reference of types and models.



24 34 010

### 24 61 012 REPLACING CONTROL UNIT 24 61 014 FOR DOWNSHIFT PREVENTION (EH)

Testing – see BMW Test Plan in Gr. 24.

The downshift prevention control unit prevents racing of the engine when operating the kickdown with the selector lever in D and at top speed.

Downshift from 4th to 3rd gear is prevented by a solenoid in the transmission depending on the speedometer signal.

Downshifting is possible only after reduction of the road speed.

When accelerating there is automatic upshifting from 3rd to 4th gear prior to the governed speed of the engine.

Location: right A-pillar below the AEGS control unit.

The downshift prevention control unit is not installed since 8/88.

The DME control unit is used to activate the solenoid.



24 34 009

Pull off protective cap (1) and plug (2).  
Unscrew holder (3).

Downshift Prevention Control Unit  
Identification:

Model/ Transm. Version H	Bosch Number
520 iA, 524 iA4	0 260 002 051
525 iA	0 260 002 032
530 iA	0 260 002 020



24 34 010

Unscrew cover for radio speaker.  
Pull off electric leads for radio speaker.



20 34 116

Downshift Prevention Control Unit  
Identification:

Model/ Transm. Version EH	Bosch Number
520 iA	0 260 002
525 iA	
530 iA	
535 iA	

Replace kickdown switch – see  
35 41 480.

Replace program switch – see  
61 31 265.



24 34 014

Unscrew control unit on body.

*Note:*  
See self diagnosis or test plan for troubleshooting and testing electronic components.

## TROUBLESHOOTING AUTOMATIC TRANSMISSION – 4 HP 22 / H = EH

Condition	Cause	Correction
<b>Position P</b>  Park will not engage	Selector linkage between selector lever and transmission misadjusted  Excessive friction in parking lock mechanism	Adjust – see 24 00 006  Replace parking lock parts (connecting rod, pawl) 24 24 002
Park does not hold (slips out)	Selector linkage between selector lever and transmission misadjusted	Adjust – see 24 00 006
Engine cannot be started in N or P, or can be started in all positions	Selector linkage between selector lever and transmission misadjusted  Transmission switch faulty  Starter interlocking relay or supply lead faulty	Adjust – see 24 00 006  Replace transmission switch 25 16 080  Repair/replace relay or supply lead
<b>Position R</b>  No reverse gear	Selector linkage between selector lever and transmission misadjusted  Oil filter screen dirty  Clutch B destroyed. In this case also no 2nd gear.  Brake D destroyed. In this case also no engine braking in position 1, 1st gear  Clutch E destroyed, in this case also no engine braking in 2nd and 3rd gears as well as in position 1, 1st gear  Reverse gear arrest does not cancel	Adjust – see 24 00 006  Replace oil filter screen; replace transmission in case of free remainder in oil sump  Disassemble clutches 24 23 002  Disassemble clutches 24 23 002  Disassemble clutches 24 23 002  Check transmission electronics. Replace control unit 24 36 002
Slipping or shaking when moving off	Clutch B or E or brake D damaged	Disassemble clutches 24 23 002

Condition	Cause	Correction
Hard engaging (soft P–R or R–R or definite double knock for P–R or R–R shift (engine speed < 1500 rpm))	Damper B defective. In this case shift 2–3 also not correct	Replace control unit 24 30 002. Check transmission electronics
Backup lights do not come on (electrical system okay)	Transmission switch faulty	Replace transmission switch 25 18 080
Car moves or creeps	Selector linkage between selector lever and transmission misadjusted  Clutch A faulty (bonded)	Adjust – see 24 00 006  Replace clutch A – see 24 23 032
<b>Position D</b>  No power flow	Oil filter screen dirty  Clutch A defective  1st gear one-way clutch slips  Selector linkage between selector lever and transmission misadjusted	Replace oil filter screen 24 31 152, exchange transmission in case of liner remainder in oil sump  Replace clutch A – see 24 23 032  Disassemble transmission 24 00 062  Adjust selector lever 24 00 006
Slipping or shaking when moving off	Clutch A damaged	Replace clutch A – see 24 23 032
Hard engaging (soft N–D (engine speed < 1500 rpm))	Clutch A damaged  Damper A faulty	Replace clutch A – see 24 23 032  Replace valve body 24 30 002
No shift (warm or cold state)  – Shifts 1–2 / 3–1	Kickdown switch faulty (only kickdown shifts)  Transmission electronics faulty  Solenoid valve (1) faulty  Control valve 1–2 / 3–4 seized  Shift valve 1–2 seized  Governor dirty	Replace kickdown switch 25 41 480  Check transmission electronics  Replace solenoid valve 24 34 851  Replace valve body 24 30 002  Replace valve body 24 30 002  Clean or replace governor 24 32 002
– Shifts 1–3	Brakes C' and/or C faulty	Disassemble clutches 24 23 032



Condition	Cause	Correction
- Shift 2-3 / 3-2	Solenoid valve (2) faulty Shift valve 2-3 seized	Replace solenoid valve 24 34 851 Replace valve body 24 30 002
- Shift 2-3	Clutch B faulty	Replace clutch B - 24 23 022
- Shift 3-4 / 4-3	Solenoid valve (1) faulty Control valve 1-2 / 3-4 seized Shift valve 3-4 seized Governor dirty	Replace solenoid valve 24 34 851 Replace valve body 24 30 002 Replace valve body 24 30 002 Clean or replace governor 24 32 002
No shift (warm or cold state)	Brake P faulty	Disassemble clutches 24 23 022
- Shift 3-4	Program switch faulty	Replace program switch 61 31 366
- Shift 1-2 Engine speed does not exceed stall speed in drive and full load	Pulse transmitter faulty	Replace pulse transmitter 24 34 870
Car moves off in 2nd gear	Transmission electronics faulty Solenoid valve (1) faulty Shift valve 1-2 seized Governor bushing seized	Check transmission electronics Replace solenoid valve 24 34 851 Replace valve body 24 30 002 Clean or replace governor 24 32 002
Car moves off in 3rd gear	Transmission electronics faulty Solenoid valve (1 or 2) faulty Shift valve 1-2 and 2-3 seized Governor bushing seized	Check transmission electronics Replace solenoid valve 24 34 851 Exchange valve body Clean or replace governor 24 32 002
Car shifts 1-3	Shift valve 2-3 seized Transmission electronics faulty Solenoid valve (2) faulty	Replace valve body 24 30 002 Check transmission electronics Replace solenoid valve 24 34 851

Condition	Cause	Correction
<b>Shift Points</b>		
Zero load shift not okay	Control unit faulty	Replace control unit 24 61 000
Full load shift points not okay	Full load signal missing	Check throttle valve switch 13 63 544
	Throttle cable not okay	Check or adjust throttle cable 24 00 006
No kickdown shift	Kickdown shift faulty	Replace switch 35 41 480
	Throttle cable kickdown adjustment not correct	Adjust throttle cable kickdown 24 00 006
Only zero load shifts	Zero load switch on engine faulty	Check or replace zero load switch 13 60/554
Only kickdown shifts	Kickdown switch faulty	Replace switch 35 41 480
<b>Shift Transitions</b>		
Zero load shifts too hard	Control unit faulty	Replace control unit 24 61 000
	Damper faulty	Replace valve body 24 30 002
	Modulation pressure too high	Replace valve body 24 30 002
	Plates damaged	Disassemble transmission 24 00 082
Full load and kickdown shifts too long	Control unit faulty	Replace control unit 24 61 000
	Damper faulty	Replace valve body 24 30 002
	Modulation pressure too low	Replace valve body 24 30 002
	Plates damaged	Disassemble transmission 24 00 082
Full load and kickdown shifts too hard	Modulation pressure not correct	Replace valve body 24 30 002
	Damper faulty	Replace valve body 24 30 002
	Control unit faulty	Replace control unit 24 61 000

Condition	Cause	Correction
<u>Position 3, 3rd Gear</u>		
No engine braking	Clutch E damaged	Disassemble clutches 24 23 022
<u>Position 2</u>		
Manual downshift 3-2 not okay	Locking valve 2 sticks Governor sticks Transmission electronics faulty Solenoid valve (2) faulty	Replace valve body 24 30 002 Replace governor 24 32 002 Check transmission electronics Replace solenoid valve 24 34 051
No engine braking	Brake C or clutch E damaged	Disassemble clutches 24 23 022
<u>Position 1</u>		
Manual downshift 2-1 not okay	Locking valve 1 sticks Governor sticks Transmission electronics faulty Solenoid valve (1) faulty	Replace valve body 24 30 002 Replace governor 24 32 002 Check transmission electronics Replace solenoid valve 24 34 051
No engine braking	Brake D or clutch E damaged	Disassemble clutches 24 23 022
<u>Torque Converter Lockup Clutch</u>		
Shift speed not correct	Converter hysteresis valve sticks No 4th gear Governor pressure not okay Control unit faulty	Replace valve body 24 30 002 Replace valve body 24 30 002 Replace governor 24 32 002 Replace control unit 24 61 000
Shift transition too hard	Converter damper faulty Converter not okay (converter lockup clutch)	Replace control unit 24 30 002 Replace converter 24 40 003

Condition	Cause	Correction
No shift	Valve body not okay	Replace valve body 24 30 002
	Converter faulty	Replace converter 24 40 003
	No 4th gear	Replace valve body 24 30 002
	Transmission electronics faulty	Check transmission electronics
	Solenoid valve (3) faulty	Replace solenoid valve 24 34 851
	Converter faulty	Replace converter 24 40 003
Converter lockup clutch always closed (engine dies in driving position)	Transmission electronics faulty	Check transmission electronics
	Solenoid valve (3) faulty	Replace solenoid valve 24 34 851
<b>General information</b>		
Shifts only as position	Transmission electronics faulty	Check transmission electronics
	Program switch faulty	Replace program switch 61 31 285
Fault indicator lighted	Transmission electronics faulty	Check transmission electronics
	Solenoid valve (2) faulty	Replace solenoid valve 24 34 851
Fault indicator lights up while driving	Transmission electronics faulty	Check transmission electronics
	Plug on transmission has poor contact	Check plug connection
Noise and then power flow interruption after long drive	Oil filter screen on valve body dirty	Only replace oil filter screen when there are no burnt clutch liners in oil sump, otherwise exchange transmission
No power flow in forward or reverse, loud noise	Drive plate between converter and engine torn off	Replace drive plate or converter 11 32 861 or 24 40 003
<b>Noise</b>		
Loud noise in all positions, especially with cold oil. Oil pump intake noise	Oil level too low	Correct oil level
	Valve body leaks	Replace valve body 24 30 002

Condition	Cause	Correction
Loud, screeching noise depending on speed in all positions, especially with warm oil, occurring after a long drive and sometimes accompanied by power flow interruptions	Oil filter screen dirty	Only replace oil filter screen when there are no clutch liners in oil sump, otherwise exchange transmission
Loud noise when converter lockup clutch closes	Torsion damper faulty	Replace converter 24 40 003
<b>Leakage</b>		
Oil dripping out of converter bell housing	Seal in pump housing damaged Pump housing leaks Converter leaking at welded seam Radial oil seal for torque converter leaks	Replace seal 24 31 002 Replace pump assembly 24 31 002 Replace converter 24 40 003 Replace radial oil seal 24 12 003
Leak between transmission case and oil sump	Oil sump mounting bolts not tightened correctly Oil sump gasket damaged	Tighten bolts* Replace gasket 24 11 002
Leak between transfer plate and transmission case (especially in area of pump pressure bore)	Mounting bolts on converter bell housing loose	Tighten bolts*
Oil loss on transmission plug	O-ring defective	Replace O-ring 24 30 002
Oil loss on output	Radial oil seal on output damaged	Replace radial oil seal 24 12 013
Oil lost through or on vent	Oil level too high Wrong oil (strong foaming) Vent cap missing O-ring on vent damaged Preload of circlip insufficient	Correct oil level Replace oil, if necessary remove transmission and drain complete oil including the torque converter oil Install cap or replace vent Increase transmission extension – replace O-ring Replace circlip

\* See Specifications for tightening torque

Condition	Cause	Correction
Oil lost on cooler pipes	Connections loose Cooler pipe damaged Cooler leaks	Tighten bolts* Replace cooler pipe Replace cooler 17 11 000
Oil lost on transfer plate	Plug on transfer plate leaks	Tighten plug* Replace seal
Leak between transmission case and transmission extension	Mounting bolts loose Gasket damaged	Tighten bolts* Replace gasket 24 11 052

\* See Specifications for tightening torque

## TROUBLESHOOTING VALVE BODY FOR 4 HP 22 / EH

## Note:

Also refer to self-diagnosis or test plan for troubleshooting and testing electronic components.

Condition	Cause	Correction
<b>Position B</b>		
No reverse gear	Solenoid (4) faulty Wire to solenoid (4) grounded out Reverse gear locking valve seized Damper B malfunctions	Replace solenoid valve 24 34 851 Replace wire harness 24 35 500 Replace valve body 24 30 002 Replace valve body 24 30 002
No reverse or forward gear	Main pressure valve seized, spring broken	Replace valve body 24 30 002
Insufficient power transmission	Pressure too low in clutch B or E, brake D	Replace valve body 24 30 002
Hard jolt when moving into position B	Damper B malfunctions Modulation pressure too high	Replace valve body 24 30 002
<b>Position D</b>		
No forward gear	Main pressure valve seized, spring broken	Replace valve body 24 30 002
Insufficient power transmission	Pressure too low in clutch A	Replace valve body 24 30 002
No shift function	Pulse sender faulty Wire to pulse sender grounded out	Replace pulse sender 24 34 870 Replace wire harness 24 35 500
No shift function 1-2 / 2-1	Solenoid (1) faulty Wire to solenoid (1) grounded out Shift valves 1-2, control valves 1-2/3-4, pressure reducing valve 1 seized	Replace solenoid valve 24 34 851 Replace wire harness 24 35 500 Replace valve body 24 30 002

Condition	Cause	Correction
<b>Position D</b>		
No shift function 2-3 / 3-2	Solenoid (2) faulty Wire to solenoid (2) grounded out Shift valve 2-3 seized	Replace solenoid valve 24 34 851 Replace wire harness 24 35 500 Replace valve body 24 30 002
No shift function 3-4 / 4-3	Solenoid (1) faulty Control valve 1: 2 / 3-4 seized	Replace solenoid valve 24 34 851 Replace valve body 24 30 002
Shifts 1-2 / 2-3 / 3-4 too long	Pressure regulator faulty Wire to pressure regulator grounded out Damper faulty Modulation valve, pressure reducing valves 1 and 2 stick	Replace pressure regulator 24 34 860 Replace wire harness 24 35 500 Replace valve body 24 30 002 Replace valve body 24 30 002
Upshifts 1-2 / 2-3 / 3-4 too hard	Pressure regulator faulty Modulation valve sticks Damper faulty	Replace pressure regulator 24 34 860 Replace valve body 24 30 002 Replace valve body 24 30 002
Downshift 4-3 too hard	Plate if dirty	Replace valve body 24 30 002
Manual downshifts 4-3 / 3-2 too hard	Damper E or C' faulty	Replace valve body 24 30 002



Condition	Cause	Correction
<u>Position 1</u> Manual downshift 2-1 not okay	Pressure regulator faulty Damper D faulty Modulation valve sticks	Replace pressure regulator 24 34 860 Replace valve body 24 30 002 Replace valve body 24 30 002
<u>Converter Lockup Clutch</u> No converter clutch locking	Solenoid (2) faulty Converter clutch damper faulty Converter pressure valve seized Pressure reducing valve 1 seized	Replace solenoid valve 24 34 851 Replace solenoid valve 24 34 851 Replace valve body 24 30 002 Replace valve body 24 30 002
No converter clutch unlocking	Solenoid (2) faulty Wire to solenoid (2) grounded out	Replace solenoid valve 24 34 851 Replace wire harness 24 35 900
Main pressure too high in all positions	Pressure regulator faulty Main pressure valve seized Modulation pressure too high	Replace pressure regulator 24 34 860 Replace valve body 24 30 002 Replace valve body 24 30 002

## 24 Automatic transmission

### A4S 270 R / 310 R

00 11 239	Oil change in automatic transmission .....	24-	0/21
24 00 005	Shift lever – adjust .....	24-	0/23
015	Hydraulic pressure values – check .....	24-	0/24
025	Automatic transmission – remove and install .....	24-	0/25
045	Exchange transmission – install .....	24-	0/28
600	Converter bell housing and spring in selector unit – replace intermediate case – seal .....	24-	0/29
601	Converter bell housing – replace intermediate case – seal .....	24-	0/29
24 11 007	Transmission oil sumps, both – remove and install/seal or replace .....	24-	11/21
055	Transmission extension – remove and install/seal .....	24-	11/23
575	Converter bell housing – remove and install/seal .....	24-	11/24
24 12 015	Radial oil seal for output flange – replace .....	24-	12/21
105	Radial oil seal for manual shift valve shaft – replace .....	24-	12/21
505	Radial oil seal for torque converter (transmission removed) – replace .....	24-	12/24
24 31 155	Transmission oil strainer – remove and install or replace .....	24-	31/21
24 34 856	Solenoid valves, all – replace .....	24-	34/21
865	Pressure regulator for selector unit – replace .....	24-	34/23
875	Pulse generator (for output speed) – replace .....	24-	34/23
24 35 505	Wiring harness in automatic transmission – replace .....	24-	35/21
24 40 005	Torque converter – remove and install or replace .....	24-	40/21
24 61 500	Control unit – remove and install or replace .....	24-	61/21
	Automatic transmission THM-R1 – troubleshoot .....	24-	90/21

### 00 11 339 Oil change in automatic transmission

Ensure that transmission is at full operating temperature before changing fluid.



Version with oil filler pipe:

Extract dipstick.

**Caution!**  
Locking dipsticks:  
Fit the handle to unlock dipstick for removal.



Remove drain plug (1).  
Drain off fluid.

Installation instruction:  
Replace seal.  
Tightening torque 24 11 6A2\*



Top up ATF fluid\*\* using special tool 24 D 080.  
Volume of ATF\*.

\* See Technical Data  
\*\* For grade of ATF fluid, see Consumables Specifications



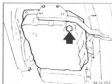
Run engine at idle speed in selector lever setting "P" or "N".  
Car must be unladen and standing on a level surface.  
Interrogate ATF temperature with Service Tester or Modis (see Troubleshooting Manual).  
Pull oil dipstick out and measure fluid level.  
Compare measured level with value in the following table.  
Wipe dipstick clean with a lint-free cloth.

Oil temperature °C	Fluid level - H mm	
	Min.	Max.
20	3	15
25	5	17
30	8	20
35	11	22
40	13	25
45	14	26
50	16	27
55	17	28
60	19	29
65	21	32
70	22	34
75	24	36
80	26	38
85	29	41
90	31	43

\* Refer to Specifications

Version without oil filler pipe:

With effect from 2.0/1 the oil filler pipe was discontinued.  
Use the filler opening on the lower side of the oil pan to replenish ATF.

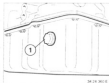


Remove drain plug (1).  
Drain off fluid.

Installation instruction:  
Replace seal.  
Tightening torque 24 11 84Z\*



To fill, attach filler neck (2)\*\* to filler aperture.  
Add ATF until it overflows.  
Screw in filler plug.  
Tightening torque 24 11 74Z\*



Check ATF level, correcting if necessary.

Car must be undriven and standing on a level surface.

Only check fluid level when transmission fluid temperature lies between 30...55° C. Interrogate ATF temperature with Service Tester or MoDiC (refer to Troubleshooting Manual).

Run engine at idle speed with selector lever in setting "P" or "N".  
Unscrew filler plug (1).

Installation instruction:  
Check seal, replacing if necessary.



Drain excessive ATF or add ATF if insufficient.  
To top up ATF, attach filler neck (2)\*\* to filler aperture.

Add ATF until it overflows.  
Screw in filler plug. Tightening torque 24 11 74Z\*.

ATF level too high:  
Strong foaming, loss through splashing, high temperature when driving fast.  
Fluid loss through vent.

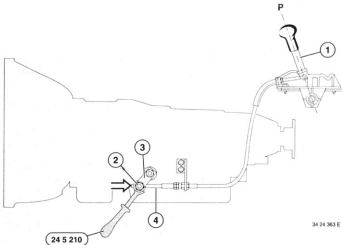
ATF level too low:  
Valve rattle, foaming, transmission slip.  
General operating disturbances.

\* Refer to Specifications  
\*\* Source of Supply: BMW Parts Service

\* Refer to Specifications

24-0/23

24-00000524 Clamping gearshift lever  
Clampverschraubung Hebel 1x0 0



Set gearshift lever (1) to "P".  
Release nut (2).

**Caution!**  
In order to avoid deforming the operating cable, the clamping screw must be held with the special tool 24 5 210.

**Note:**  
The special tool 24 5 210 can only be fitted in position "P".

Press forward lever (3) (park position).

Press operating cable rod (4) opposite forward direction and release again.

Firmly secure operating cable rod (4) with nut (2) (held with special tool 24 5 210).

For tightening torque 24 51 1A2\*.

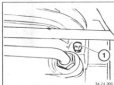
24 24 263 E

\* Refer to Technical Data



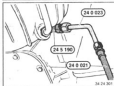
### 24 00 015 Checking hydraulic pressure values

Connect hose 24 0 001 to pressure gage 13 3 001.



Unscrew and remove plug (1) from the converter bell housing to check the main pressure.

**Caution!**  
Inch threads.



Screw in and tighten special tool 24 5 190 (adapter).  
Secure pipe manifold 24 0 003 to adapter and connect to hose 24 0 001.

Start engine.  
Selector lever setting "P" or "N".  
Engine speed = 1500 rpm.  
Read off main pressure on pressure gage.  
Main pressure specification: 9.5 ... 10.5 bar.

### 24 00 025 Removing and installing transmission

Disconnect negative lead.

#### Caution!

First read fault memories with tester and print any faults as disconnecting the negative lead will cancel the fault memories in the control units.

Use tester to read out fault memories and print out data on any errors prior to disconnecting battery.

Remove propshaft from transmission and center mount and fasten to one side.  
Refer to 26 11 000

#### Note:

On version with two center mounts, only disconnect front center mount.



Drain oil.  
Never reuse drained ATF.

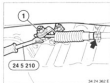
#### Note:

Replace the transmission if the ATF smells burnt and is black.

#### Caution!

Clean oil cooler and pipes with compressed air and flush twice with ATF if the transmission is faulty.

Installation instruction:  
Replenishing ATF, see 00 11 026



#### o Remove selector lever

Move selector lever into setting "P".  
Unscrew nut (2).

#### Caution!

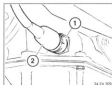
Always counterhold bolt with special tool 24 5 210 to avoid deformation of the cable.

#### Note!

The special tool can only be fitted in setting "P".  
Unscrew cable from holder.  
Pull out cable.  
Tightening torque 25 16 2A2\*

#### Installation instruction:

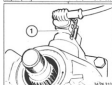
Adjust selector lever - see 24 00 006.



Turn bayonet lock (1) counter-clockwise.  
Pull off plug (2).  
Lift cable harness out of holder.

#### Installation instruction:

Fit plug (2) in such a way that marking lines are aligned with one another.



Pull plug (1) off of speed sender.

\* Refer to Specifications



- **Unfasten torque converter screw connection**

Lift cover off aperture for torque converter screw connection.

**Note:**

This aperture, depending upon model variant, is usually located under the engine oil sump.

24 24 110 E



- Or in the side cover plate under the exhaust manifold.

24 24 110 E



- Unfasten the screw connections on the torque converter using special tool 24 1 110. To do this, keep rotating engine as far as next screw by turning the central screw on the crankshaft.

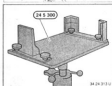
**Caution!**

Only use original bolts.

**Installation instruction:**

Tightening torque 24 48 1A2\*

24 24 110 E

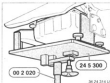


- **Lower transmission**

Preassemble fixture 24 5 300 to suit THM-R1 transmission as marked.

\* Refer to Specifications

24 24 310 E



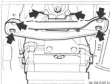
Support transmission from underneath with special tools 24 5 300 and 00 2 000.

24 24 310 E



If applicable, remove center of gravity suspension.

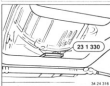
24 24 300 E



Unscrew cross member.

Installation instruction:  
Centering transmission (refer to Group 25).  
Tightening torque 24 71 1A2\*.

24 24 000 E



6-cylinder engine:

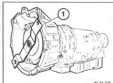
Before lowering transmission, insert spacer plate 23 1 330 between cross-member and oil pan.

Lower transmission.

\* Refer to Specifications

24 24 310 E





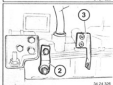
24 01 325

### 24 00 045 Installing exchange transmission

Removing transmission 24 00 025.

#### Caution!

Always clean oil cooler and pipes with compressed air and flush twice with ATF before installing an exchange transmission.  
Transmission identification\*\* on data plate.  
Transfer transport holder (7).



24 01 326

Transfer lever (2) and bracket (3).  
Tightening torque 24 01 1A2.

Transfer rubber mounts and exhaust bracket.



24 01 328

Put oil filter pipe out of case.

#### Installation instruction:

Check sealing plug (4), replacing if necessary.

#### Caution!

Automatic transmission is supplied with a factory fill of ATF.

For this reason, a fluid level check is not required until after the transmission has been installed (refer to 00 11 038).



24 01 328

Version with oil filter pipe

Transfer oil filter pipe.  
Unscrew bolts.

\* Refer to Specifications

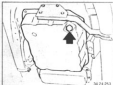
\*\* Refer to Parts Catalog

24 00 600 Replacing converter bell housing and spring in selector unit, sealing intermediate case (A48 275R/310R)

Refer to Repair Manual 3 Series E36

24 00 601 Replacing converter bell housing, sealing intermediate case (A48 275R/310R)

Refer to Repair Manual 3 Series E36



### 24 11 007 Removing and installing / sealing or replacing both transmission oil sumps

Drain oil.  
Remove oil sumps.

Remove magnet from the large oil sump and clean.  
Remove gaskets and remove remaining pieces of gaskets.

#### Note:

The screws are micro-encapsulated and must be replaced after every disassembly. Only use screws with M-thread.

#### Fit gaskets for oil sumps.

Fit magnet in large oil sump. Fit oil sumps in position and screw in all screws as far as it will go.

#### Caution!

Do not tighten screws crosswise and do not tighten screws.

Firmly tighten screws once one after the other to specified tightening torque\*.



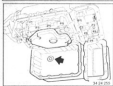
Fill with oil\*.

**Caution!**  
Gear oil must only be filled using funnel 24 0 080.



Run engine at idle speed in selector lever position P or N.  
Vehicle must be unladen and parked on even surface.  
Check transmission oil temperature with Service Tester or MoDC (refer to Test Manual).  
Remove dipstick and measure oil level and compare in following table.  
Only clean dipstick with lint-free cloth.

Oil temperature °C	Oil level + H mm	
	Min.	Max.
20	3	15
25	5	17
30	8	20
35	11	22
40	13	25
45	14	26
50	16	27
55	17	28
60	18	29
65	21	32
70	22	34
75	24	36
80	26	39
85	28	41
90	31	43



Version with oil filler tube:

Remove oil dipstick.

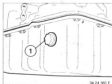
#### Caution!

Oil dipstick with lock.  
Dipstick can only be removed by tilting handle.



\* Refer to Technical Data

\* Refer to Technical Data



Version without oil filler tube:

The oil filler tube was discontinued after 2/91.  
Use the filler opening on the lower side of the oil pan to replenish ATF.

Unscrew filler plug (1).

Insulation:

Check seal, replacing if necessary.



Hang filler (2)\*\* in filler opening.

Add ATF until it overflows.

Run engine at idle speed in selector lever setting "P" or "N".

Car must be unladen and standing on a level surface.

Add ATF until it overflows.

Increase of temperature to 30...35° C.

Interrogate ATF temperature with Service Tester or MoDeC (refer to Troubleshooting Manual).

Recheck ATF level, correcting if necessary.

Screw in and tighten filler plug (1).

Tightening torque\*.

ATF level too high:

Strong foaming, loss through splashing, high temperature when driving fast.

Fluid loss through vent.

ATF level too low:

Valve rattle, foaming, transmission slip.

General operating disturbances.

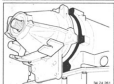
\* Refer to Specifications.

\*\* Source of Supply: BMW Parts Service

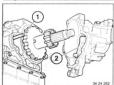


### 24 11 055 Removing and installing / sealing transmission extension

Remove propshaft, see 24 00 025.  
 Remove output flange.  
 Hold output flange with special tool 23 0 020.  
 Unscrew collar nut with a wrench socket.  
 Pull off output flange.



Pull plug off of speed sender.  
 Remove transmission extension.  
 Unscrew bolts with special tool 24 5 180.  
**Caution!**  
 Bolts have inch threads.  
 Remove transmission extension and gasket.

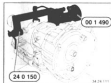


Install gasket with grease (Vaseline).  
 Mount transmission extension.  
 Use special tool 24 5 180.  
 Guide operating rod (1) for parking lock into panel (2).

**Caution!**  
 Only use bolts with inch threads.  
 Tightening torque\*  
 Mount and bolt output flange.  
 Tightening torque\*

### 24 11 575 Removing and installing sealing converter bell housing

Remove automatic transmission, refer to 24 00 025



Secure transmission to assembly frame 00 1 490 with mounting bracket 24 0 150.



Pull torque converter out of oil pump carefully using special tool 24 4 000.

**Caution!**  
Escaping ATF.

**Installation:**  
Carefully guide openings on converter into primary pump by turning slightly.



**Caution!**  
Do not damage converter mounting and sealing ring.  
Insert torque converter as far as stop.

The torque converter has engaged correctly when the distance between case and torque converter screw connection reaches approx. 31 mm.



Set transmission upright.  
Lift out O-ring.

**Note:**  
A slight quantity of oil will escape through the breather.



Unscrew the seven outer screws in the torque converter bell housing.

**Caution!**  
Do not unscrew the five inner screws.



Detach the converter bell housing from the adapter case with two levers (screwdriver).

Carefully lift off converter bell housing.



50 11 500 0

Once the screw connection has been unfastened, also loosen the connection between adapter case and transmission case. Do not unfasten this screw connection when removing the converter bell housing from the adapter housing because the gasket cannot be replaced.



R 24 0000



R 24 0000

**Note:**

A spacer disk is fitted to the oil pump. Refit the same spacer disk (i.e. one of the same color).

Attach spacer disk to oil pump with Vaseline.



R 24 0001

Clean sealing faces and remove any oil which may have emerged from the threaded bores. Replace the sealing ring and gasket.

**Installation instruction:**

Attach gasket with Vaseline. Ensure that recesses in paper gasket are located correctly.



24 5 180

R 24 0000

Insert special tool 24 5 180 in two opposing threaded bores.



24 5 180

R 24 0000

Fit converter bell housing and secure with five screws. Remove special tool 24 5 180. Tighten down the remaining screws.

Tightening torque 24 11 342\*



R 24 0000

Fit new D-ring to the torque converter shaft.



50 24 000

**Note:**

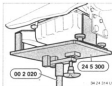
If applicable, fit radial seal in torque converter; see 24 12 500

\* Refer to Specifications



### 24 12 015 Replacing radial oil seal for output flange

Unscrew propeller shaft - see 24 00 020.  
Remove output flange.  
Hold output flange with special tool 23 0 020.  
Unscrew collar nut with a wrench socket.  
Pull off output flange.



### 24 12 105 Replacing radial oil seal for manual shift valve shaft

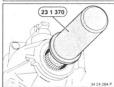
Remove propeller shaft, transmission plug and engine speed sensor plug - refer to 24 00 020.  
Support transmission from underneath with special tools 24 5 300 and 00 2 020.  
Unfasten crossmember from body.



Lift out radial oil seal (1).



Before lowering transmission, insert spacer plate 23 1 330 between crossmember and oil pan.  
Drain transmission as far as possible.



Lubricate seating lip with ATF.  
Drive in radial oil seal with special tool 23 1 370.  
Mount and bolt output flange.  
Tightening torque 24 21 1A.2\*  
Check oil level and top up if necessary.



Remove shift control unit from main case

Remove oil pan, refer to 24 11 007  
Remove oil screws.  
Unscrew bolts with special tool 24 5 180.  
**Caution!**  
Bolts have imperial threads.

**Installation:**  
Check gasket between strainer and valve body.



Remove plugs (1 ... 5) on solenoid valves.

**Caution!**  
Pry off plug with a screwdriver.  
Do not pull off plug on wires.  
Pull off plug through hole in transfer case.  
Unscrew nut on plug connection.  
Pull out wiring harness.





Unscrew cover for servo piston.  
Unfasten screws with special tool 24 5 160.

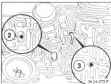
**Caution!**  
Bolts have imperial threads.  
Take off cover and gasket.

34 24 070



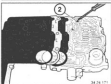
Unscrew valve body on main case.  
Unfasten screws with special tool 24 5 160.  
Watch out for lockplate.  
Lift off valve body with gasket, pulling the  
overrun valve connecting lever (2) off the gear.  
Overrun valve should remain in the valve body.

34 24 071



Watch out for valve balls (2 and 3) in main case.

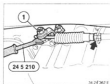
34 24 072 P



Unscrew transfer plate on valve body.  
Remove gasket.  
Replace gasket.

**Caution!**  
Watch out for valve ball (2).

34 24 171



Unfasten nut (1) in setting "P"

**Caution!**  
Always brace belt with special tool 24 5 210 to  
avoid distortion of the cable.

**Note:**  
The special tool can only be fitted in setting  
"P".  
Unscrew cable from holder.  
Pull out cable.  
Remove lever from transmission.

34 24 042 P

**Installation:**  
Adjust shift unit 24 00 006.  
Tightening torque 24 51 14.2\*



Loosen nut (3)  
Version with pin:  
Drive out pin.

**Note:**  
Nut (3) cannot be removed until shaft has  
been pressed out.  
Pull shift element (4) off shaft.

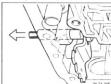
34 24 040



Remove clamping pin (4) (side cutters)  
**Installation:**  
Replace pin.

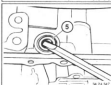
34 24 040

\* Refer to Technical Data



Pull or press out shift valve shaft.

**Installation:**  
If necessary, remove burr from shaft.



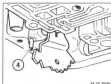
Lever out radial oil seal (5) with a screwdriver.



Lubricate shift valve shaft with oil and insert\* in case.  
Fit radial seal (5) to case and drive firmly home with special tool (24 5 290).  
Place shift element on shaft and screw on nut.

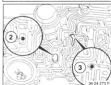


Hold groove of shaft tight with a suitable mandrel inserted through the bore.



Install pin (4) with the open end facing in and drive in.

**Important!**  
Drive in pin only far enough that it can be removed again by pulling it out.  
Place shift element on shaft.  
Secure shift element with a nut or pin.  
Tightening torque 24 52 14.2\*



Place two valve balls in main case (see valve ball).  
Check installed positions (2 and 3).



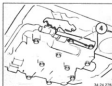
Paste gasket on case with a light coat of grease (vaseline).  
Screw in special tools 24 5 150.



Place valve body on main case.  
Attach connecting lever (3) on overrun valve and operating lever.

**Note:**  
Long arm for overrun valve, short arm for operating lever.

\* Refer to Technical Data



Screw in bolts.  
Remove centering pin 24 1 150.  
Tighten valve body bolts crosswise.  
Special tool 24 5 150

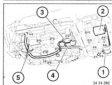
Note:  
Also secure lockplate (4).

Caution!  
Only use screws with imperial thread.  
Tightening torque: 24 30 "ft·lbf"



Screw on cover (1) for servo piston.  
Socket nut 24 5 180.

Caution!  
Only use bolts with imperial threads.  
Tightening torque: 25 Nm.



Connect wire harness to solenoid valves  
(1 ... 5).

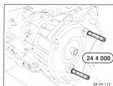
Note:  
Plugs are coded.



Mount and bolt strainer.  
Special tool 24 31 242\*

Caution!  
Only use bolts with imperial threads.  
Tightening torque: 18 ... 21 Nm.

\* Refer to Technical Data



24 12 505 Replace radial seal for  
torque converter  
(transmission removed)

Pull torque converter out of oil pump carefully  
using assembly handles 24 4 000.

Caution!  
Escaping ATF.

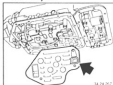


Unscrew Torx bolts with a Torx socket.  
Pull out radial oil seal with extractor tool  
50 5 010.

Place a suitable pressure piece (1) on the  
input shaft on which the pressure bolt can  
bear.



Lubricate sealing lip with ATF.  
Install radial oil seal.  
Tightening torque: 3 Nm.

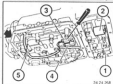


### 24 30 ... REMOVING AND INSTALLING BOTH VALVE BODIES

Remove both oil sumps – 24 11 027.  
Unscrew oil filter screen.  
Unscrew bolts with Special Tool 24 S 180.

**Important!**  
Bolts have inch threads.

**Installation:**  
Check gasket between oil filter screen and valve body.



Pull off plugs (1 ... 5) on solenoids.

**Important!**  
Pry off plugs with a screwdriver — don't pull off an electric leads.

Pull out plugs through bore in transfer case.  
Unscrew nut on plug connector.  
Pull out wire harness.



Unscrew valve body on transfer case.  
Unscrew bolts with Special Tool 24 S 180.

**Important!**  
Bolts have inch threads.

Take off valve body.

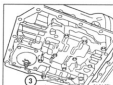
**Important!**  
Check installed position of gasket, transfer plate and gasket.  
Check ball valve (1) in transfer case.



Unscrew cover for servo piston.  
Unscrew bolts with Special Tool 24 S 180.

**Important!**  
Bolts have inch threads.

Take off cover and gasket.

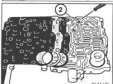


Unscrew valve body on main case.  
Unscrew bolts with Special Tool 24 S 180.

Check plate for the lock.  
Lift off valve body with gasket, pulling the connecting lever (3) for the coasting valve off of the locking pawl at the same time.  
Coasting valve should remain in the valve body.



Check ball valves (2 and 3) in main case.



Unscrew transfer plate on valve body.  
Take off gasket.  
Replace gasket.

**Important!**  
Check ball valve (2).



Mount gasket and transfer plate, and center with Special Tools 24 S 140.  
Screw in and tighten bolts.

**Important!**  
Only use bolts with inch threads.  
Tightening torque = 13 Nm (9 ft. lbs.).  
Removing special tool centering pins.

## 24-30/22



Place two ball valves in main case (with vaseline).  
Check locations (2 and 3).



Mount gasket on case with a light coat of grease (vaseline).  
Screw in Special Tools 24 5 150.



Place valve body on main case.  
Attach connecting lever (3) on coasting valve and operating lever.

Note:  
Long arm faces the coasting valve;  
short arm faces the operating lever.



Screw in bolts.  
Remove Special Tools 24 1 150.  
Tighten bolts of valve body crosswise.  
Use Special Tool 24 5 180.

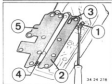
Note:  
Also bolt down lockplate (4).

Important!  
Only use bolts with inch threads.  
Tightening torque = 20 Nm (14 ft. lbs.).



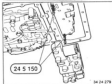
Mount cover (1) for the servo piston.  
Use Special Tool 24 5 180.

Important!  
Only use bolts with inch threads.  
Tightening torque = 20 Nm (18 ft. lbs.).



Place ball valves in transfer case (with vaseline).  
Check location (1).

Important!  
Install gasket (2) with oval opening (3) facing the ball valve.  
Install transfer plate (4) and second gasket (5).



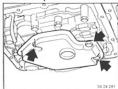
Screw in Special Tools 24 5 150.  
Place valve body on transfer case.  
Screw in bolts.  
Remove Special Tools 24 5 150.  
Tighten bolts of valve body crosswise.  
Use Special Tool 24 5 180.

Important!  
Only use bolts with inch threads.  
Tightening torque = 20 Nm (14 ft. lbs.).



Connect wire harness on solenoids (1 ... 5).  
Plugs are coded.

## 24-30/23



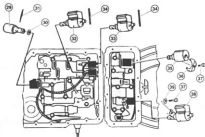
Install and screw on oil filter screen.  
Use Special Tool 24 5 180.

*Important!*

Only use bolts with inch threads.  
Tightening torque = 18 ... 21 Nm  
(13 ... 15 ft. lbs.).

30 24 281

### 24 34 856 Replacing all solenoid valves (oil pans removed)



#### Arrangement of solenoid valve

- 28 Solenoid brake band
- 30 Corrugated disc
- 31 Pin
- 32 Solenoid switch stage 2/3
- 33 Solenoid switch stage 1/2 and 3/4
- 34 Spring pin
- 35 Pressure regulator
- 36 Retaining bracket
- 37 Screw, 1/4 inch
- 38 Solenoid valve, torque converter clutch
- 39 Disc



#### a) Solenoid valve (32) 2nd/3rd gear

Press off plug (1) with screwdriver.  
Do not pull on wires.  
Pull out pin (2) (use side cutters).

**Installation:**  
Replace pin (2).  
Pin must protrude about 5 mm.



Pull or press (use screwdriver) out solenoid valve.

**Installation:**  
Coat seals with grease (vaseline).  
Press in solenoid valve as far as stop.



#### b) Solenoid valve (32) 1st/2nd and 3rd/4th gear

Press off plug (1) with screwdriver.  
Do not pull on wires.  
Pull out pin (2) (use side cutters).

**Installation:**  
Replace clamping pin (2).  
Pin must protrude about 5 mm.



Pull or press (use screwdriver) out solenoid valve.

**Installation:**  
Coat seals with grease (vaseline).  
Press in solenoid valve as far as stop.



c) Solenoid valve (29) brake band

Remove oil screen 24 31 195.  
Press off plug (1) with screwdriver.  
Do not pull on wires.  
Press in solenoid valve - light spring pressure -  
and pull out pin (2) by hand or with a pliers if  
necessary.



Pull or press (use screwdriver) out solenoid  
valve.

Installation:  
Coat seals with grease (vaseline).  
Press in solenoid valve as far as stop and  
tighten screw.  
Tightening torque 24 34 242 \*



Pull out solenoid valve.  
Avoid damage to corrugated washer (3).



Installation:  
Coat seals with grease (vaseline).  
Install solenoid valve that groove (4) is aligned  
with bore (5).  
Press in solenoid valve that pin (2) can be in-  
serted.

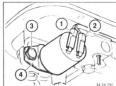


d) Solenoid valve (28), torque converter clutch

Press off plug (1) with screwdriver.  
Do not pull on wires.  
Remove screw (2).

Important!  
Imperial threads.





**24 34 865 Replacing pressure regulator  
for selecting unit  
(Oil pump removed)**

Disconnect cables (1) and (2).  
Remove screw (3).

Caution!  
Inch thread  
Remove support bracket (4).  
Pull out pressure regulator.

34 34 251



Installation note:  
Fit pressure regulator in position.  
Support bracket (4) must be fitted and secured  
with curved section facing outward.  
For tightening torque 24 34 24 2\*.

34 34 252



**24 34 875 Replacing pulse generator  
for output speed**

Disconnect plug (1).  
Remove screw (2).

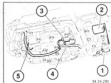
34 34 251



Pull out or press out pulse generator.

Installation note:  
Coat O-ring (3) with grease (Vaseline).

34 34 252



### 24 35 505 Replacing wiring harness in automatic transmission

Remove oil screen 24 31 135.  
Remove plugs (1 ... 5) from the solenoid wires.

**Caution!**  
Pry off plug with a screwdriver.  
Do not pull on wires.



Unscrew nut (6) from plug.  
Withdraw plug from inside.

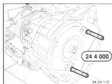


**Installation:**  
Check seal (7).  
Place flattened side of plug facing upwards.  
Tightening torque 24 35 110\*



Pull out wire harness through bore in transfer case.

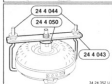
\* Refer to Technical Data



### 24 40 005 Removing and installing or removing torque converter

Remove transmission, refer to 24 30 025.  
Pull torque converter out of primary pump carefully using assembly handles 24 4 000.

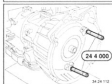
**Caution!**  
Escaping ATF.



**Installation:**  
Check torque converter for leaks using fixture 24 4 050, retaining bracket 24 4 043 and retaining screws 24 4 044.  
Test pressure: 0.5 bar.

**Caution!**  
Danger of injury - always use special tool 24 4 043.

Torque converter must be replaced if the bearing surface on the converter shaft is damaged.



Carefully guide openings on converter into primary pump by turning slightly and using assembly handles 24 4 000.

**Caution!**  
Make sure converter bearings and seal are not damaged while guiding in.  
Insert torque converter as far as it stops.



Checking installed torque converter:  
Engine and transmission oil must be at operating temperature.  
Engine must develop full power.  
Start engine.  
Pull up parking brake lever and press down on brake pedal firmly.  
Move selector lever to D.  
Press accelerator pedal to kickdown.  
Read stall speed \* off tachometer.

**Caution!**  
Never test stall speed longer than ten seconds to avoid overheating. Stall speed much higher than specified value \*.  
a) Torque converter not sufficiently filled  
- top up the oil level  
b) Slip in the clutches  
- check the clutches.

Stall speed much lower than specified value \*.  
a) Engine not developing sufficient power.  
Check engine.

b) Torque converter or pump defective.  
Replace torque converter or check pump.



Torque converters cannot be cleaned with standard workshop equipment and must be replaced in case of transmission damage or torn oil strainer.  
Converter identification\*\*

\*\* Refer to Technical Data



### 24 61 500 Removing and installing or replacing control unit

The control unit for 8H transmissions is located in the A-pillar on the right side. Removing and installing gearbox 31 18 250.

Lift off cover for loudspeaker.  
Disconnect wires for loudspeaker.



Pull plug (1) off of control unit, swinging spring retainer (2) down for this purpose.

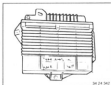
**Caution!**  
Always switch ignition off first before disconnecting or connecting plug.



Partially remove insulating mat.  
Only loosen screws (3 ... 5).



Lift out control unit and remove from underside.



Code is on identification plate.  
Refer to B&B Parts catalog for cross reference of types and models.

## TROUBLESHOOTING AUTOMATIC TRANSMISSION THM-R1

**Note:**  
See self-diagnosis or test plan for troubleshooting and testing electronic components.

Condition	Cause	Correction
Engine cannot be started in N or P or in all positions	Selector lever not in N or P Misadjustment between selector lever and transmission Transmission switch faulty	Move selector lever to N or P Adjust selector lever – see 24 00 007 Replace transmission switch – see 25 16 060
Position P Park does not engage	Misadjustment between selector lever and transmission Excessive friction in parking lock mechanism	Adjust selector lever – see 24 00 007 Replace parking lock parts (connecting rod, pawl)
Park does not hold (slips out)	Misadjustment between selector lever and transmission	Adjust selector lever – see 24 00 007
Delayed shift from N to D	Oil level in transmission too low Oil pressure too low	Correct oil level Check oil pressure – see 24 00 015
Slip or shake in 1st gear	Oil pressure too low Torque converter faulty Brake band misadjusted Oil leak in oil circuit for the brake band 4th gear one-way clutch or planet gear set one-way clutch faulty	Check oil pressure – see 24 00 015 Replace converter – see 24 40 005 Adjust brake band Check brake band piston and cover for leaks/seal Replace one-way clutches

## TROUBLESHOOTING AUTOMATIC TRANSMISSION THM-R1

Condition	Cause	Correction
Position R No reverse gear	Maladjustment between selector lever and transmission Reverse gear clutch faulty Oil filter screen dirty	Adjust selector lever - see 24 00 007  Repair reverse gear clutch Replace oil filter screen
Car moves or creeps in R	Maladjustment between selector lever and transmission Brake band adjusted too tight	Adjust selector lever - see 24 00 007  Adjust brake band
Hard engaging jolt from R to D	Brake band locked or faulty	Check/replace brake band
Poor acceleration	Emergency running program activated Torque converter faulty	Check self-diagnosis Replace converter - 24 40 005
No upshift 1-2	Maladjustment between selector lever and transmission Oil loss in 2nd gear clutch Solenoid/electric lead faulty	Adjust selector lever - see 24 00 007  Seal piston of 2nd gear clutch Check lead/replace solenoid - see 24 34 006
Problems with 1-2 shift	Wrong oil pressure for 2nd gear clutch Oil loss in 2nd gear clutch Pressure reservoir valve for 1/2 gear clutch seized or leaks	Seal piston of 2nd gear clutch Replace valve body
No upshift 2-3	Maladjustment between selector lever and transmission Solenoid/electric lead faulty Shift valve in valve body faulty	Adjust selector lever - see 24 00 007  Check lead/replace solenoid - see 24 34 006 Replace valve body
Problems with 2-3 shift	Brake band maladjusted Brake band valve faulty/seized Oil loss in 3rd gear clutch Oil loss in return pipe of pressure reservoir for brake band Wrong oil pressure	Adjust brake band  Seal piston of 3rd gear clutch

## TROUBLESHOOTING AUTOMATIC TRANSMISSION THM-R1

Condition	Cause	Correction
No upshift 3-4	Maladjustment between selector lever and transmission Oil loss in 3rd gear clutch Solenoid/electric lead faulty	Adjust selector lever - see 24 00 007 Seal piston of 3rd gear clutch Check lead/replace solenoid - see 24 34 856
Problems with 3-4 shift	Oil loss in 4th gear clutch Wrong oil pressure 4th gear overdrive clutch does not disengage	Seal piston of 4th gear clutch Repair overdrive clutch
No bearing of converter clutch	Solenoid/electric lead faulty Oil loss in oil circuit	Check lead/replace solenoid - see 24 34 856
Rattling from converter clutch	Converter faulty Insufficient oil pressure	Replace converter - see 24 40 005 Check oil pressure - see 24 00 015
Converter clutch does not disengage	Solenoid/electric lead faulty Return pipe clogged	Check lead/replace solenoid - see 24 34 856
No "D" program	Program switch faulty Break in electric lead	Replace program switch - see 61 31 265 Check / repair electric lead
No "M" program	Program switch faulty Break in electric lead	Replace program switch - see 61 31 265 Check / repair electric lead
No kickdown	Kickdown switch faulty Break in electric lead	Replace kickdown switch - see 35 41 480 Check / repair electric lead

## TROUBLESHOOTING AUTOMATIC TRANSMISSION THM-R1

Condition	Cause	Correction
No downshift	1/2 and 3/3 solenoids or electric lead faulty Shift valves in valve body faulty	Check electric lead/replace solenoids – see 34 34 856 Replace valve body
No engine braking effect Selector lever in D (3rd gear) M program / selector lever in 3, 2, 1	4th gear overdrive clutch faulty Oil loss in oil circuit	Repair overdrive clutch
ATF temperature too high Oil escapes through vent	Oil level too high No function of converter clutch Extreme load in emergency running program or M program	Correct oil level Replace solenoid for converter lockup clutch / check electric lead



## TROUBLESHOOTING AUTOMATIC TRANSMISSION THM-R1

Condition	Cause	Correction
<b>Leakage</b> Oil drips out of converter bell housing	O-ring of input shaft faulty Pump housing leaks Converter leaks on welded seam Radial oil seal for converter leaks	Replace O-ring Replace complete pump - see 24 31 ... Replace converter - see 24 40 005 Replace radial oil seal - see 24 12 005
Leak between transmission case and oil sump	Oil sump mounting bolts not tightened correctly Oil sump gasket damaged	Tighten bolts to correct torque* Replace gasket - see 24 11 007
Leak on transfer case	Converter bell housing mounting bolts loose Case gaskets faulty	Tighten bolts to correct torque* Seal case
Oil loss on transmission plug	O-ring faulty Transmission plug not tight	Replace O-ring - see 24 36 ... Tighten transmission plug
Oil loss on output	Radial oil seal on output damaged	Replace radial oil seal - see 24 12 015
Oil loss through or on vent	Oil level too high Wrong oil (strong contamination)  Vent cover missing O-ring on vent damaged	Correct oil level Replace oil, if necessary remove transmission and drain completely including torque converter Mount cover or replace vent Replace O-ring
Oil loss on filler pipe	Plug on filler pipe faulty	Replace plug
Leak between transmission case and extension	Mounting bolts loose Gasket damaged	Tighten bolts to correct torque* Replace gasket - see 24 11 002
Oil loss on oil cooler pipe	Connection loose Oil cooler pipe damaged Cooler leaks	Tighten to correct torque* Replace oil cooler pipe Replace cooler - see 17 11 006

\* See Specifications

## 24 Automatic transmission

### A5S 310 Z

00 11 239	Oil change in automatic transmission .....	24-	0/300
24 00 007	Selector lever – adjust .....	24-	0/302
016	Hydraulic pressure value – check .....	24-	0/303
026	Transmission – remove and install – engine M50 /M51 transmission A5S 310 Z .....	24-	0/304
026	Transmission – remove and install – engine M60 transmission A5S 310 Z .....	24-	0/310
026	Transmission with transfer box – remove and install – 4-wheel drive .....	24-	0/321
046	Exchange transmission – install .....	24-	0/326
24 11 008	Transmission oil pan – remove and install/seal .....	24-	11/31
24 12 016	Radial seal for output flange – replace .....	24-	12/31
106	Radial seal for manual selector valve shaft – replace .....	24-	12/33
24 13 156	Output flange – replace .....	24-	13/31
706	Bearing on transmission extension – replace .....	24-	13/31
24 30 006	Shift unit – remove and install/replace .....	24-	30/31
24 31 020	Oil pump housing – remove and install/seal .....	24-	31/31
156	Transmission oil strainer – remove and install/replace .....	24-	31/32
24 34 006	Parking interlock (pawl / leg spring) – remove and install/replace .....	24-	34/31
853	All solenoid valves – replace .....	24-	34/32
861	Shift unit pressure regulator – replace .....	24-	34/33
871	Impulse sensor for output speed – replace .....	24-	34/33
872	Impulse sensor for turbine speed – replace .....	24-	34/33
24 35 501	Wiring harness in automatic transmission – replace .....	24-	35/31
24 40 006	Torque converter – remove and install/replace .....	24-	40/31
24 61 500	Control unit – remove and install/replace .....	24-	61/31
	Automatic transmission – troubleshoot .....	24-	93/31
	Shift unit – troubleshoot .....	24-	93/36
	Peripherals – troubleshoot .....	24-	93/12

## 00 11 239 DRAINING OIL IN AUTOMATIC TRANSMISSION

Version with Oil Filter Pipe:

**Important!**

The oil change should only be carried out at operating temperature.



34 24 020 U

Pull out oil dipstick.

**Notes:**

The oil dipstick with arrest can only be pulled out after tilting the grip.



34 24 021 U

Unscrew drain plug (1).  
Drain ATF.

**Installation:**

Replace seal.  
Tightening torque\*.

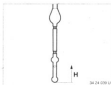


34 24 022 U

Pour in ATF only with help of Special Tool 24 0 080.

Volume of ATF\*\*.

\* Refer to Specifications



34 24 023 U

Check / correct ATF level with selector lever in P or N and engine running at idling speed.

Car must be on a level surface.

Wipe off oil dipstick with a rag which does not lose lint.

ATF temperature is sensed by a temperature dependent resistor which is integrated in the transmission wire harness.

Read ATF temperature with MoDc or a Service Tester (refer to Test Plans).

Pull out oil dipstick and measure oil level and compare with value in this table.

Oil Temperature + °C	ATF Level + H in mm	
	Min.	Max.
30	3	16
40	8	23
50	12	31
60	16	39
70	21	46
80	26	53
90	31	59

**ATF Level Too High:**

Strong foaming, splash loss, high temperature when driving fast.  
Oil test via the sept.

**ATF Level Too Low:**

Valves rattle, foaming, engine spins.  
General disturbances.

**Version without Oil Filler Pipe:**

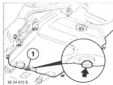
The oil filler pipe has been omitted since 1.5T.  
ATF is poured in and ATF level is checked through a filler bore underneath the oil sump.  
The oil change should only be carried out at operating temperature.



Car must be on level surface.  
With the engine stopped, pour in ATF using filler adapter (3<sup>1</sup>) until it runs out of the spill bore.  
Don't plug the bore.  
Start engine and move the selector lever in and out of all ranges while operating the brake pedal.

ATF temperature must be 30 to 35° C.

Interrogate ATF temperature with MoDc or a Service Tester (refer to Test Plans).  
Run engine at idling speed with selector lever in "P" or "R".  
Recheck ATF level.  
Screw in filler plug.  
Tightening torque<sup>2</sup>.



Unscrew drain plug (1).  
Drain ATF.

**Note:**  
Dispose old ATF properly.

**Installation:**  
Replace seal.  
Tightening torque<sup>2</sup>.



Fill transmission with ATF.

ATF<sup>3</sup> is poured in through the filler bore underneath the oil sump.  
Unscrew filler plug (3).

**Installation:**  
Check seal, replacing it if necessary.

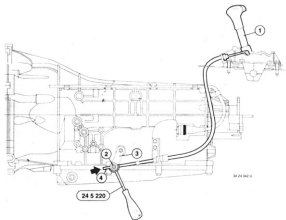
<sup>1</sup> Refer to Specifications  
<sup>2</sup> Refer to Operating Fluids

<sup>3</sup> Refer to Specifications  
<sup>4</sup> Source of Supply: BMW Parts

## 24-0/302

### 24 80 007 Adjusting gearshift lever

Transmission A35 310 Z



Set gearshift lever (1) to "P".  
Release nut (2).

#### Caution!

In order to avoid deforming the operating cable, the clamping screw must be held with the special tool 24 5 220.

#### Note:

The special tool 24 5 220 can only be fitted in position "P".

Press forward lever (3) (park position).

Press operating cable rod (4) opposite forward direction and release again.

Firmly secure operating cable rod (4) with nut (3) (held with special tool 24 5 220).

Observe tightening torque 10 ... 12 Nm



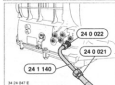
#### 24 00 016 CHECKING HYDRAULIC PRESSURE VALUES

Connect Special Tools 24 0 021 and 13 3 061.



Unscrew and remove plug (1) from the right-hand side of the transmission case to check the main pressure. Identification on case: PH.

**Important!**  
Check seal, replacing it if necessary. Tightening torque\*.



Screw in Special Tool 24 0 022 with feeling until resistance is noticed (adapter threads are tapered).

Mount Special Tool 24 1 140 (yellow pipe) on Special Tool 24 0 022 (adapter) and connect with Special Tool 24 0 021 (hose).

Selector lever in P or R.  
Start and run engine at idling speed\*.  
Read main pressure on pressure gauge.  
Main pressure specification: 5.4 ... 6.4 bar.

\* Refer to Specifications



### 24 00 026 Removing and installing transmission

- Engine MS0 / MS1 transmission  
ABS 310 Z

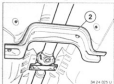
Disconnect negative lead.

**Caution!**

First read fault memories with tester and print any faults since disconnecting the negative lead will cancel the fault memories in the control units.

Remove the complete exhaust unit 18 00 020. Remove heat baffle plate (7).

24 04 026 E



24 04 027 E

Remove bracket (2).

Installation instruction:  
Tightening torque\*.



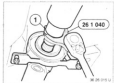
24 04 028 E

Unscrew propeller shaft on transmission.

Installation instruction:

Replace stop nuts.

Tighten nuts with specified tightening torque\*.



24 00 029 E

Version with screwed-on ring:

Loosen screwed-on ring (1) several turns.

Installation instruction:

Tighten screwed-on ring (1) with special tool 26 1 040 after finishing installation.

\* Tightening torque\*.

Press joint disk away from transmission.

\* Refer to Specifications



24 04 307 E

Unscrew center mount.

Installation instruction:

Preload center mount in direction of travel (A).  
With sliding member on center mount

A = 4 ... 6 mm.

Without sliding member on center mount

A = 2 ... 4 mm

Field propshaft downwards and withdraw from transmission.

**Caution!**

Do not allow the propeller shaft to drop into the joints.

Suspend propeller shaft from car on a piece of wire.

\* Tightening torque\*.



24 04 031 E

Drain ATF.

**Caution!**

Never reuse drained ATF.

Installation instruction:

Transmission must be replaced if ATF smells burnt and is black.

**Caution!**

Clean oil cooler and pipes with compressed air and flush twice with ATF if the transmission is faulty.

Remove oil filler pipe (1).

Installation note:

\* Tightening torque\*.

\* Refer to Specifications



Unscrew nut (1).

**Important!**

Always counterhold bolt with Special Tool 24 5 220 to prevent deformation of the cable.

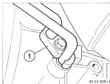
**Note:**

Special Tool 24 5 210 can be applied only in position P.

Unscrew cable at holder.  
Pull out cable.

**Installation:**

Adjust selector lever – see 24 00 006.  
Tightening torque\*.



Unscrew holder (1) for oil cooler pipe.

**Installation:**

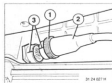
Tightening torque\*.



Pull oil cooler pipe out of transmission.

**Installation:**

Check O-rings (2), replacing them if necessary.  
Tightening torque\*.

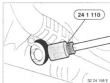


Turn bypass lock (1) counterclockwise.  
Pull off plug (2).

Lift wire harness out of holder.

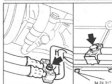
**Installation:**

Connect plug (2) that marks (3) are aligned.



Lift cap off opening (1) in oil sump.

Unscrew torque converter from drive plate at three points using Special Tool 24 1 110.  
Turn flywheel for this purpose.



Unscrew oil cooler pipe clamps on crankcase and oil sump.

**Installation:**

Tightening torque\*.



**Installation:**

Insert bolt with Special Tool 24 1 110 and tighten with a torque wrench.  
Tightening torque\*.

**Important!**

Only use size M 10 x 16 mm bolts together with spring washers.  
Non-conformance leads to destruction of the transmission.

\* Refer to Specifications

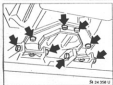
\* Refer to Specifications





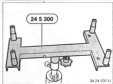
Unscrew stabilizer on engine carrier at left and right hand sides.

Installation:  
Tightening torque\*.

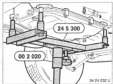


Remove gravity center mount.

Installation:  
Rubber mounts must be adapted by moving after installation of the rear cross member.  
Tightening torque\*.

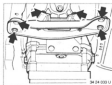


Assemble Special Tool 24 5 300 to suit a 5 HP-18 transmission as marked.



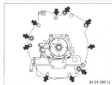
Support transmission from underneath with Special Tools 24 5 300 and 60 2 000.

\* Refer to Specifications



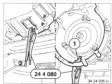
Unscrew cross member.  
Lower transmission as far as connecting pipe.

Installation:  
Center transmission - see Group 26.  
Tightening torque\*.



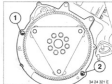
Unscrew transmission on engine.  
Unscrew Tors bolts with a Tors socket.

Important!  
Washers must be used to avoid increasing the breaking loose torque.  
Tightening torque\*.



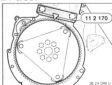
Prevent converter from sliding out by applying and clamping Special Tool 24 4 080 on transmission case with flat side of retainer (1) facing the converter. Pull transmission off of engine.

Important!  
The lifting fixture with mounted transmission may be moved only in completely lowered state.



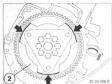
Important!  
Check that dowel sleeves (1 and 2) are not missing before installing transmission. If applicable, transfer dowel sleeves from transmission or use new dowel sleeves.

\* Refer to Specifications



**Installation:**  
Check drive plate for breaks and cracks, replacing it if necessary.  
Hold flywheel using Special Tool 11 2 170.

**Important!**  
Replace expansion bolts and install new bolts with lock cement\*.  
Only coat threads.  
Clean ragged bore thoroughly.  
Tightening torque\*.

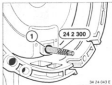


#### Version with Sheet Metal Flywheel (2):

**Important!**  
Keep to sequence of installation.  
Sheet metal flywheel (2) has three indentations for the torque converter mounting tabs.

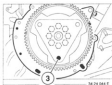
When guiding the engine and transmission together the three mounting tabs on the torque converter must be aligned with the three indentations in the sheet metal flywheel.

Non-conformance will lead to follow-up damage on the automatic transmission. Turning of the torque converter, or engine, is no longer possible after guiding the engine and transmission together and would lead to damage.



Turn torque converter on the transmission than bore (1) in the tab points down perpendicularly.  
Screw Special Tool 24 2 300 into the tab.

\* Refer to Specifications  
\*\* Source of Supply: BMW Parts



Bore (3) on drive plate must point perpendicularly to center of opening in oil sump.



Lift automatic transmission until bore (3) in drive plate is reached.  
Carefully guide transmission into bore (3) of drive plate using Special Tool 24 2 300.  
Bolt transmission case to engine.  
Insert Special Tool 24 2 300 from tab forwards.  
Mount torque converter.  
Tightening torque\*.



Pour in ATF.

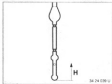
Version with Oil Filler Pipe:  
Pull oil dipstick out.

**Important!**  
Oil dipstick is locked and can only be pulled out after tilting it on the grip.



Pour in ATF only with use of Special Tool 24 0 090.  
Volume: approx. 3.0 liters.

\* Refer to Specifications



Check / correct oil level with selector lever in P or N and engine running at idling speed.

Car must be on a level surface.

Wipe off oil dipstick with a rag which does not lose lint.

ATF temperature is sensed by a temperature dependent resistor which is integrated in the transmission wire harness.

Read ATF temperature with MoDiC or a Service Tester (refer to Test Plan).

Put out oil dipstick and measure oil level and compare with value in this table.

Oil Temperature + °C	Oil Level = H in mm	
	Min.	Max.
30	3	15
40	8	23
50	12	31
60	16	39
70	21	46
80	26	53
90	31	59

#### Oil Level Too High:

Strong foaming, loss through splashing, high temperature when driving fast, oil lost via vent.

#### Oil Level Too Low:

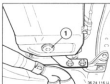
Valves rattling, foaming, engine spinning, general operation disturbances.

#### Version without Oil Filler Pipe:

The oil filler pipe has been omitted since 1.8L.

Check ATF level after installation of the transmission.

ATF is poured in and ATF level is checked through a filter bore underneath the oil pump.



Car must be on level surface.

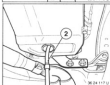
ATF temperature must be 30 to 55° C to check ATF level.

Interrogate ATF temperature with MoDiC or a Service Tester (refer to Test Plan). Run engine at idling speed with selector lever in "P" or "N".

Unscrew filter plug (1).

#### Installation:

Check seal, replacing it if necessary. Check or correct ATF level.



Fill in ATF with help of filler neck (2) so long until it runs out of the overflow hole. Screw in and tighten filter plug. Tightening torque\*.

\* Refer to Specifications.

\*\* Source of Supply: BMW Parts

**24 00 026 Removing and installing transmission**  
 - Engine M60 / Transmission  
 ABS 310 Z -

Disconnect negative lead from battery.

**Caution!**

Disconnecting the negative lead cancels the fault memories in the control units.

For this reason, first interrogate the fault memories with the Service Tester and print out any faults recorded.

Remove complete underbody protection.

Remove complete exhaust assembly (8 00 020).

Remove and cover.



82 23 050 E

Unscrew heat shield (1).



82 23 011 E

Remove bracket for Lambda oxygen sensor plug.



82 24 064 E



82 24 061 E

Unclip cable bracket on transmission.



82 24 063 E

Loosen nut (1).

**Caution!**

To prevent deformation of the cable, always brace the screw with special tool 24 5 220. Tightening torque\*

**Note:**

Special tool 24 5 220 can only be fitted in setting "F".



82 24 064 E

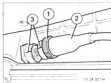
Remove Bowden cable sleeves from counter support. Pull out cable.

**Installation instructions:**

Fit rubber gaiter. Tightening torque\*

Adjust selector lever, see 24 00 007

\* Refer to Specifications



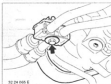
Turn bayonet lock (1) counterclockwise.  
Pull off plug (2).  
Lift wire harness out of holder.

**Installation:**  
Connect plug (2) that marks (3) are aligned.



Pull oil cooler pipes out of transmission.

**Installation:**  
Check O-rings (2), replacing them if necessary.



Unscrew oil cooler pipe clamps on power steering pump.

**Installation:**  
Tightening torque\*.

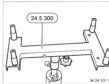


Unscrew stabilizer at left and right hand ends and let it hang down.



Unscrew oil cooler pipe clamps on oil pump.

**Installation:**  
Tightening torque\*.

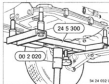


Assemble Special Tool 24 5 300 to suit a 5 HP-10 transmission.



Unscrew oil cooler pipe clamp (1).

**Installation:**  
Tightening torque\*.



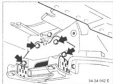
Support transmission from underneath using Special Tools 24 5 300 and 00 2 020.

\* Refer to Specifications



Unscrew cross member.

**Installation:**  
Center transmission - refer to Group 26.  
Tightening torque\*.



Unscrew exhaust suspension at transmission.



Unscrew joint disc at transmission.



**Installation:**  
Replace step nuts.  
Tighten bolts to specified tightening torque\*.

**Important!**  
Only turn nuts on flange end whenever possible by design to avoid tension in the joint disc.

\* Refer to Specifications



Unscrew center mount.  
Bend propeller shaft down and pull off of centering pins on transmission.

**Important!**  
Do not let propeller shaft fall into joints.  
Suspend it from car on piece of wire.



**Installation:**  
Preload center mount in forward direction by distance (A) ± 2 ... 4 mm.  
Tightening torque\*.



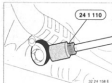
Unscrew heat shields at left and right hand sides and push forward.



Turn steering wheel fully against left or right lock.

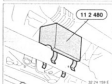
Lift cap out of opening in oil sump.

\* Refer to Specifications



Unscrew torque converter from drive plate with special tool 24 1 110. (3 or 4 screws).  
To do this, turn flywheel round one screw at a time.

**Note:**  
The torque converter screw connection has been changed from 3 to 4 screws.

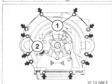


Fit special tool 11 2 480 between connecting tube and engine oil pump.



Lower transmission.

**Caution!**  
The exhaust manifold must not contact the traction stud mounts.

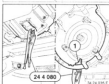


Unscrew transmission on engine. (Torx screws).

**Note:**  
Screws (1) Torx E 10  
all others Torx E 12  
The screws opposite the starter motor (2) have nuts on the front.



**Installation instruction:**  
Note that Torx screws are fitted with washers.  
Tightening torque\* =



Secure torque converter to prevent it from falling out. To do this, place special tool 24 4 080 on transmission case with flat side of retaining torque (T) against torque converter and secure.  
Pull transmission off of engine.

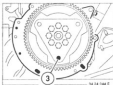
**Caution!**  
To transport the transmission, lower transmission fully onto lifting fixture.  
- Risk of accident -



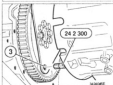
**Note** down sleeves.  
If necessary, transfer / replace down sleeves on transmission.



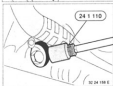
**Installation instruction:**  
Turn the torque converter on the transmission until here (1) faces down perpendicular to the oil.  
Screw special tool 24 3 300 into the tab.



**Installation:**  
Bore (3) on drive plate must point perpendicularly to center of opening in oil sump.

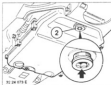


**Installation:**  
Lift automatic transmission until bore (3) in drive plate is reached.  
Carefully guide transmission into bore (2) of drive plate using Special Tool 24 2 300. Both transmission case to engine. Unscrew Special Tool 24 2 300 from tab forwards.  
Mount torque converter to flywheel.  
Tightening torque\*.



**Installation:**  
Install bolt using Special Tool 24 1 110 and tighten using a torque wrench.  
Tightening torque\*.

**Important!**  
Only use original bolts\*\* together with spring washers.  
Non-conformance will lead to destruction of the transmission.



**Installation:**  
Fill transmission with ATF.

ATF is poured in through filter opening underneath the oil sump.  
Unscrew filter plug (2).  
(Check seal, replacing it if necessary.)



Car must be on level surface.  
With engine stopped, pour in ATF with help of filler neck (3)\*\* so long until it runs out of the overflow hole.  
Do not plug hole.  
Start engine and shift in and out of all gears several times while operating the brake pedal.

ATF temperature must be 30 to 55° C.

Interrogate ATF temperature with MeDIC or a Service Tester (refer to Test Plan).  
Run engine at idling speed with selector lever in "P" or "N".  
Recheck ATF level.  
Screw in filter plug.  
Tightening torque\*.

\* Refer to Specifications  
\*\* Source of Supply: BMW Parts

\* Refer to Specifications  
\*\* Source of Supply: BMW Parts



**24 00 026 Removing and installing transmission with transfer case**  
 - 4-wheel drive

Disconnect negative lead.

**Caution!**

First read fault memories with tester and print any faults since disconnecting the negative lead will cancel the fault memories in the control units. Removing and installing exhaust assembly 18 00 020.

**a Remove fan shroud:**

Remove expanding rivets from fan shroud and lift fan shroud up slightly.



50 11 008-1

**Installation instruction:**

Connect up fan shroud on left and right and in center.



50 11 008-1

**b Remove propshaft:**

Remove heat baffle plate (7).



34 07 010-0



34 07 011-0

Unscrew propeller shaft on transmission.

**Installation instruction:**  
 Replace stop nuts.  
 Tightening torque 26 11 242\*



34 04 307-0

Unscrew center mount.

**Installation instruction:**  
 Preload center mount in direction of travel  
 $A = 2 \dots 4$  mm.



34 07 011-0

Fold propeller shaft downwards and withdraw from transmission.

**Caution!**

Do not allow the propeller shaft to drop into the joints.  
 Suspend propeller shaft from car on a piece of wire.  
 Tightening torque 26 11 542\*.

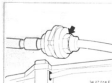


34 07 011-0

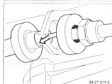
**c Working on the automatic transmission:**

Remove trackbar.  
 Remove Bowden cable.

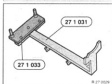
\* Refer to Specifications



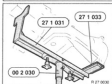
Unscrew nut for Bowden cable sleeve.



Detach Bowden cable sleeve from bracket.



Preassemble special tools 27 1 031 and 27 1 033 to suit automatic transmission.



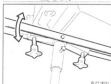
Support transmission on lifting fixture 00 2 030.



Unscrew cross-member from body and transfer box and remove.

Lower transmission.

Installation instruction:  
Tightening torque 24 71 142\*



Adjust inclination by turning the knurled-head bolts with special tool 27 1 031.



Jam a block (wooden or similar material) between front axle carrier and engine oil pan (A = 50 mm).

Note:

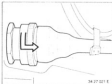
The block prevents the engine from tipping forwards when the transmission flange is unfastened.



Installation instruction:

When lowering the transmission, the coolant air guide for the alternator can slip out. Check once the transmission has been installed.

\* Refer to Specifications



24 27 021 B

Disconnect plug connection for transmission control unit (bayonet connection).



24 27 022 B

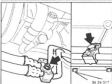
Turn bayonet connection for transfer box control counter-clockwise and remove.

**Installation instruction:**  
Fit plug in such a way that marking grooves are aligned with one another.



24 27 023 B

Remove bracket for cable on transmission control unit.

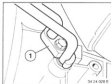


24 28 017

Loosen oil cooler pipe clamps on crankcase and oil pan.

**Installation instruction:**  
Tightening torque 17 22 3A2\*.

\* Refer to Specifications



24 24 028 B

Remove retaining tab (1) for oil cooler lead on transmission.  
Withdraw oil cooler lead.



24 21 029 B

**Installation instruction:**  
Check O-rings (2), replacing if necessary.



24 24 142 B

Lift rubber stops out of apertures in cover plate (below exhaust manifold).



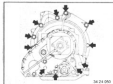
24 1 110

Loosen the screw connections on the torque converter using special tool 24 1 110. To do this, keep rotating engine as far as next screw by turning the central screw on the crankshaft.

**Caution!**  
Only use original bolts.

**Installation instruction:**  
Tightening torque 24 40 1A2\*

\* Refer to Specifications



Disconnect transmission flange from engine.  
(Torx screws).



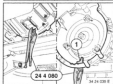
Installation instruction:  
Note that Torx screws are fitted with washers.

Tightening torque 24 00 1A2\*



Carefully remove transmission.

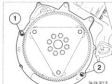
Caution!  
Prevent torque converter from sliding out.  
To do this, press down with screwdriver pointing towards transmission while removing the transmission unit.



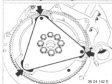
As soon as possible, fit and secure special tool 24 4 080 on transmission case with flat side of retaining tongue (1) facing the torque converter.

Caution!  
A lifting fixture with mounted transmission may be moved only in completely lowered position. The lifting fixture is not suitable for transporting the transmission.  
- Danger of accident! -

\* Refer to Specifications



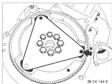
Installation instruction:  
Check that dowel sleeves (1 and 2) are not missing.  
If applicable, transfer dowel sleeves from transmission or use new dowel sleeves.



Version with sheet metal flywheel:

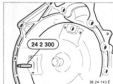
Caution!  
Keep to sequence of installation.  
Sheet metal flywheel (2) has three indentations for the torque converter mounting tabs.

When guiding the engine and transmission together the three mounting tabs on the torque converter must be aligned with the three indentations in the sheet metal flywheel. Non-conformance will lead to secondary damage on the automatic transmission.  
Turning the torque converter, or cranking the engine, is no longer possible after guiding the engine and transmission together and would lead to damage.



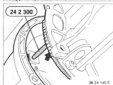
Bars on drive plate must point perpendicularly to center of opening in guard.

\* Refer to Specifications



Turn torque converter on the transmission that faces in the tabs point to the center of bores in the flywheel.

Screw special tool 24 2 300 into the tab.



Lift automatic transmission until bore in drive plate is reached.

Guide transmission in carefully with special tool 24 2 300 in bore (3) on the drive plate. Bolt transmission case to engine.

Unscrew special tool 24 2 300 from the tab towards the front.

Mount torque converter.

Tightening torque 24 40 142\*



o Check transmission fluid level.

The ATF fluid\*\*\* is filled through the lower filler aperture in the oil pan.  
Remove filler plug (2).

Installation instruction:  
Check seal, replacing if necessary.



Car must be standing on a level surface.  
When the engine is stationary, top up with ATF fluid with filler neck (2)\*\* until fluid overflows around the filler screw.  
Don't plug the bore.  
Start engine. Depress brake and shift the selector lever through all positions several times.

Oil temperature must be between 30...35°C.

- Interrogate with **Medic** or **Service Tester** (see Troubleshooting Manual) -

Allow engine to idle in selector lever setting "P" or "N".

Recheck ATF level.  
Screw in filler plug.  
Tightening torque\*

\* Refer to Specifications

- Refer to Specifications  
- Source of Supply: BMW Parts Service  
\*\*\* Refer to Consumables Specifications



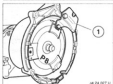
24 00 000 0

**24 00 046 Installing exchange transmission**

Removing transmission 24 00 006.

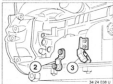
**Caution!**

Always clean oil cooler and pipes with compressed air and flush twice with ATF before installing an exchange transmission.  
Transmission identification coding\* on type plate or label.



24 04 000 0

Transfer transport holder (1).



24 04 000 0

Transfer lever (2) and retaining bracket (3) and cable bracket for Lambda oxygen sensors.

**Installation instruction:**

Tightening torque 24 51 142\*



24 04 000 0

**Caution!**

Automatic transmissions are supplied filled with ATF.  
Version with oil filler pipe:  
Remove plug from oil sump before installing the oil filler pipe.  
Catch escaping ATF in a clean container.  
Pour in ATF using special tool 24 0 080 after installing transmission.

\* Refer to specifications



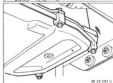
### 24 11 008 REMOVING AND INSTALLING / SEALING TRANSMISSION OIL SUMP

Drain oil.

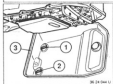
Version with Oil Filter Pipe:  
Unscrew filter pipe (1).



Unscrew oil sump.  
Take off oil sump with gasket.



Installation:  
Mount holder with straight arm on side and curved holders at front and rear.  
Tightening torque.



Clean oil sump.

Important!  
Place magnets (1 and 2) in oil sump.  
Check gasket (3), replacing if necessary.

\* Refer to Specifications



Version with Oil Filter Pipe:  
Pull out oil dipstick.

Important!  
Oil dipstick is locked and can be pulled out only after tilting the handle.  
Pour in ATF.



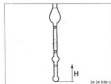
Pour in ATF using Special Tool 24 0 080.  
Volume of ATF: approx. 3.0 liters.

Check / correct oil level with selector lever in P or N and engine running at idling speed.

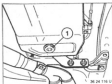
Car must be on a level surface.  
Wipe oil on dipstick with a rag which does not lose lint.

ATF temperature is sensed by a temperature dependent resistor which is integrated in the transmission wire harness.

Read ATF temperature with MoVIC or a Service Tester (refer to Test Plans).  
Pull out oil dipstick and measure oil level and compare with value in this table.



Oil Temperature ± °C	Oil Level ± H in mm	
	Min.	Max.
30	3	18
40	6	23
50	12	31
60	16	39
70	21	46
80	26	53
90	31	59

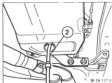


**Variation without Oil Filler Pipe:**

Oil filler pipe is omitted as of 1.8t.  
Automatic transmissions are filled with ATF through filler opening from below of the oil sump.  
Unscrew filler plug (1).

**Installation:**

Check seal, replacing if necessary.



Car must be on a level surface.

With the engine stopped, pour in ATF using filler (2)\*\* so long until ATF runs out of overflow hole.

Do not plug the hole.

Start engine and move selector lever in and out of all positions, while operating the brake pedal.

ATF temperature must be 30 ... 55° C.

Interrogate ATF temperature with MoDiC or Service Tester (refer to Test Plan).

Run engine at idling speed with selector lever in P or N.

Recheck ATF level.

Screw in and tighten filler bolt.

Tightening torque:

\* Refer to Specifications

\*\* Source of Supply: BMW Parts



### 24 12 016 Replacing radial oil seal for output flange

Remove propshaft (refer to 24 30 026).  
The output flange can no longer be dismantled from outside.  
Transmission extension has to be removed for removal of output flange.

**Caution!**  
Until this design modification is introduced, the oil pan must be removed before removal of the transmission extension and special tool 24 1 210 must be used, otherwise the clutch disks will slip out.

Because of this it is necessary to dismantle the transmission.

Special tool need no longer be used for removal of the oil pan with effort from.

Transmission number: 132300

For installation of special tool 24 1 210:

To remove oil pan, refer to 24 11 008.  
Remove cover plate (1) from shift unit.

Installation instruction:  
Tightening torque 24 11 2A2\*

\* Refer to Specifications



Prevent axial movement by installing special tool 24 1 210 between parking lock gear and case.  
Plates could slide out during removal of the transmission extension.  
Unscrew bolt on valve body.  
Install special tool 24 1 210 for parking gear detent and case and secure with screw (1).



Both versions:

Remove cross member from body and transmission extension.  
Unscrew bolts.

Installation instruction:  
Install guide (1) for cable holder.  
Tightening torque 24 11 1A2\*.



Pull off transmission extension.  
Watch out for spacer (1).  
Replace O-ring (2).



Drive back retaining tab on grooved nut.

\* Refer to Specifications



30 11 000 U



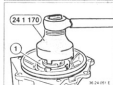
30 24 152 E



30 20 010 U

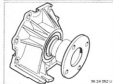


Clamp Special Tool 24 1 220 in a vise.  
Place transmission extension with output  
flange in Special Tool 24 1 220.

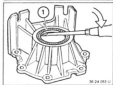


Unscrew slotted nut (1) using Special Tool  
24 1 170.

Installation:  
Tightening torque\*

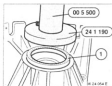


Take transmission extension off of Special  
Tool 24 1 220.  
Pull output flange out of bearings.



Lift out radial oil seal (1).

\* Refer to Specifications



Installation:  
Drive in new radial oil seal (1) flush using  
Special Tools 23 1 119 and 00 5 500.



### 24 12 106 Replacing radial oil seal for manual shift valve shaft

Loosen nut (1).

#### Caution!

In order to avoid deforming the operating cable, clamping screw must be held with special tool 24 5 220.

#### Note!

Special tool 24 5 220 can only be fitted in position "P".  
Detach operating cable from support bracket. Pull out operating (Blowster) cable.

#### Installation note:

Adjust gearshift, refer to 24 00 007.



#### Installation note:

Fit special tool 24 5 490 on manual shift valve shaft.

Oil sealing lip of new radial oil seal (1) with automatic transmission oil.

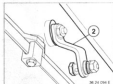
Slide on radial oil seal (1) up to casing.



#### Installation note:

Press radial oil seal into transmission casing with special tool 24 5 250.

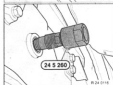
Remove special tool 24 5 490 from manual shift valve shaft.



Remove lever (2).

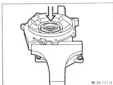
#### Installation note:

For tightening torque 24 01 1A2.\*



Remove radial oil seal from transmission casing with special tool 24 5 260.

\* Refer to Technical Data



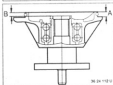
24 13 116 U

## 24 13 106 REPLACING OUTPUT FLANGE

Remove output flange – refer to 24 13 016.

**Important!**  
Axial play must be checked and, if necessary, adjusted.

Clamp transmission extension in a vice.  
Output flange must not bear.  
Press output flange in direction of output.

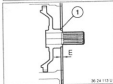


24 24 118 U

Measure distance (A) from shoulder to sealing surface and distance (B) from shoulder to end of output flange.

Example:

- A = 19.0 mm
- B = 7.4 mm
- C = 2.6 mm

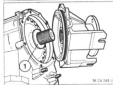


24 24 113 U

Measure distance (E) from sealing surface to shoulder (1) on parking lock gear.  
Press in parking lock gear for this purpose.

Example:

- E = 4.0 mm

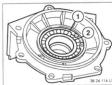


24 24 104 U

Example:

- E = 4.0 mm
- C = 2.6 mm
- 2.4 mm
- = 0.15 ... 0.25 mm axial play

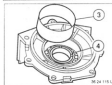
Install spacer (1) of correct thickness.  
Spacers are available from Parts in thicknesses of 0.8 to 2.8 mm.



24 24 118 U

## 24 13 106 REPLACING BEARING OF TRANSMISSION EXTENSION – Output Flange Removed –

Lift out circlip (1).  
Remove ball ring (2).



24 24 118 U

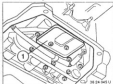
Heat transmission extension in area of bearing race to about 90° C with a hot air blower.  
Remove bearing race (3).

Installation:

First insert ball ring (4) before installing bearing race.

**Important!**

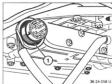
Axial play must be checked and, if necessary, adjusted – see 24 13 106.



**24 30 006 REMOVING AND INSTALLING OR REPLACING VALVE BODY**

Remove oil sump - see 24 11 006.  
Remove oil strainer - see 24 31 104.  
Unscrew cover (1) from valve body.

Installation:  
Tightening torque\*.



Pull out plug.

Installation:  
Check O-ring (1), replacing if necessary.  
Install the flat side on plug face case.



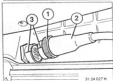
Unscrew valve body on case.

Important!  
Only unscrew bolts with head size (A) of 12 mm.

Installation:  
Tightening torque\*.

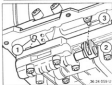


Installation:  
Hold plug receptacle on the flat side with a screwdriver to prevent turning.



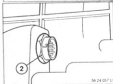
Turn bayonet lock (1) counterclockwise.  
Pull off plug (2).

Installation:  
Connect plug (2) that marks (3) are aligned.



Remove valve body with wire harness.

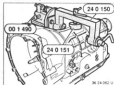
Installation:  
Attach valve body to centering pin (1) and  
overman valve (2) in selector lever shaft (3).



Unscrew nut (2).

Installation:  
Tightening torque\*.

\* Refer to Specifications



### 24 31 020 REMOVING AND INSTALLING / SEALING OIL PUMP HOUSING

Remove torque converter – see 24 40 006.  
Mount transmission on Special Tool 24 0 150 in conjunction with Special Tool 00 1 490.  
Mount transmission in horizontal position with help of Special Tool 24 0 151.



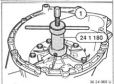
Set transmission upright.  
Mark installed position of oil pump housing to make reinstallation easier.



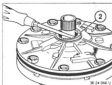
Unscrew bolts.

**Important!**  
Watch out for seals (1).

**Installation:**  
Replace seals (1).



Apply Special Tool 24 1 180 and clamp right on converter support shaft.  
The oil pump housing is pressed out by turning spindle (1) in.  
Lift out oil pump housing.  
Remove Special Tool 24 1 180.



Lift out radial oil seal (2).



Lubricate sealing lip of radial oil seal with ATF.

Drive in radial oil seal (2) to fit tight using Special Tools 24 0 110 and 24 0 111.  
Installed depth = 1 mm.

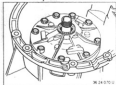


Replace round seal (3).



Check for correct installed position of thrust washer (4), needle bearing (5) and thrust washer (6) before installing the oil pump housing.  
Lubricate round seal (3) with ATF.

## 24-31/32

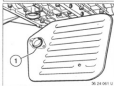


Mount oil pump housing.  
Check anti-made marks.  
Install bolts with new seals.  
Bolt oil pump housing to transmission case  
by tightening the bolts uniformly.  
Tightening torque = 10 Nm.



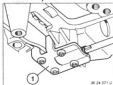
### 24-31 156 REMOVING AND INSTALLING OR REPLACING TRANSMISSION OIL STRAINER

Remove oil sump - see 24 11 008.  
Unscrew oil strainer on valve body.



Take off oil strainer.  
Watch out for O-ring (1).

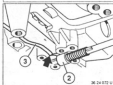
Installation:  
Tightening torque = 5 Nm.



**24 34 006 REMOVING AND INSTALLING OR REPLACING PARKING LOCK (PARK / SPRING)**

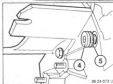
Remove valve body – see 24 30 006. Unscrew holder (1) on case.

Installation:  
Tightening torque\*.



Take off holder.

Installation:  
Connecting rod (2) must engage in groove of locking lever (3).



Unscrew plug (4).

Installation:  
Check seal (5), replacing if necessary. Tightening torque\*.



Drive out shaft pin from inside to outside.

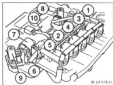


Remove spring (6) and parking lock lever (7).

Installation:  
Install spring (6) that long arm faces locking lever (7).

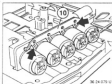
\* See Specifications



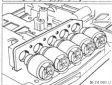


Arrangement of Solenoid Valves

- 1 Solenoid valve
- 2 Solenoid valve
- 3 Solenoid valve
- 4 Solenoid valve
- 5 Solenoid valve
- 6 Solenoid valve for corn, lockup clutch
- 7 Pressure regulator
- 8 Pulse sender for mean turbine speed
- 9 Pulse sender for output speed
- 10 Temperature sensor

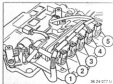


Installation:  
Install holder (10) with curved side facing solenoid valves.  
Tightening torque\*



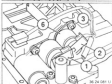
Pull out solenoid valves.

Installation:  
Solenoid valves are identical.

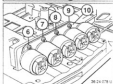


24 34 003 REPLACING ALL SOLENOID VALVES

Remove valve body - 24 30 006.  
Pull plugs (1 ... 3) off of solenoid valves.  
Do not pull on wires.



Remove solenoid valve (5).  
Pull off plugs (1 and 2) and unscrew screw (3).



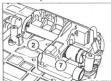
Unscrew screws (6 ... 8).  
Take off holder (10).



Take off holder (4).  
Pull out solenoid valve.

Installation:  
Install holder (4) with lightly curved side facing valve housing.  
Identification: solenoid valve (5) has a white plug receptacle.  
\*Tightening torque\*

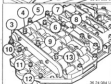
\* Refer to Specifications



## 24 34 861 REPLACING PRESSURE REGULATOR FOR VALVE BODY

Remove valve body – see 24 30 006.  
Pressure regulator (7) cannot be replaced separately, since the modulation pressure has to be adjusted.  
Modulation pressure can only be adjusted by the manufacturer.

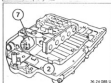
Replace pressure regulator (7) only in conjunction with valve housing (2).



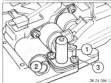
Remove solenoid valves (1 ... 5) – see 24 34 853.  
Unscrew valve housing (2) from valve body (7) by loosening screws (3 ... 12).

**Important!**  
Check length of screws.

**Installation:**  
Tightening torque\*.



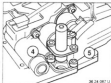
Take valve housing (2) with pressure regulator (7) off of valve body.



## 24 34 871 REPLACING PULSE SENDER FOR OUTPUT SPEED

Remove valve body – see 24 30 006.  
Pull off plug (1).  
Unscrew screws (2 and 3).

**Installation:**  
Tightening torque\*.



Lift off pulse sender.

**Important!**  
Watch out for spacers (4 and 5).



## 24 34 872 REPLACING PULSE SENDER FOR TURBINE SPEED

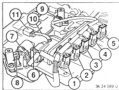
Remove valve body – see 24 30 006.  
Pull off plug (1).  
Unscrew screws (2 and 3).  
Lift off pulse sender.

**Installation:**  
Tightening torque\*.

\* See Specifications

\* See Specifications

## 24-35/31

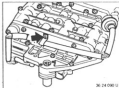


### 24 35 501 REPLACING WIRE HARNESS IN AUTOMATIC TRANSMISSION

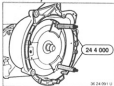
Remove valve body – see 24 30 006.  
Pull plugs off of solenoids (1 ... 6) and pressure regulator (7).  
Pull plugs (8 and 9) off of pulse senders.

#### Note:

Temperature sensor (10) is integrated in the wire harness and must be inserted into holder (11).



Unscrew holder on valve body.  
Take off wire harness.



90 24 001 L2

#### 24 40 006 REMOVING AND INSTALLING OR REPLACING TORQUE CONVERTER

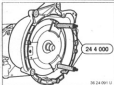
Remove transmission – see 24 30 026.  
Pull torque converter out of primary pump carefully using Special Tools 24 4 000.

Caution!  
Escaping ATF.



90 24 002 L2

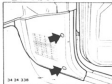
Torque converters cannot be cleaned with common workshop equipment and must be replaced when damaged.  
Torque converter identification\*.



90 24 001 L2

Carefully guide openings on converter into primary pump by turning slightly and using Special Tool 24 4 000.

Important!  
Make sure that converter bearing and seal are not damaged while guiding in.  
Install torque converter as far as stop.



### 24 61 500 REMOVING AND INSTALLING / REPLACING CONTROL UNIT

The control unit for EM transmissions is located in the right A-pillar. Read and print fault memories prior to removal.

Remove glovebox - refer to 24 16 360.  
Unscrew loudspeaker cover.  
Disconnect loudspeaker wires.  
Remove protective hood.



Pull plug (1) out of the control unit after bringing spring retainer (2) downwards.

#### Caution!

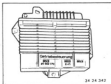
Always switch the ignition off before disconnecting or connecting the plug.



Put soundproofing sheet off partially. Only loosen screws (3 ... 5).



Lift control unit out and remove downwards.



Code is provided on the data plate.  
Refer to BMW Parts Catalog for cross reference of types and models.

## TROUBLESHOOTING AUTOMATIC TRANSMISSION A 5 S 310 Z

Condition	Cause	Correction
<b>Position P</b> Park position does not engage	a) Shift linkage between selector lever and transmission maladjusted b) Excessive friction in parking lock mechanism	a) Adjust shift - see 24 00 008 b) Replace parking lock parts (connecting rod, pawl) - see 24 24 005.
Park position does not hold (slips)	a) Shift linkage between selector lever and transmission maladjusted	a) Adjust shift - see 24 00 008
Engine cannot be started in N or P, or can be started in all positions	a) Shift linkage between selector lever and transmission maladjusted b) Transmission switch faulty Starter interlocking relay or wire faulty	a) Adjust shift - see 24 00 008 b) Replace transmission switch - see 25 16 080 Repair/replace relay or wire
<b>Position R</b> No reverse gear	a) Shift linkage between selector lever and transmission maladjusted b) Clutch B destroyed c) Brake C destroyed. In this case also no engine braking effect in position 2, 1st gear d) Brake G destroyed e) Refer to "Troubleshooting Valve Body"	a) Adjust shift - see 24 00 008 b) Exchange transmission - see 24 00 040 c) Exchange transmission - see 24 00 040 d) Exchange transmission - see 24 00 040
Hard engaging (off P-R or R-R)	a) Idling speed too high b) Refer to "Troubleshooting Valve Body"	a) Refer to "Test Plan"
Backup lights do not light up (electronics OK)	a) Transmission switch faulty b) Shift linkage between selector lever and transmission maladjusted	a) Replace transmission switch - see 25 16 080 a) Adjust shift - see 24 00 008
Car moves or creeps	a) Shift linkage between selector lever and transmission maladjusted b) Clutch A defective (bonded)	a) Adjust shift - see 24 00 008 b) Exchange transmission - see 24 00 040

Condition	Cause	Correction
Position D No power flow	<ul style="list-style-type: none"> <li>a) Clutch A destroyed</li> <li>b) 1st gear one-way clutch faulty</li> <li>c) Shift linkage between selector lever and transmission maladjusted</li> </ul>	<ul style="list-style-type: none"> <li>a) Exchange transmission - see 24 00 046</li> <li>b) Exchange transmission - see 24 00 046</li> <li>a) Adjust shift - see 24 00 008</li> </ul>
Hard engaging jolt N - D (engine speed > 1500 rpm)	<ul style="list-style-type: none"> <li>a) Idling speed too high</li> <li>b) Also refer to "Troubleshooting Valve Body"</li> </ul>	<ul style="list-style-type: none"> <li>a) Refer to "Test Plan"</li> </ul>
No shift (warm or cold)	<ul style="list-style-type: none"> <li>a) Refer to "Troubleshooting Valve Body"</li> </ul>	
No shift Shift 1-2	<ul style="list-style-type: none"> <li>a) Brakes C1 and 2 faulty</li> <li>b) Insufficient oil supply to brakes C1 and C2</li> </ul>	<ul style="list-style-type: none"> <li>a) Exchange transmission - see 24 00 046</li> <li>b) Exchange transmission - see 24 00 046</li> </ul>
Shift 2-1	<ul style="list-style-type: none"> <li>a) Refer to "Troubleshooting Valve Body"</li> </ul>	
Shift 2-3	<ul style="list-style-type: none"> <li>a) Clutch F faulty</li> <li>b) Insufficient oil supply to clutch F</li> </ul>	<ul style="list-style-type: none"> <li>a) Exchange transmission - see 24 00 046</li> <li>b) Exchange transmission - see 24 00 046</li> </ul>
Shift 3-2	<ul style="list-style-type: none"> <li>a) Refer to "Troubleshooting Valve Body"</li> </ul>	
Shift 3-4	<ul style="list-style-type: none"> <li>a) Clutch E faulty</li> <li>b) Insufficient oil supply to clutch E</li> </ul>	<ul style="list-style-type: none"> <li>a) Exchange transmission - see 24 00 046</li> <li>b) Exchange transmission - see 24 00 046</li> </ul>
No braking effect Shift 4-3	<ul style="list-style-type: none"> <li>a) Brake band C2 faulty; in this case shift 1-2 not OK</li> <li>b) Insufficient oil supply to brake C2</li> <li>c) Brake band C2 not preloaded, spring broken; in this case shift 1-2 not OK</li> </ul>	<ul style="list-style-type: none"> <li>a) Exchange transmission - see 24 00 046</li> <li>b) Exchange transmission - see 24 00 046</li> <li>c) Adjust brake band</li> </ul>

Condition	Cause	Correction
No shift Shift 4-5  Shift 5-4	a) Refer to "Troubleshooting Valve Body" b) Clutch A faulty. In this case no 1st ... 4th gears	a) Exchange transmission - see 24 00 046
Shift from full load to kickdown too long	a) Plates broken b) Also refer to "Troubleshooting Valve Body"	a) Exchange transmission - see 24 00 046
Engine spins in shift 3-1	a) Poor friction torque at plates b) 1st gear one-way clutch not OK	a) Exchange transmission - see 24 00 046 b) Exchange transmission - see 24 00 046
Engine spins in shift 3-3-2	a) Poor friction torque at plates b) Also refer to "Troubleshooting Valve Body"	a) Exchange transmission - see 24 00 046
Engine spins in shift 4-3	a) Poor friction torque at plates b) 3rd gear one-way clutch not OK	a) Exchange transmission - see 24 00 046 b) Exchange transmission - see 24 00 046
Engine spins in shift 4-5-4	a) Poor friction torque at plates b) Also refer to "Troubleshooting Valve Body"	a) Exchange transmission - see 24 00 046
No engine braking effect, no manual downshift 5-4  4-3 / 3-2	a) Clutch A damaged b) Also refer to "Troubleshooting Valve Body" a) Refer to "Troubleshooting Valve Body"	a) Exchange transmission - see 24 00 046 a) Exchange transmission - see 24 00 046
No 1st gear, no braking effect	a) Brake B faulty b) Also refer to "Troubleshooting Valve Body"	a) Exchange transmission - see 24 00 046



Condition	Cause	Correction
Shift transition too hard	a) Torque converter faulty b) Also refer to "Troubleshooting Valve Body"	a) Replace converter - see 24 40 006
No converter lockup clutch	a) Torque converter faulty b) Also refer to "Troubleshooting Valve Body"	a) Replace converter - see 24 40 006
Engine dies when moving off in Drive (converter lockup clutch always engaged)	a) Torque converter faulty b) Also refer to "Troubleshooting Valve Body"	a) Replace converter - see 24 40 006
<b>Noise</b>		
Noise in all positions	a) ATF level too low b) Valve body leaks c) Oil strainer dirty d) Round seal on oil filter missing / faulty	a) Correct ATF level - see 24 00 026 b) Exchange valve body - see 24 30 006 c) Replace oil strainer - see 24 31 156 d) Replace seal - see 24 31 196
<b>Leaks</b>		
Oil dripping from converter bell housing	a) Seals on oil pump body leak b) Round seal on oil pump body leaks c) Radial oil seal for torque converter faulty	a) Replace seals - see 24 31 020 b) Replace round seal - see 24 31 020 c) Replace radial oil seal - see 24 31 020
Leak between transmission case and oil sump	a) Mounting bolts loose b) Gasket faulty	a) Tighten bolts <sup>*</sup> b) Replace gasket - see 24 11 006

\* Refer to Specifications for tightening torque

Condition	Cause	Correction
<b>Leaks</b>	a) Radial oil seal for output flange leaks	a) Replace radial oil seal - see 24 12 016
Output leaks	b) O-ring for transmission extension leaks	b) Replace O-ring - see 24 12 016
Manual shift valve shaft leaks	a) Radial oil seal leaks	a) Replace radial oil seal - see 24 12 106
Transmission plug leaks	a) Nut loose	a) Tighten nut*
	b) O-ring faulty	b) Replace O-ring
Plugs on transmission case leak	a) Plugs loose	a) Tighten plugs*
	b) Seals faulty	b) Replace seals
Oil cooler pipes leak	a) Oil cooler pipes loose	a) Tighten oil cooler pipes*
	b) O-rings faulty	b) Replace O-rings

\* Refer to Specifications for tightening torque

## TROUBLESHOOTING VALVE BODY A 5 S 310 Z

Condition	Cause	Correction
Position R	a) Signal wire to solenoid 3 grounded	a) Repair/replace wire harness - see 24 35 501
No power flow in reverse	b) Valve piston for reverse gear lock not in parked position	b) Exchange valve body - see 24 30 006
Hard engaging jolt in position R	a) Damper of brake D malfunctions b) Modulation pressure too high c) Wire to pressure regulator faulty d) Pressure regulator faulty	a) Exchange valve body - see 24 30 006 b) Replace pressure regulator - see 24 34 861 c) Repair/replace wire harness - see 24 35 501 d) Replace pressure regulator - see 24 34 861
Position D	a) Damper A blocked	a) Exchange valve body - see 24 30 006
No power flow in forward	b) Signal wire to solenoid 5 grounded	b) Repair/replace wire harness - see 24 35 501
Hard engaging jolt in position D	a) Damper of clutch A malfunctions b) Wire to pressure regulator faulty c) Pressure regulator faulty d) Modulation valve malfunctions	a) Exchange valve body - see 24 30 006 b) Repair/replace wire harness - see 24 35 501 c) Replace pressure regulator - see 24 34 861 d) Exchange valve body - see 24 30 006
Hard shift jolts in general	a) Modulation valve malfunctions b) Wire to pressure regulator faulty c) Pressure regulator faulty	a) Exchange valve body - see 24 30 006 b) Repair/replace wire harness - see 24 34 501 c) Replace pressure regulator - see 24 34 861

Condition	Cause	Correction
Position D No shift 1-2	<ul style="list-style-type: none"> <li>a) Wire to output speed sensor faulty</li> <li>b) Output speed sensor faulty</li> <li>c) Signal wire to solenoid 1 grounded</li> <li>d) Shift valve 1 seized in parked position</li> <li>e) Damper C2 or clutch valve C1 seized</li> <li>f) Shift valve 3 seized in parked position</li> </ul>	<ul style="list-style-type: none"> <li>a) Repair/replace wire harness - see 24 35 501</li> <li>b) Replace speed sensor - see 24 34 871</li> <li>c) Repair/replace wire harness - see 24 35 501</li> <li>d) Exchange valve body - see 24 30 006</li> <li>e) Exchange valve body - see 24 30 006</li> <li>f) Exchange valve body - see 24 30 006</li> </ul>
No shift 2-1	<ul style="list-style-type: none"> <li>a) Signal or positive wire to solenoid 1 faulty</li> <li>b) Solenoid 1 faulty</li> <li>c) Shift valve seized in pushed position</li> </ul>	<ul style="list-style-type: none"> <li>a) Repair/replace wire harness - see 24 35 501</li> <li>b) Replace solenoid 1 - see 24 34 853</li> <li>c) Exchange valve body - see 24 30 006</li> </ul>
No shift 2-3	<ul style="list-style-type: none"> <li>a) Signal wire to solenoid 2 faulty</li> <li>b) Solenoid 2 faulty</li> <li>c) Shift valve 2 seized in pushed position</li> <li>d) Pulling valve 2-3 seized in parked position</li> </ul>	<ul style="list-style-type: none"> <li>a) Repair/replace wire harness - see 24 35 501</li> <li>b) Replace solenoid 2 - see 24 34 853</li> <li>c) Exchange valve body - see 24 30 006</li> <li>d) Exchange valve body - see 24 30 006</li> </ul>
No shift 3-2	<ul style="list-style-type: none"> <li>a) Signal or positive wire to solenoid 2 faulty</li> <li>b) Shift valve seized in parked position</li> <li>c) Pulling valve 2-3 seized in pushed position</li> </ul>	<ul style="list-style-type: none"> <li>a) Repair/replace wire harness - see 24 35 501</li> <li>b) Exchange valve body - see 24 30 006</li> <li>c) Exchange valve body - see 24 30 006</li> </ul>

Condition	Cause	Correction
Position D No shift 3-4	a) Signal wire to solenoid 3 grounded b) Solenoid 3 faulty c) Shift valve seized in pushed position d) Damper E seized	a) Repair/replace wire harness - see 24 35 501 b) Replace solenoid 3 - see 24 34 853 c) Exchange valve body - see 24 30 006 d) Exchange valve body - see 24 30 006
No shift 4-3	a) Signal or positive wire to solenoid 3 faulty b) Shift valve 3 seized in parked position	a) Repair/replace wire harness - see 24 35 501 b) Exchange valve body - see 24 30 006
No shift 4-5	a) Signal or positive wire to solenoid 1 faulty b) Shift valve 4 seized in parked position c) Damper C2 seized	a) Repair/replace wire harness - see 24 35 501 b) Exchange valve body - see 24 30 006 c) Exchange valve body - see 24 30 006
No shift 5-4	a) Signal wire to solenoid 1 grounded b) Solenoid 1 faulty c) Shift valve 4 seized in pushed position	a) Repair/replace wire harness - see 24 35 501 b) Replace solenoid 1 - see 24 34 853 c) Exchange valve body - see 24 30 006

Condition	Cause	Correction
Car moves off in 3rd gear	<ul style="list-style-type: none"> <li>a) Signal or positive wire to solenoid 1 faulty; in this case no 5th gear</li> <li>b) Shift valve 1 seized in parked position</li> </ul>	<ul style="list-style-type: none"> <li>a) Repair/replace wire harness - see 24 35 501</li> <li>b) Exchange valve body - see 24 30 006</li> </ul>
Car moves off in 3rd gear	<ul style="list-style-type: none"> <li>a) Signal or positive wire to solenoids 1 and 2 faulty</li> <li>b) Shift valves 1 and 2 seized in parked position</li> </ul>	<ul style="list-style-type: none"> <li>a) Repair/replace wire harness - see 24 35 501</li> <li>b) Exchange valve body - see 24 30 006</li> </ul>
Car moves off in 4th gear	<ul style="list-style-type: none"> <li>a) General positive wire faulty (transmission without current)</li> <li>b) Shift valves 1, 2 and 3 seized in parked position</li> </ul>	<ul style="list-style-type: none"> <li>a) Repair/replace wire harness - see 24 35 501</li> <li>b) Exchange valve body - see 24 30 006</li> </ul>
Shift transitions in zero load positions Full load shifts too hard	<ul style="list-style-type: none"> <li>a) Modulation valve malfunctions</li> <li>b) Wire to pressure regulator faulty</li> <li>c) Pressure regulator faulty</li> <li>d) Damper malfunctions</li> </ul>	<ul style="list-style-type: none"> <li>a) Exchange valve body - see 24 30 006</li> <li>b) Repair/replace wire harness - see 24 35 501</li> <li>c) Replace pressure regulator - see 24 34 851</li> <li>d) Exchange valve body - see 24 30 006</li> </ul>
Shift transitions of full load and kickdown shifts too long	<ul style="list-style-type: none"> <li>a) Pressure reducing valve 1 or 2 malfunctions</li> <li>b) Modulation valve malfunctions</li> <li>c) Pressure regulator faulty</li> </ul>	<ul style="list-style-type: none"> <li>a) Exchange valve body - see 24 30 006</li> <li>b) Exchange valve body - see 24 30 006</li> <li>c) Replace pressure regulator - see 24 34 851</li> </ul>

Condition	Cause	Correction
Engine dies from shift 3-3 / 3-2 (overlapped control)	<ul style="list-style-type: none"> <li>a) Signal or positive wire to solenoid 4 faulty</li> <li>b) Solenoid 4 faulty</li> <li>c) Pull/push valve 1 moves too hard</li> <li>d) Aperture for damper G clogged</li> <li>e) Damper F moves too hard</li> <li>f) Pull valve 3-3/2 moves too hard</li> </ul>	<ul style="list-style-type: none"> <li>a) Repair/replace wire harness - see 24 35 501</li> <li>b) Replace solenoid 4 - see 24 34 853</li> <li>c) Exchange valve body - see 24 30 006</li> <li>d) Exchange valve body - see 24 30 006</li> <li>e) Exchange valve body - see 24 30 006</li> <li>f) Exchange valve body - see 24 30 006</li> </ul>
Engine dies from shift 4-5 / 5-4 (overlapped control)	<ul style="list-style-type: none"> <li>a) Signal or positive wire to solenoid 5 faulty</li> <li>b) Solenoid 5 faulty</li> <li>c) Pull/push valve 2 moves too hard</li> <li>d) Damper G2 malfunctions</li> <li>e) Pull valve 4-5/4 moves too hard</li> <li>f) Damper A moves too hard</li> </ul>	<ul style="list-style-type: none"> <li>a) Repair/replace wire harness - see 24 35 501</li> <li>b) Replace solenoid 4 - see 24 34 853</li> <li>c) Exchange valve body - see 24 30 006</li> <li>d) Exchange valve body - see 24 30 006</li> <li>e) Exchange valve body - see 24 30 006</li> <li>f) Exchange valve body - see 24 30 006</li> </ul>
Converter lockup clutch Shift transition too hard	<ul style="list-style-type: none"> <li>a) Converter lockup clutch valve malfunctions</li> </ul>	<ul style="list-style-type: none"> <li>a) Exchange valve body - see 24 30 006</li> </ul>
No converter lockup clutch	<ul style="list-style-type: none"> <li>a) Signal or positive wire to solenoid 6 faulty</li> <li>b) Solenoid 6 faulty</li> </ul>	<ul style="list-style-type: none"> <li>a) Repair/replace wire harness - see 24 35 501</li> <li>b) Replace solenoid 6 - see 24 34 853</li> </ul>

Condition	Cause	Correction
Engine dies when stopping car in drive position (converter lockup clutch always engaged)	a) Signal wire to solenoid 6 grounded b) Converter lockup clutch valve seized in pushed position c) Solenoid 6 faulty	a) Repair/replace wire harness - see 24 35 501 b) Exchange valve body - see 24 35 006 c) Replace solenoid 6 - see 24 34 853
Shift speed and shift comfort in general not OK	a) Temperature sensor not OK	a) Replace wire harness - see 24 35 501.



## TROUBLESHOOTING PERIPHERAL EQUIPMENT

Condition	Cause	Correction
Idling speed control (throttle valve, electronic engine power control) Wrong shift points, oscillating shifts	a) Engine idling speed too high or too low b) Idling speed control valve faulty	a) Refer to "Test Plan" b) Replace idling speed control valve - see 13 41 501
Kickdown switch No kickdown shifts; only partial load/full load shifts	a) Wire harness faulty b) Kickdown switch faulty c) Kickdown switch maladjusted	a) Repair wire harness b) Replace kickdown switch - see 35 41 480 c) Check adjustment - see 35 41 480
Program switch No S program or only S program	a) Signal wire to program switch faulty b) Program switch faulty	a) Repair wire harness b) Replace program switch - see 51 31 255
No W program or only W program	a) Signal wire to program switch faulty b) Program switch faulty	a) Repair wire harness b) Replace program switch - see 51 31 255
Position switch (selector lever) No shifts Car remains in shifted gear	a) No positive supply / fuse faulty b) Signal wire faulty c) Switch faulty	a) Replace fuse b) Repair wire harness c) Replace switch - see 25 15 060

# 24 Automatic transmission

## A5S 300 J

24 00 003	Shift lever – adjust .....	24- 00/41
027	Automatic transmission – remove and install .....	24- 00/42
047	Automatic transmission – install .....	24- 00/46
24 11 009	Transmission oil sump – remove and install, seal or replace .....	24- 11/41
24 12 107	Radial oil seal for manual shift valve shaft – replace .....	24- 12/41
506	Radial oil seal for torque converter – replace .....	24- 12/42
24 20 001	O-ring for output flange – replace .....	24- 20/41
24 30 008	Selector unit – remove and install/replace .....	24- 30/41
24 31 158	Gear oil strainer – remove and install/replace .....	24- 31/41
24 34 140	Damper cover – remove and install/seal .....	24- 34/41
872	RPM sensor – replace .....	24- 34/42
844	Solenoid valves for pressure regulator/torque converter – replace .....	24- 34/43
845	Solenoid valves for reverse gear inhibit – replace .....	24- 34/43
846	Solenoid valve block A B C – replace .....	24- 34/43
24 35 506	Wiring harness for automatic transmission – replace .....	24- 35/41
24 40 007	Torque converter – remove and install or replace .....	24- 40/41
24 52 500	Notched disk – replace .....	24- 52/41
24 61 501	Control unit – remove and install or replace .....	24- 61/41
525	Resistor for control unit – replace .....	24- 61/42

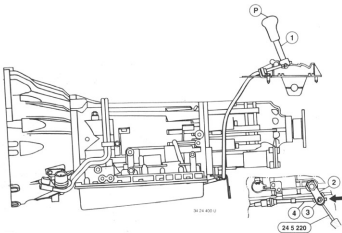
## A5S 560Z

00 11 239	Oil change in automatic transmission .....	24- 00/51
24 00 007	Shift lever – adjust .....	24- 00/53
026	Automatic transmission – remove and install .....	24- 00/55
046	Replacement transmission – install .....	24- 00/60
585	Automatic transmission – disassemble and assemble .....	24- 06/61
24 11 008	Transmission oil sump – remove and install, seal .....	24- 11/50
24 12 016	Radial oil seal for output flange – replace .....	24- 12/50
106	Radial oil seal for manual shift valve shaft – replace .....	24- 12/53
506	Radial oil seal for torque converter – replace .....	24- 12/54
24 13 156	Output flange – replace .....	24- 13/50
706	Bearing for transmission extension – replace .....	24- 13/51
24 30 006	Selector unit – remove and install or replace .....	24- 30/50
24 31 156	Transmission oil strainer – remove and install, replace .....	24- 31/50
24 34 006	Parking lock (pawlfleg spring) – remove and install or replace .....	24- 34/50
857	Solenoid valves and/or pressure regulator – replace .....	24- 34/51
873	Pulse generator (turbine speed) – replace (oil pan removed) .....	24- 34/52
874	Pulse generator (output speed) – replace (oil pan removed) .....	24- 34/53
24 35 501	Wiring harness in automatic transmission – replace (selector unit removed) .....	24- 35/50
24 40 006	Torque converter – remove and install or replace .....	24- 40/50
24 61 501	(EGS) control unit – remove and install or replace .....	24- 61/50

## 24-00/41

### 24 00 003 Adjusting gearshift lever

Transmission Jato



Set gearshift lever (1) to "P".  
Release nut (2).

#### Caution!

In order to avoid deforming the operating cable, the clamping screw must be held with the special tool 24 5 220.

#### Note:

The special tool 24 5 220 can only be fitted in position "P".

Press forward lever (2) (park position).

Press operating cable rod (4) opposite forward direction and release again.

Firmly secure operating cable rod (4) with nut (2) (held with special tool 24 5 220).

For tightening torque 24 51 1A2\*.



24 24 000 E

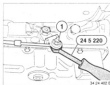
### 24 00 027 Removing and installing automatic transmission

Disconnect ground lead from battery.

#### Caution!

Disconnecting the negative lead will cancel the fault memories in the control units. For this reason, first read fault memories with tester and print any faults prior to disconnecting battery.

Remove exhaust assembly - refer to 18 00 020.  
Remove heat shield (1).



24 24 401 E

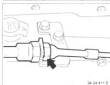
Unfasten nut (1) in transmission setting "P".

#### Caution!

Always brace clamping screw with special tool 24 5 220 to avoid distortion of the cable.

#### Note:

Special tool 24 5 220 can only be fitted in setting "P".

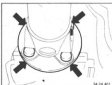


24 24 411 E

Unscrew cable from counter holder.  
Pull out cable.

#### Installation:

Adjust shift mechanism, refer to 24 00 007.

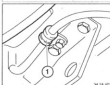


24 24 401 E

Unscrew propeller shaft on transmission.

#### Installation:

Replace stop nuts.



24 24 401 E

Remove cable holder (2) from transmission.



24 24 007 E

Unscrew center mount.

#### Installation:

Preload center mount in direction of travel (A) with 2...4 mm.  
Fold propeller shaft downwards and withdraw from transmission.

#### Caution!

Do not allow the propeller shaft to drop into the joints.  
Suspend propeller shaft from car on a piece of wire.

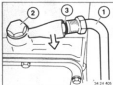


24 24 404 E

Turn bypass lock (1) counterclockwise.  
Pull off plug (2).

#### Installation:

Fit plug (2) in such a way that the marking lines (3) are aligned with one another.  
Disconnect plug (4).

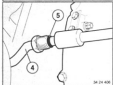


Unscrew oil cooler feed pipe (1).  
Loosen coupling bolt (2) and swing converter  
downwards.  
Pull oil cooler pipe out in this position.

**Installation:**  
Check O-ring (3), replacing if necessary.  
Tightening torque 24 31 44.2 \*



Unscrew oil cooler pipe at crankcase and oil  
pump.



Unscrew oil cooler return line (4).

**Installation:**  
Check O-ring (5), replacing if necessary.  
Tightening torque 24 31 44.2 \*



Lift cover off aperture (1) in oil pan.  
Unscrew torque converter from drive plate at  
three points with special tool 24 1 110.  
Turn flywheel for this step.



**Installation:**  
Install bolt using special tool 24 1 110 and  
tighten using a torque wrench.  
Tightening torque 24 40 14.2 \*

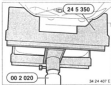
**Caution!**  
Only use M 10 x10 mm screws in conjunction  
with spring washer.



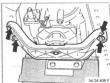
Remove stabilizer from left and right sides of  
engine mount.



Remove center of gravity loading.



Support transmission from below with special  
tool 24 5 350 in conjunction with lifting fixture  
00 2 020.



Unscrew the cross member from the body.  
Lower the transmission.

**Installation:**  
Center the transmission - refer to Gr. 25.  
Tightening torque\*.



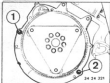
Unbolt the transmission from the engine.  
Unscrew Torx bolts with a Torx wrench  
socket.

**Important!**  
Washers must be used to avoid increasing  
the breaking loose torque.  
Tightening torque\*.



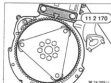
Apply and clamp Special Tool 24 4 080 on  
the transmission case with flat side (1) of  
the retainer facing the torque converter, to  
prevent the converter from sliding out.  
Pull the transmission off of the engine.

**Important!**  
The special tool jack with mounted trans-  
mission may only be moved in completely  
lowered position.



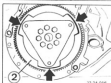
**Important!**  
Ensure that dowel sleeves (1) and (2) are not  
missing prior to installation of the trans-  
mission.  
If necessary, transfer dowel sleeves from  
the transmission.

\* Refer to Specifications



**Installation:**  
Inspect the drive plate for breaks and  
cracks, replacing it if necessary.  
Hold flywheel with Special Tool 11 2 170.

**Important!**  
Replace expansion bolts and install the  
new bolts with a bolt cement\*\*.  
Only coat the threads.  
First clean the tapped holes in the crank-  
shaft thoroughly.  
Tightening torque\*.



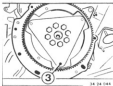
**Version with Sheet Metal Flywheel (2):**

**Important!**  
Keep to the sequence of installation.  
Sheet metal flywheel (2) has three inden-  
tations to take the mounting tabs of the  
torque converter.  
When guiding the engine and transmission  
together, the three mounting tabs on the  
torque converter must be aligned with the  
three indentations on the sheet metal fly-  
wheel.  
Non-conformance will cause follow-up  
damage to the automatic transmission.  
Turning the torque converter or engine is  
no longer possible after guiding together  
and an attempt to turn would lead to  
damage.



Turn the torque converter on the transmis-  
sion that bore (1) of the tab points down at  
right angles.  
Screw Special Tool 24 3 300 into the tab.

\*\* Refer to Specifications  
\*\* Source of Supply: BMW Parts



Bore (3) of the drive plate must point at right angles to the center of the oil pan opening.



Lift the automatic transmission until bore (3) of the drive plate is reached. Guide the transmission into bore (3) of the drive plate carefully, using Special Tool 24 2 300.

Bolt the transmission case on the engine. Unscrew Special Tool 24 2 300 out of the tab towards the front.

Secure the torque converter.



Check the ATF level after installation of the transmission.

Car must stand on a level surface.

Check the ATF level only when the ATF temperature is between 50 and 55° C.

Interrogate the ATF temperature with Modis or a Service Tester (refer to Test Plan).

Run the engine at idling speed with the selector lever in P or N.

Unscrew filler plug (1).

Installation:

Check the seal, replacing it if necessary.



Check and, if necessary, correct the ATF level.

Pour in ATF through filler (2)\*\* until it runs out of the spill bore.

Important!

Only ATF approved for Jatco transmissions may be used.

Install and tighten the filler plug. Tightening torque\*.

\* Refer to Specifications

\*\* Source of Supply: BMW Parts



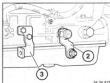
### 24 00 047 Installing exchange transmission.

Remove transmission, refer to 24 00 037.

**Caution!**  
Always blow oil cooler and lines clean with blast of compressed air and rinse twice with transmission oil before installing an exchange transmission.  
Use special oil.  
Transmission identification and code\*\* on label.



Transfer transport holder (1).



Transfer lever (2) and bracket (3).  
Tightening torque 24 51 1A2\*

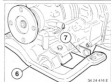


Transfer oil cooler return pipe (4).  
Unscrew bolts from holder.



Unscrew banjo bolt (5).

Installation:  
Check seals, replace if necessary.  
Tightening torque 17 22 8A2\*



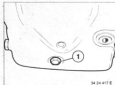
Transfer cross member (6) and exhaust carrier (7).

**Caution!**  
Automatic transmissions are supplied filled with ATF.  
For this reason, simply perform an oil level check after installing the transmission (refer to 24 00 037).

\* Refer to Technical Data  
\*\* Source of Supply: BMW Parts service

\* Refer to Technical Data





**24 11 009 Removing and installing/sealing or replacing transmission oil pan.**

Remove drain plug (1).  
Drain oil.

Installation:  
Replace seal.  
Tightening torque 24 11 8A2 \*

24 11 417 E



Unscrew oil sump.  
Take off oil sump with gasket.

Installation:  
Replace seal.

24 11 018 E



Clean oil sump.

Caution!  
Place magnet disc (1) in oil sump.  
Replace gasket (2).

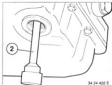
24 11 020 E



Unscrew filler plug (1).

24 11 021 E

\* Refer to Technical Data



Hang filler (2)\*\* in filler opening.  
Pour in ATF until it overflows.

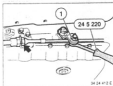
Caution!  
Only oil grade approved for Jatco transmissions may be used.

24 11 022 E

Run engine in selector lever setting "P" or "N".  
Select all settings in transmission.  
Increase transmission oil temperature to approx. 50 ... 55° C  
Interrogate ATF temperature with MoDiC or Service Tester (refer to Electrical Troubleshooting Manual).  
Recheck ATF level.  
Drain excessive ATF or pour in additional ATF.  
Screw in filler plug.  
Tightening torque 24 11 7A2 \*

\* Refer to Technical Data

\*\* Source of Supply: BMW Parts service



### 24 12 107 REPLACING RADIAL OIL SEAL FOR MANUAL SHIFT VALVE SHAFT

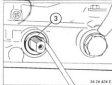
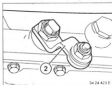
Remove exhaust assembly - refer to 18 00 020.  
Unscrew nut (1) in position P.

**Important!**  
Always counterhold on bolt using Special Tool 24 5 220 to avoid deformation of the cable.

**Note:**  
Special Tool 24 5 220 can only be applied in position P.

Unscrew cable from holder.  
Pull cable out.

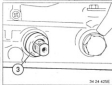
**Installation:**  
Adjust shift - refer to 24 00 007.  
Tightening torque\*.



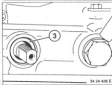
Unscrew lever (2).

**Installation:**  
Tightening torque\*.

Lever radial oil seal (3) out using a narrow screwdriver.

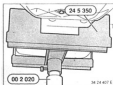


Protect threads and edges of manual shift valve shaft with adhesive tape.  
Lubricate sealing lip of radial oil seal with oil.  
Push radial oil seal (3) over the adhesive tape up to the case.

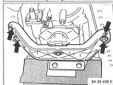


Drive radial oil seal (3) in using a suitable sleeve.  
The radial oil seal must be flush with the bevel.

**Note:**  
Check ATF level - refer to 24 00 027.



Support the transmission from underneath using Special Tools 24 5 330 and 00 2 020.



Unscrew cross member from the body.  
Lower the transmission as far as possible.

**Installation:**  
Center the transmission - refer to Cr. 26.  
Tightening torque\*.

\* Refer to Specifications

\* Refer to Specifications



**24 12 506 Replace radial seal for torque converter**  
( transmission removed )

Remove torque converter 24 40 007.  
Remove radial seal (1) with special tool 00 5 010.



Lubricate sealing lip with oil.  
Apply radial oil seal (1) on case.



Drive radial oil seal (1) in flush using special tool 24 1 099.



Check O-ring (2) on input shaft, replace if necessary.



#### 24 20 001 REPLACING O-RING FOR OUTPUT FLANGE

Remove exhaust assembly - refer to 18 00 000.

Unscrew propeller shaft at transmission and center mount - refer to 24 00 027.

Block output flange using Special Tool 23 0 020.

Unscrew stop nut (1).

Installation:

Replace stop nut.  
Tightening torque\*



Lever O-ring (2) out using a scribe.

Installation:

Lubricate O-ring (2) tightly with oil and install it in the groove.

Note:

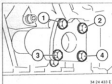
Check ATF level - refer to 24 00 027.

24 30 008 Removing and installing or  
replacing selector unit

Refer to Repair Manual 3 Series E38.

24-31 158 Removing and installing or  
replacing transmission oil  
strainer

Refer to Repair Manual 3 Series E26.



#### 24 34 140 Removing and installing / sealing damper cover

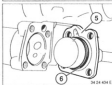
Remove bolts (1 ... 4).

##### Installation note:

Bolts are coated and must be replaced every time they are assembled.

Clean thread in transmission casing before fitting bolts.

For tightening torque\*.



Remove damper cover.

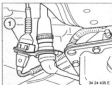
Replace gasket (5) and O-ring (6).

Lightly oil O-ring with automatic transmission oil\*\*.

##### Note:

Check oil level, refer to 24 00 021.

\* Refer to Technical Data.  
 \*\* Refer to BMW Fluids and Lubricants Specifications.

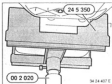


34 34 435 E

### 24 34 672 Replacing RPM sensor

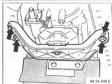
Remove complete exhaust system 18 00 020.  
Detach propeller shaft at transmission and center bearing from body (refer to 24 00 027).

Disconnect plug-and-socket connection (1).



34 34 437 E

Support transmission with special tool 24 5 350 in conjunction with lifting fixture 00 2 030.



34 34 438 E

Release cross member from body.  
Lower transmission as far as possible.

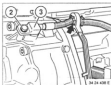
Installation note:  
Align transmission in center (refer to FIG 26).  
For tightening torque\*.



34 34 437 E

Cut open cable ties.  
Detach wiring harness from holder.

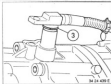
\* Refer to Technical Data



34 34 439 E

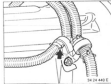
Remove screw (2).  
Pull out RPM sensor (3).  
Detach wiring harness from holder.

Installation note:  
For tightening torque.



34 34 439 E

Installation note:  
Lightly grease O-ring (3).



34 34 440 E

Detach wiring harness from front holder.

Release oil cooler return line from transmission.  
Push oil cooler return line away from transmission until plug connection of wiring harness can be disconnected.  
Remove RPM sensor together with wiring harness.

Installation note:  
Lay and secure wiring harness in same position as before removal.



34 34 437 E

\* Refer to Technical Data



24 34 844 Replacing solenoid valves  
for pressure regulator /  
torque converter

Refer to Repair Manual 3 Series E36

24 34 845 Replacing solenoid valve for  
reverse gear inhibit

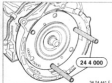
Refer to Repair Manual 3 Series E36

24 34 846 Replacing solenoid valve  
block A B C

Refer to Repair Manual 3 Series E36

24 35 506 Replacing wiring harness in automatic transmission

Refer to Repair Manual 3 Series E36



#### 24 40 007 Removing and installing or replacing torque converter

Remove transmission - refer to 24 00 007.  
Pull torque converter out of primary pump carefully using assembly handles 24 4 000.

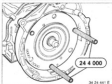
**Caution!**  
Escaping ATF.



Torque converters cannot be cleaned with standard workshop equipment and must be replaced when damaged.



**Installation:**  
Check O-ring (2) on input shaft, replacing if necessary.



Carefully guide openings on converter into primary pump by turning slightly and using assembly handle 24 4 000.

**Caution!**  
Make sure converter bearings and seal are not damaged while guiding in.  
Insert torque converter as far as stop.

\* Refer to Technical Data

24-52-500 Replacing notched disk

Refer to Repair Manual 3 Series E26



### 24-61 501 Removing and installing or replacing control unit

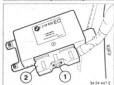
The control unit for 8H transmission is located in the right-hand A-pillar.  
 Removing and installing glovebox, refer to 61 16 340.  
 Remove speaker covering.  
 Disconnect wire for speaker.  
 Remove protective hood.



Partly remove soundproofing mat.  
 Only loosen off screws (3 ... 5).



Lift out control unit and remove by pulling downward.



Release screw (1).  
 Disconnect plug connector (2).

**Caution!**  
 The plug connector must only be disconnected and reconnected with the ignition switched off.

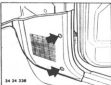
**Installation note:**  
 Tightening torque 5 Nm.



Identification letter on type identification plate.  
 For type and model allocation, refer to BMW Parts Catalogue.

### 24 61 626 REPLACING RESISTOR FOR CONTROL UNIT

The resistor for the control unit is located in the right A-pillar.  
 Remove glovebox - refer to 51 16 300.  
 Unscrew loudspeaker cover.  
 Disconnect loudspeaker wires.  
 Remove the protective hood.



24 24 238

Unscrew screws (1 and 2).

Installation:  
 Tightening torque\*.



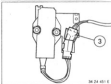
24 24 447

Remove the resistor together with the holder upwards.



24 24 450

Disconnect plug (3).



24 24 451

\* Refer to Specifications

**00 11 239 Oil change in automatic transmission**  
(M80 engine, A35 562 2 transmission)

**Note:**

The transmission has lifetime lubrication. Oil changes are therefore only required under exceptional circumstances.

**Caution!**

Special oil - refer to Lubricant Specifications



Ensure that transmission is at full operating temperature before changing fluid.

Remove drain plug (1).  
Drain oil.

**Note:**

Dispose of old oil correctly.

**Installation instruction:**

Replace seal.

Tightening torque 24 11 6A2\*



6 Top up transmission oil level.

ATF\*\*\* is poured in through the filler bore underneath the oil sump. Unscrew filler plug (1).

**Installation instruction:**

Check seal, replacing if necessary.

With engine stationary, fill with oil until it overflows.

Screw in oil filler plug and start engine. Selector lever position "P".

Open oil filler plug and, with engine running, top up with oil until it overflows.

**Caution!**

If suction noises occur during the filling process, air is being drawn in. This causes the transmission oil to foam, thereby increasing its volume.

This results in an excessively low oil level. If this happens, repeat the oil level check a few hours later.

\* Refer to Specifications

\*\* Refer to Consumables Specifications

\*\*\* Refer to Specifications

\*\*\*\* Refer to Consumables Specifications

e Check oil level / adjust:

Perform the oil level check rapidly.  
When the check is complete, the transmission temperature must not exceed 50° C.

It is always preferable to check the oil level at lower temperatures.

The inspection should therefore be completed at 30° C if possible.

The transmission then holds about 0.8 liters more oil than when the oil level is checked at 50° C.

At the start of the oil level check, the transmission temperature must be between 20° and 30° C.

Read off temperature with MoDiC or Service Tester.

Park car on level ground.

Run engine at idle speed.

With M50 engines, switch on lights to increase engine speed.

With the engine running (idle speed; apply brake), slowly shift up and down all gears in "program" (winter program).

Move selector lever into position "P", then unscrew and remove oil filler plug with engine running.

Pour in ATF until it overflows.

With engine running, screw oil filler plug back in.

Installation instruction:

Replace seal.

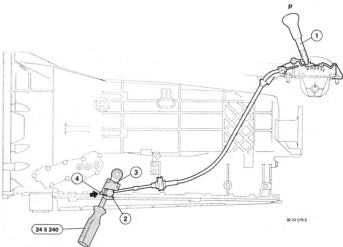
Tightening torque 24 11 7A2\*



\* Refer to Specifications

\*\* Source of Supply: BMW Parts Service





Set gearshift lever (3) to "P".

Release nut (2).

**Caution!**

In order to avoid deforming the operating cable, the clamping screw must be held with the special tool 24 5 240.

**Note:**

The special tool 24 5 240 can only be fitted in position "P".

Press forward lever (3) (park position).

Press operating cable rod (1) opposite forward direction and release again.

Firmly secure operating cable rod (4) with nut (2) (held with special tool 24 5 240).

For tightening torque 24 10 2AZ\*.

**24 00 026 Removing and installing transmission**

- Engine M90 transmission  
A38 580 Z -

Disconnect negative lead from the battery.  
**Caution!**  
First read fault memories with tester and print any faults as fault memories of control units will be cancelled by disconnecting the battery.  
Remove complete exhaust system 18 00 020.  
Remove underbody protection from engine.

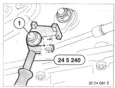
Remove protective cover.



Unscrew head shield (1).



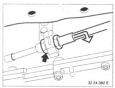
Remove bracket for Lambda oxygen sensor plug.



Loosen nut (1).

**Caution!**  
To avoid distortion of the cable, always brace with special tool 24 5 240 on the clamping screw.  
**Tightening torque\***

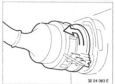
**Note:**  
Special tool 24 5 240 can only be fitted in setting "9".



Remove cable sleeve from counter support.  
Pull out cable.

**Installation instruction:**  
**Tightening torque\***

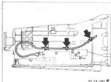
Adjust shift mechanism 24 00 007.



Turn bayonet connection counter-clockwise.  
Pull off plugs.  
Lift cable harness out of holder.

**Installation instruction:**  
Fit plug, taking care to ensure that the marker lines are aligned.

\* Refer to Specifications



30 24 080 F

Install satellite holders on transmission.



30 24 084 E

Unscrew coolant pipes on left and right hand sides of transmission oil cooler.

*Note:*  
Approximately 1 liter of coolant will run out when unscrewing the pipes.

Fill cooling system - refer to 17 90 005.



30 24 085 G

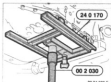
*Installation:*  
Replace O-rings.  
Tightening torque\*.



30 23 056 G

Unscrew stabilizer at left and right hand ends and let it hang down.

\* Refer to Specifications



30 24 080 F

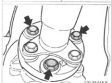
Support transmission from underneath using special Tools 34 0 170 and 00 2 030.



30 24 087 G

Unscrew cross member.

*Installation:*  
Center transmission - refer to Group 26.  
Tightening torque\*.



30 23 049 E

Unscrew joint disc at transmission.



30 23 049 E

*Installation:*  
Replace stop nuts.  
Tighten bolts to specified tightening torque\*.

*Important!*  
Only turn nuts on flange end and whenever possible by design to avoid tension in the joint disc.

\* Refer to Specifications



Unscrew center mount.  
Bend propeller shaft down and pull off of centering pins on transmission.

**Important!**  
Do not let propeller shaft fall into joints.  
Suspend it from car on piece of wire.

32 24 036 E



**Installation:**  
Preload center mount in forward direction by distance (A) = 2 ... 4 mm.  
Tightening torque\*

32 24 015 E



Unscrew heel shields at left and right hand sides and push forward.

32 24 141 E



Turn steering wheel fully against left or right lock.

Lift cap out of opening in oil sump.

32 24 137 E

\* Refer to Specifications



24 1 110

32 24 158 E

Unscrew three torque converter to drive plate mounting bolts using Special Tool 24 1 110 and turning flywheel 1/3 turn for each bolt.



11 2 480

32 24 159 E

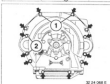
Apply Special Tool 11 2 480 between connecting pipe and engine oil pan.



Lower transmission.

**Important!**  
Exhaust manifolds must not bear on thrust strut mounts.

32 24 150 E



Unbolt transmission from engine (Tors bolts).

**Notes:**  
Bolts (1) = Tors B 10  
Other bolts = Tors E 10  
Bolts (2) opposite the starter are fitted with nuts at front.

32 24 058 E



32 24 048 E

**Installation instruction:**

Note that Torx screws are fitted with washers.  
Tightening torque 24 00 1A2\*



24 4 120

32 24 049 E

Prevent torque converter from slipping out by fitting and securing special tool 24 4 120 to transmission case with flat side of retaining tab facing torque converter.  
Pull transmission off engine.

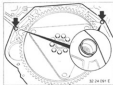
**Caution!**

To transport the transmission, lower transmission fully onto lifting fixture.

- Risk of accident -
- Transmission weight approx. 120 Kg

**Caution!**

When putting down transmission without support, do not place on oil cooler.

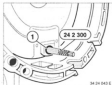


32 24 051 E

**Note** dowel sleeves.

If necessary, transfer / replace dowel sleeves on transmission.

\* Refer to Specifications

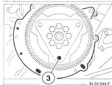


34 24 042 E

**Installation instruction:**

Turn the torque converter on the transmission until bore (1) faces down perpendicular to the tab.

Screw special tool 24 2 300 into the tab.



34 24 044 E

**Installation instruction:**

Bore (2) on drive plate must point perpendicularly to center of opening in oil sump.



34 24 045 E

**Installation instruction:**

Lift automatic transmission until bore (2) in drive plate is reached.

Guide transmission in carefully with special tool 24 2 300 in bore (2) on the drive plate.

Bolt transmission case to engine.

Remove special tool 24 2 300 from tab by rotating and pulling forwards.

Bolt torque converter to flywheel.



**Installation instruction:**  
 Install bolt using special tool 24 1 110 and  
 tighten using a torque wrench.  
 Tightening torque 24 40 1A2\*

**Caution!**  
 Only use original screws\*\*.



**Installation instruction:**  
 If necessary top up/adjust transmission fluid  
 level, refer to 00 11 236.



32 24 000 0

## 24 00 046 installing exchange transmission

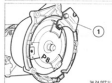
- Engine M 60 transmission  
ABB 580 Z -

Removing transmission 24 00 026.

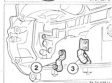
**Note:**  
Check transmission designation/coding\* on type plate or label.

Check that correct electronic transmission control unit (EGG) is fitted to transmission.

Fit transport container (7).



34 24 007 0



34 24 038 0

Fit lever (2), retaining angle (3) and cable clip for Lambda oxygen sensor.



32 24 089 0

Fit left and right exhaust brackets.

**Caution!**  
Automatic transmission is supplied with an oil fill.  
After installation, simply check the transmission fluid level.

Check top up of level, see 06 11 239

Whenever a transmission is replaced, cancel the EGS adaption memory using the Service Tester and perform a new adaption procedure.

Perform all upshifts ( 1-2, 2-3, 3-4, 4-5 ) several times in E program and setting "D" at a range of different accelerator positions (low, medium, high part throttle, full throttle). Perform several repeats of shifts which have been the subject of complaint.

24 00 585 Disassembling and assembling automatic transmission (A38 560Z)

Refer to Repair Manual 7 Series E38





**24 11 000 REMOVING AND INSTALLING SEALING TRANSMISSION OIL SUMP**

Unscrew drain plug (1).  
Drain oil.

**Note:**  
Dispose old oil properly.

**Installation:**  
Fill transmission with oil – refer to "Oil Change in Automatic Transmission" in 00 11 228 of Group 24.



Unscrew oil sump bolts.  
Remove oil sump and gasket.



Lift expansion tank off of oil sump.



If applicable, lift off retainers, remove and clean magnets.



**Installation:**  
Clean oil sump.  
Install magnets.  
Hold new gasket on oil sump by using glycerine grease.



**Installation:**  
Tighten bolts uniformly in several steps.  
"Tightening torque".

## 24 12 016 REPLACING RADIAL OIL SEAL FOR OUTPUT FLANGE

### Note:

The output flange can no longer be removed from the outside.  
The transmission extension must be taken off for removal of the output flange.

Remove exhaust assembly - refer to 18 90 020.



Remove heat shield (1).



Unscrew holder for oxygen sensor plugs.



Loosen nut (1).

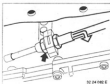
### Important!

Always counterhold on bolt using Special Tool 24 S 240 to avoid deformation of the cable.  
Tightening torque\*.

### Note:

Special Tool 24 S 240 can only be applied in position "P".

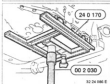
\* Refer to Specifications



Unscrew cable sleeve at counterholder.  
Pull out cable.

Installation:  
Tightening torque\*.

Adjust selector lever - refer to 24 00 007.



Support transmission from underneath using Special Tools 24 D 170 and 80 Z 030.



Unscrew cross member.

### Installation:

Center transmission - refer to Group 26.  
Tightening torque\*.



Unscrew joint (1) at transmission.

\* Refer to Specifications



**Installation:**  
Replace stop nuts.  
Tighten bolts to specified tightening torque\*.

**Important!**  
Only turn nuts on flange end whenever possible by design to avoid tension in the joint disc.



**Unscrew center mount.**  
Bend propeller shaft down and pull off of centering pins on transmission.

**Important!**  
Do not let propeller shaft fall into joints. Suspend it from car on piece of wire.



**Installation:**  
Preload center mount in forward direction by distance (A) = 2 ... 4 mm.  
Tightening torque\*.

Lower transmission as far as possible.

\* Refer to Specifications



Unscrew transmission extension.

**Installation:**  
Tightening torque\*.



Pull off transmission extension.

**Installation:**  
Replace O-ring.



**Installation:**  
Check for shim.  
Install same shim (same thickness) again.



Knock back lock or slotted nut.

\* Refer to Specifications



Clamp special tool 24 0 190 in vice.  
Fit transmission extension with output flange  
in the special tool.

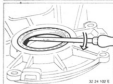


Release slotted nut with special tool 24 4 110.

Installation note:  
For tightening torque\*.



Remove transmission extension from special  
tool.  
Pull output flange out of mounting.

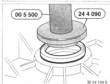


Lift out radial oil seal.

\* Refer to Technical Data.



Caution!  
Bearing inner race and balls with cage can  
drop out.  
Observe installation direction.



Fit new radial oil seal flush with special tool  
24 4 090 in conjunction with handle 00 5 500.

### 24 12 106 Replacing radial oil seal for manual shift valve shaft

#### Note:

On completion of work, check transmission oil level and correct as required, refer to 24 11 236.

Set selector lever to position "P".

Fit special tool 24 5 240 on gearshift lever.

#### Note:

Special tool can only be fitted in position "P".

Release nut (1).

**Installation note:**  
Adjust gearshift lever, refer to 24 00 007.

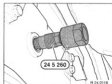
Remove operating cable sleeve from support bracket and pull out.

**Installation note:**  
For tightening torque 25 16 1A2\*.

Release nut.  
Detach gearshift lever.

**Installation note:**  
For tightening torque 24 01 1A2\*.

\* Refer to Technical Data



Remove radial oil seal from transmission casing with special tool 24 5 260.



#### Installation note:

Fit special tool 24 5 490 on manual shift valve shaft.

Oil sealing lip of radial oil seal (2) with automatic transmission oil.  
Slide gear on radial oil seal (3) up to casing.



#### Installation note:

Press radial oil seal into transmission casing with special tool 24 5 260.

Remove special tool 24 5 490 from manual shift valve shaft.

#### Note:

The radial oil seal on the right-hand side of the transmission is replaced in the same way.





32 24 108 0

### 24 12 506 Replacing radial oil seal for torque converter

Remove torque converter 24 40 006.

Lever out snap-ring with small screwdriver.



32 24 108 0

Lift out radial oil seal with open-ended wrench (PKA2 13).



32 24 108 0

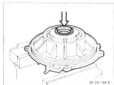
Installation note:

Note washer under radial oil seal.



32 24 108 0

Oil new radial oil seal and install with special tool 24 4 100.



### 24 13 156 Replacing output flange

Remove output flange  
(refer to 24 12 018).

**Caution!**  
Axial clearance must be checked and adjusted if necessary.

Clamp transmission extension in vice.  
Output flange must not rest on vice.  
Press output flange in output direction.



Calculation example:

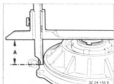
$B = 45.1$  mm  
minus  $A = 42.7$  mm  
Distance =  $2.4$  mm

minimum  $0.25 \dots 0.45$  mm axial clearance

Calculated thickness of spacer ring  
=  $2.15 \dots 1.95$  mm

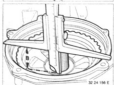
Spacer rings are available from parts service  
from  $1.0 \dots 3.2$  mm in steps of  $0.2$  mm.

Install required spacer ring (2.0 mm).



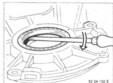
Determine dimension (A) from support shoulder to sealing surface.  
Press-down output flange for this purpose.

Example:  
 $A = 42.7$  mm



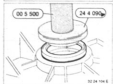
Determine dimension (B) from sealing surface of transmission casing to shoulder on spring wheel.

Example:  
 $B = 45.1$  mm

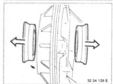


24 13 106 REPLACING BEARING OF TRANSMISSION EXTENSION - Output Flange Removed -

Pry out radial oil seal.



Installation:  
Drive in new radial oil seal flush using Special Tools 24 4 096 and 00 5 500.



Remove both inner races.

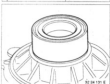


Remove circlip.



Remove ball cage.

Installation:  
Check installed direction.



Heat transmission extension in area of bearing race to about 80° C using a hot air blower.

Remove bearing race.

Installation:  
Heat case again.  
Install first ball cage.

**Important!**  
Axial play must be checked / adjusted if necessary - refer to 24 13 106.

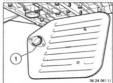


**24 30 006 REMOVING AND INSTALLING /  
REPLACING VALVE BODY**

Remove oil sump - refer to 24 11 008.

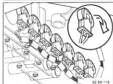


Unscrew oil strainer on valve body.



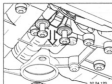
Remove oil strainer.  
Check for O-ring (1).

Installation:  
Tightening torque\*.

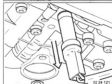


Pull plugs off of solenoids.

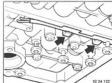
\* Refer to Specifications



Unscrew holder.



Pull out pulse sender.  
Unclip wires.



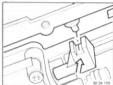
Installation:  
Check routing of wires.



Unscrew all bolts with large bolt heads  
( $\phi = 12$  mm).  
Remove valve body.

Installation:  
Tighten all bolts in several steps.  
Tightening torque\*.

\* Refer to Specifications



**Installation note:**  
During assembly, fit slide valve on pin of notched disk.



Detach wiring harness from retaining lugs.



**Installation note:**  
Replace O-rings.  
Note centering pin.

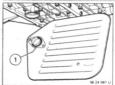


If necessary convert bushes.  
Replace O-rings.



**24 21 136 REMOVING AND INSTALLING /  
REPLACING TRANSMISSION  
OIL STRAINER**

Remove oil sump - refer to 24 11 008.  
Unscrew oil strainer on valve body.



Remove oil strainer.  
Check O-ring (1).

Installation:  
Tightening torque\*

\* Refer to Specifications

**24 34 006 REMOVING AND INSTALLING  
OR REPLACING PARKING  
LOCK (PARK. / SPRING)**

Remove oil sump - refer to 24 11 008.  
Remove Transmission extension - refer to  
24 12 015.



24 34 130 B

Unscrew retainer for pulse sender.  
Pull out pulse sender.

Installation:  
Tightening torque\*.



24 34 134 E

Unscrew guide plate.

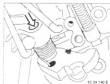
Installation:  
Tightening torque\*.



24 34 135 F

Installation:  
Check arrangement of lockpin.

\* Refer to Specifications



24 34 140 B

Drive out bearing shaft from inside to out-  
side using a suitable 5.0 mm dia. plastic  
punch.

Remove parking lock lever and spring.



24 34 140 C

Installation:  
Attach spring in bore and retainer.



24 34 142 G

Installation:  
Replace seal on bearing shaft.



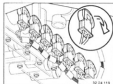
24 34 140 E

Lift off shim and parking lock gear.

**Important!**  
If the parking lock gear is replaced, the  
thickness of the shim must be recalculated -  
refer to 24 12 194.

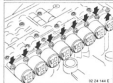
### 24 34 857 REPLACING SOLENOIDS AND / OR PRESSURE REGULATOR

Remove oil sump - refer to 24 11 508.



24 34 119

Pull concerned plugs off of solenoids.



24 34 140 E

Unscrew retaining cap.

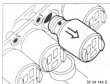
Installation:  
Tightening torque\*



24 34 140 E

Installation:  
The spring rail is curved in direction of the valve body.

\* Refer to Specifications



24 34 140 E

Pull out solenoid or pressure regulator.



24 34 147 E

Note:  
Solenoids cannot be mixed up.

- 1 = Solenoid
- 2 = Pressure regulator - 13 mm dia. pin
- 3 = Pressure regulator - 17 mm dia. pin



24 34 148 E

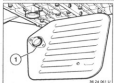
Installation:  
Check for O-ring.  
Turn solenoids in such a manner that pins face in direction of the oil sump.

**24 34 873 REPLACING PULSE SENDER  
(TURBINE SPEED)  
- Oil Sump Removed -**

Remove oil sump - refer to 24 11 006.

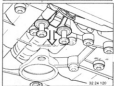


Unscrew oil strainer on valve body.



Remove oil strainer.  
Check for O-ring (1).

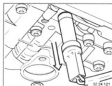
Installation:  
Tightening torque\*.



Unscrew holder.

Installation:  
Tightening torque\*.

\* Refer to Specifications



Pull out pulse sender.  
Take wiring out of retainers.  
Disconnect plug.



Installation:  
Check routing of wiring.

24 34 874 REPLACING PULSE SENDER  
(OUTPUT SPEED)  
- Oil Sump Removed -

Remove oil sump - refer to 24 11 006.



Unscrew retainer.

Installation:  
Tightening torque\*.



Pull out pulse sender.  
Disconnect plug.

\* Refer to Specifications.

**24 25 501 REPLACING WIRE HARNESS IN  
AUTOMATIC TRANSMISSION  
- Valve Body Removed -**

Remove valve body - refer to 24 11 008.

**Note:**  
Removal is necessary to be able to attach  
the wire harness in retainers on the valve  
body.



52 24 130 E

Unscrew retainer.

**Installation:**  
Tightening torque\*.



52 24 136 E

Pull out pulse sender.  
Disconnect plug.



52 24 134 E

Remove retainer.  
Pull out plug towards inside.

\* Refer to Specifications



52 24 131 E

**Installation:**  
Check O-rings, replacing them if necessary.



52 24 138 E

**Installation:**  
Lock plug with retainer on body to prevent  
turning.



52 24 137 E

**Installation:**  
Check routing and colors of wires.

1 = brown  
2 = yellow





#### 24 40 006 Removing and installing / replacing torque converter

Remove transmission, refer to 24 00 026.  
Using assembly handles 24 4 006, carefully pull torque converter out of primary pump.

**Caution!**  
Transmission oil flows out.



The torque converter cannot be cleaned with standard workshop equipment and must be replaced if damaged.  
Converter identification\*

**Installation note:**  
While turning slightly, carefully fit the recesses on the torque converter in the primary pump. Use assembly handles 24 4 006 for this purpose.

**Caution!**  
Do not damage converter bearing mount and seal when fitting. Fit torque converter as far as it will go against stop.

**Note:**  
The torque converter is engaged correctly in position when the distance between the casing and threaded connection on the converter is approx. 25 mm



\* Refer to Technical Data



**24 61 101 REMOVING AND INSTALLING /  
REPLACING CONTROL UNIT  
(600)**

Unscrew electronic box lid (right hand side  
looking forward in car).

*Installation:*

Check for seals on wire harnesses.



Pull plug off of control unit.



Pull out retainers.



Pull out control unit.

*Installation:*

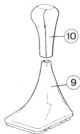
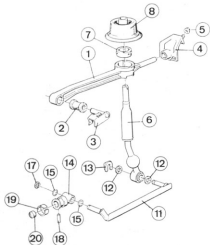
Attach control unit with openings on case  
in retainers at securing points.

Code is on data plate.

Refer to Parts Catalog for cross reference  
of versions and models.

## 25 Gear shift mechanism

	Layout of gear shift mechanism .....	25- 11/0
25 11 000	Shift lever – remove and install .....	25- 11/1
041	Spherical shell for shift lever – replace .....	25- 11/3
081	Imitation leather dust cover for shift lever – replace .....	25- 11/4
111	Shift rod joint – replace .....	25- 11/5
211	Selector arm for shift lever mounting – replace .....	25- 11/6
245	Support bearing for selector arm – replace .....	25- 11/7
	Layout of gear shift mechanism for automatic transmission .....	25- 16/0
25 16 050	Shift lever complete with shift lever bracket – remove and install .....	25- 16/1
061	Knob for shift lever – replace .....	25- 16/2
076	Pull rod in shift lever – replace .....	25- 16/3
	Interlock function – check .....	25- 16/3
	Shift lock function – check .....	25- 16/3
...	Shift lever complete with shift lever bracket – remove and install .....	25- 16/4
080	Shift lever – remove and install or replace .....	25- 16/7
202	Operating cable for gear selector lever – replace .....	25- 16/9



**SHIFT LAYOUT DRAWING**  
- Manual Transmission -

- 1 Shift console
- 2 Bearing sleeve
- 3 Bearing shaft
- 4 Bearing bracket
- 5 Nut
- 6 Shift lever
- 7 Mount
- 8 Rubber cover
- 9 Leather cover
- 10 Shift lever knob
- 11 Shift rod
- 12 Washers
- 13 Retainer
- 14 Shift rod joint
- 15 Spacers
- 17 Retainer
- 18 Cylindrical pin
- 19 Spring sleeve
- 20 Lubricating felt

32 25 058



### 25 11 000 REMOVING AND INSTALLING SHIFT LEVER

Pull knob off of shift lever.

**Note:**  
Pulling off requires a force of about  
40 kp (90 lbs.).



**M 5:**  
The shift lever knob is illuminated.  
Watch out for electric leads while  
pulling off.



Lift front end of cover out of the  
retainers.  
Lift off cover with dust cover.



**Installation:**  
Engage retainers at rear and clip in at  
front.

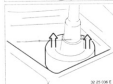


Remove insulation sheet.

**Installation:**  
Rubber mat is located between carpet  
and center console.



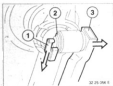
**M 5:**  
Disconnect plug (1).  
The shift lever knob can only be  
replaced together with the electric  
leads.  
This requires pulling the plug out  
through the dust cover.



Button dust cover on body and shift  
console.



**Installation:**  
Button inner dust cover over selector  
arm and outer dust cover in body  
opening.



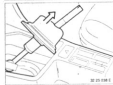
Lift out retainer (1).  
 Take off washer (2).  
 Pull out selector rod (3).



Apply Special Tool 25 1 100.  
 Turn counterclockwise 90°.  
 Press up spherical plate.



**Installation:**  
 Mount spherical plate in such a manner that tabs on spherical plate are aligned with openings in selector arm.  
 Press in shift lever until retainers are heard to engage on the left and right sides.



Take out shift lever from above and unbutton in dust cover.

## 25-11/3



### 25 11 041 Replacing spherical shell for gearshift lever

Remove gearshift lever 25 11 00.  
Remove spherical shell by pressing down.

**Installation note:**  
Grease spherical shell and ball with Klüber  
Polylub GL Y 801\*.



#### 25 11 001 REPLACING DUST COVER FOR SHIFT LEVER

Pull off shift lever knob.

*Note:*  
Force required for pulling off:  
approx. 40 kp (88 lbs.).



Lift front of cover out of retainers.  
Lift off cover with dust cover.



*Installation:*

Engage retainers at rear and clip in at front.



Unbutton dust cover on cover.





### 25 11 111 Replacing shift rod joint

Remove propeller shaft at transmission, refer to 25 11 000.  
Engage reverse gear.  
Remove retainer (1).  
Remove washer (2).  
Pull out shift rod (3).



Lift retaining sleeves out of grooves and slide forward.



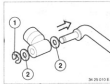
Drive out pin.  
Pull out shift rod with joint.



Installation note:  
Check damping disk in joint and replace if necessary.

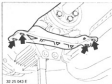


Installation note:  
Shift bearing bush to left side.



Lever out retaining ring (1).  
Remove washers (2).  
Pull out shift rod.

Installation note:  
Install washers (2) such that the chamfer faces away from the shift rod joint.  
Grease bearing points with Klüber Polykub GL Y 681\*.

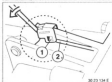


### 25 11 211 Replacing selector arm for gearshift lever mounting

Remove propeller shaft of manual transmission, refer to 25 11 000.  
Remove gearshift lever 25 11 000.  
Support transmission.  
Unscrew cross member.  
Lower transmission down to front axle carrier.



Fit screwdriver between spring and housing.



Detach spring (1) from lug (2) on housing and pivot up.  
Remove pivot pin.

Installation note:  
Grease pivot pin with Klüber Polyub GLY 801\*.



Swivel back clip.  
Remove pivot pin.  
Detach selector arm.

\* Source of supply: BMW Parts Service



Remove selector arm from rear mounting.

Installation note:  
Check support ring and grease with Klüber Polyub GLY 801\*.



Replace bearing bush(es):

Press out old bearing bush(es).  
Cool new bearing bush(es) with Circolight\* and press into selector arm hole until side beading of bush(es) project evenly.

\* Source of supply: BMW Parts Service



### 25 11 245 Replacing support bearing for selector arm

Remove exhaust system 19 20 020.  
Remove heat shield.



Release bolt.

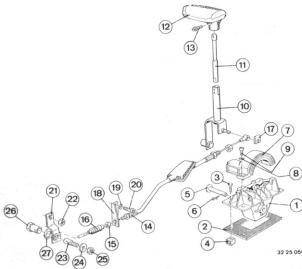


Slide bearing bracket forward, turn, press down selector arm and remove support bracket.



Installation note:  
Grease support bracket with Klüber Polyub  
GLY 801\*.  
Attach bracket in retaining legs.

\* Source of supply: BMW Parts Service



SHIFT LAYOUT DRAWING  
- Automatic Transmission -

- 1 Console
- 2 Insulator
- 3 Self-tapping screw
- 4 Self-tapping nut
- 5 Bearing shaft
- 6 Cotter pin
- 7 Switch
- 8 Washer
- 9 Screw
- 10 Selector lever
- 11 Pull rod
- 12 Handle
- 13 Filler head bolt
- 14 Cable
- 15 Nut
- 16 Cover
- 18 Holder
- 19 Washer
- 20 Filler head bolt
- 21 Lever
- 22 Nut
- 23 Clamping bolt
- 24 Washer
- 25 Nut
- 26 Sleeve
- 27 Washer



### 25 16 050 Removing and installing selector lever with console

Pull off EGS switch, remove plug.

25 16 01 1 H



Unscrew filler/lead screw (3 mm hexagon socket).  
Pull off handle.

25 16 01 2 H



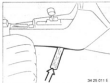
Installation instruction:  
Engage pin of button in bore of pull rod.

25 16 01 3 H



Remove front cover from retaining lugs.  
Remove cover.

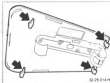
25 16 01 4 H



25 16 01 5 H

#### Note:

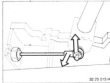
To lift out the trim, push up between transmission tunnel and console with a flat object (e.g. wooden ruler).



25 16 01 6 H

#### Installation instruction:

Attach retaining lugs from back, clip in at front.



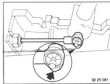
25 16 01 7 H

#### Pry out retainer.

Unfasten lug from bolts.

#### Caution!

Do not bend steel wire.



25 16 01 8 H

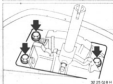
#### Installation instruction:

Lug on the eye points upwards.

## 25-16/2



Unscrew nut.  
Disconnect Bowden cable sleeve from retaining bracket.



Unscrew bolts.



Press together the retaining clips.  
Disconnect plug.



Removing selector console and protective cover.

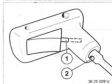
Installation instruction:  
Examine / replace protective gasket.  
Adjust selector mechanism, see main group 24.



25 16 061 Replacing handle for selector lever

Unscrew filler head screw (3 mm hexagon socket).  
Pull off handle with pull rod.

Installation instruction:  
Tightening torque\*



Disconnect pull rod (button not pressed).  
Engage pin (1) of button in bore (2) of pull rod.

25 16 076 Replacing pull rod in selector lever

Description given in Replacing Handle For Selector Lever, see 25 16 061.

\* Refer to Specifications

## CHECKING INTERLOCK

Turn ignition key to center position (red).  
 It must be possible to move the selector lever in and out of all positions.  
 It should only be possible to turn the ignition key back to "Zero" position and remove the key with the selector lever in P.  
 It must not be possible to move the selector lever out of P with the ignition key in "Zero" position or removed.



- 1 Interlock
- 2 Shiftlock

## CHECKING SHIFTLICK

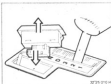
With the engine running and car stopped the selector lever must be in P or N.  
 With the brake pedal operated and an engine speed of less than 2500 rpm the selector lever must be unlocked.

With the brake pedal operated and an engine speed of more than 2500 rpm the selector lever must be locked in P or N.  
 When moving the selector lever quickly from R to D and from D to R the selector lever lock must not be activated in position N.

If the selector lever is left in position N for longer than about 5 seconds the lock must be activated.

Except for positions P and N, the selector lever must never be locked regardless of the operating condition.

The selector lever lock must not be activated at a road speed of more than 5 km/h.



32 25 010 H

### 25 15 ... Removing and installing selector lever and console

Version with Interlock/Shift-Lock:

Lift out switch for EGS control unit, remove plug.



32 25 011 H

Unscrew filler head screw (3 mm hexagon socket).  
Remove handle.



32 25 012 H

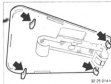
Installation instruction:

Insert pin on button in bore of pull rod.



32 25 013 H

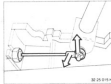
Lift out front cover from retaining lugs.  
Remove cover.



32 25 014 H

Installation instruction:

Attach retaining lugs at back and clip in at front.



32 25 015 H

Lift out stamping spring.  
Unfasten eye on bolt.

Caution!

Do not bend steel wire.



32 25 017

Installation instruction:

Lug on the eye points downwards.

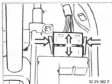


32 25 018 H

Unscrew and remove nut.

Detach Bowden cable sleeve from retaining bracket.

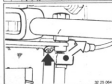




Press together retaining clips.  
Disconnect plug.

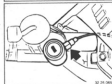


Unscrew screw (1)

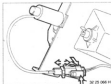


Unscrew holder.  
Disconnect interlock cable.

Installation instruction:  
Adjust interlock cable.



Fit new interlock cable, see Replacing Steering Lock, main group 22.



Detach plug connection for Shiftlock.



Unscrew bolts.



Remove console and protective cover.

Installation instruction:  
Examine protective gasket and replace if necessary.  
Adjust gearshift mechanism, see main group 24.

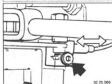


Assembly and adjustment of interlock cable.  
Move selector lever into setting "P" (front detent on bearing post).



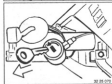
Connect cable system on pin of lever.

25-16-06 E



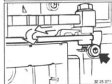
Fit cable with bracket and screw on bearing pin (cable tube must initially retain axial movement in the bracket).

25-16-07



Move ignition key into zero setting (remove ignition key).

25-16-08



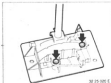
Press detent lever down and tighten screw for retaining cable to torque of 8 Nm.

25-16-09



Check function of interlock and shiftlock.

25-16-10



25 25 000 E

### 25 16 080 Removing, installing and replacing selector lever

**Remove transmission switch:**  
Remove screws.



25 25 001 E

**Move selector lever into central position.**  
Lift off switch.



25 25 002 E

**Installation instruction:**  
Align slot in housing and guide groove in slide with one another (i.e. align them).  
Check that the driver spigot is correctly located.



25 25 003 E

**Remove selector lever:**  
Remove pull rod.



25 25 004 E

Unlock cotter pin.



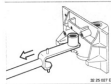
25 25 005 E

**Press out bolt.**  
(Press fit).



25 25 006 E

**Installation instruction:**  
Note installation direction of bolt.



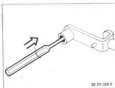
25 25 007 E

**Remove selector lever from housing.**

**Installation instruction:**  
Lubricate bearing surfaces with Klüber Poly-lub GS 1500\*\* grease.

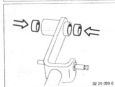
\*\* Source of Supply: BMW Parts Service

## 25-16/8



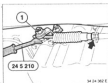
### Replacing Bearing Sleeves:

Drive both bearing sleeves out.



### Installation:

Press new bearing sleeves in flush.



### 25 16 202 Replace cable for gear selector lever

Unscrew nut (1) in setting "P".

#### Caution!

To prevent any distortion of the cable, brace with special tool 24 5 210 or 24 5 220 on the clamping screw.

Transmission A 4 S 310 R,  
Special tool 24 5 210.

Transmission A 5 S 310 Z and A 5 S 300 J,  
Special tool 24 5 220.

#### Note:

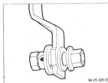
The special tool can only be fitted in setting "P".

Unscrew cable from holder.  
Remove cable.

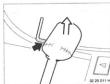


#### Installation instruction:

Note the arrangement of washers.  
Check / replace rubber mount.



Lift out switch for EH control unit, remove plug.



Unscrew clamping screw (1 mm hexagon socket).  
Remove handle.

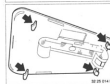


#### Installation instruction:

Insert pin of button in pull rod bore.



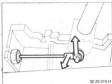
Lift cover out from front of retaining lugs.  
Remove cover.



#### Installation instruction:

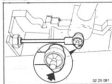
Attach retaining lugs at rear and clip into place at front.

## 25-16/10

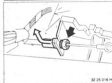


Lift out clamping spring.  
Unfasten eyelet from bolt.

**Caution!**  
Do not bend steel wire.



Installation instruction:  
Lug on the eyelet points downwards.



Unscrew and remove nut.  
Detach Bowden cable sleeve from retaining bracket.



Cut open carpet and hammer into place.



Remove rubber grommet together with Bowden cable.



Installation instruction:  
Insert Bowden cable from top.  
Button up rubber grommet.

**Note:**  
After complete assembly of the Bowden cable,  
check location of rubber grommet once again.  
Adjust shift mechanism, see main group 24.

## 26 Propeller shaft

26 11 000	Propeller shaft – remove and install .....	26- 11/1
030	Propeller shaft – balance (center and adjust deflection angle) .....	26- 11/4
051	Flexible coupling for front propeller shaft – replace .....	26- 11/6
160	Constant velocity joint for propeller shaft – replace – version with press-fitted knurled bolts .....	26- 11/8
160	Constant velocity joint for propeller shaft – replace – version with screwed stud bolt .....	26-11/10
501	Centering for propeller shaft at front – replace .....	26-11/12
26 12 001	Propeller shaft center mount – complete unit – replace – propeller shaft with sliding member on center mount .....	26- 12/1
001	Propeller shaft center mount – complete unit – replace – propeller shaft without sliding member on center mount .....	26- 12/2
002	Both propeller shaft center mounts – complete units – replace .....	26- 12/3
011	Grooved ball bearing in propeller shaft center mount – replace .....	26- 12/5
500	Propeller shaft center mount – preload and check .....	26- 12/5
26 20 000	Input shaft – 4-wheel drive – remove and install .....	26- 20/1
051	Flexible coupling for input shaft – 4-wheel drive – remove and install .....	26- 20/2
	Propeller shaft – troubleshoot .....	26- 90/1



**26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT**

Remove exhaust assembly - refer to 18 00 000.

**Note:**

The propeller shaft is adapted to permanent requirements in reference to the transmission version, power flow and vibration behavior, so that removal and installation will differ and depend on the version.

Remove the heat shield if applicable.

**Version with Front Joint Disc:**

Unscrew the joint disc at the transmission.

**Installation:**

Note the length of bolts due to the thicker joint disc for the M5.  
 S181 ... S351 = 56 mm  
 M5 = 60 mm

**Installation:**

Replace the stop nuts.  
 Tightening torque\*.

**Important!**

Only tighten the nuts or bolts on the flange and whenever possible to avoid tension in the joint disc.

**Note:**

The vibration damper is mounted on the transmission end of the output flange. By turning 60° the vibration damper can be pushed over the output flange.

\* Refer to Specifications



Turn the vibration damper 60° and lay it on the rubber coupling. The vibration damper is removed together with the propeller shaft.



**Version with Front Universal Joint:**

Support the transmission from underneath. Unscrew the transmission suspension.

**Installation:**

Center the transmission - refer to Gr. 26. Tightening torque\*.



Unscrew the universal joint from the transmission.

**Installation:**

Replace the stop nuts.  
 Tightening torque\*.



**Version with Slide:**

Loosen the threaded bush several turns, using Special Tool 26 1 040.

**Installation:**

Tighten the threaded bush after complete installation, using Special Tool 26 1 040. Tightening torque\*.

\* Refer to Specifications







Removing propeller shaft from rear axle differential.

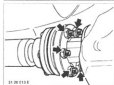
**Caution!**  
Draw relative positions of flanges.



Version with universal joint:

Unscrew universal joint on transmission.

**Installation instruction:**  
Replace stop nuts.  
Note tightening torque 26 11 442\*.



Version with constant velocity joint:

Unscrew universal joint on rear axle differential.

**Installation instruction:**  
Replace stop nuts.

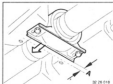
**Caution!**  
The tightening torque 26 11 442\* for M 8 bolt connections can differ depending upon the version of nuts used.



**Installation instruction:**  
Check / replace gasket.

**Caution!**  
The constant velocity joint is not micro-encapsulated.  
Protect joint from dirt with transport cap or similar item.  
Check grease fill\*.

\* Refer to Specifications



Remove center mount from body.

**Installation instruction:**  
Preload center mount in forward direction.  
Tightening torque 26 11 642\*

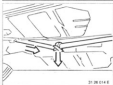
Preload on propeller shafts with sliding member on center mount  $A = 4 \dots 6$  mm.  
Propshafts (with) sliding member on center mount  $A = 2 \dots 4$  mm.



Model 315:

Three-section propeller shaft.  
In addition, remove second center mount from back of body.

**Installation instruction:**  
Preload center mount in forward direction in parallel fashion.  $A = 2 \dots 4$  mm.



Bend down propeller shaft at center mount and withdraw from centering spigot on transmission.

Remove propeller shaft.  
The propeller shaft is balanced in the driveline and may only be replaced as a complete unit.

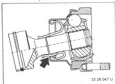


Do not separate propeller shaft in sliding member.

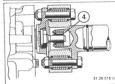
Propeller shaft sections are mounted in such a manner that the universal joints are in one plane.

If the sliding member was mistakenly damaged without marking, the only mistake possible is incorrect assembly (offset at 180°) due to the balancing operation.

\* Refer to Specifications

**Important!**

Do not let the propeller shaft fall into the joints. The rubber cover of the constant velocity joint in particular would be damaged.

**Inspection:**

Check center (4).

Replace a damaged center.

Lubricate the center with Molykote Long-term 2<sup>nd</sup> prior to installation.

### 26 11 030 BALANCING PROPELLER SHAFT (CHECKING AND ADJUSTING DEFLECTION ANGLES)

#### Vibration or Noise:

##### Requirements:

Propeller shaft in perfect optical condition. Balance the propeller shaft, if balance plates are missing or there is suspicion of propeller shaft imbalance (refer to the operating instructions supplied with the balancing machine).

##### Important!

Test run a jacked-up car only with supported wheel suspension on the driven wheels (deflection angle of output shaft). Never exceed the top speed specified for a car in jacked-up state or on a dynamometer test stand.

Conform with safety precautions!

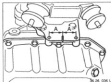
#### Centering Propeller Shaft:

Loosen the exhaust assembly, engine rubber mounts and transmission cross member. Apply Special Tool 26 1 030.

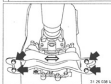
#### Measuring Points:

Bore in engine carrier at rear.  
Manual transmission - center cast IR.

4 HP-2015 HP-18 Automatic Transmissions:  
Center bolt of transmission extension (punch mark the measuring point).



**TIME R1 Automatic Transmission:**  
Determine the measuring point.  
Measure distance A from the center of the bore to the inside.  
A = 31.0 mm.  
Punch mark the measuring point.

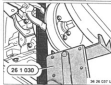


Move the transmission sideways until the special tool gauge shows the same distance on the left and right sides. Mount the cross member. Tightening torque\*.



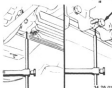
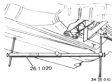
#### Checking Deflection Angle of Propeller Shaft:

**M40 Engines:**  
Clamp rail (steel ruler) on the pulley in vertical position (use a clamp). Place Special Tool 26 1 030 on the rail.

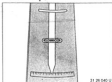


**M20/M30 Engines:**  
Clamp rail (steel ruler) on the vibration damper in vertical position (use a clamp). Place Special Tool 26 1 030 on the rail.

\* Refer to Specifications



## 26-11/5



31 26 040 2

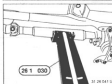
Set the indicator perpendicular with help of the water scale.

**Note:**

Always apply the special tool with the scale in the same direction (e.g. scale right).

One graduation = 0°

The position of the car is not important, as only separate angles are compared.



31 26 041 2

Place the special tool on the front section of the propeller shaft and measure the angle.

Determine the "deflection angle" of the joint disc and, if necessary, correct it by installing max. 3 mm thick shims on the transmission suspension or center mount.

**Example:**

Engine angle

± 16°

Propeller shaft angle

± 2-08°

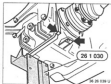
Joint disc deflection angle

+ 0° 10'

**Note:**

When correcting deflection angles by installing shims, remember that this will change the deflection angle of the neighboring joints.

In general a small as possible deflection angle on joints would be ideal.



26 1 030

31 26 039 2

If a machined surface is accessible on the rear axle final drive, Special Tool 26 1 030 may be applied on the machined surface. Measure the deflection angle\*.



26 1 030

31 26 040 2

Place Special Tool 26 1 030 on the rear section of the propeller shaft and measure the angle.

Determine the "deflection angle" of the center mount and, if necessary, correct it by installing shims of up to max. 3 mm thickness on the transmission suspension or center mount.



26 1 030

32 28 035

Place Special Tool 26 030 on the rear axle final drive together with a rail (steel ruler). Measure the deflection angle\*.

\* Refer to Specifications

\* Refer to Specifications



### 26 11 051 REPLACING FRONT JOINT DISC FOR PROPELLER SHAFT

Remove exhaust assembly - refer to 18 00 020.  
Remove the heat shield if applicable.

#### Note:

The propeller shaft is adapted to pertinent requirements in reference to the transmission version, power flow and vibration behavior, so that removal and installation will differ and depend on the version.

Unscrew the joint disc at the transmission.

#### Installation:

Note the length of bolts due to the thicker joint disc for the M5.  
 S18 ... S35 = 56 mm  
 M5 = 60 mm

#### Installation:

Replace the stop nuts.  
Tightening torque\*.

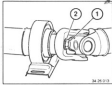
#### Important:

Only tighten the nuts or bolts on the flange and whenever possible to avoid tension in the joint disc.

#### Note:

The vibration damper is mounted on the transmission end of the output flange. By turning 90° the vibration damper can be pushed over the output flange.

\* Refer to Specifications



Turn the vibration damper 90° and try it on the rubber coupling.  
The vibration damper is removed together with the propeller shaft.

#### Version with Slide:

Loosen the threaded bush several turns, using Special Tool 26 1 040.

#### Installation:

Tighten the threaded bush after complete installation, using Special Tool 26 1 040. Tightening torque\*.

Unscrew the center mount from the body.

#### Installation:

Preload the center mount parallel in forward direction.  
Tightening torque\*.

Preload the center mount by distance A = 4 to 6 mm for propeller shafts with a slide or by distance A = 2 to 4 mm for propeller shafts without a slide.

#### BMW 518:

Three-piece propeller shaft.  
Unscrew the second center mount at rear from the body.

#### Installation:

Preload the center mount parallel in forward direction by distance A = 2 to 4 mm.

\* Refer to Specifications

## 26-11/7



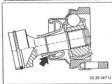
Bend the propeller shaft down and pull it out of the centering pin on the transmission.

**Important!**

Do not disconnect the propeller shaft at the slide.

The propeller shaft was balanced in an assembled state and may only be replaced as a complete assembly.

Suspend the propeller shaft from the car on a piece of wire.



**Important!**

Do not let the propeller shaft fall into the joints. The rubber cover of the constant velocity joint in particular would be damaged.



Unscrew the joint disc from the propeller shaft.

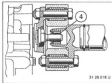
**Important!**

The joint disc must be installed that the arrows point to the flange arms.

Replace the self-locking nuts.

Tightening torque\*

Only tighten the nuts or bolts on the flange and to avoid tension in the joint disc.



**Installation:**

Check center (4).

Replace a damaged center.

Lubricate the center with Molykote Long-term 3\*\* prior to installation.

\* Refer to Specifications

\*\* Source of Supply: BMW Parts



26 11 160

**26 11 160 REPLACING CONSTANT VELOCITY JOINT FOR PROPELLER SHAFT**  
 - Version with Press-Fit Knurled Head Bolts -

Remove complete propeller shaft - refer to 26 11 000.  
 Remove hose strip.



26 26 100

Life circlip out.

Installation:  
 Replace the circlip.



26 26 104

Pull constant velocity joint off together with the dust cover.



26 26 105

Press knurled head bolts and washers out of the constant velocity joint.



26 26 106

Press dust cover on.



26 26 107

Fill new constant velocity joint with 80 grams of grease\*

Note:  
 Don't cam the inner race with cage as the balls would fall out.



26 26 108

Place the gasket on the shoulder provided for this purpose.  
 Press dust cover on.

Installation:  
 Check for correct positioning of the bolts.



26 26 109

Press knurled head bolts in together with washers.

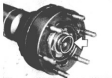
\* Source of Supply: BMW Parts



26 26 110



26 26 111



26 26 112



26 26 113

Clean the splines to remove grease and rust with a bolt cement\*\*.

**Important!**  
Keep the bolt cement out of the ball paths.

Drive the constant velocity joint onto the propeller shaft using Special Tool 23 F 040.

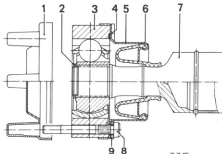
Install the dustlip.

**Note:**  
Check for correct and tight fit.

Install hose clamp on the dust cover.

\*\* Source of Supply: BMW Parts

## CONSTANT VELOCITY JOINT DRAWING



- 1 Transporting cap
- 2 Clamp
- 3 Constant velocity joint
- 4 Gasket
- 5 End cover
- 6 Dust cover
- 7 Propeller shaft
- 8 Bolt
- 9 Washer



**26 11 150 REPLACING CONSTANT VELOCITY JOINT FOR PROPELLER SHAFT**  
 -Version with Screwed-In Stud-

Remove complete propeller shaft - refer to 26 11 000.  
 Remove hose strap.



22 26 035

Lift circlip out.

Installation:  
 Replace the circlip.



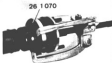
22 26 036

Saw through the sheet metal sleeve along the line all around.



22 26 037

Push the sleeve back.  
 Apply Special Tool 26 1 070.  
 Push the constant velocity joint off using a standard puller.



22 26 038

Fill new constant velocity joint with 80 grams of grease?

Note:  
 Don't paint the inner race with cage as the balls would fall out.



22 26 039

Clean the splines to remove grease and coat with a bolt cement\*\*.

Important!  
 Keep the bolt cement out of the ball paths.



22 26 040

Drive the constant velocity joint onto the propeller shaft using Special Tool 22 1 040.



22 26 041

Install the circlip.

Note:  
 Check for correct and tight fit.



22 26 042

\*\* Source of Supply: BMW Parts

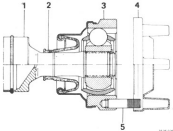
26-11/11



22 26 038

Install hose clamp on the dust cover.

CONSTANT VELOCITY JOINT DRAWING



- 1 Propeller shaft
- 2 Dust cover
- 3 Constant velocity joint
- 4 Transporting cap
- 5 Slud



## 26 11 501 REPLACING CENTER FOR FRONT END OF PROPELLER SHAFT - Propeller Shaft Removed -

Fill the center with viscous grease and drive it out using Special Tool 11 1 130. Pressure on the grease filling drives the center bearing out.



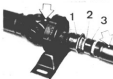
Lubricate the center with Molykote Long-term 2" and drive it in using Special Tool 11 1 130. The sealing lip faces down.



Protrusion A = 4 to 6 mm.



26 1 0 4 0



26 1 0 4 0



26 1 0 4 0



26 1 0 4 0

**26 12 001 REPLACING PROPELLER SHAFT CENTER MOUNT**  
- Propeller Shaft with Slide on Center Mount -

Remove propeller shaft - refer to 26 11 000.  
Unscrew threaded bush using Special Tool 26 1 0 4 0.  
Pull off front section of the propeller shaft.

**Important!**  
The propeller shaft was balanced in an assembled state and may not be turned in the slide.

Note the paint marks.  
Mark an unmarked propeller shaft.

**Installation:**  
Lubricate the slide with Molykote Longram 3\*\*.  
Install threaded bush (1), washer (2) and rubber ring (3).  
Assemble the propeller shaft that the paint marks are aligned.

**Note:**  
The propeller shaft sections are mounted in such a manner that the universal joints are in one plane.  
If the slide had been erroneously disassembled without marking, wrong installation of only 180° is possible due to the balancing.

**Installation:**  
Tighten the threaded bush after completed installation using Special Tool 26 1 0 4 0. Tightening torque\*.

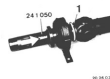
\* Refer to Specifications  
\*\* Source of Supply: BMW Parts



26 26 0 1 4



26 26 0 3 3



26 26 0 3 4



26 26 0 1 1

Lift clip (4) out and remove dust guard (5).

Pull the center mount off together with the grooved ball bearing.  
Use a standard puller.

Install dust guard (1).  
Drive the center mount on to fit tight using Special Tool 26 1 0 5 0.

**Installation:**  
Check the installed position of the dust guard — it must be flush with the center mount.

**Important!**  
Check movement of the center mount.



26 12 010



26 12 011



26 12 012



26 12 013

**26 12 001 REPLACING PROPELLER  
SHAFT CENTER MOUNT**  
- Propeller shaft without Side  
on Center Mount -

Remove propeller shaft - refer to 26 11 000.

**Important!**

The propeller shaft was balanced in an assembled state and the propeller shaft sections may not be turned when assembled. Note the paint marks. Mark an unmarked propeller shaft.

Unscrew the bolt.

Pull off front section of the propeller shaft.

**Installation:**

Assemble the propeller shaft that the paint marks are aligned. Install the bolt with a bolt careener\*\*.

Tightening torque<sup>1</sup>.

Pull the center mount off together with the grooved ball bearing. Use a standard puller.

**Installation:**

Check the installed position of the dust guard.

<sup>1</sup> Refer to Specifications

<sup>\*\*</sup> Source of Supply: SKF Parts



24 1 040

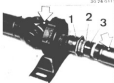
Drive the center mount on to fit tight using Special Tool 24 1 040.

**Important!**

Check movement of the center mount.



30 26 010



30 26 012



26 1 0 5 0



30 26 014

### 26 12 001 REPLACING BOTH PROPELLER SHAFT CENTER MOUNTS - Three Piece Propeller Shaft -

Remove propeller shaft - refer to 26 11 000.  
Unscrew threaded bush using Special Tool 26 1 0 4 0.  
Pull off front section of the propeller shaft.

#### Important!

The propeller shaft was balanced in an assembled state and may not be turned in the slide.

Note the paint marks.  
Mark unmarked propeller shaft sections.

#### Installation:

Lubricate the slide with Molykote Longterm 2\*\*.

Install threaded bush (1), washer (2) and rubber ring (3).

Assemble the propeller shaft that the paint marks are aligned.

#### Note:

The propeller shaft sections are mounted in such a manner that the universal joints are in one plane.

If the slide had been erroneously disassembled without marking, wrong installation of only by **IBO**\* is possible due to the balancing.

Use circlip (4) and remove dust guard (5).

\* Refer to Specifications

\*\* Source of Supply: BMW Parts



30 26 013



30 26 014



30 26 017

Pull the center mount off together with the grooved ball bearing.  
Use a standard puller.

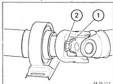
Install dust guard (1).  
Drive the center mount on to fit tight using Special Tool 26 1 0 5 0.

#### Installation:

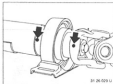
Check the installed position of the dust guard — it must be flush with the center mount.

#### Important!

Check movement of the center mount.



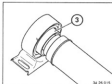
Unscrew bolt (1).  
Press the universal joint off while unscrewing the bolt.  
Remove washer (2).



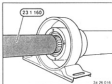
**Important!**  
The propeller shaft was balanced in an assembled state and may not be turned in the slide.  
Note the paint marks.  
Mark unmarked propeller shaft sections.

Pull off rear sections of the propeller shaft.

**Installation:**  
Assemble the propeller shaft that the paint marks are aligned.  
Install the bolt with a bolt cement\*, tightening torque\*.

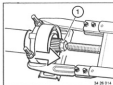


Install the center mount with a long collar (3) for the propeller shaft sections.



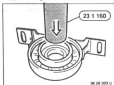
Drive the center mount on to fit tight using Special Tool 23 1 160.

**Important!**  
Check movement of the center mount.



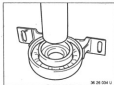
Remove the dust guard.  
Screw the universal joint mounting bolt (1) in again without the washer.  
Pull the second center mount off together with the grooved ball bearing.  
Use a standard puller.

\* Refer to Specifications  
— Source of Supply: BMW Parts



## 26 12 011 REPLACING GROOVED BALL BEARING IN PROPELLER SHAFT CENTER MOUNT

Remove center mount - refer to 26 12 001 / 002.  
Press the grooved ball bearing out using Special Tool 23 1 160.



Always coat the center mount in the area of the ball bearing with *Cincoalight*<sup>®</sup>.  
Press the ball bearing in as far as the stop using a suitable sleeve.

## 26 12 000 PRELOADING AND CHECKING PROPELLER SHAFT CENTER MOUNT

Refer to "Removing Propeller Shaft" in 26 11 000 for the procedures.



## 26 20 000 Removing and installing input shaft

- 1-wheel drive -

### Caution!

Do not use engine to move vehicle once input shaft has been removed.

Remove all six screws.

### Installation instruction:

Replace stop nuts.

To prevent torsion stress on the flexible coupling, only turn the nuts or bolts on the flange side - if possible.

Tightening torque 26 11 5A2\*

Slide back input shaft.

Remove joint disk with centering flange.

### Installation instruction:

Check seal, replace if necessary.

Coat centering spigot with Molykote Longterm 2\*\* grease.

\* Refer to Specifications

\*\* Source of Supply: BMW Parts Service



26 20 001

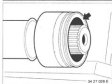
### Installation instruction:

Flexible coupling must be installed that arrows point to flange arms.



26 20 004

Remove input shaft from transfer box.



26 21 009 01

### Installation instruction:

During installation, ensure that sealing ring on the input shaft is located accurately in the dust cover.



26 20 000



26 20 001



26 20 002

### 26 20 031 Removing and installing flexible coupling for input shaft. - 4-wheel drive -

#### Caution!

Do not use engine to move vehicle once the joint disk has been removed.

Remove all six screws.

#### Installation instruction:

Replace stop nuts.

To prevent torsion stress on the joint disk, only tighten the nuts or screws on the flange side - if possible.

Tightening torque 26 ft lbf\*

Slide back input shaft.

Remove joint disk with centering flange.

#### Installation instruction:

Check seal, replace if necessary.

Coat centering spigot with Molykote Longterm 2\*\* grease.

\* Refer to Specifications.

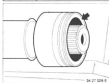
\*\* Source of Supply: BMW Parts Service



26 20 031

#### Installation instruction:

Joint disk must be installed that arrows point to flange arms.



26 20 031

#### Installation instruction:

Coat sealing ring with grease.

During installation, ensure that the sealing ring on the front input shaft does not slide into the dust cover.



26 20 031



26 20 031



26 20 031

## TROUBLESHOOTING PROPELLER SHAFT

Condition	Cause	Correction
Drumming noise in stationary car	a) Propeller shaft without influence	a) Check engine tuning; take tension out of exhaust assembly.
Shaking while moving off forward/reverse (center mount knocking)	a) Propeller shaft not aligned precisely b) Runout on centering pin, transmission or final drive flanges  c) Center mount rubber torn. Propeller shaft axial compensator of propeller shaft with slide seized.  d) Universal joints worn excessively or seized  e) Engine/transmission suspension not okay f) Joint disc rubber torn	a) Align propeller shaft. b) Check centering pin and flanges for runout with a dial gage – see Specifications. Align or replace final drive/transmission flange. c) Replace center mount – see 26 12 001. Align propeller shaft. Check movement of axial compensator, lubricating slide with Molykote Longterm 2 if necessary and tightening the screwed on sleeve with correct torque*. d) Check whether there is play or difficult movement, replacing propeller shaft if necessary – see 26 11 000. e) Check mounts, aligning or replacing if necessary. f) Replace joint disc – see 26 11 001.
Shaking at 40 to 50 km/h (25 to 30 mph)	a) Propeller shaft not aligned precisely b) Runout on centering pin, transmission or final drive flanges  c) Center mount rubber torn. Propeller shaft axial compensator of propeller shaft with slide seized.  d) Universal joints worn excessively or seized  e) Joint disc rubber torn	a) Align propeller shaft. b) Check centering pin and flanges for runout with a dial gage – see Specifications. Align or replace final drive/transmission flange. c) Replace center mount – see 26 12 001. Align propeller shaft. Check movement of axial compensator, lubricating slide with Molykote Longterm 2 if necessary and tightening screwed-on sleeve with correct torque*. d) Check whether there is play or difficult movement, replacing propeller shaft if necessary – see 26 11 000. e) Replace joint disc – see 26 11 001.

\* See Specifications

## TROUBLESHOOTING PROPELLER SHAFT

Condition	Cause	Correction
Drumming noise from 60 km/h (37 mph) on	<p>a) Propeller shaft not aligned precisely or installed with tension / axial compensator of propeller shaft with slide seized</p> <p>b) Centering pin damaged.</p> <p>c) Runout on centering pin, transmission or final drive flanges</p> <p>d) Erroneous centering due to excessively worn flange bones (loose mounting bolts).</p> <p>e) Excessive propeller shaft imbalance, balance plate missing</p> <p>f) Universal joints worn excessively or seized</p>	<p>a) Align propeller shaft. Check movement of axial compensator, lubricating the slide with Molykote Longstem 2 if necessary and tightening screwed-on sleeve with correct torque*.</p> <p>b) Replace centering pin – see 26 11 501.*</p> <p>c) Check centering pin and flanges for runout with a dial gage – see Specifications. Align or replace final drive/transmission flange.</p> <p>d) Replace transmission or final drive flange.</p> <p>e) Balance or replace propeller shaft.</p> <p>f) Check whether there is play or difficult movement, replacing propeller shaft if necessary.</p>
Loud center mount noise while driving	<p>a) Center mount not perpendicular to propeller shaft; not or insufficiently preloaded</p> <p>b) Center mount grooved ball bearing not okay</p>	<p>a) Preload center mount in forward direction and perpendicular to propeller shaft. 4 to 6 mm (0.157 to 0.236") preload for propeller shaft <u>with</u> slide on center mount; <u>without</u> slide: 2 to 4 mm (0.079 to 0.157").</p> <p>b) Replace grooved ball bearing – see 26 12 001.</p>

\* See Specifications

## 27 Transfer box

27 10 001	EM interlock – function check .....	27- 10/1
010	Transfer box – remove and install – manual transmission .....	27- 10/2
010	Transfer box – remove and install – automatic transmission .....	27- 10/5
27 21 020	Radial seal for output flange – replace .....	27- 21/1
030	Radial seal for output shaft on front axle – replace .....	27- 21/2
510	Radial seal for input shaft – replace – manual transmission .....	27- 21/4
510	Radial seals for input shaft – replace – automatic transmission .....	27- 21/5
27 70 000	Rubber mount for transmission mounting – replace .....	27- 70/1

## 27-10/1

### 27 10 001 Check function of EM interlock

The following test can be performed to obtain a "yes / no" status message on the function of the EM interlock in the transfer box:

1. Place car on vehicle lift. All wheels clear of ground.
2. Apply handbrake.
3. Start engine and select 1st gear or Drive setting.
4. Depress accelerator - front wheels should turn.
5. Depress accelerator further until the rear wheels start to rotate, despite the applied handbrake.  
*Caution!*  
Only perform test for a brief period. (Wear on brake linings).
6. If the EM interlock is not functioning, the rear wheels do not rotate, even when engine speed is increased.

## 27 10 010 Removing and installing transfer box

- Manual transmission -

Removing and installing exhaust system  
18 00 020



### c Removing propshaft:

Remove heat baffle plate (11).



Unscrew propeller shaft on transmission.

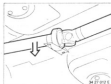
Installation instruction:  
Replace stop nuts.  
Tighten screws with specified torque\*.



Unscrew center mount.

Installation instruction:  
Center mount in forward direction A ± 4 ... 6 mm.  
Preload in forward direction.

\* Refer to Specifications



Fold propeller shaft downwards and withdraw from transmission.

Caution!  
Don't let the propeller shaft fall into the joints.  
Suspend propeller shaft from car on a piece of wire.  
Tightening torque\*.



### d Removing transfer box.

Unscrew flexible coupling between manual transmission and transfer box from output flange on manual transmission.

Installation instruction:  
Replace stop nuts.  
Tightening torque\*

Note:  
To avoid tension stress on the flexible coupling, only - if the design makes this possible - tighten nuts or screws on the flange side.



Support transmission from underside.

\* Refer to Specifications



Unscrew cross-member from body and transfer box and remove. Lower transmission.

Installation instruction:  
Tightening torque\*



Installation instruction:  
When lowering the transmission, the coolant air guide for the alternator can slip out. Check once the transmission has been installed.



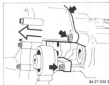
Turn bayonet connection for transfer box control counter-clockwise and remove.

Installation instruction:  
Fit plug in such a way that marking grooves are aligned with one another.



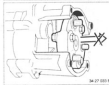
Remove bracket for cable on transmission control unit.

\* Refer to Specifications



Unbolt transfer box and remove by drawing backwards.

Installation instruction:  
Tightening torque\*



Caution!

The input shaft must not slip down when lifting out the transfer box since this would damage the shaft seal.



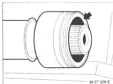
Installation instruction:  
Note dowel sleeves.



Installation instruction:  
Move rubber coupling into a position where the top screw is unable to slip into the housing head.  
Align manual transmission flange accordingly.

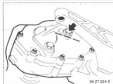
\* Refer to Specifications





**Installation instruction:**

During installation, ensure that the sealing ring on the front propeller shaft does not slip into the dust cap.



**o Checking oil level in the transfer box.**

Check the oil level on the filler screw.  
If necessary, top up with oil to the lowest edge of the filler aperture.

**Installation instruction:**

"Tightening torque"

- Refer to Specifications
- For oil grade refer to Consumables Specifications

## 27 10 010 Removing and installing transfer box

- Automatic transmission -

Remove automatic transmission complete with transfer box 24 00 028

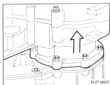
Secure torque converter to prevent dropping out.

Secure transmission with special tool 24 0 181 in conjunction with adapters 24 0 183 and 24 0 184 and mount on assembly rig 00 1 490.

Drain oil from transfer box.

Installation note:  
For tightening torque 27 06 7A2\*.

\* Refer to Technical Data



Position transmission vertically.  
- Transfer box at top -

Unscrew transfer box and lift off.

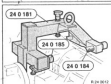


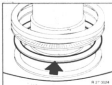
Caution!  
Do not swirl automatic transmission after removing transfer box.  
The clutch disks can slip out making it necessary to disassemble the entire transmission, if necessary fit holder, refer to 24 12 018



The spacer ring must be determined anew if the automatic transmission of transfer box is to be replaced or other jobs are to be carried out which influence the thickness of the spacer ring.

- 1) Spacer ring
- 2) Needle thrust bearing



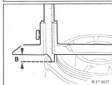
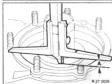


• Determining thickness of shim:

Place existing shim with pressure bearing in automatic transmission.

Determine dimension (A) on automatic transmission between contact face and pressure bearing.

Example: Dimension A = 12.3



Place transfer box upright.

Determine dimension (B) on transfer box between contact face to support face for pressure bearing.

Example: Dimension B = 12.0

Example:

minus	A	=	12.3 mm
plus	B	=	12.0 mm
End float	=	0.3 mm	

Required end float = 0.1 – 0.6 mm.  
Install correspondingly thicker or thinner shim.

Note:

Selection: dimension A greater than dimension B = thinner disk,  
dimension A larger than dimension B = thicker disk.

• Fitting transfer box:

Replace O-ring on transfer box and coat with Yasefine.

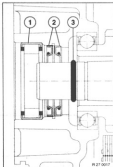


Caution!

An O-ring is located on the transmission shaft.

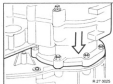
Check / replace O-ring and coat with Yasefine.





Arrangement:

- 1 Bearing
- 2 Radial seal
- 3 O-ring



Attach shim and axial bearing with 'Kessline'.

Carefully fit transfer box and tighten down.

Tightening torque 27 00 24.2\*

Caution!  
Water down sleeve.

\* Refer to Specifications



Place plastic cap on the nut shown in the illustration.

(Protection for Bowden cables)



After installation in the vehicle, top up oil\*\* in the transfer box.

Correct oil level in automatic transmission.

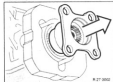
\*\* Oil grade: refer to Consumables Specifications

### 27 21 020 Replacing radial seal on output flange

Remove propeller shaft from transfer box, see 26 11 000.



Attach special tool 23 0 020.  
Hold output flange with special tool 23 0 020.  
Unscrew collar nut with special tool 23 1 210.



Pull off output flange.

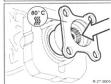


Remove radial seal with special tool 00 5 010.



Coat new radial seal with oil and insert with special tool 27 1 320.

**Note:**  
Sealing lip faces housing.



Heat output flange to 80 °C and slide spline onto output shaft.



Fit screw-locking device\*\* to thread and collar of collar nut.

Screw on collar nut.  
Tightening torque 27 00 64Z\*



Check oil level in transfer box:

Check oil level on filler screw.  
If necessary, fill with oil\*\*\* to lower edge of filler apertures.

**Installation instruction:**  
Tightening torque 27 00 7AZ\*

\* Refer to Specifications  
\*\* Source of Supply: BMW Parts Service  
\*\*\* Oil grade: refer to Consumables Specifications

### 27 21 030 Replacing radial seal for output shaft on front axle

Removing and installing exhaust system, see 18 00 000.

Remove propeller shaft from back of transfer box, see 26 11 000.

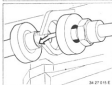
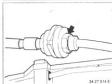
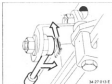
Removing and installing propeller shaft from front, see 26 20 000.

#### a Work on the automatic transmission:

Lift out clips.  
Remove Bowden cable.

Unscrew nut for Bowden cable sleeve.

Detach Bowden cable sleeve from bracket.



#### b Lowering transfer box:

Support transmission on the converter bell housing.

Unscrew cross-member from body and transfer box and remove.  
Lower transmission.

Installation instruction:  
Tightening torque 27 00 842\*



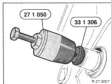
Installation instruction:  
When lowering the transmission, the coolant air guide for the alternator can slip out.  
Check once the transmission has been installed.



Press off protective cap.



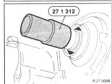
\* Refer to Specifications



Lift out radial seal with special tool 27 1 050 in conjunction with 33 1 306.



Fit special tool 27 1 311.



Coat radial seal with grease and drive in with special tool 27 1 312.



Press on protective cap.



Check oil level in transfer box:

Check oil level on the filler screw. If necessary, fill with oil\*\* to lower edge of filler aperture.

Installation instruction:  
Tightening torque 27 05 142\*

\* Refer to Specifications  
\*\* Oil grade: refer to Consumables Specifications

**27 21 510 Replacing radial seal for input shaft**  
*(Manual transmission)*

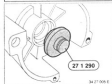
Remove transfer box 27 10 010



Remove input shaft.



Lift out radial seal.



Coat new radial seal with grease and drive in to place with sealing lip facing towards, using special tool 27 1 290.



Carefully insert input shaft.  
 (Damage to radial seal).



Prevent input shaft from falling out. If necessary, use bracket from replacement transmission.



• Checking oil level in transfer box

After installation, check oil level on filler screw. If necessary, fill with oil\*\* to lower edge of filler aperture.

Installation instruction:  
 Tightening torque 27 05 16J\*

\* Refer to Specifications

\*\* Oil grade: refer to Consumables Specifications



## 27 21 510 Replacing radial seals for input shaft

- Automatic transmission -

Remove transfer box 27 10 010

### Note:

The radial seals are located behind the roller bearing.



Fig. 27 0214

### Note:

An O-ring is located on the transmission shaft.

Check O-ring, replacing it if necessary, and coat with Vaseline.



27 1 330

Fig. 27 008 E

### a Removing roller bearing:

Turn back spindle from special tool 27 1 330 as far as possible.

Rotate slots in circular direction, insert special tool.



27 1 330

Fig. 27 007 E

Turn slots until aligned with marking. (Axe's now grip behind the bearing).

Remove roller bearing.



Fig. 27 001 B

### b Replacing radial seals:

Lift out radial seals ( 2 off ) with special tool 00 5 010.



27 1 280

Fig. 27 007 E

Coat smaller radial seal with oil and install with sealing lip facing inwards.

Coat larger radial seal with oil and install with sealing lip facing outwards.

Drive in both radial seals with special tool 27 1 280.

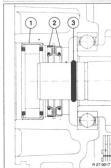
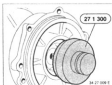


Fig. 27 001 C

### Arrangement:

- 1 Bearing
- 2 Radial seals
- 3 O-ring

## 27-21/6



Drive in new roller bearing with special tool 27 1 300.



o Checking oil level in transfer box:

After installation, check oil level on the filler screw.

If necessary, fill with oil\*\* to lower edge of the filler aperture.

Installation instruction:

Tightening torque 27 00 142\*

\* Refer to Specifications

\*\* Oil grade: refer to Consumables Specifications

## 27 70 000 Replacing rubber mount for transmission mount

Manual transmission:  
Removing and installing exhaust system,  
see 18 00 000

Automatic transmission :

Remove transfer box 27 10 010



Remove heat baffle plate.



Support transmission on the converter bell housing.



Unscrew cross-member from body and transfer box and remove.  
Lower transmission.

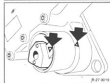
Installation instruction:  
Tightening torque 27 00 8A2\*

\* Refer to Specifications



a Replacing rubber mount.

Fit special tool 27 1 190.  
Press rubber mount out forwards.



Fit new rubber mount.  
The arrow on the housing must be aligned with the marking ( arrow ) on the rubber mount.  
The protruding side of the internal bush points in reverse direction of travel (i.e. backwards).



Press rubber mount flush with transmission housing with special tool 27 1 190.

# 31 Front axle

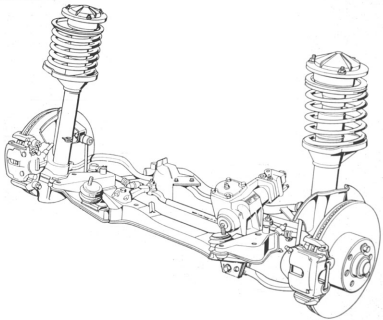
	Front wheel suspension – layout drawing .....	31-	0/1
	Struts and arms – layout drawing .....	31-	0/2
31 10 000	Front axle assembly – remove and install .....	31-	10/1
31 11 001	Front axle carrier – replace .....	31-	11/1
31 12 000	Control arm, left or right – remove and install .....	31-	12/1
090	Thrust strut, left or right – remove and install or replace .....	31-	12/2
130	Rubber mount in left or right control arm – replace .....	31-	12/3
...	Thrust strut mounts – check .....	31-	12/4
147	Rubber mount in left or right thrust strut – replace .....	31-	12/5
31 21 180	Bearings (wheel hub) for front wheel – replace .....	31-	21/1
31 31 000	Front spring strut, left or right – remove and install .....	31-	31/1
031	Front spring strut, left or right – replace .....	31-	31/2
	Shock absorber with mount and coil spring – layout drawing .....	31-	32/1
31 32 001	Shock absorber for left or right front spring strut – replace .....	31-	32/3
31 33 001	Mount for left or right front spring strut – replace .....	31-	33/1
100	Coil spring for left or right front spring strut – remove and install or replace .....	31-	33/1
...	Car ride level height – measure and correct (before 1992 models) .....	31-	33/2
...	Car ride level height – measure and correct (since 1992 models) .....	31-	33/5
31 35 000	Front stabilizer – remove and install or replace .....	31-	35/1
	Front axle – troubleshoot .....	31-	90/1
	Shock absorbers – troubleshoot .....	31-	90/3

## Four wheel drive

	Front wheel suspension layout drawing .....	31-	0/10
31 10 000	Front axle assembly – remove and install .....	31-	10/10
31 11 001	Front axle carrier – replace .....	31-	11/10
31 12 000	Control arm, left or right – remove and install .....	31-	12/10
046	Control arm bracket – replace .....	31-	12/11
130	Control arm rubber mount – replace .....	31-	12/13
31 21 090	Pivot bearing, left or right – replace .....	31-	21/10
121	Wheel hub (drive flange), left or right – replace .....	31-	21/11
151	Bearings of wheel hub (drive flange), left or right – replace .....	31-	21/12
	Spring strut assembly layout drawing .....	31-	31/10
31 31 031	Front spring strut shock absorber, left or right – replace .....	31-	31/11
31 33 001	Front spring strut mount, left or right – replace .....	31-	33/10
100	Front spring strut coil spring, left or right – replace .....	31-	33/10
...	Car ride level height – measure and correct .....	31-	33/11
31 35 000	Front stabilizer – remove and install .....	31-	35/10
31 50 000	Front axle differential – remove and install or replace .....	31-	50/10
31 51 015	Shaft seal for left output shaft – replace .....	31-	51/10
020	Shaft seal for right output shaft – replace .....	31-	51/10
060	O-ring for right front axle differential – replace .....	31-	51/11
065	O-ring for right mounting block – replace .....	31-	51/11
31 53 050	Bearing (in bearing block) for right output shaft – replace .....	31-	53/10
31 60 000	Output shaft, left or right – remove and install or replace .....	31-	60/10
	Front axle – troubleshoot .....	31-	90/10
	Shock absorber – troubleshoot .....	31-	90/12

31-0/1

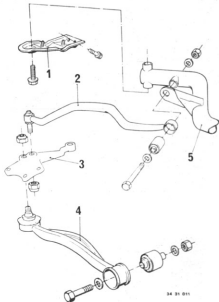
FRONT AXLE LAYOUT DRAWING



31-0/2

LAYOUT DRAWING OF STRUTS AND ARMS

- 1 Support
- 2 Thrust strut
- 3 Tie rod arm
- 4 Control arm
- 5 Connecting pipe

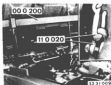


### 31 10 000 Removing and installing complete front axle assembly

Remove brake calliper (lines remain connected), refer to Group 34  
 Remove ABS pulse generator, refer to Group 34  
 Observe EDC notes, Group 37.

**Note:**  
 Align front axle after mounting, refer to Group 32

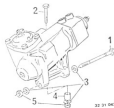
Attach engine to tool 00 0 200.  
 Use chain and shackle of tool 11 0 020.  
 Depending on engine, also refer to Removing Engine 11 00 090.



**Release nut**  
 Using tool 32 0 040, press tie rod from pitman arm.

**Installation note:**  
 Replace self-locking nut.  
 For tightening torque\*.

\* Refer to Technical Data



Release steering gear retaining bolts (1 and 2).  
 Tie back steering gear - lines remain connected.

**Installation note:**

- 1 Bolt
- 2 Bolt, only install strength class 10.9
- 3 Washer
- 4 Bush
- 5 Replace nuts

For tightening torque\*.



Release bolts on left and right

**Installation note:**  
 For tightening torque, refer to Technical Data

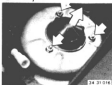


Release engine mount on left and right of front axle carrier.  
 Also release right-hand engine mount at top.

**Installation note:**  
 For tightening torque\*.

\* Refer to Technical Data

## 31-10/2



Lift off cap.  
Unscrew nuts on left and right sides.  
Installation:  
Replace self locking nuts.  
Tightening torque\*.



Place workshop jack underneath the front axle center.  
Unscrew bolts on left and right sides and lower the front axle slowly.  
*Important!*  
Spring struts must not fall out or down – this would damage the ball joints.  
Installation:  
Tightening torque\*.

\* See Specifications



## 31 11 001 Replacing front axle carrier

**Note:**

The pitman arm must be adjusted after installing a new front axle carrier, refer to Group 31 21 510.

Align front axle after assembly, refer to Group 32

Attach engine to special tool 00 0 200. Use chain and shackles from tool 11 0 020. Depending on type of engine, also refer Removing Engine 11 00 050.

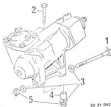
Release engine mount on left and right of front axle carrier. Also release right-hand engine mount at top.

**Installation note:**  
For tightening torque\*.

Remove left and right control arms.

**Installation note:**  
Replace self-locking nuts. Washer on both sides. For tightening torque\*, in normal position\*

\* Refer to Technical Data



Release steering gear retaining bolts (1 and 2). Tie back steering gear - lines remain connected.

**Installation note:**

- 1 Bolt
- 2 Bolt, only fit strength class 10.9
- 3 Washer
- 4 Bush
- 5 Replace nuts

For tightening torque\*.



Remove idler arm.

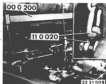
**Installation note:**  
Replace self-locking nut. For tightening torque\*

- 1 Bolt
- 2 Idler arm
- 3 Washer
- 4 Self-locking nut
- 5 Front axle carrier

Release bolts on left and right and remove front axle carrier.

**Installation note:**  
For tightening torque\*.

\* Refer to Technical Data



## 31 12 000 REMOVING AND INSTALLING LEFT OR RIGHT CONTROL ARM

Remove front wheel – see Group 35.

Unscrew bolts.

Installation:

Clean threads of bore and bolts.  
Install bolts with a bolt cement\*\*.  
Tightening torque\*.

Check for correct installed position.

Unscrew nut.

Press off ball joint with Special Tool 31 1 190.

Installation:

Remove grease on ball pin and in bore.  
Replace self-locking nut.  
Tightening torque\*.

\* See Specifications

\*\* Source of Supply: HVB



Unscrew bolt.

Installation:

Replace self-locking nut.

Use washers on both sides.

Tightening torque\* for car loaded down to normal position\*.



\* See Specifications

## 31 12 090 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT THRUST STRUT

Remove front wheel – see Group 36.



Unscrew nut.  
Pry off ball joint with Special Tool  
31 2 140.

**Installation:**  
Keep grease off of ball journal and  
bars.  
Replace self-locking nut.  
Tightening torque\*.



Unscrew thrust strut (counterhold with  
open-ended wrench), grinding off if  
necessary.

**Installation:**  
Replace self-locking nut.  
Use washers on both sides.  
Tightening torque\* for car loaded down  
to normal position\*.

**Important!**  
Thrust strut mounts must always be  
installed or replaced in pairs.

\* See Specifications

## 31-12/3



### 31 12 130 REPLACING RUBBER MOUNT IN LEFT OR RIGHT CONTROL ARM

Unscrew control arm.  
Aluminum control arms must always be replaced.

**Installation:**  
Replace self-locking nut.  
Use washers on both sides.  
Tightening torque\* for car loaded down to normal position\*.

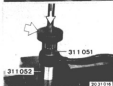


Suspend control arm from car on a piece of wire (prevents damaging the ball joint).

Pull out rubber mount with Special Tools 31 1 051 and 33 3 142/144.

**Installation:**  
Remove grease from rubber mount and control arm bones.

Pull in rubber mount from the bevelled side of the control arm.  
Same tools as above.



**Removed Control Arm:**  
Press rubber mount out and in on a press and with Special Tools 31 1 051 / 052 as well as a pressure pad.

\* See Specifications



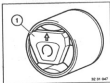
### 31 12 ... CHECKING THRUST STRUT MOUNTS

Load the car down to normal position\*. Measure distance (A) between the rubber part and centering sleeve, using a feeler gage blade.

Specification:  
A = 1.0 to 2.0 mm

If there is deviation from the specification, the mount must be replaced - refer to 31 12 147.

**Important!**  
Thrust strut mounts must always be installed or replaced in pairs.



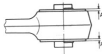
**Note:**  
The hydraulic pressure strut mounts, which can be recognized on the plastic clip (1), cannot be checked.  
Both mounts must be replaced, if fluid is running out of a hydraulic mount.

## 31 12 147 REPLACING RUBBER MOUNTS ON LEFT OR RIGHT THRUST STRUT

Remove thrust strut - refer to 31 12 090.

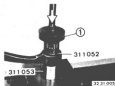
### Important!

Thrust strut mounts must always be installed or replaced in pairs.



32 31 003

**Installation:**  
Ensure equal amount of protrusion (A) on both sides.



32 31 005

Press the rubber mount out in a press using Special Tools 31 1 053 + 052 and thrust piece (1).

### Installation:

Rubber mount and thrust strut bore must be free of grease.

The arrow on the rubber mount points to the mark on the thrust strut.

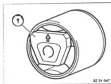


32 31 004

### Hydraulic Mounts:

The arrow on plastic clip (1) points to the mark on the thrust strut.

The special tool must bear on the outer sleeve of the mount while pressing the mount in.



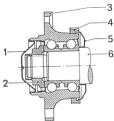
32 31 007

## 31 21 180 REPLACING BEARINGS (WHEEL HUB) FOR FRONT WHEEL

### Important!

Do not reuse the bearing unit after removal.  
Unscrew brake disc – line remains connected  
(see Group 34).

Wheel Bearings:



31 21 000

- 1 Grease cap
- 2 Collar nut
- 3 Bearing unit
  
- 4 Pulser gear
- 5 Dust cover
- 6 Stub axle



Pry off grease cap with a screwdriver.  
Do not reuse the cap!



Chisel off lock of collar nut.  
Unscrew nut with Special Tool 31 2 080.  
Do not reuse the nut!



Pull off bearing unit with Special Tools  
31 2 102/105/106 and wheel bolts (1).  
Do not reuse the bearing unit!

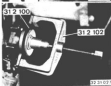
## 31-21/2



When Bearing Inner Race Remains on Stub Axle:  
Insert socket wrench key and unscrew guard.



Screw on new collar nut with correct tightening torque\* and lock by punching.



Pull off bearing inner race and dust cover with Special Tools 31 2 100/102.



Install new cap with a sealing compound\*\*.



Screw on guard (1).  
Install new dust cover (2).  
Screw on Special Tool 31 2 110 whole length of threads.



Slide and pull on new bearing unit with Special Tool 31 2 110.

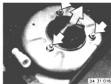
\* See Specifications

\*\* Source of Supply: HWS



### 31 31 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT SPRING STRUT ASSEMBLY

Unscrew brake caliper (line remains connected) – see Group 24.  
Remove ABS pulse sender – see Group 24.  
Refer to EDC information in Group 37.



Lift off cap.  
Support spring strut.  
Unscrew spring strut mount on wheel hub.  
Installation:  
Replace self-locking nuts.  
Tightening torque\*.



Unscrew stabilizer push rod, counterholding with an open-ended wrench.  
Installation:  
Wrench surface on ball pin parallel to the absorber axle.  
Replace self-locking nut.  
Tightening torque\*.



Unscrew bolts.  
Installation:  
Clean threads of bore and bolts.  
Install bolts with a bolt capener\*\*.  
Tightening torque\*.

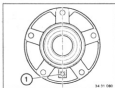


Check for correct installed position.

\* See Specifications  
\*\* Source of Supply: H990

**Important!**  
Always store shock absorbers standing upright. If shock absorbers are stored lying down with piston rods run in, they could cause a rattling noise when used again.  
**Caution!**  
Store shock absorbers standing upright with piston rods run out at room temperature for 24 hours.

\* See Specifications



### 31 31 000 REPLACING LEFT OR RIGHT FRONT SPRING STRUT

Remove spring strut - refer to 31 31 000.  
 Remove shock absorber for spring strut - refer to 31 32 001.  
 Replace wheel bearings - refer to 31 12 147.

#### Important!

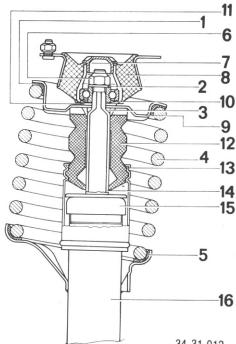
On cars which had been produced prior to introduction of the standard wheel bearing, parts as shown on the parts microfiche must be replaced in addition to the spring strut.

The standard wheel bearing can be recognized on bore (1) provided in the middle for brake disk installation.

# 31-32/1

Spring Strut Assembly Drawing - 525 i:

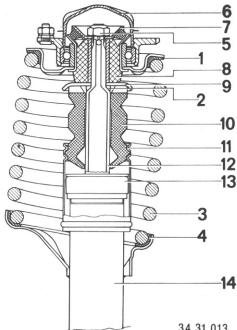
- 1 Spring retainer, upper
- 2 Washer
- 3 Ring for hollow piston rod
- 4 Coil spring
- 5 Spring retainer, lower
- 6 Nut
- 7 Cap
- 8 Mount
- 9 Spring retainer, upper
- 10 Seal
- 11 Washer
- 12 Rubber damper
- 13 Protective pipe
- 14 Shock absorber
- 15 Screw-on ring
- 16 Spring strut



## LAYOUT DRAWING OF SHOCK ABSORBER WITH MOUNT FOR SEPARATE SUSPENSION AND COIL SPRING

Models 5245d ... M5 (After Conversion of Standard Spring Strut)

- 1 Upper spring ring
- 2 Ring for hollow piston rod
- 3 Coil spring
- 4 Lower spring ring
- 5 Nut
- 6 Cap
- 7 Stop washer
- 8 Mount
- 9 Support
- 10 Rubber mount
- 11 Protective pipe
- 12 Shock absorber
- 13 Screw-on ring
- 14 Spring strut



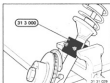
### 31 32 001 Replacing shock absorber for front left or right spring strut

To know whether a spring strut shock absorber has to be replaced, it must either be checked installed with a Shock Tester or removed and checked in a shock absorber testing machine. Also refer to Service Information 31 01 82 (S&T).



Unscrew self-locking nut with tool 31 3 170/210 (replace socket), brace piston rod.

Installation:  
Replace self-locking nut.  
Tightening torque\*



Remove complete spring strut - 31 31 000 - and clamp in vise with tool 31 3 000.



Press together coil spring using spring tensioner 31 3 121/122.

Caution!  
The tool must grip 3 spring coils.



Installation:  
Installation sequence, refer to "arrangement of shock absorber".  
Check top and bottom base spring mount and replace if necessary.  
The ends of the coil springs must locate in the recesses in the top and bottom spring plate.

\* Refer to Technical Data

## 31-32/4



32 31 017

Unscrew screw-on ring with Special Tool 31 3 150.

Installation:  
Tightening torque\*.

### Important!

The M 5 is delivered ex factory with "wet spring struts". If they are still installed, it is always necessary to replace both shock absorbers.

Take off rubber cover.

Pull off levered stop shell - don't reuse it.



32 31 046

Unscrew screw-on ring slowly with Special Tool 31 3 160 (to let pressure escape in the absorber).

Installation:  
Replace screw-on ring.  
Tightening torque\*.



32 31 044



32 31 018

Pull out shock absorber (1).

### Installation:

Remove old oil from spring strut pipe (2).

Fill with engine oil\*\* prior to installation of new shock absorber.

Engine oil is required to carry off heat from the shock absorber to the spring strut pipe.

### Important!

Single-pipe gas pressure front axle cartridges, recognized on piston rod diameter - at least 33 mm (1.299"), may not be installed with oil - see Service Information of Group 37.

Only store shock absorbers standing upright. If shock absorbers are stored laying down with their piston rods run in, this could cause a rattling noise when used in car again.

### Correction:

Store shock absorbers standing upright with piston rods run out at room temperature for 24 hours.

\* See Specifications

\*\* See Operating Fluids

**31 32 001 REPLACING MOUNT FOR  
LEFT OR RIGHT FRONT  
SPRING STRUT**

Procedures are identical with those for  
replacing shock absorber – see 31 32 001.

**Important!**

If the installed mount is marked with "L" or  
"R", a mount with the same mark must be  
installed.

Also refer to correcting chamber in Group 32.



32 31 019

**31 33 100 REMOVING AND INSTALLING  
OR REPLACING COIL SPRING  
FOR LEFT OR RIGHT FRONT  
SPRING STRUT**

Procedures are identical with those for  
replacing shock absorber – see 31 32 001.

**Important!**

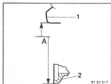
Only install pairs of springs on one axle with  
the same BMW number (5) located on end  
of spring.

Refer to parts microfiche for cross reference  
of springs to vehicle type and, if applicable,  
special equipment (e.g. air conditioner, sport  
suspension, etc.) as well as dates of introduc-  
tion.

The BMW number on the spring can be used  
to determine the part number and therefore  
the correct spring for a pertinent vehicle type  
according to the parts microfiche.



34 31 014



31 33 007

## 31 33 ... MEASURING / CORRECTING RIDE LEVEL HEIGHT BEFORE 1992 MODELS

Load down car to normal position\*.

Measure actual height (A) from wheel house lower edge (1) to rim flange (2) at center of wheel height. Determine the mean value of each wheel after lifting and lowering the car body, and then the mean value of the axle.

Determine any deviation from the nominal ride level height value\*.

Identify the installed springs - refer to 31 33 100.

Find correction spring in the table. The numbers are ride level height deviation (nominal values in mm) between the pertinent springs.

## Example:

The car is supplied with coil springs having BMW No. 1 135 046 and is, for example, 8 mm too deep due to so many optional extra equipment items. The nominal ride level height\* is reached again by installing springs having BMW No. 1 135 464 (refer to 31 33 100 for information on determining part numbers).

## Note:

Additional ride level height correction by installing spring rings in different thickness is not possible.

Table for Standard Suspension - 320:

- A = Equipment after connection  
 B = Equipment of delivered car  
 a = Adjusted higher  
 b = Adjusted lower

		A							
		1 135 046	1 135 462	1 135 460	1 135 464				
B	1 135 046		+6	+13	+20				
	1 135 462	-6		+7	+14				
	1 135 463	-13	-6		+7				
	1 135 464		-14	-7					





# 31-33/4

Table for Standard Suspension - 120k, 125k, 130, 135k

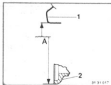
Refer to page 31-33/2 for explanation.

		A							
		134 398	134 399	134 400	132 242	133 336	133 337	133 338	134 439
B	134 398		+ 9 + 14	+ 23					
	134 399	- 8	+ 8 + 14	+ 23					
	134 400	- 17	- 8	+ 8 + 15	+ 22				
	132 242		- 16	- 8	+ 7 + 15	+ 22			
	133 336			- 16	- 8	+ 7 + 14	+ 21		
	133 337				- 15	- 7	+ 7 + 14		
	133 338					- 15	- 7	+ 7	
	134 439						- 14	- 7	

Table for Sport Suspension - 120k

Refer to page 31-33/2 for explanation.

		A							
		134 398	134 399	134 400	132 242	133 336	133 337	133 338	134 439
B	134 398		+ 9 + 14	+ 23					
	134 399	- 8	+ 8 + 14	+ 23					
	134 400	- 17	- 8	+ 8 + 15	+ 22				
	132 242		- 16	- 8	+ 7 + 15	+ 22			
	133 336			- 16	- 8	+ 7 + 14	+ 21		
	133 337				- 15	- 7	+ 7 + 14		
	133 338					- 15	- 7	+ 7	
	134 439						- 14	- 7	

**31 33 ... MEASURING / CORRECTING RIDE LEVEL HEIGHT SINCE 1992 MODELS**

Load down car to normal position\*.

Measure actual height (A) from wheel house lower edge (1) to rim flange (2) at center of wheel height. Determine the mean value of each wheel after lifting and lowering the car body, and then the mean value of the axle.

In case of deviation from the nominal value\*, install new coil springs - refer to parts lists for information on determining correct coil springs.

## 31-35/1



### 31 35 000 REMOVING AND INSTALLING OR REPLACING FRONT STABILIZER

Unscrew push rod on left and right sides.

Installation:

Wrench surface on ball pin is parallel to the absorber axis.

Replace with locking nut.

Tightening torque\*.



Unscrew nuts on left and right sides.

Take off the stabilizer.

\* See Specifications.

## TROUBLESHOOTING FRONT AXLE

Condition	Cause	Correction
Grinding noise (louder in curves)	a) Wheel bearings defective	a) Replace wheel bearings
Vibration	a) Imbalance of wheels b) Rim lateral and radial runout c) Tire radial runout	a) Balance wheels b) Replace rims, if necessary c) Match or replace tires
Steering wheel shake	a) Rim lateral and radial runout b) Imbalance of wheels c) Shock absorber effect insufficient d) Thrust strut mounts defective e) Wrong thrust strut mounts installed f) Steering gear play excessive	a) Replace rims, if necessary b) Balance wheels c) Replace shock absorbers d) Replace thrust strut mounts e) Replace thrust strut mounts f) Adjust pressure point
Rattling noise	a) Shock absorber cartridge in spring strut loose b) Ball joint on control arm worn c) Ball joint on thrust strut worn d) Stabilizer rubber mounts worn e) Ball joints of push rod worn f) Front axle carrier mounted loose on body	a) Tighten screw-on ring (check threads) b) Replace control arm c) Replace thrust strut d) Replace rubber mounts e) Replace push rod f) Tighten (check threads)

## TROUBLESHOOTING FRONT AXLE

Condition	Cause	Correction
Body swing long time after driving over rough road	Weak shock absorbers – see page 31 - 90/3	Replace shock absorbers
Body dip when driving over successive rough road surfaces		
Body rise while accelerating		
Wheel jump even on normal road surfaces		
Car breaking out while braking		
Breaking out (skidding) in curves due to poor track holding		

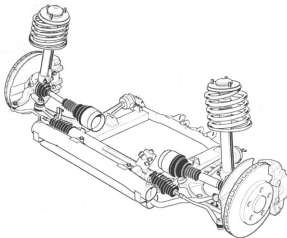
## TROUBLESHOOTING SHOCK ABSORBERS

The condition of shock absorbers can only be checked with a shock absorber tester in car or with a shock absorber testing machine after removal.  
Cars with EDG (Electronic Absorber Control) – See Group 37.

Condition	Cause	Correction
Shock absorbers knocking (bottoming)	a) Rubber dampers defective b) Weak shock absorbers	a) Check or replace rubber dampers b) Replace shock absorbers
Shock absorber noise	a) Shock absorber cartridge loose b) Installed shock absorber had been stored lying down with piston rod run in c) Shock absorbers defective	a) Tighten screw on ring – inspect threads b) Store shock absorber standing upright with piston rod run out and at room temperature for 24 hours c) Replace shock absorbers
Poor handling	a) Weak shock absorbers	a) Replace shock absorbers
Flat spots on tire treads	a) Shock absorbers defective	a) Replace shock absorbers

31-0/10

FRONT AXLE LAYOUT DRAWING



31 01 028



### 31 10 000 REMOVING AND INSTALLING COMPLETE FRONT AXLE

#### Important!

Check the wheel alignment after installation - refer to Group 32.



Unscrew covers of front wheels.  
Unscrew left and right cotter nuts.

#### Installation:

Replace the cotter nuts.  
Tightening torque\*.  
Lock the collars of the nuts in both grooves of the shaft with a punch.

Remove the front wheels - refer to G1 38.  
Unscrew left and right brake calipers and suspend them from the body on pieces of wire - refer to Group 38.  
Disconnect the ABS wire plug.  
Unscrew wires secured to the spring strut.  
Remove the stabiliser - refer to 31 32 000.

Unscrew nut (1) on left and right sides.

#### Installation:

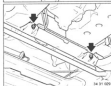
Replace the self-locking nut.  
Install washer (2).  
Tightening torque\*.

\* Refer to Specifications



34 21 000

Press the tie rod off using Special Tool 32 3 000.



34 21 000

Unscrew the nuts and pull the bolts out.

Installation:  
Tightening torque\*.



34 21 000

If applicable, unscrew the holder for oil pipes.



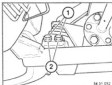
34 21 000

Attach Special Tool 90 0 200 to the engine.  
The supports bear on the side panel bolts.

\* Refer to Specifications



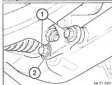
34 21 000



Unscrew bolts (1) on left and right hand sides.

Installation:  
Use washers (2).  
Tightening torque\*.

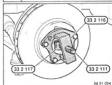
34 21 052



Unscrew bolts (1) on left and right hand sides.  
Pull control arms aside and secure them on spring strut with a piece of wire so that the ball joint on the spring strut cannot be damaged.

Installation:  
Use washer (2) on the forward bolt.  
Tightening torque\*.

34 21 053



Bolt on Special Tools 33 2 111, 33 2 116 and 33 2 117 with three wheel bolts.  
Press output shaft out of drive flange on left and right hand sides.

Installation:  
Bolt on Special Tools 33 2 116, 33 2 118 and 33 2 119 with three wheel bolts.  
Pull output shaft into drive flange.

34 21 054



34 21 055

\* Refer to Specifications



Slide Special Tool 31 5 110 into gap between case and output shaft.  
Pry out left and right output shafts with a jerk and remove them.

Installation:  
Replace circlips of output shafts.  
Circlips of output shafts must be heard to engage in the front axle final drive.

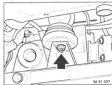
34 21 056



Support spring struts on left and right hand sides, unscrew nuts and remove spring struts.

Installation:  
Tightening torque\*.

34 21 057



Unscrew nut on left and right hand sides.

Installation:  
Tightening torque\*.

34 21 057



Unscrew bolts.

\* Refer to Specifications

34 21 058

31-10/12



Support the front axle carrier.  
Unscrew the bolt on left and right sides.

Installation:  
Tightening torque:



Unscrew bolts.  
Remove the front axle carrier towards the front.

Installation:  
Tightening torque:  
Remove and install heat shield.

### 31 11 001 REPLACING FRONT AXLE CARRIER

#### Important!

After installation:  
Check output shafts for correct engagement in front axle final drives.  
Check wheel alignment - refer to Gr. 32.

Remove stabilizer - refer to 31 35 000.



UnscREW nuts and pull out bolts.

Installation:  
Tightening torque\*.

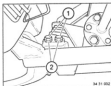


If applicable, unscREW holder for oil pipes.



Attach Special Tool 00 0 200 on engine.  
Supports bear on side panel screws.

\* Refer to Specifications



UnscREW bolts (1) on left and right hand sides.

Installation:  
Use washers (2).  
Tightening torque\*.



UnscREW bolts (1) on left and right hand sides.

Pull control arms aside and secure them on spring strut with a piece of wire so that the ball joint on the spring strut cannot be damaged.

Installation:  
Use washer (2) on the forward bolt.  
Tightening torque\*.



UnscREW nut on left and right hand sides.

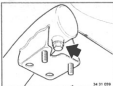
Installation:  
Tightening torque\*.



UnscREW bolts.

\* Refer to Specifications

31-11/11



Support the front axle carrier.  
Unscrew the bolt on left and right sides.

Installation:  
Tightening torque\*.



Unscrew bolts.  
Remove the front axle carrier towards the front.

Installation:  
Tightening torque\*.  
Remove and install heat shield.

**31 12 000 REMOVING AND INSTALLING  
LEFT OR RIGHT CONTROL  
ARM**

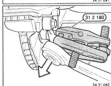
Remove output shaft - refer to 31 60 000.



31 21 041

Unscrew nut.

**Installation:**  
Replace the self-locking nut.  
Tightening torque\*



31 21 042

Press the control arm off using Special  
Tool 31 2 180.

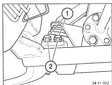


31 21 040

If applicable, unscrew the nut.  
Press the ball joint off of the control arm  
using Special Tool 32 2 040.

**Installation:**  
Replace the self-locking nut.  
Tightening torque\*

\* Refer to Specifications



### 31 12 046 REPLACING HOLDER FOR CONTROL ARM

**Important!**  
After installation:  
Check output shafts for correct engagement in front axle final drives.

Unscrew bolts (1).

Installation:  
Use washers (2).  
Tightening torque\*.

31 12 046



Unscrew bolts (1).  
Pull control arm aside and secure it on spring strut with a piece of wire so that the ball joint on the spring strut cannot be damaged.

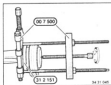
Installation:  
Use washer (2) on the forward bolt.  
Tightening torque\*.

31 12 047



31 12 048

Punch mark center of control arm.



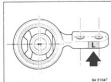
31 12 049

Pull holder off of control arm using Special Tools 31 12 151 and 90 7 500.



31 12 050

**Important!**  
A rubber mount pulled off of control arm must never be reused, as the rubberized interior sleeve will be destroyed by pulling off dry.  
Replace rubber mount - refer to 31 12 130.  
Always replace left and right rubber mounts and use rubber mounts of same make (appears on mount).



31 12 047

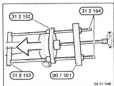
Coat control arm journal with approved lubricant\*\*.

Installation:  
Holders are marked with  
L for left holder or  
R for right holder.  
Centering bores (larger diameter) face down.

\* Refer to Specifications

\*\* Refer to Specifications  
\*\*\* Source of Supply: BMW Parts

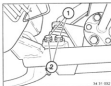
## 31-12/12



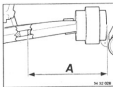
Attach Special Tool 31 2 153 in the bore of the control arm.  
Pull the bracket/mount onto the control arm using Special Tools 31 2 152 / 154 and 00 7 501.

### NOTE:

If the threaded rods are too short, the mount must be pulled on with the help of two nuts.  
After the mount has been pulled on approx. 10 mm, Special Tool 00 7 501 can be used again.



**Important!**  
Bolt the bracket to the front axle carrier immediately.  
Tightening torque\*.  
Load the car down to normal position\* immediately.  
Leave the car in normal position at least 30 minutes and avoid bottoming of the suspension.  
The lubricant will have evaporated after about 30 minutes and the control arm will fit right and be correctly positioned in the rubber mount.  
Non-conformance with these procedures will lead to serious impairment of handling behavior.



Push the bracket/mount on up to distance (A).  
The mount must be free of tension when measuring the distance – loosen the special tool.  
Measure distance A at the bottom of the control arm from a perpendicular line of the mount eye to the edge of the machined bore in the control arm.

A = 170.3 ± 0.3 mm

\* Refer to Specifications



## 31-12/13

### 31 12 130 REPLACING RUBBER MOUNTS FOR CONTROL ARM

#### Important!

Always replace the left and right rubber mounts and use rubber mounts of the same make (identification on mounts).

Remove bracket for control arm - refer to 31 12 546.

Press rubber mount out of the bracket using Special Tools 31 2 131 / 132.

#### Installation:

Check the installed position!

Mark (1) on the rubber mount must be aligned with mark (2) on the bracket. The bracket and rubber mount must be free of grease.

Apply the rubber mount at the bevelled side of the bracket and press it in to distance (A) using Special Tools 31 2 131 / 132.

$A = 18 \pm 0,3 \text{ mm}$

#### Important!

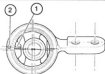
Larger protrusion (A) of the rubber mount must be on the side of the bracket with the larger diameter centering bore.

$A = 18 \pm 0,3 \text{ mm}$

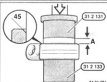
\* Refer to Specifications



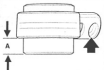
34 31 049



34 31 048



34 31 051



34 31 050

### 31 21 090 Replacing left or right swivel bearing

#### Caution!

#### After assembly:

Check that output shafts are correctly located in front axle differential.

Remove wheel hub (driver flange) 31 21 121.  
Remove ABS input sensor.



Remove circlip.

Do not remove the bearing because a new bearing has to be installed.

#### Installation instruction:

Install bearing in wheel hub 31 21 151.



Unfasten nut.

#### Installation instruction:

Replace self-locking nut.  
Tightening torque 31 10 5A2\*.



Unscrew nuts (1).

#### Installation instruction:

Replace self-locking nut.  
Install washer (2).  
Tightening torque 32 21 3A2\*.



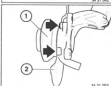
Press control arm off swivel bearing with special tool 31 21 180.



Press off track rod with special tool 32 2 090.

#### Installation instruction:

Remove grease from pin and bore.



Knock dust cover sleeve (1) off swivel bearing.  
Remove protective plate (2).

#### Installation instruction:

If necessary, replace dust cover sleeve (1).

\* Refer to Specifications

\* Refer to Specifications

## 31-21/11



Unfasten and remove screw (1).

Installation instruction:

Install washer (2).

Screw (1) must make positive contact with the retaining web (3).

Tightening torque 31 21 0A2\*.



Use hammer to knock swivel bearing off spring strut.

## 31 21 121 Replacing left or right wheel ) hub (driver flange)

The work is identical to Replacing Bearing on Wheel Hub 31 21 121.

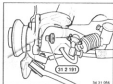
### Caution!

When the driver flange is removed, the wheel bearing is destroyed, it is always necessary to fit a new one.

\* Refer to Specifications

**31 21 121 REPLACING BEARING OF LEFT OR RIGHT WHEEL HUB (DRIVE FLANGE)**

Remove output shaft - refer to 31 60 500.  
Remove brake disk - refer to Group 34.



34 21 056

Secure the control arm to the front axle center with one bolt.  
Apply Special Tool 31 2 191.



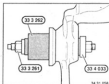
34 21 057

Attach Special Tool 31 2 190 on the tie rod arm and bolt it at the brake caliper mounting points.  
Press the drive flange out.  
Remove the special tool.



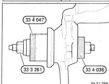
34 21 052

Remove the circlip.



34 21 058

Pull the bearing out using Special Tools 33 2 261 / 262 and 33 4 033.



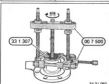
34 21 059

Push a new bearing in using Special Tools 33 2 261 and 33 4 033 / 047.



34 21 060

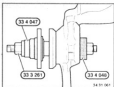
Install the circlip.



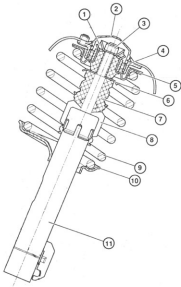
34 21 061

Pull the bearing inner race off of the drive flange using Special Tools 00 7 500 and 33 1 267.

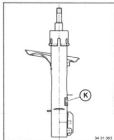
## 31-21/13



Pull the drive range in using Special Tools  
33 3 261 and 33 4 047 / 048.  
Install the output shaft and brake disc.



- 1 Stop washer
- 2 Cap
- 3 Nut
- 4 Mount
- 5 Spring retainer, upper
- 6 Washer
- 7 Rubber mount
- 8 Bellows
- 9 Coil spring
- 10 Spring retainer, lower
- 11 Spring strut shock absorber



34 31 003

### 31 31 031 Replacing left or right front spring strut shock absorber

To know whether a spring strut shock absorber has to be replaced, it must either be checked installed with a Shock Tester or removed and checked in a shock absorber testing machine.  
Also refer to Service Information 37 01 92 (962).

When replacing a spring strut shock absorber, always ensure that the replacement unit is marked with the same code (K) as the old shock absorber.

Remove front wheel, see 36 10 300.  
Remove stabilizer bar, see 31 35 090.  
Remove brake caliper and tie up, (do not sever brake line), refer to 34 11 516.

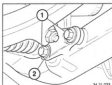
**Caution!**  
After assembly:  
Check that output shafts are correctly located in front axle differential.

Unscrew nuts (1).

**Installation:**  
Replace self-locking nut.  
Install washer (2).  
Tightening torque 32 21 342\*.

Press off track rod with special tool 32 3 090.

\* Refer to Technical Data



34 31 033

Unscrew bolts (1).

**Installation:**  
Fit washer (2) to the front screw.  
Tightening torque 31 12 342\*.



34 31 034

Unfasten and remove screw (1).

**Installation:**  
Install washer (2).  
Screw (1) must locate in bore of retaining web (3).  
Tightening torque 31 31 342\*.



34 31 037

**Support swivel bearing.**  
Use a plastic hammer to knock the swivel bearing off the spring strut.  
To prevent damage to the propeller shaft, lower the swivel bearing until the spring strut is freely accessible.



34 31 035

Unscrew nuts and remove spring strut.

**Installation:**  
Tightening torque 31 1 142\*.



34 31 039



36 31 040

\* Refer to Technical Data

## 31-31/12



Clamp special tool 31 3 120 / 122 on the jaw support in the vise.

**Caution!**  
Do not squeeze together guide bars.



Take up spring strut shock absorber in the special tool and compress the coil spring.



Unscrew nut with special tool 31 3 170 / 210 (exchanging wrench socket if necessary) and take off spring strut shock absorber.

**Installation instruction:**  
Replace self-locking nut.  
Tightening torque 31 31 2AL2\*



**Installation instruction:**  
Check rubber damper with protective tube and spring rings, replacing if necessary.  
Note installation sequence, see arrangement of spring strut shock absorber.  
Ends of springs must locate in the recesses in the plate spring.

\* Refer to Specifications



**31 33 001 REPLACING LEFT OR RIGHT  
SPRING STRUT ASSEMBLY**

The procedures are identical with those for  
"Replacing Spring Strut Shock Absorber"  
in 31 31 031.

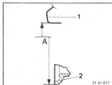
**31 33 100 REPLACING COIL SPRING FOR  
LEFT OR RIGHT FRONT  
SPRING STRUT**

The procedures are identical with those for  
"Replacing Spring Strut Shock Absorber"  
in 31 31 031.

**Important!**

Only install pairs of springs on one axle,  
with the same BSW part number (1) (found  
on end of the spring).

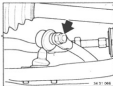
Refer to the Parts Microfiche for a survey  
of springs according to vehicle types and,  
if applicable, special equipment such as air  
conditioner, sport suspension, etc. as well  
as introduction dates.

**31 33 . . . MEASURING / CORRECTING RIDE LEVEL HEIGHT**

Load down car to normal position\*.

Measure actual height (A) from wheel house lower edge (1) to rim flange (2) at center of wheel height. Determine the mean value of each wheel after lifting and lowering the car body, and then the mean value of the axle.

In case of deviation from the nominal value\*, install new coil springs - refer to parts microfiche for information on determining correct coil springs.



31 35 000 REMOVING AND INSTALLING  
FRONT STABILIZER

Unscrew left and right nuts.

Installation:  
Tightening torque\*.



Unscrew left and right nuts.  
Remove the stabilizer.

Installation:  
Tightening torque\*.

\* Refer to Specifications

### 31 50 000 Removing and installing or replacing the front axle differential

Removing input shaft from front axle differential, see 29 20 000  
 Removing left and right output shafts, see 31 60 000.

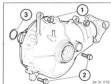
Attach engine to special tool 00 0 200. The supports locate against the screw connection of the side wall.

Unscrew nut.  
 Lift engine using special tool 00 0 200 and turn detent (1) outwards.

Unfasten screw and drain off transmission oil.

Installation instruction:  
 Replace sealing rings (1). Fill with transmission oil\*\*.  
 Tightening torque 31 50 1A2 + 1A2\*.

\* Refer to Specifications  
 \*\* Refer to Consumables Specifications



Unfasten nuts (1) and screws (2).

Installation instruction:  
 Always replace sealing ring (3).  
 Tightening torque 31 50 0A2\*.



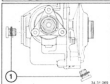
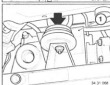
Press front axle differential away from engine oil sump and remove by lowering downwards.

If necessary, replace sealing ring, see 31 51 015.

Running-in note for exchange or repairs to the front axle differential:

The running-in rules and the oil change interval for new vehicles apply, up to 1000 km; max. permitted roadspeed = 2/3 of top speed. A label or tag should be provided to remind the driver.

\* Refer to Specifications



### 31 51 010 Replacing shaft seal for input flange on front axle differential

Removing input shaft from front axle differential, see Gr. 06.



R 31 0010

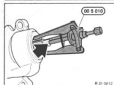
Lever out retaining plate (1). Mark the position of the nut on the shaft with punch marks.



R 31 0011

Use special tool 23 0 020 to brace the input shaft and unscrew nut. Remove input flange.

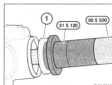
**Caution!**  
If an input flange is badly worn, it must be replaced, see 31 51 512.



R 31 0012

Shaft seal with special tool 06 5 010 abziehen.

**Caution!**  
Do not damage the bush in the shaft.



R 31 0013

Dip the shaft seal (1) in oil\* and drive firmly home with special tool 31 5 120 + 06 5 500.



R 31 0010

Clean and fit input flange. Tighten nut until punch marks on nut and shaft are aligned with each other.

**Caution!**  
Under no circumstances tighten the nut beyond the punch marks since it is otherwise necessary to replace the clamping sleeve; see 31 51 512 Replacing Input Flange. For this, the punch marks should be aligned before starting work.

Replace retaining plate (1). Tap up oil\* in front axle differential.

31 51 015 REPLACING SHAFT SEAL FOR  
LEFT OUTPUT SHAFT

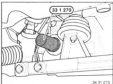
Remove output shaft - refer to 31 60 000.

31 51 020 REPLACING SHAFT SEAL FOR  
RIGHT OUTPUT SHAFT

The procedures are the same as those for  
"Replacing Shaft Seal for Left Output Shaft"  
in 31 51 015.



Lever the shaft seal out with help of a thin  
rod.



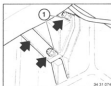
Dip the shaft seal in gear tube and drive it  
in as far as the stop using Special Tool  
33 1 270.

**31 51 060 REPLACING RIGHT FRONT  
AXLE FINAL DRIVE O-RING**

The procedures are identical with those for  
"Removing Front Axle Final Drive" in  
31 50 000.

**31 51 065 REPLACING RIGHT CONSOLE  
O-RING**

Remove right output shaft - refer to  
31 50 000.



Unscrew the bolts and remove the console.

Installation:  
Remove washer (3).  
Tightening torque\*.



Replace O-ring (1).

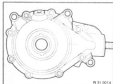
Installation:  
Dip the O-ring in gear lube.

# 31-51/13

## 31 51 512 Replacing input flange

- Front axle differential removed -

Unscrew bolts.  
Remove cover and shim.



Lower out retaining plate (1).



Use special tool 00 2 010 or 00 2 000 to determine the friction torque of the drive pinion bearing and note down result.



Use special tool 23 0 020 to brace the input flange and unfasten the nut.  
Remove input flange.

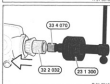


Remove shaft seal with special tool 00 3 010

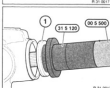
Caution!  
Do not damage the bush in the shaft.



Drive drive pinion off inner bearing race of outer bearing with plastic hammer or force up with press if necessary.  
Replace clamping sleeve (1).



Pull drive pinion onto inner bearing race with special tools 32 2 032 / 33 4 070 and 23 1 300.



Dip shaft seal (1) in oil\* and drive firmly home with special tool 31 5 120 / 00 5 500.

\* Refer to Consumables Specifications





Clean new input flange, attach and tighten the new nut with special tool 23 9 020 to a tightening torque of 31 52 14J<sup>\*</sup>.



Use special tool 00 2 010 or 00 2 000 to measure the friction moment. Gradually tighten the nut until the friction moment reaches the specified value = 20 Nm for the new shaft seal.

**Caution!**

If the nut was tightened too far, replace the clamping sleeves. Loosening the nut to adjust the friction value is not permitted.

**Replace tab washer**

Install differential housing.  
Clean seating face of housing and cover and coat with sealing compound<sup>\*\*\*</sup>.  
Screw down cover to tightening torque 21 50 6A2<sup>\*\*</sup>.

Tap up oil<sup>\*\*</sup> in front axle differential.

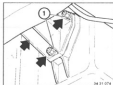
\* Refer to Specifications

\*\* Refer to Consumables Specifications

\*\*\* Source of Supply: B&W Parts Service

31 53 050 REPLACING RIGHT OUTPUT  
SHAFT BEARING (IN CON-  
SOLE)

Remove right output shaft - refer to  
31 60 005.



Unscrew the bolts and remove the console.

*Precaution:*  
Use washers (1).  
Tightening torque.



Put the bearing out together with the shaft  
seal using Special Tool 00 8 550.



Press a new bearing in using Special Tool  
23 1 290.

• Refer to Specifications



Dip the new shaft seal in gear lube and  
drive it in as far as the stop using Special  
Tool 23 1 290.

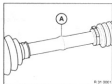


Dip new O-ring (1) in gear lube and put it  
on.

### 31 60 000 Removing and installing or replacing left or right output shaft

**After assembly:**  
Check that output shafts are correctly located in front axle differential.  
Check oil level.

**Caution!**  
If an output shaft without web is replaced with an output shaft with web (A), a new detent must be installed on the engine mounts - in accordance with Parts film - on the appropriate side.



Remove cover on front wheel.  
Untighten collar nut.

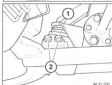
**Installation instruction:**  
Replace collar nut.  
Tightening torque\*  
Peen (secure) the collar on the nut with a punch in both grooves of the shaft.

\* Refer to Specifications



Remove front wheel, see Gr. 26.  
Untighten screw.

**Installation instruction:**  
Tightening torque\*.



Unscrew bolts (1).

**Installation instruction:**  
Fit disks (2).  
Tightening torque\*.



Unscrew bolts (1).  
Pull control arm to one side and secure to spring strut with wire to ensure that the ball joint on the spring strut is not damaged.

**Installation instruction:**  
Fit washer to the front screw (2).  
Tightening torque\*.

\* Refer to Specifications

## 31-60/11



Screw on special tool 33 2 115/116/117 with 3 wheel studs.  
Press output shaft out of left and right sides of driver flange.

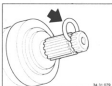


Installation instruction:  
Screw on special tool 33 2 115/116/119 with 3 wheel studs.  
Pull output shaft into the driver flange.



Slide special tool 31 5 115 into the gap between housing and output shaft. Lever out left and right sides of output shaft with a jolt and remove.

Installation instruction:  
The snap ring on the output shaft must audibly locate in the front axle differential.

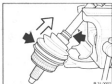


**Caution!**  
The retaining ring on the output shaft must always be replaced.

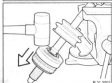
If necessary, replace shaft seal, see 31 51 015.

### 31 60 020 Replacing one constant velocity joint (outer) on the output shaft

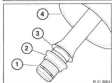
Remove output shaft 31 60 000.



Clamp output shaft in vise with aluminum jaws.  
Unfasten both clips and remove gaiter.



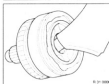
Use a plastic hammer to drive the constant velocity joint off the spline shaft.



Remove retaining ring (1), adapter ring (2), plate spring (3) and gaiter (4).  
Clean spline shaft.

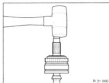


Slide on new gaiter (4).  
Fit new plate spring (3) and new adapter ring (2) - note installation position.  
Insert new retaining ring (1) in the groove.

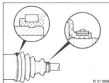


Apply approx. 2/3 of volume of grease from the tube in the new constant velocity joint.  
Distribute the remaining grease in the gaiter.

**Caution!**  
Only use grease from the blue tube.



Use a plastic hammer to drive the constant velocity joint on to the spline shaft until the retaining ring engages in its functional position.



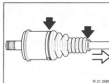
Fit gaiter to constant velocity joint and move spline shaft in to installation position.  
Insert screwdriver between gaiter and spline shaft and vent constant velocity joint.  
Secure gaiter with new clips.

### 31 60 030 Replacing one gaiter on the output shaft (outer)

Work is identical to 31 60 020 - Replacing Constant Velocity Joint (outer).

**Caution!**

Clean the constant velocity joint thoroughly.



### 31 60 035 Replacing both gaiters on the output shaft

Remove constant velocity joint (outer), 31 60 020

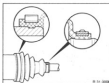
Unfasten both clips on inner joint and remove gaiter.

Do not dismantle the joint!

Clean the joint thoroughly. Insert approx. 2/3 of the volume of grease in the two white tubes into the joint. Distribute the remaining grease in the new gaiter.

**Caution!**

Only use grease from the white tubes.



Move gaiter on joint and on spline shaft into installation position.

Insert screwdriver between gaiter and spline shaft and vent joint.

Secure gaiter with new clips.

## TROUBLESHOOTING FRONT AXLE

Condition	Cause	Correction
Grinding noise (louder in curves)	a) Wheel bearings faulty	a) Replace wheel bearings
Vibration	a) Imbalance of wheels b) Rim lateral and radial runout c) Tire radial runout d) Output shaft faulty	a) Balance wheels b) Replace rims if necessary c) Replace output shaft d) Replace output shaft
Steering wheel shake	a) Imbalance of wheels b) Rim lateral and radial runout c) Shock absorber effect insufficient d) Control arm mounts faulty e) Wrong control arm mounts installed f) Excessive steering gear play g) Output shaft faulty	a) Balance wheels b) Replace rims if necessary c) Replace shock absorbers d) Replace control arm mounts e) Exchange control arm mounts f) Adjust pressure point g) Replace output shaft
Rattling noise	a) Control arm ball joint worn b) Stabilizer rubber mounts worn c) Thrust strut ball joints worn d) Front axle carrier mounted loose at body	a) Replace control arm b) Replace rubber mounts c) Replace thrust strut d) Tighten (check threads)
Load change knock	a) Excessive backlash b) Output shaft faulty	a) Adjust backlash b) Replace output shaft
Acceleration or overrun noise	a) Backlash excessive or insufficient	a) Adjust backlash
Oil loss	a) Radial oil seal leaks b) Vent plugged c) Wrong oil grade	a) Replace radial oil seal b) Clean vent c) Replace front axle final drive oil*

\* Refer to Operating Fluids

## TROUBLESHOOTING FRONT AXLE

Condition	Cause	Correction
Body swing long time after driving car over rough road	Weak shock absorbers - refer to troubleshooting shock absorbers on page 31-903.	Replace shock absorbers.
Body wig when driving car over successive rough road surfaces		
Body rise while accelerating		
Wheel jump even on normal road surfaces		
Car breaking out while braking		
Breaking out (skidding) in curves due to poor track holding		



The condition of shock absorbers can be checked with a shock absorber tester or in a shock absorber testing machine.

### TROUBLESHOOTING SHOCK ABSORBERS

Condition	Cause	Correction
Shock absorbers knocking (bottoming)	a) Rubber dampers faulty b) Weak shock absorbers	a) Check or replace rubber dampers b) Replace shock absorbers
Shock absorber noise	a) Newly installed shock absorbers had been stored laying down with piston rod run in b) Shock absorbers faulty	a) Store shock absorbers standing upright with piston rod run out and at room temperature for 24 hours b) Replace shock absorbers
Poor handling properties	Weak shock absorbers	Replace shock absorbers
Flat spots on the treads	Shock absorbers faulty	Replace shock absorbers

## 32 Steering and wheel alignment

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## GENERAL INFORMATION

### Steering Gear:

The steering gear could be damaged from impact forces if a car is involved in an accident or operated under conditions similar to an accident. There must always be conformance with factory specifications in the interest of safety - refer to Service Information 32 01 88 (828).

### Tie Rod Joint:

Refer to Service Information 32 03 87 (733) for an evaluation of wear on ball joints.

### Serotonin:

Troubleshoot with BMW DIAGNOSING SYSTEM - refer to Car Electric/Electronic Test Plan.

### Airbag:

Troubleshoot with BMW DIAGNOSING SYSTEM - refer to Car Electric/Electronic Test Plan.

### MS:

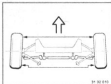
The rear wheel toe can be adjusted.

### Electric Steering Wheel Adjustment:

Troubleshoot with BMW DIAGNOSING SYSTEM - refer to Car Electric/Electronic Test Plan.

### Car with Interlock System:

The function must be checked if a component of the interlock system had been removed and installed or the installed position of the interlock cable was changed - refer to 32 32 170.



31 32 011

#### GENERAL INFORMATION AND DEFINITIONS

##### Toe

is the reduction in distance of front of front wheels to rear of front wheels. Toe prevents the wheels from running apart while driving and consequently wheel slippage and grinding, excessive tire wear, excessive loads on steering linkage and joints as well as hard steering of car. Toe is measured in "straight ahead position".



31 32 012

##### Camber

is the inclination of the wheel from the perpendicular.



31 32 013

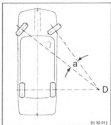
##### King pin inclination

is the angle, by which the king pin\* is inclined inward from a perpendicular line to the lateral axis of the car.

The king pin inclination produces returning forces, which return the road wheels and steering wheel to straight ahead after driving through a curve or around a corner.

Camber and king pin inclination determine the location of the wheel contact point with the road surface.

King pin inclination reduces the leverage, on which frictional forces are engaged, which makes it easier to turn the wheels to left or right lock. In addition, the jolts from rough road surfaces do not have so strong influence on the steering.



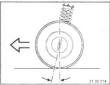
31 32 014

##### Toe difference angle

is the angular position of the wheel on the inside of a curve to the wheel on the outside of a curve when driving in a curve. The steering is designed that the angular position of the wheels changes as steering lock progresses. The toe difference angle provides information on the perturbed operation of the steering trapezoid for left or right steering lock from the center position. A correctly adjusted toe difference angle produces equal values for left and right lock in due consideration for factory tolerances.

- α = Toe difference angle
- D = Turning circle center point

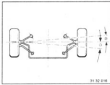
\* The "king pin" is equal to a line through the center point of the spring strut mount and control arm ball joint.



**Caster**

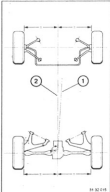
is the inclination of the king pin in forward direction as seen from the side.

The wheels are pulled and not pushed because of caster. In a similar manner to king pin inclination, when driving in curves or around corners returning forces are produced to help return the wheels to straight ahead position.



**Wheel offset**

is the angle, by which one front wheel is displaced more toward front or rear than the other front wheel.

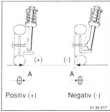


**Geometrical axis 1**

is the bisecting line of an angle from the local rear wheel toe. Front wheel measurements are taken in reference to this axis.

**Symmetrical axis 2**

is a center line running through the front and rear axles.



**King pin offset / scrub radius**

is the distance from the center of the point of contact between the wheel and road to the point of intersection of an extended king pin axis.

Scrub radius is influenced by camber, king pin inclination and roll offset.

1 The "king pin" is equal to a line through the center point of the spring strut mount and control arm ball joint.

1 The "king pin" is equal to a line through the center point of the spring strut mount and control arm ball joint.

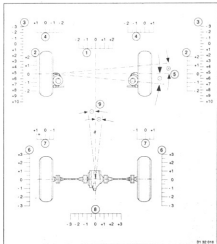
## 32 00 190 CHECKING WHEEL ALIGNMENT WITH ELECTRONIC TESTER (with KDS)

Requirements to be fulfilled prior to checking wheel alignment:

1. Good, uniform tire treads.
2. Specified tire pressure<sup>1)</sup>.
3. Wheel rims in perfect condition<sup>2)</sup>.
4. Specified wheel bearing play<sup>3)</sup>.
5. Car loaded down to normal position<sup>4)</sup>.
6. Specified ride level height<sup>5)</sup>.

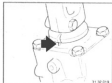
Always check wheel alignment only with a recommended electronic tester (see Workshop Equipment) and also speedtrials on the rear wheels.

- 1 = Toe
- 2 = Camber
- 3 = Caster (with 10° or 30° wheel lock)
- 4 = Toe difference angle (with 30° wheel lock)
- 5 = Wheel offset
- 6 = Camber
- 7 = Rear wheel position
- 8 = Toe
- 9 = Geometrical axis



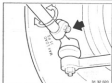
<sup>1)</sup> Refer to Specifications of Gr. 31/01/03/06

<sup>2)</sup> Refer to Service Information of Gr. 30



### 32 00 610 Adjusting front axle (with KDS)

Adjust toe-in and toe-out angles.  
Set steering gear in straight ahead position (marks on casing and steering shaft must agree).



Loosen both clamping screws of tie rod.  
Adjust toe-in of left and right wheel by turning the threaded sleeve to the specified setpoint\*.

**Installation note:**  
Make sure the ball joint is not twisted.  
For tightening torque\*.



Four-wheel drive:  
Loosen nut.  
Adjust toe-in of left and right wheel by turning the tie rod to the specified setpoint\*.

**Installation note:**  
Make sure the ball joint is not twisted.  
For tightening torque\*.



### 32 00 620 Adjusting rear axle (with KDS)

**MS:**  
Loosen nut.  
Adjust toe-in on left and right wheel by turning the eccentric screw to the specified setpoint\*.

**Installation note:**  
Firmly tighten screw on right-hand semi-trailing arm with special tool 32 3 090 to tightening torque\*.

## 32 00 ... CORRECTING CAMBER

Eccentric mounts can be installed to correct the front axle camber by an  $30'$ , when deviation is caused by the summary of unfavorable tolerances.

**Important!**

This measure must never be applied to eliminate changes in the axle geometry caused in an accident.

**Example:**

Nominal camber value	+ $7'$ ... - $43'$
Actual camber value	- $60'$
Correction added	+ $30'$
New actual value	- $30'$



Correction mounts are marked with "+" or "-" next to the stud.  
 Replace spring strut mounts - refer to 31 03 601.



## TROUBLESHOOTING FRONT WHEEL ALIGNMENT

Condition	Cause	Correction
1 Toe deviation	<ul style="list-style-type: none"> <li>a) Car not in normal position</li> <li>b) Tie rod(s) bent</li> <li>c) Track arm on spring strut bent</li> <li>d) Tie rod ball joints worn</li> <li>e) Rubber mount in control arm faulty</li> </ul>	<ul style="list-style-type: none"> <li>a) Ride level height, see Specifications of Group 31</li> <li>b) Replace tie rod(s)</li> <li>c) Replace track arm</li> <li>d) Replace tie rod(s) or ball joints</li> <li>e) Replace rubber mount</li> </ul>
2 Camber deviation Camber is given by design and cannot be adjusted.	<ul style="list-style-type: none"> <li>a) Rubber mount in control arm faulty</li> <li>b) Control arm deformed</li> <li>c) Spring strut deformed</li> <li>d) Guide joint worn</li> <li>e) Spring force insufficient</li> <li>f) Front axle carrier deformed</li> <li>g) Spring strut mount holder deformed</li> <li>h) Distortion in floor assembly (engine carrier)</li> <li>i) Unfavorable summary of tolerances</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace rubber mount</li> <li>b) Replace control arm</li> <li>c) Replace spring strut</li> <li>d) Replace control arm</li> <li>e) Replace coil springs</li> <li>f) Ride level height, see Specifications of Group 31</li> <li>f) Replace front axle carrier</li> <li>g) Repair front end</li> <li>h) Repair body</li> <li>i) Install eccentric mounts</li> </ul>
3 Caster deviation Caster is given by design and cannot be adjusted.	<ul style="list-style-type: none"> <li>a) Rubber mount for thrust strut faulty</li> <li>b) Thrust strut deformed</li> <li>c) Control arm deformed</li> <li>d) Spring strut deformed</li> <li>e) Wheel house deformed (spring strut mount)</li> <li>f) Distortion in floor assembly (engine carrier)</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace rubber mount</li> <li>b) Replace thrust strut</li> <li>c) Replace control arm</li> <li>d) Replace spring strut</li> <li>e) Repair front end</li> <li>f) Repair body</li> </ul>
4 Toe difference angle deviation	<p>Assuming camber and caster are correct:</p> <ul style="list-style-type: none"> <li>a) Tie rods not adjusted uniformly</li> <li>b) Track arm on spring strut bent</li> </ul>	<ul style="list-style-type: none"> <li>a) Adjust tie on left and right sides to same value</li> <li>b) Replace track arm</li> </ul>
5 Wheel offset deviation	<p>Assuming front wheels have equal single toe to geometrical axis:</p> <ul style="list-style-type: none"> <li>a) Front axle carrier deformed</li> <li>b) Engine carrier deformed</li> <li>c) Control arm deformed</li> <li>d) Thrust strut deformed</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace front axle carrier</li> <li>b) Repair body</li> <li>c) Replace control arm</li> <li>d) Replace thrust strut</li> </ul>

## TROUBLESHOOTING REAR WHEEL ALIGNMENT

Condition	Cause	Correction
6 Camber deviation	<ul style="list-style-type: none"> <li>a) Car not in normal position Spring force insufficient</li> <li>b) Rubber mounts on rear axle carrier faulty</li> <li>c) Rubber mounts on final drive faulty</li> <li>d) Silent blocks in trailing arm faulty</li> <li>e) Rear axle carrier deformed</li> <li>f) Trailing arm deformed</li> <li>g) Distortion in floor assembly</li> </ul>	<ul style="list-style-type: none"> <li>a) Ride level height, see Specifications of Group 33</li> <li>b) Replace rubber mounts</li> <li>c) Replace rubber mounts</li> <li>d) Replace silent blocks</li> <li>e) Check or replace rear axle carrier</li> <li>f) Check or replace trailing arm</li> <li>g) Repair body</li> </ul>
7 Rear wheel position deviation	<ul style="list-style-type: none"> <li>a) Rear axle carrier displaced laterally</li> <li>b) Distortion in floor assembly</li> </ul>	<ul style="list-style-type: none"> <li>a) Check / replace rubber mounts on rear axle carrier</li> <li>b) Repair body</li> </ul>
8 Toe deviation	<ul style="list-style-type: none"> <li>a) Car not in normal position or spring force insufficient</li> <li>b) Rubber mounts in rear axle carrier faulty</li> <li>c) Rubber mounts on final drive faulty</li> <li>d) Silent blocks in trailing arm faulty</li> <li>e) Rear axle carrier deformed</li> <li>f) Trailing arm deformed</li> <li>g) Unfavorable summary of tolerances</li> </ul>	<ul style="list-style-type: none"> <li>a) Ride level height, see Specifications of Group 33</li> <li>b) Replace rubber mounts</li> <li>c) Replace rubber mounts</li> <li>d) Replace silent blocks</li> <li>e) Check or replace rear axle carrier</li> <li>f) Check or replace trailing arm</li> <li>g) Install eccentric silent blocks - see 33 32 541</li> </ul>
9 Deviation of geometrical axis from symmetrical axis	<p>Assuming single wheel toe cannot be adjusted:</p> <ul style="list-style-type: none"> <li>a) Distortion in floor assembly</li> </ul>	<ul style="list-style-type: none"> <li>a) Repair body</li> </ul>



30 12 020



08 12 006

### 32 1.3 006 Filling and bleeding power steering

#### 1. Fill with engine stationary

Fill oil container to dipstick mark "MAX" or to A + approx. 25 mm below the edge with hydraulic fluid\*.

#### 2. Bleeding

Start engine.

Turn steering wheel to left and right locks twice each way.

#### 3. Oil level check with engine stationary

##### a) Without level regulation:

fill up to "MAX" mark.

##### b) With level regulation:

Lift rear axle until wheels are suspended.

After 2 minutes, the oil level should be max. 5 mm over the base of the screen.

Correct oil level as required with engine stationary.

On ASC + T vehicles, see 34 00 040.

## 32-13/2



### 32 13 014 ADJUSTING PRESSURE POINT IN POWER STEERING GEAR

**Requirements:**  
Steering gear and mounts/joints of steering column in perfect condition.

**Uncrew the nut.**  
Press the tie rod off of the steering drop arm using Special Tool 32 2 040.

**Installation:**  
Replace the self locking nut.  
Tightening torque\*.

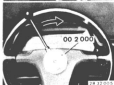


**Adjusting:**  
Turn the steering wheel counterclockwise about 1 turn from straight ahead position. Loosen nut (1) on the steering gear and turn adjusting screw (2) until the specified friction torque\* is reached while passing the pressure point.

**Installation:**  
Tightening torque\* for nut.  
Reread the pressure point.

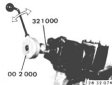


Set the steering gear in straight ahead position (marks on spindle and case).



Lift the BMW emblem out or remove the airbag unit - refer to 32 34 028.  
Turn the steering wheel counterclockwise about one turn.  
Mount Special Tool 00 2 000, turn the steering wheel clockwise past the pressure point and read the friction torque\*.

\* Refer to Specifications



**Steering Gear Removed:**  
Mount Special Tool 32 1 000 on the spindle and apply Special Tool 00 2 000.  
Adjust as described above.

\* Refer to Specifications

## 32 13 060 REMOVING AND INSTALLING POWER STEERING GEAR

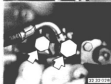
Suck the hydraulic fluid out of the tank — don't reuse it.

**Installation:**  
Fill and bleed the hydraulic system - refer to 32 15 006.

**Car's with Airbag:**  
Remove the steering wheel - refer to 32 13 030.



32 13 011



32 13 014

**Installation:**  
Check the straight ahead position of the steering wheel and steering gear.  
Turn the steering wheel counterclockwise or clockwise as far as lock and then back about 1.7 turns until the marks are aligned.

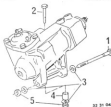
Unscrew the hydraulic pipes.  
Plug the bores with dust caps.  
If applicable, pull the plug off of the converter for Servotronic.

**Installation:**  
Replace seals.  
Tightening torque\*.

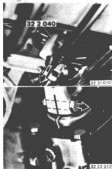
Unscrew bolts (1 and 2).  
Remove the steering gear.

**Installation:**  
Tightening torque\*.

- 1 Bolt
- 2 Bolt (only use grade 10.9)
- 3 Washer
- 4 Bushing
- 5 Nut (replace)



32 13 040



32 13 040

32 13 040

32 13 040

**Ball-and-nut Power Steering:**  
Unscrew nut.  
Press the tie rod off of the steering drop arm using Special Tool 32 13 040.

**Installation:**  
Replace the self-locking nut.  
Tightening torque\*.

Unscrew bolt.  
Push the universal joint off of the steering gear.

**Installation:**  
The bolt must be in the locking groove of the steering stub.  
Tightening torque\*.

\* Refer to Specifications

\* Refer to Specifications

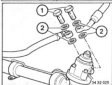


**Rack-and-pinion Power Steering:**  
Remove the front wheels - refer to Gr. 36.  
Unscrew left and right nuts (1).

**Installation:**  
Replace the self-locking nuts.  
Install washers (2).  
Tightening torque\*.

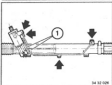


Press the left and right track rods off using  
Special Tool 32 3-090.



Unscrew steering gear bolts (1).

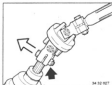
**Installation:**  
Replace seals (2).  
Tightening torque\*.



Unscrew return pipes (1) from the steering  
gear.

**Installation:**  
Replace the seals.  
Tightening torque\*.

\* Refer to Specifications



Remove the bolt and disconnect the joint  
from the steering gear.

**Installation:**  
The bolt must be located in the groove of  
the steering gear spindle.  
Replace the nut.  
Tightening torque\*.



Unscrew left and right nuts.  
Remove the steering gear from the side.

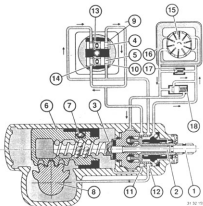
**Installation:**  
Tightening torque\*.

\* Refer to Specifications

## DESIGN AND DESCRIPTION OF BALL AND NUT POWER STEERING

The housing contains a complete mechanical steering gear, the control valve and operating cylinder. Steering spindle (1) is connected elastically with worm (3) via torsion bar (2) and with valve pistons (4 and 5) without play. The valve pistons are installed transversely in the worm head. The connection between piston (5) and worm (3) is accomplished with an infinite line of balls. When turning the worm the balls are taken up at one end by circulating tube (7) and put out again at the other end of the balls. Piston (5) and sector shaft (8) are meshed. The special shape of teeth on the sector shaft permits zero-play adjustment with an adjusting screw.

In neutral position of valves (4 and 5) the oil flow delivered by the pump passes through the steering and can flow through the opened lead and return control edges to the cylinder chamber and return flow. Hydraulic support cuts in when force is transmitted from the steering wheel or from the steering drop arm via the sector shaft and pistons to the worm. Torsion bar (2) then serves as a link. It deforms itself in the elastic range and returns the valve pistons to neutral position after releasing the steering wheel. Moving valves (4 and 5) will let the oil flow into only one of the operating cylinder chambers and in this manner support the rotating motion of the steering spindle and/or counteract the jolt from rough roads.



## Steering Wheel in Neutral Position:

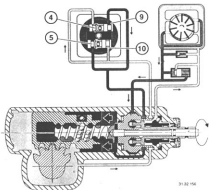
Oil flows from the impeller pump into the worm head, through lead grooves (9 and 10) to radial grooves (11 and 12). From here via connecting hoses to the right and left cylinder chambers and via opened return flow grooves (13 and 14) back to the oil tank. The valve is also illustrated in cross section.

- 18 = Pump
- 15 = Oil tank
- 17 = Pressure relief valve
- 18 = Control valve

## 32-13/6

### Steering Wheel Turned Clockwise:

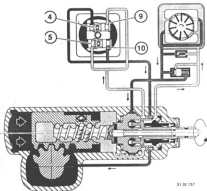
Valve piston (4) is displaced to the right and feed groove (9) is opened. Valve piston (5) is displaced to the left and feed groove (10) closed—this lets the oil flow into the right cylinder chamber. Oil in the left cylinder chamber is forced out and flows back into the oil tank.





Steering Wheel Turned Counterclockwise:

Valve piston (5) is displaced to the right and feed groove (10) opened. Valve piston (4) is displaced to the left and feed groove (9) closed. This lets the oil flow into the left cylinder chamber. Oil in the right cylinder chamber is forced out and flows back into the oil tank.



## SERVOTRONIC

## Components:

- Electronic speedometer
- Control unit (installed in A pillar)
- Electric/hydraulic converter (bolted on steering gear)

## Design:

The speed signal from the speedometer is evaluated in the control unit and put out to the converter in form of electric pulses. The converter regulates the flow of oil out of the reaction chambers into return flow.

## Description:

Turning the steering wheel clockwise causes the right valve piston (6) to move. This lets the oil flow into the right cylinder chamber (12) as well as via the right check valve (8) into the right reaction chamber (4).

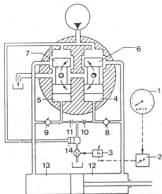
When the car is in "parking" state (there are no speed signals from the speedometer), converter valve (3) remains closed and the oil continues to flow via both orifices (10 and 11) to the left reaction chamber (5). The closed left check valve (9) prevents the oil from flowing into the pressureless left cylinder chamber (13) which is connected with return flow. Since there is equal pressure in both reaction chambers (4 and 5), there is no counterforce (no reaction) on the steering wheel. The steering wheel is easy to turn.

When driving fast on "highways", the converter valve is wide open and the oil flows from the pressurized right cylinder chamber (12) via the right check valve (8), right orifice (10) and converter (3) to return flow. The right reaction chamber (4) then has full pressure, while the left reaction chamber (5) is without pressure. This produces a left-turning torque, which tries to force the valve pistons back into neutral position (maximum reaction). The steering wheel is hard to turn.

When driving at medium speed, converter valve (3) is opened only partially. The reduced return pressure is transmitted to the left reaction chamber (5), while the right reaction chamber (4) has maximum pressure. The counterforce acting on valve pistons (6 and 7) is lower accordingly.

Cross Section Drawing of Valve in Worm Head (also refer to page 32 - 3/5):

- |                               |                            |
|-------------------------------|----------------------------|
| 1 Speedometer                 | 8 Check valve, right       |
| 2 Control unit                | 9 Check valve, left        |
| 3 Electro/hydraulic converter | 10 Orifice, right          |
| 4 Reaction chamber, right     | 11 Orifice, left           |
| 5 Reaction chamber, left      | 12 Cylinder chamber, right |
| 6 Valve piston, right         | 13 Cylinder chamber, left  |
| 7 Valve piston, left          | 14 Reaction limit valve    |



### 32 13 503 Disassembling and assembling power steering gear

- Power steering gear removed -

Remove tie rods, refer to 32 21 231.

#### Caution!

Take the utmost care and ensure absolute cleanliness when working on the steering gear. Do not use any force whatsoever during disassembly and assembly work. The use of force can cause damage which can lead to failure of the steering system.

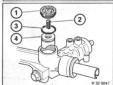
#### Disconnect leakage line.

Detach delivery lines and remove O-rings.

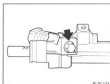
1. Mark position of adjusting screw (7) with respect to housing with center punch dots.
2. Determine installation depth of adjusting screw (1) in housing with a depth gage and note down.
3. Release adjusting screw (1).
4. Remove spring (2), O-ring (3) and spacer (4).



32 13 120

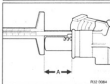


32 13 054



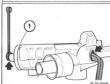
32 13 123

Unscrew end cap.



32 13 056

Set steering gear in mid-position (by having total number of turns). In this position, the marks on the steering spindle, cap and housing agree. Make marks if necessary. Determine dimension (A) with a depth gage and note down. This dimension is required as a check during assembly.



32 13 058

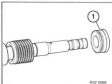
Remove protective cap (1) from steering shaft.  
Release nut - hold on flat of steering shaft -



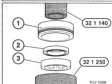
32 13 059

Lower out snap-ring.  
Pull steering shaft out of housing.

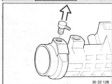
## 32-13/10



Remove bearing bush (1).



Using special tool 32 1 140/250, remove radial oil seal (2) together with bearing (3) out of bearing bush (1).



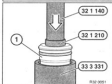
Disconnect connection for leakage oil line.



Lever out snapping through hole for leakage oil line and pull out of housing.



Pull gear rack with bearing bush (1) out of tube.



Remove radial oil seal from bearing bush (1) with special tool 32 1 140/210 and 32 3 331.



Remove radial oil seal out of tube with special tool 32 1 140/210.



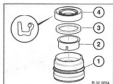
Using a drift punch, carefully drive bearing out of steering shaft housing. This improves access to the radial oil seal.

## 32-13/11



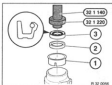
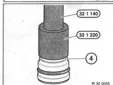
**Caution!**  
Do not damage polished cylinder bore.  
With the aid of a drift punch, carefully drive radial oil seal (1) out of steering shaft housing.

Thoroughly clean all parts.  
Coat new sealing rings with hydraulic fluid and pack radial shaft seal between dust cap and sealing lip with grease, refer to **BMW Fluids and Lubricants Specifications**.

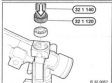


Replace O-ring (1).  
Fit new plastic bush (2) and support ring (3) in bearing bush.  
Radial oil seal (4).

Fit new radial shaft seal (4) - with open side facing towards special tool 32 1 140/220 - as far as it will go in the bearing bush.



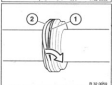
Fit plastic bush (1) and support ring (2) in the tube.  
Fit new radial oil seal (4) - open side facing towards special tool 32 1 140/220 - as far as it will go in the tube.



Grease bearing.  
refer to **BMW Fluids and Lubricants Specifications**.  
and, using special tool 32 1 140/120 fit in steering shaft housing as far as it will go.



Fit new radial oil seal - open side facing towards special tool 32 1 140/220 - as far as it will go in the steering shaft housing.



Replace O-ring (1) and piston ring (2).



R 32 000

Carefully insert gear rack in the tube, making sure:

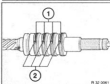
1. The inner radial oil seal is not damaged by the gear teeth and
2. the piston ring (2) is not damaged.

Fit bearing bush on gear rack and fit in tube.



R 32 140

Fit new snap-ring with the open side located opposite the leakage oil hole.



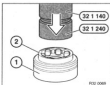
R 32 001

Replace piston rings (1) and O-rings (2) below them.



R 32 007

Fit new radial oil seal (2) - open side facing upward - as far as it will go in bearing bush (1) with special tool 32 1 140/240/250. Replace O-ring (2).



R 32 008

Fit bearing (2) - labelling facing upwards - as far as it will go in bearing bush (1) with special tool 32 1 140/240/250.



R 32 006

Fit bearing bush (1) - radial oil seal facing upwards - on steering shaft.



R 32 145

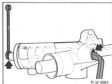
Grease rack and pinion, refer to BMW Fluids and Lubricants Specifications.

Pull out rack by dimension (A) noted down. Carefully insert steering shaft in housing and fit snap-ring. Check marks.

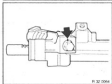


R 32 009

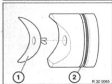
Fit new protective cap in this position where marks on housing, steering shaft and protective cap must agree.



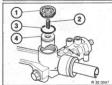
Replace self-locking nut and tighten to tightening torque = 17 Nm.



Tighten end cap to tightening torque = 32 Nm and fix in position by caulking.



Replace film relay (1) and O-ring (2).



Grease thrust piece (4), spring (2) and O-ring (3) and fit in position.

Screw in adjusting screw (1) to the determined installation depth and align marks.

Secure adjusting screw in position by caulking.

Caution!

It must be possible to move the rack smoothly over its entire range.



Fit leakage oil line connections. Connect leakage oil line and install delivery lines with new O-rings. Tightening torque = 20 Nm.

## TROUBLESHOOTING BALL AND NUT POWER STEERING

Condition	Cause	Correction
Steering hard to turn left or right from center	Pressure point adjusted too tight	Adjust pressure point
Steering runs automatically to final position consistently	Valve setting for hydraulic center incorrect	Replace steering gear (adjusting only possible in the factory)
Steering wheel has excessive play	<ul style="list-style-type: none"> <li>a) Steering gear loose on front axle carrier</li> <li>b) Universal joints have excessive play</li> <li>c) Joint disk loose</li> <li>d) Tie rod ends worn</li> <li>e) Play between worm and piston</li> <li>f) Worm has axial play</li> <li>g) Insufficient oil in system</li> </ul>	<ul style="list-style-type: none"> <li>a) Tighten steering gear</li> <li>b) Replace universal joints</li> <li>c) Tighten joint disk</li> <li>d) Replace tie rod ends</li> <li>e) Replace steering gear</li> <li>f) Replace steering gear</li> <li>g) Add oil* and bleed power steering - see 32 13 006</li> </ul>
Steering wheel shakes	<ul style="list-style-type: none"> <li>a) Wheels have imbalance or radial runout</li> <li>b) Toe, camber, caster or king pin inclination incorrect</li> <li>c) Thrust strut bent</li> <li>d) Rubber mount for thrust strut defective</li> <li>e) Control arm bent</li> <li>f) Weak shock absorbers</li> <li>g) Bearing sleeve in steering guide arm defective</li> </ul>	<ul style="list-style-type: none"> <li>a) Balance wheels; replace rim or tire in case of radial runout</li> <li>b) Check/adjust front wheel alignment with optical tester</li> <li>c) Replace thrust strut</li> <li>d) Replace rubber mount</li> <li>e) Replace control arm</li> <li>f) Replace shock absorbers</li> <li>g) Replace bearing sleeve</li> </ul>
Steering is hard to turn against left or right lock	<ul style="list-style-type: none"> <li>a) No pressure built up in lower pressure chamber</li> <li>b) No pressure built up in upper pressure chamber</li> <li>c) Insufficient oil in system</li> <li>d) Control valve in power pump seized</li> <li>e) Filter clogged</li> <li>f) Valve piston seized or leaks</li> <li>g) Piston seal damaged</li> <li>h) Teflon rings in worm head leak</li> <li>i) Teflon ring in intermediate cover leaks</li> <li>k) System filled with strong foaming, unsuitable oil</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace steering gear</li> <li>b) Replace steering gear</li> <li>c) Add oil* and bleed power steering - see 32 13 006</li> <li>d) Replace power pump</li> <li>e) Replace filter, clean lines</li> <li>f) Replace steering gear</li> <li>g) Replace steering gear</li> <li>h) Replace steering gear</li> <li>i) Replace steering gear</li> <li>k) Fill system with specified oil*</li> </ul>

\* Refer to Specifications



## TROUBLESHOOTING BALL AND NUT POWER STEERING

Condition	Cause	Correction
Loss of hydraulic fluid	<ul style="list-style-type: none"> <li>a) Hose connections leak</li> <li>b) Oil tank seal leaks</li> <li>c) Radial oil seal for sector shaft defective</li> <li>d) Radial oil seal for steering spindle defective</li> <li>e) O-ring in cover leaks</li> <li>f) O-rings in intermediate cover leak</li> </ul>	<ul style="list-style-type: none"> <li>a) Tighten hose connections or replace hoses</li> <li>b) Replace seal</li> <li>c) Seal steering gear</li> <li>d) Seal steering gear</li> <li>e) Seal steering gear</li> <li>f) Seal steering gear</li> </ul>
No straight ahead	Height of steering drop arm not correct	Adjust steering drop arm - see 32 21 529

## TROUBLESHOOTING RACK AND PINION POWER STEERING

Condition	Cause	Correction
Steering hard to turn left or right from center	Pressure point not adjusted correctly.	Replace steering gear
Steering runs automatically to final position unexpectedly	Valve setting for hydraulic center incorrect	Replace steering gear (adjusting only possible in the factory)
Steering wheel has excessive play	<ul style="list-style-type: none"> <li>a) Steering gear loose on front axle carrier</li> <li>b) Universal joints have excessive play</li> <li>c) Joint disk loose</li> <li>d) Tie rods worn</li> <li>e) Affirm has axial play</li> <li>f) Insufficient oil in system</li> </ul>	<ul style="list-style-type: none"> <li>a) Tighten steering gear</li> <li>b) Replace universal joints</li> <li>c) Tighten joint disk</li> <li>d) Replace tie rods</li> <li>e) Replace steering gear</li> <li>f) Add oil* and bleed power steering - see 32 13 006</li> </ul>
Steering wheel shakes	<ul style="list-style-type: none"> <li>a) Wheels have imbalance or radial runout</li> <li>b) Toe, camber, caster or king pin inclination incorrect</li> <li>c) Control arm bent</li> <li>d) Weak shock absorbers</li> </ul>	<ul style="list-style-type: none"> <li>a) Balance wheels; replace rim or tire in case of radial runout</li> <li>b) Check/adjust front wheel alignment with optical tester</li> <li>c) Replace control arm</li> <li>d) Replace shock absorbers</li> </ul>
Steering hard to turn against left or right lock	<ul style="list-style-type: none"> <li>a) Insufficient oil in system</li> <li>b) Drive belt too loose</li> <li>c) Filter clogged</li> <li>d) Control valve in pump seized</li> <li>e) Valve piston leaks or seized</li> <li>f) System filled with strong foaming, unsuitable oil</li> </ul>	<ul style="list-style-type: none"> <li>a) Add oil* and bleed power steering - see 32 13 006</li> <li>b) Tighten or replace drive belt</li> <li>c) Clean filter</li> <li>d) Replace pump</li> <li>e) Replace steering gear</li> <li>f) Fill system with specified oil*</li> </ul>
Steering runs only difficultly to left or right lock	No pressure built up in left or right cylinder chamber	Replace steering gear

\* Refer to Specifications

## TROUBLESHOOTING RACK AND PINION POWER STEERING

Condition	Cause	Correction
Loss of hydraulic fluid	<ul style="list-style-type: none"> <li>a) Hose connections leak</li> <li>b) Oil tank seal leaks</li> <li>c) Radial oil seal for steering spindle defective</li> <li>d) O-ring in cover leaks</li> </ul>	<ul style="list-style-type: none"> <li>a) Tighten hose connections or replace hoses</li> <li>b) Replace seal</li> <li>c) Seal steering gear</li> <li>d) Seal steering gear</li> </ul>
No straight ahead	<ul style="list-style-type: none"> <li>a) Insufficient oil in system</li> <li>b) Tie rods worn</li> </ul>	<ul style="list-style-type: none"> <li>a) Add oil and bleed power steering - see 32 13 006</li> <li>b) Replace tie rods</li> </ul>
Steering runs difficultly when turn to lock quickly	<ul style="list-style-type: none"> <li>a) Drive belt loose</li> <li>b) Pump delivery rate insufficient</li> </ul>	<ul style="list-style-type: none"> <li>a) Tighten or replace drive belt</li> <li>b) Check or replace pump</li> </ul>
Strong knocks felt on steering wheel while steering	<ul style="list-style-type: none"> <li>a) Insufficient oil in system</li> <li>b) Air in system in spite of sufficient oil</li> <li>c) Excessive play between rack and pinion</li> <li>d) Valve body has excessive play</li> </ul>	<ul style="list-style-type: none"> <li>a) Add oil* and bleed power steering - see 32 13 006</li> <li>b) Check where air is being sucked in on intake side</li> <li>c) Replace steering gear</li> <li>d) Replace steering gear</li> </ul>
Hesitant return of steering wheel	Mount, ball joint, tie rod joints or hard moving steering spindle in steering column	Check/repair or replace mount, ball joint, tie rod joints and steering spindle in steering column
Refer to Specifications		

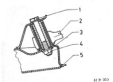
## 32-21/1



### 32 21 080 REMOVING AND INSTALLING STEERING GUIDE ARM

Unscrew nut.  
Press off ball joint with Special Tool  
32 2 040.

Installation:  
Replace self locking nut.  
Tightening torque\*.



Unscrew steering guide arm.

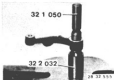
Installation:  
Replace self locking nut.  
Tightening torque\*.

- 1 Bolt
- 2 Steering guide arm
- 3 Washer
- 4 Self locking nut
- 5 Front axle server

Important!  
If the steering guide arm is replaced, adjust  
the steering drop arm – see 32 21 510.

\* See Specifications

## 32-21/2



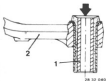
### 32 21 091 REPLACING DAMPER FOR STEERING GUIDE ARM

Remove steering guide arm – see 32 21 080.  
Press out damper with Special Tools  
32 1 050 and 32 2 032.

Note pressing in direction.

1 = Damper

2 = Steering guide arm



Press in new damper against the stop with  
Special Tools 33 1 305 and 32 2 032.

Important!

Adjust steering drop arm after installation –  
see 32 21 510.



### 32 21 101 REPLACING LEFT OR RIGHT TIE ROD ARM

Remove front wheel - refer to Group 26.  
 Unscrew nut.  
 Press ball joint off of tie rod arm using Special Tool 32 2 050.

Installation:  
 Replace self-locking nut.  
 Tightening torque\*.  
 Check front wheel alignment - refer to 32 90 - ...



Unscrew bolts.

Installation:  
 Clean threads of tapered bores and bolts.  
 Install bolts with bolt cement\*\*.  
 Tightening torque\*.



Check for correct installed position.



Unscrew nut on control arm and thrust arm.  
 Press off ball joints using Special Tool 31 1 110.

Installation:  
 Replace self-locking nut.  
 Tightening torque\*.

\* Refer to Specifications  
 \*\* Source of Supply: BMW Parts

**32 31 151 REPLACING LEFT OR RIGHT  
TIE ROD END**

Remove the front wheel - refer to Cr. 36.

Check wheel alignment after installation.

Four Wheel Drive:

Remove the front wheel - refer to Cr. 36.

Check wheel alignment after installation.



Loosen bolt (1).  
Unscrew nut (2).

Installation:  
Replace self-locking nut (2).  
Tightening torque\*.



Press the tie rod off using Special Tool  
32 2 050.



Unscrew the tie rod end.

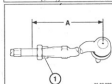


Unscrew nut (1).

Installation:  
Replace self-locking nut (1).  
Use washer (2).  
Tightening torque\*.



Press the tie rod off using Special Tool  
32 3 090.



Measure distance (A) before unscrewing the tie rods - makes wheel alignment easier.  
Unscrew nut.  
Unscrew tie rod end.

Installation:  
Install clamping ring (1).  
Screw tie rod end in up to distance (A).  
Tightening torque\*.

\* Refer to Specifications

\* Refer to Specifications

### 32 21 231 REPLACING LEFT OR RIGHT TIE ROD

**Important!**  
Adjust front wheel alignment after installation - refer to 32 30 030.

Remove the front wheel - refer to Gr. 36.



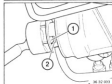
Unbend the lockplate.  
Remove the tie rod using Special Tool 32 2 110.

**Important!**  
Unbend the lockplate with a suitable pliers (never with a hammer) to avoid damaging the rack and suspension.



Unscrew nut (1).

**Installation:**  
Replace self-locking nut (1).  
Use washer (2).  
Tightening torque\*.



**Installation:**  
Replace the lockplate.  
Turning lock (1) must be positioned in groove (2) of the rack.  
Tightening torque\*.  
Bend the lockplate with a pliers.



Press the tie rod off using Special Tool 32 3 080.



Loosen the clamp and push the boot back.

**Installation:**  
Check / replace the boot.

\* Refer to Specifications

\* Refer to Specifications





### 32 21 261 REPLACING CENTER TIE ROD

Unscrew nuts on left and right sides.

Installation:

Replace self-locking nuts.

Tightening torque\*

Adjust steering drop arm - refer to

32 21 310.

Check front wheel alignment - refer to

32 90 - ...

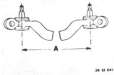


Press off side tie rods using Special Tool

32 2 060 and center tie rod using Special

Tool 32 2 040.

Control distance A = 534 ± 1 mm.

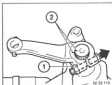


\* Refer to Specifications

**32 21 500 REMOVING AND INSTALLING  
STEERING DROP ARM**

– Steering Gear Removed –

Mark position of sliding steering drop arm on the sector shaft prior to unscrewing Bolt (1).  
If necessary, adjust steering drop arm – see 32 21 510.

**Installation:**

Slide on steering drop arm up to the mark, whereby marks (2) must also be aligned.

Replace self locking nut.

Tightening torque\*.

\* See Specifications

### 32 21 510 ADJUSTING STEERING DROP ARM

Adjusting the steering drop arm moves the left and right tie rods to the same height. This guarantees the same amount of toe on left and right wheels when the car's suspension is bottomed. It also optimizes directional stability on rough road surfaces.

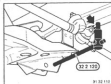


Set steering gear to straight ahead position (marks on spindle and case aligned).



Unscrew left and right control arms on front axle carrier.

**Important!**  
Replace self-locking nuts.  
Tightening torque\*



Mount Special Tool 32 2 120 on control arm (mount at the steering guide arm side). Align the master mandrel with the centering bore in the pivot pin and clamp.

\* Refer to Specifications



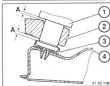
32 2 120



32 2 120

Mount the special tool on the other side — without changing the master mandrel.

Loosen bolt.  
Move steering drop arm until centering bore is aligned with master mandrel as precisely as possible.  
Max. permissible deviation =  $\pm 1.5$  mm.  
Tighten nut.  
Tightening torque\*.  
Rereck adjustment if necessary.



32 2 120

**Important!**  
Turn steering gear from stop to stop — steering drop arm must move easily.

Distance A = 0.5 mm.

- 1 Steering gear
- 2 Steering drop arm
- 3 Spacer
- 4 Front axle carrier

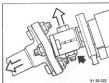
\* Refer to Specifications

**32 31 002 REMOVING AND INSTALLING  
OR REPLACING STEERING  
ANGLE SENSOR**

Disconnect battery - refer to Group 51.  
Remove dashboard trim panel at bottom -  
refer to Group 51.  
Models with Airbag:  
Remove steering wheel - refer to 32 33 000.

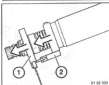
**Important!**

After installation, offset steering angle for  
electronic shock absorber control - refer to  
Car Electric/Electronic Test Plan in Gr. 37.



Remove bolt.  
Press down on steering spindle.

**Installation:**  
Bolt must be located in locking groove of  
the steering spindle.  
Replace self-locking nut.  
Tightening torque\*.



Push steering angle sensor (1) off of steering  
spindle.

**Installation:**  
Pin of steering angle sensor (1) must seat  
in turning lock (2).

\* Refer to Specifications



### 32 31 090 REMOVING AND INSTALLING STEERING COLUMN ASSY.

Disconnect battery ground lead.  
Remove steering wheel - refer to 32 31 090.  
Remove dashboard trim panel at bottom - refer to Group 8.  
Check position of collar ring (1) to snap ring (2).

Unscrew steering column casing.

If applicable, unscrew interlock cable of steering lock.

Remove bolt.  
Press down on steering spindle.

Installation:  
Bolt must be located in locking groove of the steering spindle.  
Replace self-locking nut.  
Tightening torque\*.

Note:  
Mark meshing point of splines with a dot of paint.  
Screw on adjusting nut far enough that the sliding force is 40 ± 25 N.

\* Refer to Specifications



Unscrew bolts.  
Chisel off shear-off screw.

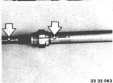
Installation:  
Replace self-locking nuts.  
Tightening torque\*.  
Tighten new shear-off screw until it shears off.

Installation:  
Install spacer.

Unscrew bolts.  
Loosen both mounting nuts on bracket.  
Press down and remove steering column.

Installation:  
Install spacer.  
Tightening torque\*.

\* Refer to Specifications



32 32 042

32 32 047

### 32 32 090 REMOVING AND INSTALLING STEERING COLUMN ASSY. (AIRBAG)

#### Caution!

Confirm with safety precautions. Improper handling could ignite the airbag and cause injuries.

Remove dashboard trim panel at bottom - refer to 31 40 180.  
Remove steering wheel - refer to 32 32 000.  
Disconnect plugs of wires leading to the steering column.

Remove collar ring (1).

#### Installation:

Recess in collar ring (1) locks snap ring (2).

Remove bolt.

Press down on steering spindle.

#### Installation:

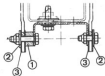
Bolt must be located in locking groove of the steering spindle.  
Replace self-locking nut.  
Tightening torque\*.

Unscrew bolts.

#### Installation:

Replace self-locking nut.  
Tightening torque\*.

\* Refer to Specifications



32 32 000

#### Installation:

- 1 Spacer
- 2 Washer
- 3 Steering liner

#### Installation:

Install spacer.

Unscrew bolt.

Loosen both mounting nuts on bracket.  
Press down and remove steering column.

#### Installation:

Install spacer.  
Tightening torque\*.

\* Refer to Specifications



32 32 010



32 32 044



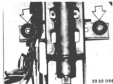
32 32 054



32 32 040



32 32 050



32 32 054

### 32 31 ... DISASSEMBLING AND ASSEMBLING STEERING COLUMN ASSEMBLY

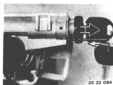
Remove steering column - refer to 32 31 095.

Pull off plug.  
Compress retainers and pull off switch.

Press retainers down using a screwdriver and remove starter switch.  
Remove wire harness holder and relay socket.

Compress and pull out horn contact.

Installation:  
Lubricate lightly with grease in area of the spring.



32 31 094

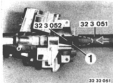
Turn ignition key to "R".  
Press Special Tool 32 3 110 or piece of 1.2 mm dia. wire into bore and pull out lock cylinder.



32 31 096

Lift out snap ring (1).  
Remove washer (2), spring (3) and support ring (4).

Installation:  
Bore of support ring (4) faces bearing.



32 31 051

Installation:  
Place snap ring (1) on Special Tool 32 3 050 and mount using Special Tool 32 3 051 (knock from hammer).  
Counterhold on steering spindle.



32 31 049

Chisel off shear-off screw.  
Pull off steering lock.  
If necessary, knock out bearing.



32 31 044



32 31 047



32 31 048



32 31 046



32 31 044

**Installation:**

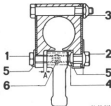
Slide steering lock on to outer pipe.  
Tighten Torx screws until they shear off.

**Lower Steering Spindle Bearing:**

Lift out snap ring (1) and remove collar ring (2) together with support ring (3).  
If necessary, knock out bearing.

**Installation:**

Stem of support ring (3) faces bearing.  
Mount snap ring using Special Tools 32 3 05h and 32 3 05i.



.. .. .

**Unbind lockplate (5).**

Unscrew bolts (7 ... 3).

Bolt (1) = left-hand threads.

**Assembling Procedures (Conform with Sequence):**

1. Screw in M 8 x 20 left-hand thread bolt (1) together with lockplate (5).  
Tightening torque = 18 Nm.  
Check for distance A = 1.75 ± 1.25 mm between lever and clamp.
2. Screw in M 8 x 28 bolt (2) together with lockplate (5) and nut (4).  
Tightening torque = 9 Nm.
3. Tighten nut (4).  
Tightening torque = 14 Nm.
4. Tighten hexagon nut (3) with lever (6) in "CLOSED" position.  
Tightening torque = 12 Nm.
5. Bend lockplate (5) to lock it.



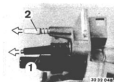
### 32-31 ... DISASSEMBLING AND ASSEMBLING STEERING COLUMN ASSEMBLY (AIRBAG)

Remove steering column - refer to 32-31 090.

Drive out expansion rivets with help of a punch.  
Remove upper section.

Pull off plug.  
Compress retainers and pull off switch.

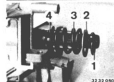
Press retainers down using a screwdriver and remove starter switch.  
Remove wire harness holder and relay socket.



Compress and pull out horn contact (1) and lockpin (2).



Turn ignition key to "R".  
Press Special Tool 32-3-110 or piece of 1.2 mm dia. wire into bore and pull out lock cylinder.



Lift out snap ring (1).  
Remove washer (2), spring (3) and support ring (4).



Installation:  
Stem of support ring (4) faces bearing.

Installation:  
Place snap ring (1) on Special Tool 32-3-051 and mount using Special Tool 32-3-051 (a knock from hammer).  
Counterhold on steering spindle.





Chisel off shear-off screw.  
Pull off steering lock.  
If necessary, knock out bearing.

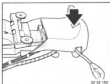
Installation:  
Use new shear-off screw.



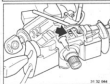
Lower Steering Spindle Bearing:

Lift out snap ring (1) and remove collar ring (2) together with support ring (3).  
If necessary, knock out bearing.

Installation:  
Stem of support ring (3) faces bearing.  
Mount snap ring using Special Tools  
32 3 001 and 32 3 052.



Manually Adjusted Steering Column:  
Unscrew screw and remove casing.



Unscrew screw.

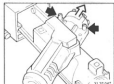


Press switch housing out of steering column with pressure from both thumbs on the retainers.

Important!  
Retainers will break off easily.



Unscrew ground lead.



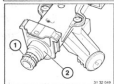
Release both grub screws.

**Installation note:**  
Secure grub screws with paint.



Remove steering angle sensor (1) with arrester (2).

**Installation note:**  
The pin of steering angle sensor (1) must be fitted in the arrester (2).



Lever out snap ring (1) and remove together with support ring (2).



**Installation note:**  
Fit support ring (2).  
Pull snap ring (1) with special tool 32 1 090 and steering wheel retaining screw until it engages in groove of steering shaft.  
Snap ring (1) can also be fitted with special tool 32 3 070.



Lever out steering shaft bearing and remove inner sleeve of bearing.

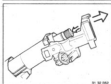


**Installation note:**  
Fit inner sleeve of bearing with chamfered side facing towards the steering lock.



Release shear-off screws.

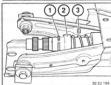
**Installation note:**  
Tighten shear-off screws until they shear.



Turn steering lock in position "R".  
Press down steering shaft and remove steering lock.

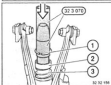


**Installation:**  
Dowel pin must fit in bore.

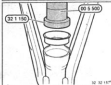


**Upper Steering Spindle Bearing:**

Lift out snap ring (1) and remove support ring (2) together with spring (3).  
Remove steering spindle.  
Pull outer pipe out of console.

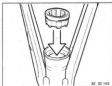


**Installation:**  
Install spring (3) and support ring (2).  
Recess in support ring (2) must face snap ring (1).  
Install snap ring (1) using Special Tool 32 3 070.

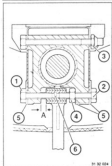


Knock steering spindle bearing out of outer pipe.

**Installation:**  
Press contact ring out of bearing.  
Knock in bearing using Special Tools 32 1 150 and 50 5 500.



Coat metal lugs of contact ring with grease\* and press contact ring into bearing.



Unscrew screw, press retainers towards outside and remove potentiometer.

**Clamp Adjustment:**  
Unbolt lockplates (5).  
Unscrew bolts (1 ... 2).

Bolt (1) = left-hand threads.

**Assembling Procedures (Conform with Sequence):**

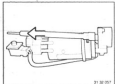
1. Screw in M 8 x 32 left-hand thread bolt (1) together with lockplate (5).  
Tightening torque = 15 Nm.  
Check for distance A = 6.5 ± 1 mm between lever and clamp.
2. Screw in M 8 x 40 bolt (2) together with lockplate (3) and nut (4).  
Tightening torque = 7 Nm.
3. Tighten nut (4).  
Tightening torque = 10 Nm.
4. Tighten hexagon nut (3) with lever (6) in "CLOSED" position.  
Tightening torque = 10 Nm.
5. Bend lockplate (5) to lock it.

## 32-31/10



Electrically adjustable steering column:  
Work is identical to mechanically adjustable  
steering column.

Unscrew bolts.  
Twist plug out of bracket.  
Remove transmission motor.



Remove shaft.



Unscrew bolts.  
Remove transmission.

### 32 32 001 REPLACING COMPLETE STEERING LOCK

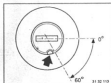
Procedures are identical with those for "Removing and Disassembling Steering Column" in 32 32 090/...

### 32 32 175 REPLACING INTERLOCK CABLE

Procedures are contained in 32 32 001 (Replacing Steering Lock) and 32 15 . . . (Removing and Installing Selector Lever - Interlock Version).

Check the function after installation as follows.

1. Move selector lever of automatic transmission into "P".
2. Remove the ignition key.
3. Press the selector lever button.
4. If the selector lever can be moved out of P, the interlock cable must be adjusted - refer to Group 25.
5. Switch the ignition on.
6. Press the selector lever button.
7. If the selector lever cannot be moved out of P, the interlock cable must be adjusted - refer to Group 25.



### 32 32 090 REMOVING AND INSTALLING / REPLACING STEERING LOCK CYLINDER

Turn the lock cylinder 60° to position "R" with the ignition key.



Press Special Tool 32 3 110 or a piece of 1,2 mm dia. wire into the bore of the lock cylinder and pull the lock cylinder out.



28 32 010



28 32 011

### 32 33 000 REMOVING AND INSTALLING STEERING WHEEL - without Airbag -

Lift out BMW emblem.

Unscrew and remove nut (1) together with washer (2).  
Mark position of steering wheel to steering spindle.

Pull off steering wheel - only possible after unlocking steering lock.

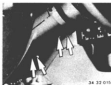
#### Installation:

Replace self-locking nut.  
Tightening torque\*.

#### Important!

Do not damage turn signal self-canceling cam.  
Lubricate slip ring for horn with grease\*\*.

\* Refer to Specifications  
\*\* Refer to Operating Fluids



24 32 011

- With Airbag -

#### Caution!

Concern with safety precautions. Improper handling could ignite the airbag and cause injuries.

Disconnect battery and cover negative pole or terminal.  
Unscrew casing lower section.



21 32 100

Pull plug (orange) out of holder and disconnect it.



21 32 101

Unscrew screws (Torx T 30 socket).

#### Installation:

First tighten screw at right hand side as seen looking in forward driving direction.  
Tightening torque\*.



24 32 012

Pull off plug and remove airbag unit.

#### Caution!

Airbag unit may only be laid aside with pad facing up (in trunk).

#### Installation:

Do not pinch wiring.

\* Refer to Specifications



Set steering wheel in straight ahead position (marks on steering gear and on steering shaft). Release nut/bolt and remove with washer.  
Mark steering wheel with respect to steering shaft.

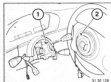
**Caution!**  
If the steering wheel is secured by a nut, it can only be removed with the steering lock unlocked.



Adjust contact ring if necessary:  
Press down spring (1) - turn contact ring to left or right as far as it will go, turn back by approx. 3 turns, until marking arrows for center position agree, release spring (1).



**Installation note:**  
Tilt slip ring with grease\*\*.



**Installation note:**  
Lock pin (1) must engage in recess (2).  
Replace self-locking nut. Tightening torque\* for nut or bolt.



**Note:**  
The retaining spring (1) which holds the contact ring in center position exerts a force by loosening the nut/bolt.

On no account must the steering wheel be moved without the nut/bolt being tightened. The contact ring will be damaged!

\* Refer to Technical Data

- with airbag fit

Remove steering wheel, refer to Repair Manual 3 Series E36.

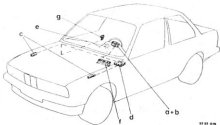
\*\* Refer to Fluids and Lubricants Specifications



## Airbag System

## Components of Airbag:

- a) Steering wheel with impact absorber and impact absorber cover, in which airbag, gas generator and squibs are integrated
- b) Contact ring - provides secure power source to squib
- c) 2 Crash sensors (left and right, front of wheel arch) and safety switch on left side
- d) Diagnosis electronics under instrument panel trim with integrated Rolling Sensor (prevents accidental deployment)
- e) Airbag latitude in the instrument cluster
- f) Knee protection (US model)
- g) Belt tensioner with gas generator and ignition squib (integrated in inertia reel of seatbelt)



## Components Airbag II and basic | central airbag unit:

refer to Repair Manual, 3 Series E26.

### Function

The system is triggered by sensors which must detect vehicle retardation equivalent to a direct head-on collision at no less than 18 km/h with a stationary and rigid object (i.e. one which does not move on impact).

The electric circuit is made and gas generators ignited. At this point, through the instantaneous combustion of the solid fuel mixture, non-toxic gases are released which:

a) fully inflate the folded airbags in the steering wheel and the instrument panel within approx. 30 ms. (fully inflated, the airbag reduces the extent of injuries to head and upper torso in head-on collisions.

The bags are deflated by two holes in the side of the airbag opposite the driver).

b) push down the piston (3) in the cylinder and tensions the safety belt by tightening a wire cable (2). The passenger is securely held against the backrest.

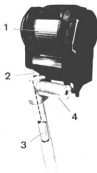
### Monitoring:

The airbag system is monitored continuously by a diagnosis unit from ignition lock position "1" on. The telltale lights up and goes out again after about 6 seconds, Airbag 8 approx. 4 seconds, indicating operational readiness of the system.

Constant flashing or continuous lighting of the telltale indicate the presence of a defect in the airbag system.

Self-diagnosis - fault-memory interrogation with BMW DIAGNOSIS SYSTEM.

Airbag 8 troubleshooting, refer to Repair Manual, 3 Series E26.



### Belt tensioner:

- 1 Safety belt, inertia reel unit
- 2 Wire cable
- 3 Piston in cylinder
- 4 Gas generator

**SAFETY RULES FOR HANDLING AIRBAG BELT TENSIONER GAS GENERATORS**

Non-conformance with these instructions could lead to unwanted activation of the system and injury.

Gas generators are pyrotechnical items. Handling, transporting and storing are subject to "legislation concerning explosive materials".

The specifications listed below are in reference to Germany. There must always be conformance with pertinent legislation in other countries.

**1. Transporting:**

- 1.1 Gas generators must never be transported in passenger compartments!
- 1.2 Company level transportation must always be in the trunk or cargo room of a vehicle in packed state — the quantity of units is limited to 50.

**2. Storing:**

- 2.1 Max. permitted quantity of gas generators in one workroom is 20.
- 2.2 Storage of up to 200 units is permitted in a suitable and lockable room.
- 2.3 Gas generators must be stored in packaging suitable for transportation.

**3. Installing and Removing:**

- 3.1 "Airbag" components and plugs can be recognized immediately on the orange color.
- 3.2 Tests and installation/removal may only be performed by personnel with qualified training in BMW service.
- 3.3 Working on the "airbag system" always requires the battery to be disconnected, the negative pole or terminal to be covered and the "airbag" plug (steering column) to be disconnected.
- 3.4 If work on the system had to be interrupted, a gas generator must not be left unattended.
- 3.5 Components of the airbag system may not be repaired, but instead they must always be replaced.
- 3.6 Never treat "airbag" components with cleaning solutions or greases.
- 3.7 Never subject gas generators to temperatures above 100° C.
- 3.8 Gas generators, crash sensors and electronic diagnosing units, which have fallen down from a height of 0.5 meters or more, cannot be installed in cars again.
- 3.9 The "airbag system" may only be checked electrically in the car and only with a BMW Service Tester.
- 3.10 The airbag gas generator may only be laid aside with the padded side facing up, since if the generator were ignited with the airbag facing down, the generator would be catapulted up and could cause injury!
- 3.11 The ignition pill of a gas generator must never be aimed at persons regardless of the circumstances.

**Procedures for Repairing and After Accidents:**

Always disconnect the battery (first interrogate fault memories as disconnecting the battery erases them), cover the negative pole or terminal and disconnect both plugs for crash sensors in the engine compartment and plugs for the gas generators, to be sure that power supply to the gas generators is interrupted, prior to working on the body or welding with an electric welder.

Also refer to other instructions in the repair manual.

**After Accidents:**

If the airbag had been activated, always replace all components with exception of wiring when not damaged.

#### 4. Scrapping "airbag" vehicles

**Airbag inflator assemblies which have not been triggered pose a danger (also for the environment):**

In accordance with relevant accident prevention regulations, "airbag" inflator assemblies must be dismantled and made inoperative before scrapping. This is necessary since pyrotechnic components can cause injuries if activated incorrectly (e.g. scrapping with cutting torch).

"Airbag" inflator assemblies in the vehicle to be scrapped must be fired with the doors closed from the outside. The ignition device with corresponding cables developed by BMW should be used for this purpose.

##### Caution!

The burning solid fuel causes the airbag unit to heat up - risk of burn injuries!

Wash hands after touching ignited inflator assemblies!

#### 5. Driver's airbag up to model year '94

- 5.1 Remove bottom section of steering column shroud and disconnect plug connection (orange) to airbag unit.
- 5.2 Connect ignition device 62 1 270 to plug connector, use cable 62 1 266 or 62 1 233 if necessary.
- 5.3 Connect ignition device to a 12 V battery (10 m distance from vehicle).
- 5.4 Keep distance from vehicle corresponding to length of ignition cable - location always in front of vehicle (this also applies to all other persons).
- 5.5 Press switch of ignition device - airbag inflates.

#### 6. Driver's airbag with indicator lamp integrated in steering wheel

- 6.1 Remove airbag unit from steering wheel.
- 6.2 Disconnect plug connector from airbag unit, connect cable 62 1 240 and connect to ignition device 62 1 270.
- 6.3 Reinstall airbag unit.
- 6.4 Connect ignition device to a 12 V battery (10 m distance from vehicle).
- 6.5 Maintain distance from vehicle corresponding to length of ignition cable - location always in front of vehicle (this also applies to all other persons).
- 6.6 Press switch on ignition device - airbag inflates.
- 6.7 Remove airbag unit - caution: Airbag unit is hot! (Danger of burn injury!) Disconnect cable.

#### 7. Belt tensioner up to model year '93

- 7.1 Insert plug-in bracket in belt buckle. If this is no longer possible, the plug-in bracket must be pushed as far as the outlet opening in the B-pillar.
- 7.2 Mark seat belt strap with a chalk line at the outlet opening of the B-pillar, in this way it is possible to check the belt tension after ignition.
- 7.3 Disconnect plug connection to belt tensioner at airbag control unit.  
Installation location of airbag control unit: LH side under instrument panel trim.
- 7.4 Connect ignition device 62 1 270 together with cable 62 1 266 to the plug connector.
- 7.5 Connect ignition device to a 12 V battery (10 m distance from vehicle).
- 7.6 Maintain distance from vehicle corresponding to length of ignition cable - location always in front of vehicle (this also applies to all other persons).
- 7.7 Press switch on ignition device - belt tensioner ignites.

#### 4. Vehicles as of model year '94 (driver's, front passenger's airbag and belt tensioner if applicable)

- 4.1 Disconnect plug connector from airbag control unit.  
Installation location of airbag control unit: Under rear seat.
- 4.2 Connect ignition device 62 1 270 together with cable 62 1 210 to the plug connector.
- 4.3 Connect ignition device to a 12 V battery (10 m distance from vehicle).
- 4.4 Maintain distance from vehicle corresponding to length of ignition cable - location always in front of vehicle (this also applies to all other persons).
- 4.5 Press switch on ignition device - all inflator assemblies ignite.



### 32 34 020 REMOVING AND INSTALLING OR REPLACING AIRBAG UNIT

**Caution!**  
Conform with safety regulations.  
Improper handling could cause activation of the airbag and lead to injuries.  
Disconnect battery and cover the negative pole or terminal.

Unscrew casing lower section.



Pull (orange) plug out of the holder and disconnect.



Unscrew screws with Special Tool  
00 2 118.

**Installation:**  
First tighten bolt on right-hand side as seen looking forward in car.  
Tightening torque\*.



Pull off plug and remove the airbag unit.

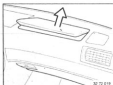
**Caution!**  
Place airbag unit aside (in trunk) with the padded side facing up.

**Installation:**  
Don't pinch the electric leads.

\* See Specifications

**32-34 500 Additional work with front passenger's airbag**  
 - Steering wheel removed -

**Caution!**  
 Observe safety instructions!  
 Incorrect handling can result in the airbag triggering thus causing injuries.



Lift out covering.



Release screws.



Disconnect plug connectors and remove front passenger's airbag.

**Caution!**  
 Place front passenger's airbag with padded cushion facing upward (luggage compartment).

**Installation note:**  
 Do not trap cable.

### 32 34 910 REPLACING CONTACT RING (AIRBAG)

#### Caution!

Conform with safety regulations.  
Improper handling could lead to activation of the airbag and lead to injuries.  
Remove steering wheel - see 32 33 000.

#### Pull off casing.

Installation:  
Lubricate slip ring for horns with grease.

#### Mark position of circlip to hub.

Unscrew three studs.  
Press down, turn and remove the circlip.

#### Installation:

Insert, turn and pull up circlip in hub.  
Studs must be in openings of the circlip.



Lift out the lock with a screwdriver.

Installation:  
Place spring on the lock and insert in horn.  
Press down on lock until it engages.



#### Disconnect plug.

Unscrew nuts and take off the contact ring.



#### Important!

A new contact ring is held in center position by a screw.  
This screw must be removed after bolting the contact ring on the steering wheel.

32 32 000

32 32 100

32 32 102

32 32 101



34 32 010

### 65 77 010 Removing and installing or removing airbag diagnosis unit

#### Caution!

Observe safety regulations!  
Incorrect handling can activate the airbag and lead to injuries.

Disconnect battery and cover ground pole or terminal.

Remove lower section of trim. Remove plug connection (orange) from bracket and disconnect.



34 32 020

Press plug connection off bracket. Unscrew holder.



34 32 040

Unscrew bolts.  
Disconnect plug connections (orange).  
Remove diagnosis unit.

#### Installation:

Arrow on unit shows direction of travel.

### 65 77 012 Removing and installing or replacing control unit for Airbag II

Refer to Repair Manual for 3 Series E36.



### 85 77 015 Replacing capacitor in airbag diagnosis unit

Diagnosis unit 85 77 015

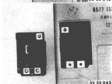


Open cover with feeler gage (0.20 mm) or a small screwdriver.

Installation note:  
Install new cover.



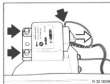
Release screws and remove capacitor.



Installation note:  
Clean contact surfaces.

### 85 77 016 Removing and installing basic/central airbag unit

**Caution!**  
Observe safety instructions!  
Incorrect handling can cause the airbag to trigger thus causing injuries.  
Disconnect battery and cover negative terminal.



Remove rear seat, refer to 52 20 010.  
Release screws, disconnect cable plug connector and remove basic/central airbag unit.

Installation note:  
Arrow on unit points in forward direction

### 85 77 018 Replacing basic/central airbag unit

Removing and installing basic/central airbag unit, refer to 85 77 016.

Encode new unit with MoDiC.



24 20 014

**65 77 000 REMOVING AND INSTALLING  
OR REPLACING ONE AIRBAG  
FRONT SENSOR**

**Caution!**

Comply with safety regulations.  
Improper handling could cause activation of  
the airbag and lead to injuries.  
Disconnect battery and cover negative pole  
or terminal.  
Unscrew casing lower section.  
Pull (orange) plug out of holder and  
disconnect.



00 2 110

Disconnect plug and unscrew screws with  
Special Tool 00 2 110.

Installation:

Arrow on sensor faces forward.

Tightening torque\*.

22 20 000

\* See Specifications

**85 77 040 REPLACING AIRBAG  
SAFETY SWITCH**

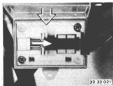
**Caution!**

Conform with safety regulations.  
Improper handling could cause activation of  
the airbag and lead to injuries.  
Disconnect battery and cover negative pole  
or terminal.

Open the cover, remove plug and unscrew  
screws.

**Note:**

Opening the cover destroys the safety  
switch, which must then be replaced.

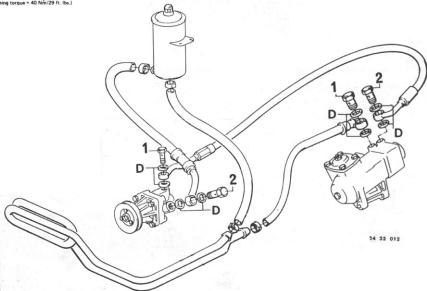


Screw on safety switch.  
Install plug.  
Slide contact sleeve on plug.  
Close cover.

# 32-41/1

## Power Steering Layout Drawing

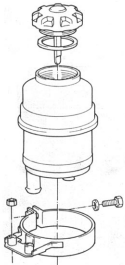
- D - Gasket
- 1 - M 14 hollow coupling bolt  
(tightening torque = 35 Nm/25 ft. lbs.)
- 2 - M 16 hollow coupling bolt  
(tightening torque = 40 Nm/29 ft. lbs.)



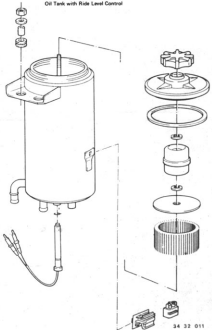
94 92 012

# 32-41/2

Oil Tank Layout Drawing



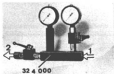
Oil Tank with Ride Level Control



### 32 41 000 CHECKING FUNCTION OF POWER STEERING PUMP

Check all hose connections, pump and steering gear for leaks before testing.

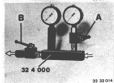
1. Checking Power Steering Pump:  
Connect pressure tester between pump and steering gear.



32 32 013

- 1 - Pump connection
- 2 - Steering gear connection

- A - Shut-off valve (low pressure)  
0 to 15 bar (0 to 213 psi)
- B - Shut-off valve (high pressure)  
0 to 150 bar (0 to 2133 psi)



32 32 014

Shut valve (A).  
Open valve (B).  
Start engine.  
Correct hydraulic fluid level\*\* in tank.

Shut valve (B) max. 10 seconds and read pressure.  
The rated pump pressure\* must be reached within  $\pm 10\%$ .  
If the rated pressure\* is exceeded, replace power steering pump - see 32 43 001.  
If the rated pressure\* is not reached, check drive belt tightness - see 32 41 100.  
Repeat test.  
If the rated pressure\* is still not reached, replace power steering pump - see 32 41 001.

\* See Specifications

\*\* See Operating Fluid Specifications



32 32 013



32 32 013

2. Checking Power Steering:  
Pressure tester connected between pump and steering gear; system bleed, valve (B) opened, valve (A) shut, engine not started.

Lift car.

Stop steering from reaching final left lock by 1/2 to 3/4 steering wheel turn with a piece of wood or something similar.

Start engine.

Full steering wheel against final left lock with a force of 100 N (23 lbs.) (force meter) about 5 seconds and read pressure.

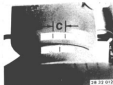
Lower final right lock and repeat test on right lock.

If pressure values are lower than pump pressure determined in point 2, replace steering gear - see 32 13 000.

## 32-41/4



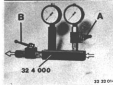
- 3. Checking Mechanical Play of Steering:**  
- Pressure point adjusted - see 32 13 014.  
- No play in steering column.  
Pressure tester between pump and steering gear.  
System bleed.  
Open valve (B).  
Shut valve (A).  
Engine not started.  
Hold steering drop arm in straight ahead position with Special Tool 32 4 060.



- Turn steering wheel counterclockwise until pressure tester shows 1 bar (14 psi) more pressure than the flow pressure value.  
Mark position of steering wheel hub.  
Repeat this in clockwise direction.  
If max. permissible travel (C) = 7 mm (0.276") is exceeded, replace the steering gear - see 32 13 060.  
Remove special tool holder and pressure tester.  
Bleed hydraulic system and, if necessary, add hydraulic fluid\*\*.

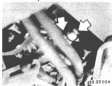


- Place strips of paper on the steering wheel hub and casing upper section.  
Make mark (center) on steering wheel hub.



- Start engine.  
Open valve (A).  
Read flow pressure.

\*\* See Operating Fluid Specifications



## 32 41 050 REMOVING AND INSTALLING POWER STEERING PUMP

Suck hydraulic fluid out of tank — never reuse it.  
Unscrew pipes.

**Installation:**  
Replace gaskets.  
Tightening torque\*.  
Bleed hydraulic system - refer to 32 13 000.



M20, M21:  
Loosen nut (1) and slacken drive belt by turning toothed element (2).



Unscrew bolts and remove power steering pump.

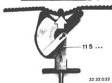
**Installation:**  
Adjust drive belt tension prior to tightening the bolts.



M30:  
Loosen bolts (1).  
Loosen nut (2) and turn tensioning pinion.  
Remove bolts (1).



**Installation:**  
Adjust drive belt tension prior to tightening the bolts.  
Torque tensioning pinion to approx. 8 Nm and tighten nut.



Check drive belt tension using Special Tool 11 B ...  
Hook bears on tip of tooth.

**Important!**  
Ensure sufficient clearance between hoses and body parts, making corrections on hose connections if necessary.

M20, M21:  
Remove ribbed drive belt - refer to Groups 11 and 12.  
Unscrew pump at oil pan.

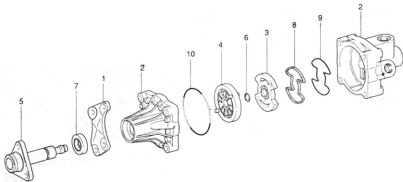
\* Refer to Specifications



# 32-41/7

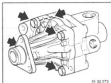
## POWER STEERING PUMP

- 1 Holder
- 2 Body
- 3 Face plate
- 4 Rotor
- 5 Shaft
- 6 Snap ring
- 7 Radial oil seal
- 8 Seal
- 9 Guide
- 10 O-ring



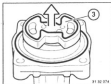
**32 41 563 DISASSEMBLING AND ASSEMBLING POWER STEERING PUMP**  
 - Pump Removed -

Absolute cleanliness is essential when working on pumps.



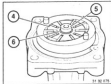
01 92 072

Mark position of holder (1) to pump body (2).  
 Unscrew bolts and separate the body.



01 92 074

Take off face plate (3).



01 92 075

Press down rotor (4) on shaft (5).  
 Remove circlip (6) and pull shaft out of body.  
 Remove rotor (4) with the impellers.



01 92 076

**Assembling**  
 Clean and lubricate all parts with hydraulic fluid.  
 Replace radial oil seal (7) - sealing lip faces in - and pack space between sealing and dust lip with grease.



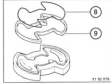
01 92 077

Insert shaft (5) in body.  
 Mount rotor (4) with recess for snap ring facing up and install snap ring (6) in radial groove of the shaft.



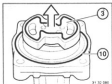
01 92 078

Install the impeller with the polished, rounded outside surfaces facing the cam ring.  
 Check that impeller moves easily.

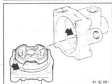


01 92 079

Install seal (8) with wide end facing down and guide (9) in face plate (3).



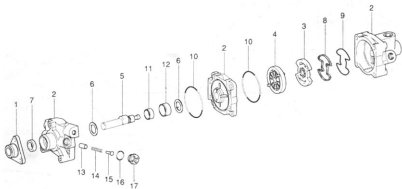
Install face plate (3) on down pin.  
Replace O-ring (10).



Mount body (checking the lines are aligned)  
and bolt down with the holder.  
Tightening torque = 10 to 18 Nm (12 to 14  
ft. lbs.).

Check function after installation of the  
power steering pump.

## TANDEM PUMP LAYOUT DRAWING



31 52 082

- 1 Flange
- 2 Body
- 3 Face plate
- 4 Rotor
- 5 Shaft
- 6 Axial washer

- 7 Radial oil seal
- 8 Seal
- 9 Guide
- 10 O-ring
- 11 Sleeve
- 12 Slide

- 13 Piston
- 14 Spring
- 15 Shaft
- 16 O-ring
- 17 Plug

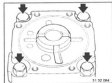
**32 41 ... DISASSEMBLING AND  
ASSEMBLING TANDEM PUMP  
- Pump Removed -**

Absolute cleanliness is required when assembling the pump.  
Lubricate all parts with hydraulic fluid.



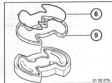
31 52 094

Mark position of flange to shaft and body  
screws to each other.  
Unscrew bolts.  
Take off body.



31 52 094

Unscrew bolts.  
Take off body (4).



31 52 076

Replace seal (8) - wide end facing plate -  
and guide (9).



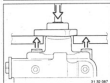
10

Replace O-ring (10).  
Bolt body - bore to bore.  
Tightening torque = 14 + 5 Nm (10 + 4 ft.lbs.).



17

Unscrew both plugs (17).  
Take off piston and sliding ring with sleeves.



31 52 087

Press triangular flange off of the shaft with a  
press, while supporting on the flange.



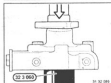
7

Replace radial oil seal (7) - sealing lip facing  
in and filled with grease.

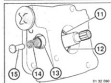
## 32-41/12



Install axial washer (5) and run in shaft (6).



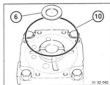
Press on flange with Special Tool 32 3 060.  
Shaft protrusion = approx. 1 mm (0.039").  
Check marks.



Insert sleeve (11) and sliding ring (12).  
Slide in both pistons (13), spring (14)  
and shaft (15).



Replace O-ring (16).  
Tighten plugs (17) with a torque of  
50 Nm (36 ft. lbs.).

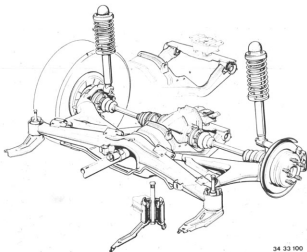


Replace O-ring (16).  
Insert axial washer (5).  
Mount and bolt body.  
Tightening torque = 8 Nm (6 ft. lbs.).

Other jobs – see 32 41 553.

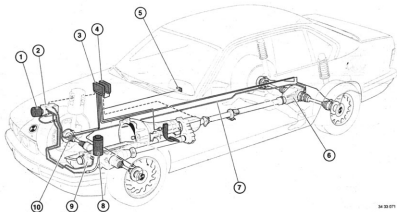
## 33 Rear axle

	Rear axle – layout drawing E34 (excluding 520i, 524td) .....	33-	0/1
	Rear axle – layout drawing (four wheel drive) .....	33-	0/2
	Breaking-in procedures after replacing/repairing final drive .....	33-	10/1
33 10 010	Rear axle final drive – remove and install (525i ... M5/Four wheel drive) .....	33-	10/2
010	Rear axle final drive – remove and install (520i, 524td) .....	33-	10/3
33 11 151	Shaft seal for drive flange – replace .....	33-	11/1
151	Shaft seal for drive flange – replace (E34 Four wheel drive) .....	33-	11/2
33 17 001	Rubber mounts for final drive (rear axle carrier) – replace .....	33-	17/1
006	Rubber mounts for final drive (front and rear) – replace .....	33-	17/2
33 19 000	EH limited slip differential – check function .....	33-	19/1
010	EH limited slip differential – bleed .....	33-	19/2
...	Hydraulic system leak test .....	33-	19/2
060	GSA control unit – remove and install or replace .....	33-	19/3
100	EH limited slip differential hydraulic control unit – remove and install or replace .....	33-	19/4
...	Pressure reservoirs – check pressure .....	33-	19/5
...	Pressure reservoirs – remove and install or replace .....	33-	19/7
33 21 000	Output shaft – remove and install .....	33-	21/1
031	Boot – replace .....	33-	21/1
33 31 000	Rear axle carrier, complete – remove and install .....	33-	31/1
	Arrangement of control arm 13" – axis .....	33-	32/1
33 32 000	Control arm, complete – remove and install .....	33-	32/2
021	Control arm – replace .....	33-	32/3
561	Both rubber thrust mounts – replace .....	33-	32/3
	Toe-in modification on left wheel .....	33-	32/5
	Toe-in modification on right wheel .....	33-	32/6
33 33 071	Rubber mount for rear axle carrier – replace .....	33-	33/1
001	Thrust rod – replace .....	33-	33/3
33 41 151	Wheel bearing and shaft seals – replace .....	33-	41/1
33 52 100	Spring strut shock absorbers – rear left or right, complete – remove and install .....	33-	52/1
131	Spring strut shock absorber, rear left or right – replace .....	33-	52/2
	Arrangement of spring strut at rear .....	33-	52/3
33 53 000	Coil spring, rear left or right – install .....	33-	53/1
	Rear axle – troubleshoot .....	33-	90/1





## FOUR WHEEL DRIVE LAYOUT DRAWING



34 32 071

- 1 Pressure reservoir
- 2 Hydraulic control unit
- 3 ABS control unit
- 4 GSA control unit
- 5 Fault/control lamp

- 6 Rear axle final drive with EM lock
- 7 Hydraulic pipe to rear axle final drive
- 8 Hydraulic fluid tank
- 9 Hydraulic fluid pump
- 10 ABS sensor

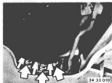
## BREAKING IN PROCEDURES AFTER REPLACING / REPAIRING REAR AXLE FINAL DRIVE

Strict conformance with these breaking in procedures is required for preloading the tapered roller bearing.

During the first 1,000 kilometers the car must be driven at different engine speeds and road speeds, but never faster than 2/3rds of the max. permissible speed.

If there is no conformance with these breaking in procedures, there could be seizure between the tapered rollers and inner race guide band, which in turn will cause continuous noise, overheating and oil leakage.

Install a tag or label to remind the driver of the next oil change.



### 33 19 010 REMOVING AND INSTALLING REAR AXLE FINAL DRIVE - (2M ... 86) / Four Wheel Drive

Unscrew the propeller shaft at the rear axle - refer to Group 26.

**Installation:**  
Replace the self-locking nuts.  
Tightening torque\*.



Unscrew and suspend the output shafts from the car on pieces of wire.

**Installation:**  
Use washers.  
Tightening torque\*.



Rear Axle Final Drive with EH Lock:

Unscrew the hydraulic pipe and plug the opening with a suitable cap.

**Installation:**  
Tightening torque\*.  
Bleed the EH limited slip differential - refer to 33 19 016.



Unscrew the rear axle final drive bolt at the front end of the rear axle carrier.

**Installation:**  
First secure the rear axle final drive on the rear axle carrier with the front bolts.  
Tightening torque\*.

\* Refer to Specifications



Pull the electric wire plug off of the speedometer pulse sender after squeezing both retainers.  
Pull the transmission and plug out of the holder.



Support the rear axle final drive from underneath using a garage jack and Special Tool 33 4 390.

Unscrew the left and right rubber mount bolts and lower the rear axle final drive.

**Installation:**  
Tightening torque\*.  
Check the oil level and, if necessary, add rear axle final drive gear lube\*\*.



**Note:**

When replacing the final drive, note the final drive ratio and version.  
Ratio and version are die-stamped in data plate (1).

\* Refer to Specifications  
\*\* Refer to Operating Fluids



### 33 10 010 REMOVING AND INSTALLING REAR AXLE FINAL DRIVE - 100 and 104cc -

Unscrew the propeller shaft at the rear axle - refer to Group 25.

**Installation:**  
Replace the anti-locking nuts.  
Tightening torque\*



Unscrew and suspend the output shafts from the car on pieces of wire. Unscrew reinforcement strut (1).

**Installation:**  
Use washers.  
Tightening torque\*



Unscrew the bolts at the top of the rear axle carrier.

**Installation:**  
Tightening torque\*



Support the rear axle final drive from underneath using a garage jack and Special Tool 33 4 280.

Unscrew the front bolts.

**Installation:**  
Tightening torque\*



Pull the electric wire plug off of the speedometer pulser sender after squeezing both retainers.

Unscrew the rubber mount bolt and lower the rear axle final drive.

**Installation:**  
Tightening torque\*.  
Check the oil level and, if necessary, add rear axle final drive gear lube\*\*.



**Note:**  
When replacing the final drive, note the final drive ratio and version.  
Ratio and version are die-stamped in data plate.

\* Refer to Specifications

\*\* Refer to Specifications  
\*\*\* Refer to Operating Fluids

33 11 011 Replacing shaft seal and output flange of rear axle differential (Type K/M/G)

Refer to Repair Manual 7 Series E30

33 11 021 Replacing shaft seal for output flange of rear axle differential

Refer to Repair Manual 7 Series E30 for differential Type G and M

Refer to Repair Manual 7 Series E30 for differential Type M and R



33 33 010



33 33 010



33 33 010

### 33 11 151 Replacing shaft seal for drive flange

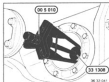
Unlunge output shaft from drive flange and tie back.

**Installation note:**  
Install shims.  
For tightening torque\*.

Press out drive flange with crowbar.

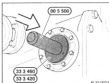
**Installation note:**  
Replace stretched round wire snap rings.  
Before mounting the drive flange, fit the round wire snap ring (1) in the groove of the differential casing such that both ends of the round wire snap ring are sunk in the groove. This prevents the ring being bent to the side. Press on drive flange by hand and by turning slightly until the round wire snap ring can be heard to engage.

\* Refer to Technical Data

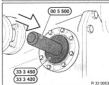


Remove shaft seal with special tool 00 5 010 and suitable thrust piece.

**Installation note:**  
Crash casing flange and sealing lips of shaft seal with differential gear oil.



**Installation note:**  
Drive in shaft seal as far as it will go with special tool 00 5 500/33 3 480 (cover with 4 bolts) or 33 3 420 (cover with 8 bolts).



**Installation note:**  
Drive in shaft seal as far as it will go with special tool 00 5 500/33 3 480 (cover with 4 bolts) or 33 3 420 (cover with 8 bolts).



### 33 11 151 REPLACING SHAFT SEAL FOR DRIVE FLANGE - E34 Four Wheel Drive -

Unscrew the output shaft at the rear axle final drive and suspend it from the car on a piece of wire.

**Installation:**  
Use washers.  
Tightening torque\*

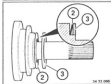
34 33 084



**Left Flange:**

Mount Special Tool 33 2 140 on the drive flange with three bolts and unscrew bolt (1). Pull the drive flange out and ensure that the bearing thrust washers and needle bearing do not fall out.

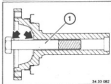
34 33 085



**Installation:**

Insert diaphragm spring (2) and bearing thrust washer (3) on the flange prior to installation of the drive flange. Press the drive flange in by hand and with slight turning.

34 33 086



**Installation:**

Replace bolt (1). Clean the bearing surfaces (between the bolt head and drive flange (sealing surface) thoroughly. Tighten the bolt using Special Tool 90 9 120. Tightening torque\*.

34 33 087



Take needle bearing (4) and thrust washer (5) out of the bearing cap.

**Installation:**

Dip the needle bearing and thrust washer in rear axle final drive gear lube prior to installation. Ensure absolute cleanliness.

34 33 087



Apply Special Tools 33 1 305 and 33 1 306, and pull the shaft seal out using Special Tool 00 5 013.

34 33 088



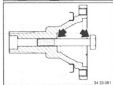
Dip the new shaft seal in rear axle final drive gear lube. Knock the shaft seal in as far as the stop using Special Tool 33 1 192.

34 33 089

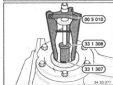
\* Refer to Specifications

**Right-hand flange**

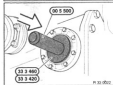
Secure special tool 33 2 140 with three bolts to drive flange and release bolt (6).  
Pull out drive flange

**Installation note:**

Press in drive flange by hand while turning slightly.  
Thoroughly clean contact surfaces between bolt head and drive flange (sealing surface).  
For tightening torque\*.



Fit thrust pieces 33 1 307 and 33 1 308 and remove shaft seal with Special Tool 00 5 010.

**Installation note:**

Coat casing flange and seal lips of shaft seal with differential gear oil.

**Installation note:**

Drive in shaft seal as far as it will go with special tool 00 5 500/33 3 460 (cover with 4 bolts) or 33 3 420 (cover with 6 bolts).

\* Refer to Technical Data



**33 17 001 REPLACING RUBBER MOUNT  
FOR REAR AXLE FINAL DRIVE  
(REAR AXLE CARRIER)**

Pull the electric wire plug off of the speedometer pulse sender.  
Support the rear axle final drive from underneath with a garage jack.



Unscrew the bolts and lower the rear axle final drive.

Installation:  
Tightening torque\*.



Unscrew the bolts and remove the rubber mount.

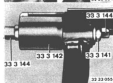
Installation:  
Clean the threads and install the bolts with Loctite.  
Tightening torque\*.



33 33 054

### 33 17 006 REPLACING ALL RUBBER MOUNTS FOR REAR AXLE FINAL DRIVE (FRONT AND REAR)

Remove exhaust assembly - refer to 18 00 029.  
Remove the heat shield.  
Remove rear axle final drive - refer to 33 10 019.  
Unscrew the propeller shaft at the center mount and lower.

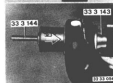


33 3 144

33 3 144

33 3 141

33 33 055



33 3 143

33 3 144

33 3 143



33 3 143

33 3 144

33 3 141

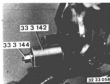
33 33 057

Pull the rear rubber mounts out using Special Tools 33 3 142, 33 3 141 and 33 3 144.

Coat new rubber mounts with Circolight® and install using Special Tools 33 3 143 and 33 3 141.

Push the rubber mounts in flush using Special Tools 33 3 141 and 33 3 144.

\* Source of Supply: BMW Parts



33 3 142

33 3 144

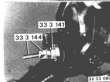
33 33 060



33 3 141

33 3 144

33 33 019



33 3 141

33 3 144

33 33 060



33 3 143

33 33 041

Unscrew the exhaust suspension holder.  
Pull the front rubber mount out using Special Tools 33 3 142 and 33 3 144.

Use Special Tool 33 3 141 for pulling out.

Coat the new rubber mount with Circolight® and install from outside using Special Tools 33 3 141 and 33 3 144.

Counterhold on inside with Special Tool 33 3 143 for pushing in.

\* Source of Supply: BMW Parts

## 33 19 000 CHECKING FUNCTION OF EH LIMITED SLIP DIFFERENTIAL

### Note:

This test is provided only for the sake of checking the entire electro-hydraulic (EH) locking system with simple means.

First ensure that the electro-mechanical (EM) lock functions before checking the EH lock.

EM lock function test - refer to Group 37.

Drive the car onto a lifting platform and raise the platform until all four wheels have cleared ground.

### 1. Checking Free Movement of Limited Slip Differential:

Switch the ignition off.

Release the parking brake lever.

Engage first gear or move the selector lever into P.

Turn the left rear wheel by hand, whereby the right rear wheel must turn in opposite direction.

### Note:

When the rear wheels can only be turned in opposite directions very difficultly or not at all, this is indication that the lock does not open.

### Possible Faults:

1. Mechanical fault in the limited slip differential.
  2. Pressure is not discharged in the hydraulic pipe to the limited slip differential.
- Troubleshooting - refer to diagnosis.

### 2. Checking Locking Effect:

#### Requirement:

Parking brake adjusted correctly.

Remove the dust cover from the parking brake lever.

Pull the parking brake lever up 5 or 6 teeth.

Slacken the parking brake cable of the right rear wheel, until the wheel can be turned easily.

Engage first gear or range D.

Both front wheels and the right rear wheel must turn in forward direction.

The left rear wheel remains locked by the parking brake.

### Caution!

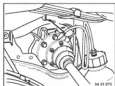
Do not carry out the following test longer than 5 seconds as otherwise the parking brake would be subjected to excessive loads.

Increase the engine speed to 1500 ... 2000 rpm and observe the left rear wheel.

The EH lock is okay, if the left rear wheel is turned in forward direction against the braking effect.

33 19 010 BLEEDING EH LIMITED SLIP  
DIFFERENTIAL

**Note:**  
Carry out the bleeding procedures via  
diagnosis.



Set up the bleeder hose with bottle on the bleeder screw of the rear axle final drive. Start the engine. Loosen the bleeder screw slightly and begin with the bleeding procedures.

Flush the hydraulic system until bubbleless hydraulic fluid runs out (flushing volume approx. 250 cm<sup>3</sup>).

Tighten the bleeder screw.  
"Tightening torque".

**Note:**  
Remove any escaped Pentosin from the surface of the rear axle final drive after bleeding.

Check for leaks - refer to 33 19 ...

Check and, if necessary, correct the hydraulic fluid level in the supply tank - refer to Group 33.

## 33 19 ... CHECKING HYDRAULIC SYSTEM FOR LEAKS

Carry out the leak test via diagnosis.

**Leak Test:**

- Begin the bleeding procedures with the engine running.
- Check connections of the hydraulic system for leaks, especially the hydraulic pipe between the hydraulic control unit and EH limited slip differential.

**33 19 050 REMOVING AND INSTALLING /  
REPLACING GSA CONTROL  
UNIT****Caution!**

Always switch the ignition off before removing or installing the control unit.



Unscrew the screws.  
Remove the cover.



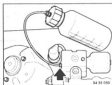
Unlock and pull plug (1) off of the control unit.  
Pull the retainers out and remove the control unit.

### 33-19-100 REMOVING AND INSTALLING / REPLACING HYDRAULIC CONTROL UNIT FOR LH LIMITED SLIP DIFFERENTIAL

#### Note:

Bleed the hydraulic system - refer to 33-19-010.

Switch the ignition off.



Discharge the pressure reservoir on the hydraulic control unit by connecting a bleeder bottle to the pressure-discharging screw and loosening the screw carefully.

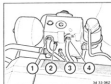
#### Caution!

If the pressure-discharging screw is unscrewed too fast, the bleeder hose could pop off due to the high oil pressure (180 bar).  
Wear protective goggles.

Wear protective goggles.

#### Installation:

Tightening torque\*



Unscrew hydraulic pipes (1 ... 4) and insert suitable caps into the openings.

#### Important!

Don't mix up the hydraulic pipes.

- 1 (T) return pipe to supply tank
- 2 (A) circulating connection (supply tank/ride level height control)
- 3 (P) feed pipe from hydraulic fluid pump
- 4 (R) feed pipe to rear axle final drive

Don't start the engine as the pipe to the pump is disconnected.

#### Installation:

Tightening torque\*

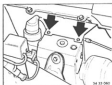


Unlock and pull plug (5) off.

Unscrew the screw and remove the hydraulic control unit.

#### Note:

Don't start the engine when the hydraulic control unit is disconnected, as the fault memory would be activated.



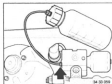
Unscrew the screws and remove the heat shield.

\* Refer to Specifications

\* Refer to Specifications

### 33 19 ... CHECKING GAS CHARGE PRESSURE IN PRESSURE RESERVOIR

Switch off ignition



Discharge the pressure reservoir on the hydraulic control unit by connecting a bleeder bottle to the pressure discharging screw and loosening the screw carefully.

#### Caution!

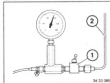
If the pressure discharging screw is unscrewed too fast, the bleeder hose could pop off due to the high oil pressure (180 bar). Wear protective goggles.

Installation:  
Tightening torque\*



Unscrew the pressure discharging screw.

\* Refer to Specifications



Connect a pressure tester to the hydraulic control unit.  
Special Tools 54 3 101/102/103/104/105/106 and 107.

Shut valve (1).  
Start the engine and wait until 140 to 160 bar pressure is built up.  
Stop the engine.  
Connect pipe (2) to a bleeder bottle or plate B in the supply tank.  
Open valve (1) far enough that the pressure drops slowly, while observing the pressure tester gauge.  
The pressure, at which the needle instantaneously drops to 0 bar, is the gas charge pressure of the pressure reservoir.

#### Note:

Repeat the test to double-check.  
If the measured pressure is less than the minimum gas charge pressure<sup>1)</sup>, the pressure reservoir must be replaced.

Remove the pressure tester.  
Install the pressure discharging screw.  
Tightening torque<sup>2)</sup>.

<sup>1)</sup> Refer to Specifications

**Flushing Hydraulic Control Unit:**

Start the engine and wait (approx. 30 sec.) until pressure is built up.

Stop the engine.

Activate the pressure build-up valve as often (2 or three times) via diagnosis (component activation) until flow noise from the hydraulic control unit is no longer heard.

**Important!**

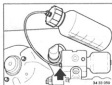
There must only be activation one time per minute.

Check and, if necessary, correct the oil level after finishing the work - refer to Group 32.



### 33 19 ... REMOVING AND INSTALLING / REPLACING PRESSURE RESERVOIR

Switch the ignition off.



Discharge the pressure reservoir on the hydraulic control unit by connecting a bleeder bottle to the pressure discharging screw and loosening the screw carefully.

#### Caution!

If the pressure discharging screw is unscrewed too fast, the bleeder hose could pop off due to the high oil pressure (180 bar).

Wear protective goggles.

#### Installation:

Tightening torque\*



Loosen the pressure reservoir using Special Tool 33 2 090 and unscrew it.

#### Installation:

Screw a new pressure reservoir in.  
Tightening torque\*

\* Refer to Specifications

### Flushing Hydraulic Control Unit

Start the engine and wait (approx. 30 sec.) until pressure is built up.

Stop the engine.

Activate the pressure build-up valve as often (3 or less times) via diagnosis (component activation) until flow noise from the hydraulic control unit is no longer heard.

#### Important!

There must only be activation one time per minute.

Check and, if necessary, correct the oil level after finishing the work - refer to Group 32.



33 21 004

## 33 21 006 REMOVING AND INSTALLING OUTPUT SHAFT

Unscrew output shaft on final drive and rear axle shaft.

**Installation:**  
Install washers on transmission and rear axle ends.  
Tightening torque\*.



38 33 031

## 33 21 031 REPLACING DUST COVER

Remove output shaft - see 33 21 006.  
Press off seating cover (1).  
Remove circlip (2).  
Loosen strap on dust cover.  
Press off cover (3).  
Peel off the dust cover.



38 33 022

Press output shaft out of constant velocity joint.

**Important!**  
Bearing inner race must bear on counterpressure plate (P).  
Don't disassemble the joint.  
Check joint for dirt or damage.

\* See Specifications



33 21 071

Mount dust cover with inside cover on the output shaft.  
The joint must be positioned with the inner race collar facing the output shaft.

**Important!**  
Use a repair kit.  
Dust cover is mounted on the cover.



38 33 078

Remove grease from splines of joint.  
Coat splines with Lactol No. 378.

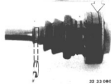
**Important!**  
Keep Lactol out of ball grooves.



38 33 079

Press on joint with cap and install circlip.

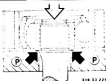
**Installation:**  
If only one end is disassembled, the seating cover on the other end must be removed to press on the joint.



38 33 080

Fill joint and dust cover with grease\*.  
Remove grease from seating surface for the dust cover.  
Mount dust cover with a new strap.  
Seal the seating cover with Curtl K2\*\* and install.

\* See Specifications  
\*\* Source of Supply: FHWB



38 33 026



### 33 31 000 REMOVING AND INSTALLING REAR AXLE CARRIER ASSY.

Remove exhaust assembly - see 18.20 020.  
 Remove propeller shaft - see 26 11 000.  
 Disconnect brake cables on parking brake lever - see 34 41 000.  
 Draw off brake fluid in tank with a syringe reserved exclusively for use with brake fluid.  
 Remove the float housing for this purpose.

**Installation**  
 Fill with brake fluid\*\* and bleed brakes.  
 Unplug right brake pad wear indicator. Disconnect ground lead and lift lead out of clamps.

Pull down connecting plug for both pulse senders and disconnect.

**Important!**  
 Don't destroy the rubber grommet.

Pull brake cables out of guides. Unscrew left and right brake lines.

**Installation:**  
 Tightening torque\*.

\* See Specifications  
 \*\* See Gr. 34 of Operating Fluids



Disconnect plug on speedometer pulse sender, squeezing both tabs together for this purpose.  
 Remove holder.



Support final drive with a workshop jack.  
 Unscrew left and right thrust struts on the floor plate.

**Installation:**  
 Replace self-locking nuts. Tightening torque\*.

Unscrew rear mounting bolt.

**Installation:**  
 Tightening torque\*.



Unscrew left and right shock absorbers on trailing arms. Lower the rear axle carrier.

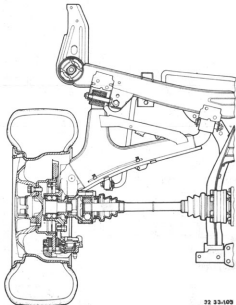
**Installation:**  
 Tighten mounting bolts with the car in normal position\*\*. Tightening torque\*.

Lift car and pull out complete rear axle carrier.

\* See Specifications  
 \*\* See Specifications of Gr. 32



TRAILING ARM LAYOUT DRAWING  
13° Trail Angle





### 33 33 000 REMOVING AND INSTALLING TRAILING ARM ASSEMBLY

Remove rear wheel - see 36 10 300.  
Pull up parking brake lever and unscrew output shaft on the drive flange, suspending it from the car on a piece of wire.

Installation:  
Tightening torque\*.



Remove brake cable on parking brake lever - see 34 41 000.  
Draw off brake fluid in tank with a syringe reserved exclusively for use with brake fluid.  
Remove fical housing for this purpose.

Installation:  
Pour in brake fluid\*\* and bleed brakes - see 34 00 048.



Pull down and disconnect plug for pulse sender.

Important!  
Don't destroy the rubber grommet.



Pull parking brake cable out of guide.  
Disconnect brake line.

Installation:  
Tightening torque\*.



Support trailing arm from underneath.  
Unscrew trailing arm on rear axle carrier.

Installation:  
First insert bolt on the inner console.

Important!  
Tighten mounting bolts with the car in normal position\*\*.  
Tightening torque\*.



M 5:  
Installation:  
Tighten bolt with Special Tool 33 3 060 in conjunction with a torque wrench set to 55 Nm (40 ft. lbs.).



Unscrew stabilizer.  
Unscrew shock absorber and take off the trailing arm.  
Important! - Installation:  
Tighten mounting bolts with the car in normal position\*\*.  
Tightening torque\*.  
Check ride level height of car with ride control - see 37 12 016, adjusting if necessary.

\* See Specifications  
\*\* See Operating Fluids

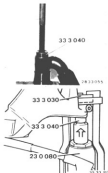
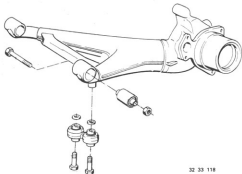
\* See Specifications  
\*\* See Specifications of Gr. 32

## 33-32/3



### 33 32 001 REPLACING TRAILING ARM

Remove trailing arm - see 33 32 000.  
Replace wheel bearings and shaft seal - see 33 32 151.  
Transfer guard.  
Rubber mounts are already installed in a new trailing arm.



### 33 32 581 REPLACING BOTH THRUST RUBBER MOUNTS - Trailing Arm Removed -

Press out rubber mounts in a press with Special Tool 33 3 040.

If a suitable press is not available, press out (and in) rubber mounts with Special Tools 33 3 030 and 33 3 030 / 040.  
Screw in pad of the pulling tool in such a manner, that the threaded section faces up.



#### Installation:

Longer section of each inner bushing faces the center of the car.

Eccentric thrust rubber mounts could be installed to correct rear axle toe deviation caused by the unfavorable summary of tolerances.

**Important!**

This measure may never be applied for the "elimination" of changes in axle geometry caused in an accident.

Check the rear wheel alignment - refer to Group 32.

Remove complete trailing arm - refer to 32 32 000.

Press the rubber mount out - refer to 32 32 061.



32 32 061

Mark the trailing arm in horizontal position on the trailing arm eye.



32 32 062

Take the corresponding angle displacement from the following diagram. Connect the numbers for toe correction on both ends of the rubber mount with lines.



32 32 063

Coat the rubber mount with Circolight® and apply it on the trailing arm that the line is aligned with the mark on the trailing arm. Press the rubber mount in. Mount the trailing arm and check the rear wheel alignment.

If correction on the outer rubber mount is not sufficient, an eccentric rubber mount may also be used on the inside.



32 32 031

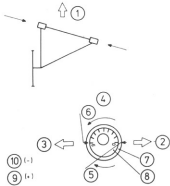
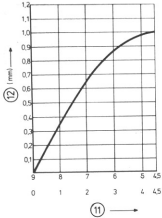


32 32 040

32 32 054

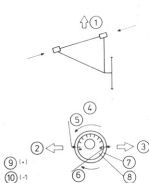
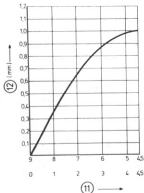
TOE CHANGE ON LEFT REAR WHEEL

- 1 Forward direction
- 2 Forward direction - inner rubber mount
- 3 Forward direction - outer rubber mount
- 4 Pressing-in note
- 5 Reading point - toe increase
- 6 Reading point - toe decrease
- 7 Trailing arm eye
- 8 Thrust rubber mount
- 9 Toe increase
- 10 Toe decrease
- 11 Displacement angle
- 12 Toe change





## TOE CHANGE ON RIGHT REAR WHEEL



- 1 Forward direction
- 2 Forward direction - inner rubber mount
- 3 Forward direction - outer rubber mount
- 4 Pressing-in note
- 5 Reading point - toe increase
- 6 Reading point - toe decrease
- 7 Trailing arm eye
- 8 Thrust rubber mount
- 9 Toe increase
- 10 Toe decrease
- 11 Displacement angle
- 12 Toe change



33 33 008

### 33 33 001 REPLACING RUBBER MOUNTS FOR REAR AXLE CARRIER

Remove the rear seat.  
Support the trailing arms from underneath.  
Unscrew the thrust stud.

Installation:  
Replace the self-locking nuts.  
Tightening torque\*.

Knock the studs out upwards.

Important!

Don't damage the threads.  
If applicable, cut off protruding rubber at the openings.

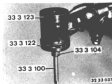


33 33 009



33 33 006

Place Special Tool 33 3 121 on the rubber mount between the body and rear axle carrier, and screw in Special Tool 33 3 107.  
Apply Special Tool 00 8 550 with its jaws in the openings, secure with Special Tool 33 3 107 and pull the rubber mount out.  
Insert the rear axle carrier at the rubber mount take-up with an industrial hot air blower to make this step easier.



33 33 007

Place Special Tool 33 3 123 on the edge of the take-up sleeve between the body and rear axle carrier, and screw in Special Tool 33 3 103.  
Coat the rubber mount with Circodiger\*\* and apply it on the rear axle carrier.  
Pull it in using Special Tools 33 3 103 and 33 3 104.

\* Refer to Specifications.

\*\* Refer to Specifications.

\*\* Source of Supply: BMW Parts



### 33 41 151 REPLACING SHAFT SEALS AND WHEEL BEARINGS

Unscrew output shaft on drive flange and suspend from car on a piece of wire.  
Remove rear brake disc - see 34 21 326.

Installation:  
Tightening torque\*.



Left out lockplate.  
Remove ABS speed sensor.



Mount Special Tool 33 4 000 with two M 10 x 30 bolts.  
Unscrew collar nut.



Pull off drive flange with Special Tool 00 7 501 and two M 10 x 30 bolts.



Screw on collar nut flush with end of shaft and drive out with a nylon hammer.

Installation:  
Check splines.  
Check drive flange, replacing flange if necessary.



Left out circlip.



Pull out wheel bearings with Special Tools 33 4 031, 33 4 032 and 33 4 038.



Use Special Tool 33 4 033.

\* See Specifications

Pull inner bearing shell off of the rear axle shaft with Special Tool 00 7 500.



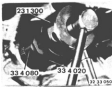
Push in complete wheel bearing with Special Tools 33 4 036, 33 4 032 and 33 4 030.



Use Special Tool 33 4 037.



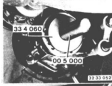
Install circlip.



Pull in rear axle shaft with Special Tools 33 1 300, 33 4 080 and 33 4 030.



**Important!**  
Give bearing surface on collar nut a light coat of oil.  
Apply Special Tool 33 4 000.  
Tighten collar nut.  
Tightening torque\*.



Drive in lockplate with Special Tools 33 4 060 and 00 5 000.



Install output shaft.  
Use washer.  
Tightening torque\*.

\* See Specifications

### 33 52 100 Removing and installing complete left or right rear spring strut shock absorber

Level control, refer to 31 12 100.

#### Notes:

Remove backrest, refer to 52 20 800.

#### Touring:

Remove wheel arch trim, refer to 31 47 121.

Jack up vehicle and support semi-trailing arm.



34 33 021\*

#### Caution!

The spring strut shock absorber performs the function of an arrester band.

Unfasten screws and remove spring strut shock absorber from semi-trailing arm.

#### Installation:

Tightening torque 33 52 1A2\*



34 33 021\*

Lift up trim (1).

\* Refer to Technical Data



34 33 033\*

Remove cap (2).



33 33 040\*

Brace spring strut shock absorber, unfasten screws and remove spring strut shock absorber.



33 33 010\*

#### Installation:

Replace sealing disc (1).  
Replace self-locking nuts.  
Tightening torque 33 52 5A2\*

#### Note:

Only store shock absorbers in upright position.

If shock absorbers are stored for extended periods with the piston rod retracted, this can give rise to hammering noises when driving.

#### Remedy:

Remove piston rod and store shock absorber upright at room temperature for 24 hours.

\* Refer to Technical Data

### 33 52 131 Replacing rear left or right spring strut shock absorber

Whether a shock absorber needs to be replaced can only be determined by testing it when installed with a shock tester or when removed with a shock absorber testing machine.  
Refer to 54 37 01 02 (362).

When replacing, a spring strut shock absorber with the same identification designation must always be installed.

Remove spring strut shock absorber, refer to 33 52 930.



33 33 074

Check support bearing (4) for damage.

Remove cap (1).



33 33 071

Release nut.  
Remove support bearing and coil spring.

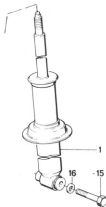
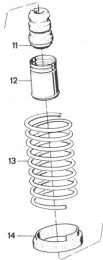
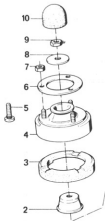
Installation note:  
Refer to spring strut layout for installation sequence.  
For tightening torque 33 52 342\*.



33 33 073

\* Refer to Technical Data

## REAR SPRING STRUT LAYOUT DRAWING



33 33 106

- 1 Shock absorber
- 2 Support
- 3 Upper spring ring
- 4 Mount
- 5 Bolt
- 6 Insulator
- 7 Collar nut M 8
- 8 Disc

- 9 Nut M 10 x 1 - B ZN
- 10 Cap
- 11 Rubber damper
- 12 Protective tube
- 13 Coil spring
- 14 Lower spring ring
- 15 Bolt M 14 x 1,5 x 80
- 16 Washer

**33 53 000 Removing and installing rear  
left or right coil spring**

The procedure is identical as that for replacing  
spring strut shock absorber, refer to 33 53 134.



## TROUBLESHOOTING REAR AXLE

Condition	Cause	Correction
Load change knock	Backlash excessive Output shaft defective Play in propeller shaft slide	Adjust backlash – see 33 52 55/1 Replace output shaft – see 33 21 000 Install slide with Loctite No. 75 for joints
Traction or compression noise	Backlash excessive or insufficient	Adjust backlash – see 33 52 55/1
Drumming	Propeller shaft Rubber mounts on rear axle carrier defective	See "Troubleshooting Propeller Shaft" Replace rubber mounts – see 33 33 671
Oil loss	Radial oil seals leak Vent clogged Wrong oil grade*	Replace radial oil seals Clean vent – see Service Information of Group 33 Replace final drive oil
Vibration	Imbalance of wheels Output shaft defective Propeller shaft	Balance wheels, replacing rims if necessary Replace output shaft – see 33 21 000 See "Troubleshooting Propeller Shaft"
Rattling or grinding noise	Shock absorbers loose Upper shock absorber rubber mount defective Lower shock absorber rubber mount defective Rubber mounts on rear axle carrier defective	Tighten shock absorbers Replace rubber mount Replace shock absorber – see 33 52 100 Replace rubber mounts – see 33 33 671
Grinding noise only when driving in curves	Wheel bearings defective	Replace wheel bearings – see 33 41 151

# 34 Brakes

34 00 ...	General information .....	34-	0/1
34 00 ...	Notes on brake fluid .....	34-	0/1
34 00 ...	Notes on brakes .....	34-	0/1
34 00 ...	Notes on brake lines .....	34-	0/1
	General information ABS/ASC+T .....	34-	0/2
34 00 009	Brake test on test rig .....	34-	0/2
519	Foot brakes (high pressure, low pressure check) – check .....	34-	0/3
017	Brake booster – check function .....	34-	0/4
046	Brake system – bleed .....	34-	0/5
047	Brake system with ABS – bleed .....	34-	0/5
	Function description ASC+T .....	34-	0/6
	Function test brake initiation without test equipment .....	34-	0/6
048	Brake system with ABS/ASC+T – bleed .....	34-	0/7
040	ASC+T mineral oil circuit – bleed .....	34-	0/9
048	Brake system with ABS/ASC+T – bleed .....	34-	0/10
34 10 014	Handbrake – adjust .....	34-	10/1
34 11 000	Pads of both front disk brakes – remove and install/replace .....	34-	11/1
020	Front brake calipers – remove and install .....	34-	11/2
092	Front brake calipers – overhaul .....	34-	11/3
220	Front brake disc – remove and install .....	34-	11/4
599	Front brake disk – check for runout and thickness deviation .....	34-	11/5
667	Front brake disc – grind .....	34-	11/5
34 21 200	Rear brake pads – remove and install .....	34-	21/1
745	Rear brake calipers – remove and install .....	34-	21/1
292	Rear brake calipers – overhaul .....	34-	21/2
320	Rear brake disks – remove and install .....	34-	21/3
879	Rear brake disks – check for runout and thickness deviation .....	34-	21/4
947	Precision turning rear brake disks .....	34-	21/4
34 31 000	Master brake cylinder – remove and install .....	34-	31/1
500	Master brake cylinder – remove and install (M60) .....	34-	31/2
34 32 361	All brake lines – replace .....	34-	32/1
381	Brake hose, front – replace .....	34-	32/1
451	Brake hose, rear – replace .....	34-	32/1
34 33 505	Brake unit (brake booster) – remove and install or replace .....	34-	33/1
505	Brake unit (brake booster) – remove and install or replace .....	34-	33/2
051	Non-return valve for brake unit – replace .....	34-	33/3
071	Vacuum hose for brake units – replace .....	34-	33/3
34 41 000	Hand brake lever – remove and install .....	34-	41/1
	Arrangement, handbrake lever .....	34-	41/2
100	Handbrake Bowden cable – remove and install .....	34-	41/3
220	Handbrake shoes – remove and install .....	34-	41/3
	Arrangement, ABS .....	34-	50/1
	Function and examination of the ABS telltale .....	34-	50/2
34 50 000	Anti-lock braking system – function check .....	34-	50/3
34 51 520	Hydraulic unit (for ABS), complete unit – remove and install or replace .....	34-	51/1
520	Hydraulic unit (for ABS), complete unit – remove and install or replace (M60) .....	34-	51/2
	ABS components .....	34-	51/4
525	Hydraulic unit (ASC+T) – remove and install or replace (M60) .....	34-	51/5
525	Hydraulic unit (ASC+T) – remove and install or replace .....	34-	51/7
34 51 540	ASC+T filter – remove and install or replace .....	34-	51/8
34 52 510	Control unit (for ABS) – replace .....	34-	52/1
61 12 510	One impulse sensor (for ABS) at front – replace .....	34-	52/2
522	One impulse sensor (for ABS) at rear – replace .....	34-	52/2
61 31 570	Relay on hydraulic unit (for ABS) – replace .....	34-	52/3
62 99 080	Telltale for ABS – replace .....	34-	52/3
	Brake system – troubleshoot .....	34-	90/1

## 34-0/1

### 34 00 ... General information

Ensure absolute cleanliness and only use lint-free cleaning rags.  
No oil or grease must enter the brake system as this could cause the brake system to fail.  
On no account must brake cleaner enter the brake system when cleaning brake components (with brake cleaner, refer to **BMW Parts Service**)  
Even small traces of brake cleaner must be avoided. Only use approved assembly pastes when carrying out repairs on brake callipers, refer to **BMW Parts Service**.  
Wash off brake dust or remove with vacuum cleaner, do not blow off with compressed air. The dust is hazardous to health!

### 34 00 ... Notes on brake fluid

Refer to **BMW Fluids and Lubricants Specifications**.  
Should brake fluid get into the eyes, immediately flush with ample clean water and visit ophthalmologist.  
Avoid skin contact, if necessary, clean with soap and water.  
Replace brake fluid every two years at the latest.  
On no account re-use drained brake fluid.  
Dispose off brake fluid only in approved facilities, refer to Workshop Equipment Planning documentation.  
Ensure no brake fluid comes in contact with the vehicle paintwork since it is aggressive and destroys paint.

### 34 00 ... Notes on brakes

Brake disks, brake drums, brake pads.  
Brake disks, brake drums and brake pads should only be replaced in axle sets.  
Brake disks, brake drums must show no signs of scoring or cracks.  
Minimum disk thickness (MIN TH), disk runout, parallel alignment and peak-to-valley height of friction surfaces must not exceed or drop below the permissible limits, refer to Technical Data.  
Brake pads must not wear down to below the specified minimum pad thickness, refer to Technical Data.  
Remove preserving agent on new components before installing.

### 34 00 ... Notes on brake lines

Release and tighten brake line screw fittings only with a special brake line wrench (this avoid damaging brake lines).  
Close off open connections of brake lines and individual components to ensure no dirt can enter the brake system.  
The brake system must be bled after brake lines have been released.  
Check all connecting parts for leaks.  
Brake lines and brake hoses must be laid correctly and must not rest or chafe on the body or fixed components.  
Firmly tighten brake hoses at the front wheels only with the wheels in the straight ahead position.

## General instructions for ABS/ASC-T

The ABS requires no maintenance at all but you must observe the following when ABS is fitted:

Plug must be pulled off the electronic control unit when welding with an electric welder (ignition switched off).

During painting work, the electronic control unit can be exposed for up to 2 hours to max. 95° C and, over longer periods, to max. 85° C.

Do not incorrectly connect up the brake lines on the hydraulic unit; if necessary, mark them prior to disassembly.

The ABS system must be checked in accordance with the Electrical Troubleshooting Manual if one of the following ABS components is removed or replaced:

- Hydraulic unit
- ABS control unit
- Wheel speed sensor
- ABS wiring harness
- Valve control relay
- Electric motor relay

S20 with ASC-T up to model year 94:

The ABS/ASC control unit must be reconfigured in accordance with the BMW Diagnosis unit if one of the following components is removed or replaced:

- ABS control unit
- Throttle valve assembly
- Throttle valve potentiometer

## 34 00 009 Checking Brakes on Test Stand

## Requirements:

Switch off ASC-T

On four-wheel drive vehicles, switch off GSA system (Governed Locking 4WD)

Tire profile G.K.

Tire fill pressure G.E.

Brake at operating temperature and dry (if necessary, heat up by applying brakes several times)

Observe the operating specifications of the relevant test bench manufacturer.



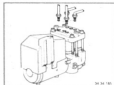
## Disable GSA system

In a separate fuse box, in the front left side of the engine compartment, there are two fuses for the GSA system.

To disable the system without activating the error memory, only remove fuse (2).

## Fuse:

- |   |      |
|---|------|
| 1 | 25 A |
| 2 | 5 A  |



31 34 130

### 34 00 519 Check footbrake (high pressure, low pressure check)

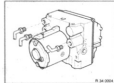
Brake circuit distribution:  
Without ABS with 4 channel ABS

1st brake circuit, front right and rear left.  
2nd brake circuit, front left and rear right.



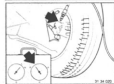
31 34 134

Brake force distribution:  
With 3 channel ABS ASC-T  
1st brake circuit, front axle.  
2nd brake circuit, rear axle.



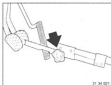
31 34 024

Brake force distribution:  
ABS, ABS ASC-T from model year 04  
1st brake circuit, front axle  
2nd brake circuit, rear axle



31 34 020

Unscrew one bleeder valve on a wheel brake in the 1st brake circuit.  
Connect up pressure tester and bleed the system.



31 34 027

### High Pressure Leak Test:

Apply force\* to brake pedal and block brake pedal with pedal support.  
Pressure may drop by max. 8% after two minutes.



31 34 020

### Low Pressure Leak Test:

Release pedal support until test pressure in brake system falls to between 2 ... 3 bar.  
Vehicle and display unit must be at rest because vibrations falsify the results.  
Over a test period of 5 minutes, the pressure must not drop at all.  
If pressure drops sharply, check all rubber parts.  
After the leak check, bleed the brake system, refer to 34 00 048/047.

Follow similar procedure for high and low pressure leak test of the 2nd brake circuit.

### 34 00 017 CHECKING FUNCTION OF BRAKE BOOSTER

#### 1. Operation Test

Operate the brake pedal with the engine stopped so often until it is hard to operate. Operate the brake pedal and start the engine.

The brake booster is okay if the brake pedal gives.

If not, refer to the troubleshooting chart.

#### 2. Leak Test

Run engine at about 3,500 rpm to operating temperature and release the accelerator (repeating 2 or 3 times) to build up vacuum in the brake booster.

Stop the engine and operate the brake pedal with a force which is equal to normal braking of the car.

The brake pedal operation should be spongy at least 1 or 2 times, whereby the suction holes of the brake booster will be heard.

In this case there is no leak and the system is okay.

If not, refer to the troubleshooting chart.



#### 3. Engine Vacuum Test

Disconnect the vacuum hose from the brake booster.

Install Special Tool 34 3 190 between the brake booster and non-return valve.

Run engine at about 3,500 rpm to operating temperature and release the accelerator (repeating 2 or 3 times) to build up vacuum in the brake booster.

Specification: approx. - 0.7 bar.

Stop the engine and discharge the vacuum by operating the brake pedal several times. Repeat this test two times.

If not okay, refer to Group 11.



#### 4. Brake Booster Test

Unscrew the bleeder screw from the left front brake caliper.

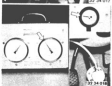
Connect the pressure tester and bleed. Mount a pedal force meter on the brake pedal.

Run engine at about 3,500 rpm to operating temperature and release the accelerator (repeating 2 or 3 times) to build up vacuum in the brake booster.

Apply force\* to the brake pedal.

This must cause the line pressure of the brakes to reach the nominal value\*.

If this value is not reached in a brake system in perfect condition, replace the brake booster.

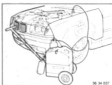


\* Refer to Specifications

## 34 00 046 BLEEDING BRAKES

**Note:**

Only use approved brake fluid\*.  
 Conform with the brake fluid change intervals\*.  
 Keep brake fluid off of painted surfaces on the car as brake fluid would destroy the paint finish.



Connect a bleeder to the brake fluid tank.

**Note:**

Conform with the operating instructions supplied with a pertinent bleeder.  
 The charging pressure must not exceed two bar.



Connect the bleeder hose with bottle to the bleeder screw of the right rear brake caliper.

Loosen the bleeder screw.  
 Tighten the bleeder screw when bubbleless brake fluid runs out.  
 Repeat these bleeding procedures at left rear, right front and left front.

**After Finishing Work:**

Check the brake fluid level.  
 Check rubber gasket (1).

\* Refer to Operating Fluids

## 34 00 047 BLEEDING BRAKES WITH ABS

Connect a bleeder to the brake fluid tank.  
 Conform with the operating instructions supplied with a pertinent bleeder.

**Important!**

Don't use air flushing.

Operate and hold the brake pedal down.

Connect the bleeder hose with bottle to the bleeder screw and open the bleeder valve on the wheel brake, beginning at right rear. Release the brake pedal and then operate it as far as the stop twelve times.

Hold the brake pedal in down position.  
 Shut the bleeder valve.

Release the brake pedal.  
 Repeat these procedures at left rear, right front and left front.

## DESCRIPTION OF AUTOMATIC STABILITY AND TRACTION CONTROL (ASC+T)

## Tasks of ASC+T:

- Taking the load off of the driver during car operation.
- Guarantee of directional stability and steering.
- Improvement of traction (-T).
- Information for the driver.

## Description of Operation:

The system has the task of regulating the slip of the driven wheels to an optimal value in reference to directional stability and vehicle propulsion regardless of the driving situation.

For regulation the engine torque is reduced by influencing the ignition (ignition timing control or injection/ignition blendout via DME) and reducing the throttle valve gap (ADB: ASC throttle valve positioner). If these measures are not sufficient, the driven wheel rotating tyre test is slowed down by the wheel brake.

The system is switched on automatically after starting the engine and can be switched off manually. The ASC lamp is off with the system switched on.

When regulation is activated, this is reported to the driver by a flashing ASC lamp in the instrument cluster.

If the ASC lamp lights up continuously, the system has been switched off automatically due to an occurred fault or had been switched off by hand.

## Note:

Troubleshooting – refer to Car (Electric / Electronic) Test Plan.

## Important!

The mineral oil circuit must be bled if repairs had been carried out on mineral oil equipment and pipes between the tank and up to and including the ASC+T hydraulic control unit.

Switch the ASC+T off for tests on the brake dynamometer or performance test stand!

## OPENED BRAKE SYSTEM FUNCTION TEST WITHOUT TESTER

Car on lifting platform — wheels have cleared ground.

## Procedures:

- Left rear wheel can be turned easily.
- Move shift lever into neutral or selector lever into "N".
- Start the engine.
- Regulate the engine speed to 2000 ± 100 rpm with help of the accelerator pedal.
- Spin the left rear wheel quickly by hand in forward direction (if applicable, hold the right rear wheel tight during test).

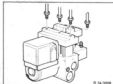
## Reaction:

- Left rear wheel is braked noticeably.

## Procedures:

- Repeat the test on the right rear wheel.





34 00 048

### 34 00 048 Venting brake system with ABS/ASC+T (ABS/ASC+T 525) M50 up to model year 04)

#### Note:

Conform with the filling and bleeding procedures when replacing or repairing the tandem master brake cylinder hydraulic unit ABS/ASC+T and components installed between these assemblies.

For other work on the brake system (e.g. replacing the brake calipers), conform to specification "Bleeding brake system with ABS", refer to 34 00 047.



34 00 150

#### 1. Bleed suction line

Fit hose of bleeder bottle to the bleed screw on the hydraulic unit.  
Open bleeder screw and flush suction line until brake fluid emerges without air bubbles.  
Close bleeder screw.

#### Note:

For greater ease of access to bleeder screw, special tool 34 3 110 can be used.

#### Caution!

Always ensure that there is no hydraulic fluid in special tool 34 3 110. If necessary, clean before use.

#### Installation:

Tightening torque 34 00 142\*

Connect BMW Service Tester / MoDC to diagnosis plug.  
Call up diagnosis program (ABS/ASC/ASD).

Call up diagnosis program (ABS/ASC/ASD).



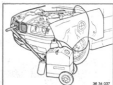
34 00 026

#### 2. Perform preliminary bleeding operation on brake system.

On each wheel brake, open vent screw in specified sequence and flush until brake fluid emerges without air bubbles.

#### Sequence:

- rear right
- rear left
- front right
- front left



34 00 027

Connect bleeding device to expansion tank and switch on.

#### Note:

Conform with manufacturer's operating instructions.  
Charging pressure should not exceed 2 bar.



34 00 028

#### 3. Bleed secondary circuit in hydraulic unit

On rear right wheel brake, connect bleeding bottle.  
Loosen bleeder screw.  
Perform bleeding operation using BMW Diagnostic System.  
Close bleeding screw.

\* Refer to Technical Data

#### 4. Bleed brake system (training operation)

On each wheel brake, in the specified sequence, drain off approx. 50 cm<sup>3</sup> of brake fluid.

Sequence:

rear right  
rear left  
front right  
front left

Then perform following procedure on each wheel brake:

- Open bleeder screw
- Depress brake pedal hard 5 times
- Drain away brake fluid until it emerges without air bubbles for about 100 cm<sup>3</sup>

Sequence:

rear right  
rear left  
front right  
front left



Switch off bleeding unit and remove from expansion tank.

Check brake fluid level.

Pay attention to rubber seal (1).

Remove BMW Service Tester / MoDC and connect up diagnosis plug.

### 34 00 040 BLEEDING ASC + T MINERAL OIL CIRCUIT

#### 1. Filling Mineral Oil Circuit

##### Important!

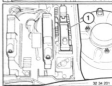
Ensure that brake system is filled with brake fluid before filling the mineral oil circuit with hydraulic fluid\*.

Fill brake system - refer to point 1 in 34 00 000.



34 04 071

Switch off ignition.  
Unscrew screws and take lid off of electronic box.



34 04 071

Unstick and pull plug (1) off of ABS/ASC+T control unit.

Fill circuit with hydraulic fluid - refer to Group 32.



#### 2. Bleeding Mineral Oil Circuit

##### Note:

The plunger-type hydraulic control unit is bled by running the engine.

Switch off ignition.  
Connect plug (1) on ABS/ASC+T control unit.

Start and run engine at idling speed at least 60 seconds (automatic) charging of ASC+T plunger-type reservoir.



Apply Special Tool 34 3 110 on bleeder screw of plunger-type hydraulic control unit and place end of hose in supply tank. Loosen bleeder screw and flush plunger-type hydraulic control unit until bubbleless hydraulic fluid runs out (at least 15 sec.). Tighten bleeder screw.

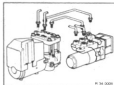
##### Note:

Tightening torque.

Check and, if necessary, correct hydraulic fluid level - refer to Group 32.

\* Refer to Operating Fluids

\* Refer to Specifications



### 34 00 048 Bleed brake system with ABS/ASC-T

ABS/ASC-T with plunger hydraulic unit

© 34 0001

#### Note:

Use the specified filling and bleeding specification when replacing or repairing components in the tandem master brake cylinder and ASC-T - plunger hydraulic unit (both included in each case).

For all other work on the brake system (e.g. replacing the brake calipers), continue to use the relevant specification "Bleeding brake system with ABS" (refer to 34 00 047). This can also be used on vehicles fitted with ASC-T.



### 1. Fill brake system with brake fluid \*

Connect bleeder hose and fluid receptacle to rear right brake caliper.  
Open bleeder valve and bleed until brake fluid emerges without air bubbles, for at least 4 minutes, then close the bleeder valve.  
Fill wheel brakes at rear left, front right and front left in a similar manner (bleed time per front wheel brake at least 1 minute)

© 34 0001

### 2. Bleed brake system

#### Caution!

Before performing the bleeding operation, always ensure that the oil side of the ASC-T plunger hydraulic unit has been vented. This applies especially when replacing or repairing control oil assemblies and lines between the expansion tank and the plunger hydraulic unit. If necessary, before bleeding the brake system, first bleed the ASC-T mineral oil circuit, refer to 34 00 046.

It is only possible to vent the ASC-T hydraulic unit correctly in conjunction with ABS/ASC test equipment 34 5 010.



Connect bleeder unit to expansion tank.

#### Note:

Conform with operating instructions supplied with bleeder.

The fill pressure must not exceed 2.5 bar.

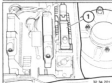
© 34 0007

\* see BMW Operating Fluids Specification

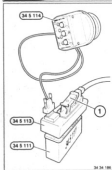


### 2.1 Bleed rear axle brake circuit:

Switch off ignition.  
Unscrew screws and remove cover from the electronics box.



Unlock control unit plug (1) and remove from control unit of ABS-ASC-T.



Attach test adapter 34 S 113 to test control unit 34 S 111.

Attach diagnosis connection cable 34 S 114 to test adapter 34 S 113.

Attach control unit plug (1) to test adapter 34 S 113.



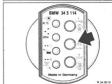
Move shift lever (manual) into neutral or move selector lever (automatic) into "P" or "N".

Start engine.



Connect the bleeder hose with bottle to the right rear brake caliper.  
Open bleed valve and fully depress brake pedal at least 20 times (brake fluid must emerge without air bubbles).

Release brake pedal.



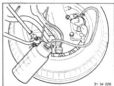
Actuate red button to start bleeding routine (duration approx. 60 seconds).

Caution!  
Brake fluid should emerge without bubbles. If necessary, repeat the bleeding procedure.

Close the bleeder valve.

Bleed rear left wheel brake in similar manner.

Switch off engine.



### 2.2 Bleed front axle brake circuit:

Connect bleeder hose and bottle to front right brake caliper.

Open bleed valve and fully depress brake pedal at least 12 times (brake fluid must emerge without air bubbles).

Keep the brake pedal depressed, close the bleeder valve and release the brake pedal. Bleed the front left wheel brake in a similar manner.



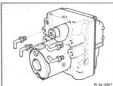
Switch off bleeder unit and remove from expansion tank.

Check brake fluid level.

Screw cap on the (brake fluid tank (ensure that rubber seal (1) is installed in cap).

Switch off ignition.

Disconnect control unit plug from adapter and connect up to ABS/ABC-T control unit. Install cover on electronics box.



### 34 00 048 Bleeding brake system with ABS/ASC-T

ABS/ASC-T from model year '04

#### Note:

Conform with the filling and bleeding procedures when replacing or repairing the Tandem master brake cylinder Hydraulic unit, ABS/ASC-T and components installed between these two assemblies.

For other work on the brake system (e.g. replacement of brake calipers), conform to specification "Bleeding the ABS brake system", refer to 34 00 047.

#### Caution!

Refer to "General Data".

Connect up BMW Service Tester / MoDiC to diagnosis plug.  
Call up diagnosis program (ABS/ASC/ASC).



Connect bleeder unit to expansion tank and switch on.

#### Note:

Conform with operating instructions supplied with bleeder unit.  
Charging pressure should not exceed 2 bar.

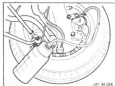


Fit bleeder hose and bottle to bleeder valve on rear right brake caliper.  
Open bleeder valve and bleed until clear. Bubble-free brake fluid emerges.  
Close the bleeder valve.  
Follow similar procedure on rear left, front right and front left wheel brake.



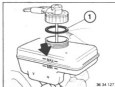
#### Bleeding rear axle brake circuit:

Attach bleeder hose and bottle to vent valve on rear right brake caliper.  
Open up vent valve.  
Perform bleeding routine with BMW diagnosis system.  
Close the bleeder valve.  
Follow similar procedure on rear left wheel brake.



**Bleed front axle brake circuit:**

Fit bleeder hose and bottle to bleeder valve on front right brake caliper.  
 Open up bleeder valve.  
 Fully depress brake pedal at least 12 times.  
 Brake fluid must emerge clear and without air bubbles.  
 Hold down brake pedal in fully depressed position.  
 Close the bleeder valve.  
 Release brake pedal.  
 Follow similar procedure on front left wheel brake.



Switch off bleeder unit and remove from expansion tank.  
 Check brake fluid level.  
 Seal expansion tank (note rubber gasket (1) in cover).

Remove BMW Service Tester / MoDiC and close diagnosis plug.



## 34 10 014 ADJUSTING PARKING BRAKE

## Test Specifications

- There should not be braking effect when parking brake lever is pulled up one tooth.
- The wheel peripheral force may deviate from the larger value by max. 30 % in comparison with the opposite wheel (measured on dynamometer).  
Adjustment is necessary in case of greater brake force difference.
- It should be possible to hold the car with the parking brake.
- The parking brake must be adjusted if the parking brake lever travel is greater than ten teeth.

## Note:

The parking brake can only be adjusted correctly if the parking brake cables and all moving parts of the parking brake move easily and function correctly.

Basic parking brake adjustment is necessary:

- After replacing brake shoes.
- After replacing brake drums.
- After resetting slack control device.
- In case of excessive parking brake lever travel (ten teeth).



Lift dust cover off.



Unscrew the adjusting nuts and loosen the cable completely.



34 10 102

1.2 Disc Brakes  
(Dual-Servo Parking Brake)

Unscrew and remove one wheel bolt from each rear wheel.  
Turn wheel until the tapered bore is positioned approx. 45° behind a vertical line at top (as seen in forward driving direction).

Installation:  
Install and tighten wheel bolt.  
Tightening torque\*.



34 10 101

Turn adjusting screw using a screwdriver until the wheel or brake disc can no longer be turned.  
Loosen the adjusting screw if catches afterwards.

## 1. Basic Adjustment

## 1.1 Drum Brakes

## Note:

If applicable, mount the wheels (brake drums must be blocked).  
Tightening torque\*.

Operate the brake pedal so long until the slack control sound (each click) is no longer heard.

(The slack control operation can also be observed through a wheel bolt bore.)

\* Refer to Specifications

## 2. Adjusting Cables

### 2.1 By Hand

Pull parking brake lever up four teeth and turn the adjusting nuts until it is just possible to still turn the rear wheels.

Release the parking brake lever; it must be possible to turn the wheels easily.

Switch ignition on, the control lamp must not be on with a released parking brake lever.

- 1 tooth: No braking effect.  
Control lamp could be on.
- 2 teeth: Control lamp must be on; if necessary, adjust the switch contact on the parking brake lever - refer to Group 61.

### 2.2 On Dynamometer

#### Caution!

Stop operation of the ERM lock in four wheel drive cars - refer to 34 00 009.

- 0 teeth: (parking brake lever released) wheel peripheral force at idling speed in cars  
a) without limited slip differential = 150 N  
b) with limited slip differential = 200 N
- 1 tooth: No braking effect.  
Control lamp could be on.
- 2 teeth: Control lamp must be on; if necessary, adjust the switch contact on the parking brake lever - refer to Group 61.

Checking of braking force difference with:  
 duo-servo parking brake in 1st tooth  
 drum brakes in 5th tooth

The left/right brake force display must be 600 - 50 N.

## 3. Breaking in Specifications for Duo-Servo Parking Brake

The following breaking in procedures are applicable in case of insufficient braking effect or after replacing brake discs and/or brake shoes.

With car moving approx. 40 km/h pull up the parking brake lever until braking of the car is noticed.

Then pull up the parking brake lever into the next catch and drive approx. 400 meters in this position.

(A basic requirement is that the parking brake is adjusted uniformly.)

#### Note:

The parking brake is completely independent of the service brake and consequently is only subjected to limited wear.

Quite often dirt and corrosion will cause the braking effect of the parking brake to give in the course of time.

### 34 11 000 Removing and installing or replacing brake pads of both disk brakes

#### Note:

After finishing work, test brake pedals several times to ensure the brake pads rest on the brake disks.

Remove front wheels, refer to 36 10 300.



Remove brake pads from brake caliper. Check dust cover for wear and replace if necessary.

#### Installation note:

Check pad thickness\*.

#### Caution!

New brake pads\* should only be installed if the brake disk thickness is greater than or equal to the minimum thickness\*\* (MIN TH).

Lightly coat brake pad back plates at the contact points with anti-squeak paste. For anti-squeak paste, refer to BMW Fluids and Lubricants Specifications.



#### Remove caps (1).

Left: Disconnect cable connector from brake pad sensor.



#### Installation note:

Completely push back piston with special tool 34 1 050.

Clean brake pad guides on brake caliper and brake back plate with a brush\*\* and thinly coat with anti-squeak paste.

For anti-squeak paste, refer to BMW Fluids and Lubricants Specifications.



#### Release guide screws (2).

#### Installation note:

Only clean guide screws, do not grease. Check thread. Replace guide screws if not satisfactory. For tightening torque 34 11 3A2\*.



Lift out retaining spring (3) and push brake caliper forward and remove.

\* Refer to Technical Data

\* Refer to Technical Data

\*\* Source of supply: BMW Parts Service

## 34-11/2



### 34 11 020 REMOVING AND INSTALLING FRONT BRAKE CALIPER

Remove front wheel – see 36 10 300.  
Draw off brake fluid with a syringe, which is reserved exclusively for brake fluid.  
Disconnect brake pipe.



Unscrew brake caliper bolt (1).  
Installation:  
Tightening torque\*.



Disconnect brake pad wear indicator plug.  
Pull off brake caliper forward.  
Installation – Important!  
Check that brake pad wear indicator wire is held in correct position by tab of dust cap.  
Rubbing of the wire on the wheel rim must always be avoided.

\* See Specifications



34 11 002

### 34 11 002 OVERHAULING FRONT CALIPER

— Use Repair Kit —

Remove front caliper — see 34 11 000.  
Press off plastic caps (1).  
Unscrew guide bolts (2).

*Installation:*

Only clean guide bolts — don't lubricate them.  
Check guide bolts, replacing if necessary.  
Tightening torque\*.

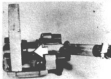


34 11 003

Disassemble caliper and take out brake pads.

*Installation:*

Press out brake pads completely before inserting spring (4).



34 11 004

Press off rubber cap and clamping ring.  
Place a liner (piece of hard wood, hard felt or something similar) in caliper recess to protect the piston.

Press out piston with compressed air applied through the connection bore.

*Caution!*

Air pressure of 10 bar (142 psi) produces a force of about 1250 N (275 lbs.).



34 11 005

Check guide sleeves (5), installing guide sleeves from the repair kit if necessary.

\* See Specifications



34 11 006

Remove seal carefully with a plastic needle.  
Clean cylinder bore and parts with alcohol and dry with compressed air.

Check cylinder bore, piston and flange surfaces thoroughly for damage.  
Machining of cylinders and piston is not approved.

*Installation:*

Give all parts a light coat of ATE brake cylinder paste and install.



34 11 007

First pull rubber cap on to the piston.  
Press in piston with a piece of hard wood, being careful not to cant the piston.



34 11 008

Pull rubber cap over edge of cylinder bore and secure with the clamping ring.  
Assemble the caliper.

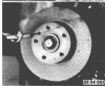


## 34 11 220 RÉMOUVANT ET INSTALLANT LE DISQUE DE FREIN AVANT

Remove front wheel – see 38 10 300.  
Pull rubber grommet (1) out of bracket.

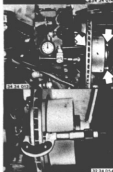


Unscrew caliper and suspend from car on a piece of wire.  
**Important!**  
The brake pipe remains connected.  
Installation:  
Tightening torque\*.



Unscrew bolt and take off the brake disc.  
Installation:  
Tightening torque\*.  
**Important!**  
Always replace both brake discs of one axle together.

\* See Specifications



### 34 11 589 CHECKING FRONT BRAKE DISC FOR RUNOUT AND DEVIATION IN THICKNESS - Front Wheel Removed -

**Requirement:** wheel bearings okay.  
**Procedure on Removed Brake Caliper:**  
 Mount Special Tools 00 2 500 and 00 1 422 on brake caliper.  
 Secure brake disc with two M 12 x 1.5 bolts additionally.  
 Check lateral runout\* of brake disc with a dial gage.

If the brake caliper is disassembled (for replacement of brake pads), Special Tools 00 2 500 and 00 2 490 can be mounted direct in the caliper tapped bore (for guide bolts).

Measure deviation in thickness\* of braking surface at about 8 points with a micrometer.

\* See Specifications



### 34 11 607 FINISH GRINDING FRONT BRAKE DISC - Brake Discs Removed -

**Important!**  
 Always grind both sides of both brake discs on one axle.  
 Check minimum thickness\*.  
 After machining to final size\*, one more brake pad set may be installed and used until worn (see wear limit\*!).  
**Installation:**  
 If it is necessary to replace a brake disc, always replace both brake discs of one axle.



### 34 21 200 REMOVING AND INSTALLING REAR BRAKE PADS

Remove rear wheels.  
 Press off plastic caps (1).  
 Right:  
 Pull off plug for brake pad wear indicator.



Unscrew guide bolts (2).  
 Installation:  
 Only clean guide bolts — don't lubricate them.  
 Replace guide bolts not in perfect condition.  
 Tightening torque\*.



Press out clamp (3).  
 Pull off caliper toward rear.



Take off outer brake pad.  
 Inner brake pad is located in the piston together with a spring.  
 Important!  
 Always replace all brake pads of both brake calipers on one axle.  
 Check make\*\*.  
 Lubricate backs of brake pads lightly with Plastilube\*\* at the brake piston contact points.

\* See Specifications  
 \*\* Source of Supply: HWB



Installation:  
 Push back piston completely.  
 Clean brake pad guides and recesses with a brush\*\*.  
 Caution!  
 Extract pad dust — never remove by blowing.  
 Check dust cover for damage.  
 Lubricate guides lightly with Plastilube\*\*.



### 34 21 345 REMOVING AND INSTALLING REAR CALIPER

Remove rear wheel.  
 Draw off brake fluid with a syringe reserved exclusively for use with brake fluid.  
 Disconnect brake pipe.



Unscrew bolts (1).  
 Unplug the brake pad wear indicator.  
 Pull off caliper toward the rear.  
 Installation:  
 Tightening torque\*.  
 Bleed brakes — see 34 00 047.

\* See Specifications  
 \*\* Source of Supply: HWB





34 24 063

### 34 21 292 OVERHAULING REAR CALIPER

— Use Repair Kit —

Remove rear caliper — see 34 21 220

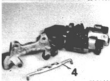
Press off plastic caps (1).

Unscrew guide bolts (2).

Installation:

Only clean guide bolts — don't lubricate them.

Check guide bolts, replacing if necessary. Tightening torque\*.

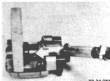


34 24 064

Disassemble caliper and take out brake pads.

Installation:

Press out brake pads completely before inserting spring (4).



34 24 065

Press off rubber cap and clamping ring.

Place liner (piece of hard wood, hard felt or something similar) in the caliper recess to protect the piston.

Press out piston with compressed air applied through the connection bore.

Caution!

Air pressure of 10 bar (142 psi) produces a force of about 1250 N (275 lbs.).



34 24 066

Check guide sleeves (5), installing guide sleeves from the repair kit if necessary.

\* See Specifications



34 24 067

Remove seal carefully with a plastic needle. Clean cylinder bores and parts with alcohol and dry with compressed air. Inspect cylinder bores, piston and flange surfaces thoroughly for damage. Machining of cylinders and pistons is not approved.

Installation:

Give all parts a light coat of ATE brake cylinder paste and install.



34 24 068

First pull rubber cap on to the piston. Press on piston with a piece of hard wood, being careful not to dent the piston.



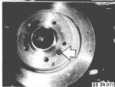
34 24 069

Pull rubber cap over edge of cylinder bore and secure with a clamping ring. Assemble the caliper.



### 34 21 320 REMOVING AND INSTALLING REAR BRAKE DISC

Remove rear wheel.  
Unscrew bolts (1).



Pull off caliper toward rear and suspend  
from car on a piece of wire.  
Brake pipe remains connected.  
Unscrew bolt and take off brake disc.

#### Important!

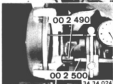
When replacement is necessary, always  
replace both brake discs of one axle.  
Adjust parking brake – see 34 10 014.  
Breaking in Parking Brake After Replacing  
Brake Discs:

Car must be broken in in three phases.

Phase 1: 5 x full stop braking from  
50 km/h (30 mph).

Phase 2: Brakes allowed to cool off.

Phase 3: 5 x full stop braking from  
50 km/h (30 mph).



**34 21 879 CHECKING REAR BRAKE DISC FOR RUNOUT AND DEVIATION IN THICKNESS**  
 - Rear Wheel Removed -

**Procedure:** On Removed Brake Caliper:  
 Mount Special Tools 00 2 500 and 33 1 422 direct in caliper tapped bore after removing the lower brake caliper mounting bolt.

Secure brake disc additionally with two M 12 x 1.5 bolts.  
 Check lateral runout\* of brake disc with a dial gauge.

If the brake caliper is disassembled (for replacement of brake pads), mount Special Tools 00 2 500 and 00 2 490 direct in a brake caliper tapped bore (for guide bolt).

Measure deviation in thickness\* of braking surface at about 8 points with a micrometer.

\* See Specifications



**34 21 947 FINISH GRINDING REAR BRAKE DISCS**  
 - Brake Discs Removed -

**Important!**  
 Always finish grind both sides of both brake discs on one axle.

Check minimum thickness\*.

**Installation:**

If a brake disc has to be replaced, always replace both brake discs of one axle.

\* See Specifications



34-34 038

### 34-31 000 REMOVING AND INSTALLING BRAKE MASTER CYLINDER

Draw off brake fluid in tank with a syringe, which is reserved exclusively for brake fluid.  
Pull off plug.

If applicable, pull off hose (1) for clutch.



34-34 039

Pull off brake fluid tank.  
Disconnect brake pipes (2 and 3).  
Brake Pipe 2:

front right = brake circuit 1

rear left =

Brake Pipe 3:

front left =

rear right = brake circuit 2



34-34 041

Unscrew mounting bolts (4 and 5).  
Installation:

Check rubber seal and connections.  
Replace self-locking nuts.



34-34 029

Installation:

Check rubber ring (7).

The building up of vacuum will be prevented when the sealing is not perfect.

Tandem Brake Master Cylinder – Description:  
Operating the brake pedal moves pistons (1 and 4) forward.

Primary cups (2 and 5) pass over the compensating bolts.

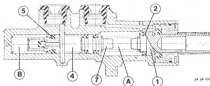
There is now balanced pressure in chambers A and B.

Diagonal Dual Circuit System:

Chamber A acts on front right and rear left.  
Chamber B acts on front left and rear right.  
Brake pedal travel will be considerably longer when a brake circuit fails.

If the second brake circuit fails, piston (1) will use the pressure building up in chamber A to push piston (4) in pressureless chamber B against tandem master cylinder housing and the first brake circuit functions.

If the first brake circuit fails, piston (1) in pressureless chamber A will be pushed against spring-loaded cap (7) and the second brake circuit will have full action via chamber B.



34-34 001

### 34 31 500 Removing and installing master brake cylinder (MBC)

#### Note:

When work is completed, bleed the brake system, refer to 34 00 047 for ABS and 34 00 048 for ABS-ASC-T.

Remove left headlight, refer to Gr. 63.



Draw brake fluid out of tank with a suction bottle reserved for exclusive use with brake fluid.



Lift supply line (1 and 2) off master brake cylinder.



Untension brake line (3 and 4).

#### Note:

Seal master brake cylinder and brake lines with suitable caps.

Brake line (3) leads to ABS hydraulic unit, 1st brake circuit (front right/rear left).  
Brake line (4) leads to ABS hydraulic unit, 2nd brake circuit (front left/rear right).

#### From model year 04:

Brake line (3) leads to ABS hydraulic unit, connection F (rear axle).  
Brake line (4) leads to ABS hydraulic unit, connection F (front axle).

#### Installation:

Tightening torque\*



Loosen screws and remove master brake cylinder.



#### Installation:

Check rubber ring between master brake cylinder and brake unit, replacing if necessary. Replace self-locking nuts. Tightening torque\*

\* Refer to Technical Data

\* Refer to Technical Data

### 34 32 361 REPLACING ALL BRAKE PIPES

Brake pipes are now only supplied in straight version and correct length with connecting nipples.

Use the removed pipe as a template for bending.

Use bending tool\* \*\*.

Don't bend pipe sharply or attempt to bend

back an incorrectly bent pipe.

Also refer to Service Information of Gr. 34.



### 34 32 361 REPLACING FRONT BRAKE HOSE

Draw off brake fluid.  
Disconnect brake hose.

Installation:

Never twist brake hose while installing.

Bleed brakes -- see 34 92 046.

Tightening torque\*\*.

See Group 34 of Operating Fluid Specifications for approved brake fluids.



### 34 32 461 REPLACING REAR BRAKE HOSE

Draw off brake fluid.  
Disconnect brake hose.

Installation:

Never twist brake hose while installing.

Bleed brakes -- see 34 92 046.

Tightening torque\*\*.

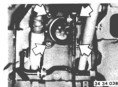
See Group 34 of Operating Fluid Specifications for approved brake fluids.

\* Source of Supply: HVB

\*\* See Specifications

### 34 33 505 REMOVING AND INSTALLING OR REPLACING BRAKE BOOSTER

Suck the brake fluid out of the brake fluid tank using a siphon used exclusively with brake fluids.



Unscrew brake booster at pedal console.  
Remove brake booster together with brake master cylinder forwards.

Installation:  
Tightening torque\*  
Adjust brake pedal - refer to Group 35.  
Adjust brake light switch - refer to Gr. 61.



Disconnect the plug.  
Pull off tank.  
Disconnect clutch hydraulic hose (1).



Unscrew brake pipes (2 and 3).

Important!  
Don't mix up brake pipes.  
Tightening torque\*.



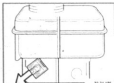
Remove dashboard trim panel at bottom left - refer to 51 45 180.  
Press off clip (3) and pull out pin (4).

\* Refer to Specifications

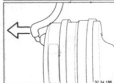
Refer to Specifications

**34 33 505 REMOVING AND INSTALLING  
OR REPLACING BRAKE  
BOOSTER (MS)**

Remove brake master cylinder - refer to  
34 31 505.



Lift out retainer and remove brake fluid  
tank.

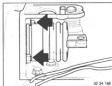


Disconnect vacuum hose at brake booster.



Lift out retainer and pull out retaining pin.

**Important!**  
Ensure the retainer engages correctly when  
installing.



Unscrew nuts and remove brake booster  
forewards.

**Installation:**  
Replace self-locking nuts.  
Tightening torque\*.

\* Refer to Specifications





34 34 038

#### 34 33 051 REPLACING NON-RETURN VALVE FOR BRAKE BOOSTER

Disconnect the vacuum hose at non-return valve (1).

Installation:  
Replace the clamps.



34 34 040

Loosen the clamps and remove the non-return valve.

Installation:  
The arrow on the non-return valve must point in direction of the intake manifold.  
Replace the clamps.



34 34 041



34 34 042

#### 34 33 071 REPLACING VACUUM HOSE FOR BRAKE BOOSTER

Unscrew the vacuum hose at the brake booster.

Installation:  
Replace the clamps.



34 34 043

Unscrew the vacuum hose at non-return valve (3).

Installation:  
Replace the clamps.



34 34 044

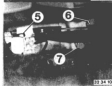
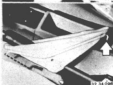
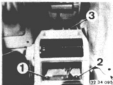
34 41 000 REMOVING AND INSTALLING  
PARKING BRAKE LEVER

Lift out an extraction mask.  
Unscrew nuts (1 and 2).  
Press off cap.  
Unscrew bolt (3).

Lift out cover.

Unscrew bolt (4).  
If applicable, pull off plugs for power  
windows, etc.

Lift the center console and remove the  
heating ducts.



Turn retainer 90° and peel down the rubber  
cover.

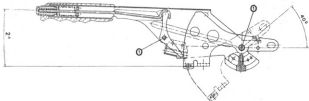
Unscrew adjusting nuts on parking brake  
cables.

Unscrew bolts (5 ... 7).  
Remove parking brake lever.

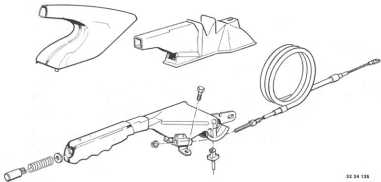
Be careful not to damage the warning  
switch while removing and installing.  
Check adjustment.  
Installation:  
Adjust parking brake — see 34 10 014.

PARKING BRAKE LEVER LAYOUT DRAWING

(1) - Riveted



32 34 104



32 34 105



### 34 41 100 REMOVING AND INSTALLING PARKING BRAKE CABLE

Remove expander lock with parking brake shoes — see 34 41 320.  
 Remove parking brake lever — see 34 41 000.  
 Unscrew parking brake cable on trailing arm and pull out.  
*Installation:*  
 Adjust parking brake — see 34 10 014.

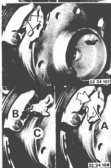


### 34 41 320 REMOVING AND INSTALLING PARKING BRAKE SHOES

Remove rear brake disc — see 34 21 320.  
 Disconnect upper return spring with a brake spring pliers.



Turn retaining spring 90° with Special Tool 34 4 000 and disconnect.



Pull brake shoes apart at top and remove from below.

*Important!*

Pin of expander lock could fall out.

Replacing Liners:

Break in as for replacement of brake discs — see 34 21 320.

Check expander lock.

Pull part A forward.

Press out pin B.

Pull out part C.

*Caution!*

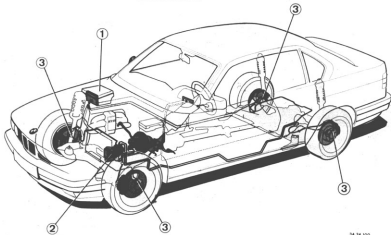
Extract liner dust — never ramped by blowing.

*Installation:*

Apply a thin coat of Molykote Paste G on sliding surfaces and pins.

Adjust parking brake — see 34 10 014.

## ABS LAYOUT DRAWING



34 39 100

- 1 - Electronic control unit
- 2 - Hydraulic control unit
- 3 - Pulse senders



## DESCRIPTION OF FUNCTION AND CHECKING ABS CONTROL LAMP

The ABS control lamp lights up after switching the ignition on. The control lamp must go out after starting the engine if ABS is okay.

The procedure is repeated each time the ignition is switched off and on.

The causes for faulty display — control lamp does not light up, does not go out or lights up while driving (even sporadically) — can be determined with help of a BMW Service Tester and brake test stand.

The control unit automatically switches to "conventional brakes" in case of an electric or electronic fault in ABS.

This means that the car can still be braked, but without regulation (the wheels could lock).

The ABS control lamp in the dashboard lights up continuously to indicate a faulty system.

**34 50 000 CHECKING FUNCTION OF  
ABS**

An electronic circuit in the control unit monitors ABS constantly.

The function must be checked when ABS indicator lamp does not go out, comes on while driving or does not come on when turning on the ignition or after performing jobs on ABS.

The function is checked with a BMW Service Tester.

Connect tester on wire harness and control unit with a suitable plug.

Refer to ABS nominal value microfiche .  
Caution!

Control unit plug may only be disconnected and connected after turning off ignition.  
See wiring diagram in ABS nominal value microfiche for connections.



34 34 037



Fig 34 131



34 34 001



34 34 054

**Servicing ABS:**

Basically the ABS does not require servicing.  
Check brake lines to and from the hydraulic unit for correct routing and leaks together with the general brake system.

### 34 51 520 REMOVING AND INSTALLING OR REPLACING COMPLETE HYDRAULIC CONTROL UNIT (FOR ABS)

Unscrew brake pipes (1) and (2).

*Installation:*

Pipe (1) to brake master cylinder, rear.  
Pipe (2) to brake master cylinder, front.

*Caution!*

Catch escaping brake fluid and don't let it get on clothes or paint finish.

Unscrew brake pipes (VL / VR / HL / HR).

*Installation:*

Don't mix up pipes (mark).

VL to left front brake caliper.

VR to right front brake caliper.

HL to left rear brake caliper.

HR to right rear brake caliper.

*Important!*

Keep open pipes and connections clean (insert plugs).

Unscrew bolt (3), Torx T 15, and lift off cover.



34 34 046

Pull out plug (4).

Pull off multipin plug (5) and insulate.



34 34 046

Unscrew ground lead (6).



34 34 046

Loosen nuts (7 ... 9).

Pull up and remove hydraulic control unit.

*Installation:*

Bleed brakes — see 34 00 046.

Check function of ABS with a BMW Service Tester — see 34 50 000.



34 34 041



34 34 046



34 34 041



34 51 520 REMOVING AND INSTALLING  
OR REPLACING HYDRAULIC  
CONTROL UNIT FOR ABS  
(MBS)

After finishing work, bleed brake system -  
refer to 34 00 047 for ABS or 34 00 048 for  
ABS/ASC-T.

Disconnect battery ground lead.  
Refer to General Information in Group 61.



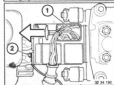
32 34 190

Suck the brake fluid out of the brake fluid  
tank using a siphon used exclusively with  
brake fluids.



32 34 190

Unscrew screw and remove cover.



32 34 190

Unlock and pull off plug (1).  
Unscrew nut (2) and remove ground wire.



32 34 191

Unscrew brake pipes (3 ... 8).

**Important!**  
Don't mix up brake pipes - mark them be-  
fore disconnecting if necessary.

**Note:**  
Plug brake pipes and ABS control unit with  
suitable plugs.

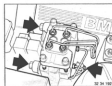
**Installation:**  
Tightening torque\*

**Brake Pipes:**

3 (VL)	to left front brake caliper
4 (VR)	to right front brake caliper
5 (HL)	to right rear brake caliper
6 (HL)	to left rear brake caliper
7	from master cyl. conn. (V)
8	from master cyl. conn. (H)

**Brake Pipes of Models with ASC-T:**

5 (HR)	to plunger inlet (HR ABS)
6 (HL)	to plunger inlet (HL ABS)



32 34 190

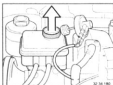
Loosen mounting nuts and remove ABS  
hydraulic control unit.

\* Refer to Specifications

### 34 51 520 Removing and installing or replacing complete hydraulic unit (for ABS) (M 60) (from model year '94)

When work is complete, bleed the brake system, refer to 34 00 047.

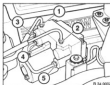
Disconnect negative lead from battery.  
Note general instructions in Gr. 511



Draw brake fluid out of tank with a suction bottle reserved for exclusive use with brake fluid.



Unlock plug (1) and remove.  
Unlock screw (2) and remove ground cable.



#### Caution!

Do not confuse position of brake lines; if necessary, mark before disconnecting.

Unlock brake leads (1 ... 5).

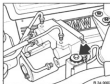
Seat brake lines and ABS hydraulic unit with suitable plugs.

#### Brake line:

- 1 (V) from master brake cylinder, connection (V)
- 2 (H) from master brake cylinder, connection (H)
- 3 (VR) to front right brake caliper
- 4 (VL) to front left brake caliper
- 5 (RA) to rear right and rear left brake caliper

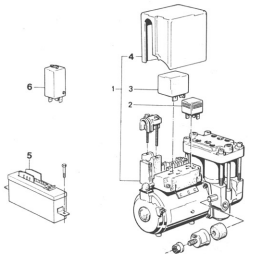
#### Installation:

Tightening torque \*



Unlock screw and remove ABS hydraulic unit.

## ABS COMPONENTS



22 34 136

- 1 Hydraulic control unit
- 2 Valve relay
- 3 Motor relay

- 4 Cap
- 5 ABS electronic control unit
- 6 ABS electronic relay

**24 51 525 REMOVING AND INSTALLING  
OR REPLACING HYDRAULIC  
CONTROL UNIT FOR ASC-T  
(ABS)**

After finishing work, bleed brake system -  
refer to 24 05 048.

Disconnect battery ground lead.  
Refer to General Information in Group 81.

Remove hydraulic fluid supply tank - refer  
to Group 32.  
Remove rear pedal assembly console -  
refer to Group 38.



Unscrew brake pipes (1 ... 4) on plunger-  
type hydraulic control unit.  
Unscrew and remove brake pipes (1 and 2)  
on ABS hydraulic control unit.

**Installation:**  
Tightening torque\*.

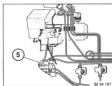
**Brake Pipes:**  
1 Plunger inlet (HR ABS)  
2 Plunger inlet (HL ABS)  
3 Plunger outlet (HL RZ)  
4 Plunger outlet (HR RZ)



Unlock and disconnect plug.



Apply Special Tool 24 3 110 on bleeder  
screw.  
Loosen bleeder screw to discharge pres-  
sure in reservoir.



Unscrew hydraulic pipe (5) at adapter.

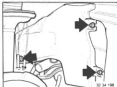
**Note:**  
A second hydraulic pipe must be unscrewed  
at this position in models with ride level  
height control.

**Important!**  
Don't mix up hydraulic pipes; mark before  
disconnecting if necessary.

**Installation:**  
Tightening torque\*.

\* Refer to Specifications

34-51/6



Untasten Nuts and remove inferior wheel arch brace.

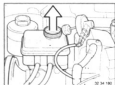


Untasten retaining screws in wheel arch and remove plunger hydraulic unit.

### 34 51-525 Removing and installing or replacing hydraulic unit (ASC+T) (From model year '94)

When work is complete, bleed the brake system, refer to 34 00-046.

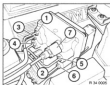
Disconnect negative lead of battery.  
Observe general instructions in Gr. 811



Draw brake fluid out of tank with a suction bottle reserved for exclusive use with brake fluid.



Unlock and remove plug (1).  
Unfasten nut (2) and remove ground cable.



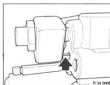
**Caution!**  
Do not confuse brake lines; if necessary, mark them before removal.

Unfasten brake lines (1 ... 6).  
Seal brake lines and hydraulic unit with suitable plugs.

Brake line:

- 1 (V) from master brake cylinder, connection (V)
- 2 (H) from master brake cylinder connection (H)
- 3 (VR) to front right brake caliper
- 4 (VL) to front left brake caliper
- 5 (HR) to rear right brake caliper
- 6 (HL) to rear left brake caliper
- 7 Diaphragm flow damper

Installation:  
Tightening torque 34 32 14.2\*



Note:  
Note installation position of the diaphragm flow damper.  
The pin must be in bore.

Installation:  
Tightening torque 34 50 24.2\*



Unfasten screw and remove hydraulic unit.

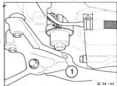
\* Refer to Technical Data

34 51 540 Removing and installing or  
replacing ASC +T filter

Filter replacement intervals, refer to Gr. 00.

When work is complete, bleed mineral oil cir-  
cuit, refer to 34 00 040.

If necessary, remove engine splash guard



Unscrew filter bell housing (1).  
Replace filter element and O-ring.

Installation:  
Tightening torque \*



### 34 52 510 REPLACING CONTROL UNIT (FOR ABS)

Unscrew cover in engine compartment on right side.

**Caution!**

Only remove or install control unit after turning off the ignition.



Push back clamp (1) and pull off right side and disengage left side of multiple pin plug. Unscrew control unit on body.



Check for correct connections when replacing the control unit.

The multiple pin plug has a tab on the left side, for which the control unit must have an opening.

**Installation:**

First engage the left side of the plug and then press the right side into the clamp.

Check function of ABS with a BMW Service Tester -- see 34 60 000.

Check the control unit number\*.

Also refer to Service Information of Gr. 34.

Electric wires for ABS are completely integrated in the main wire harness.

\* See Specifications.





34 34 000

### 81 12 510 REMOVING AND INSTALLING OR REPLACING ONE FRONT PULSE (SPEED) SENSOR (FOR ABS)

Turn off ignition.

Unscrew socket head screw.

Lift wire out of holder.

Pull out pulse sensor.

Installation:

Check seal, replacing if necessary.

Lubricate pulse sensor and housing with Molykote Longterm 2 prior to installation.



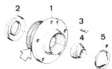
34 34 000

Disconnect plug in engine compartment when replacing the pulse sensor; turn and push down plug.

Installation:

The spacing distance for front pulse sensors is given by the take up bore.

Check function of ABS with a BMW Service Tester – see 34 50 000.



32 34 123

### Removing and Installing/Replacing Front Pulse Wheel for ABS:

Teeth of the pulse wheel are integrated in the front wheel hub.

See replacing wheel hub in 31 21 561.



32 34 001

### Removing and Installing/Replacing Rear Pulse Wheel for ABS:

The rear pulse wheel is integrated in the drive flange.

See replacing rear wheel bearings in 32 41 151.



32 34 124

### 81 12 603 REMOVING AND INSTALLING OR REPLACING REAR PULSE (SPEED) SENSOR (FOR ABS)

Turn off ignition.

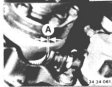
Remove rear wheel – see 36 10 300.

Remove rear caliper – see 34 21 220.

Installation:

The distance\* between pulse sensor and pulse wheel (A) is given by design and cannot be adjusted.

However, the pulse wheel must be visually inspected for dirt or damage.



34 34 001



32 34 124

Unscrew socket head screw.

Lift wire out of holder.

Pull out pulse sensor.

Installation:

Check seal, replacing if necessary.

Lubricate pulse sensor and housing with Molykote Longterm 2 prior to installation.



34 34 001

### Replacing Rear Pulse Sensor:

Take wires out of slings.

Pull out wires and rubber grommet.

Disconnect plug.

Take off pulse sensor.

Important!

Don't damage the rubber grommet.

\* See Specifications.



**61 31 570 REPLACING RELAYS ON HYDRAULIC UNIT (FOR ABS)**

Unscrew screws (1) (Torx T 15).  
Pull off cover.

Pull out engine relay (2) or valve relay (3).

**Replacing Electronic Relay for ABS:**  
Open cover on relay carrier in engine compartment on left hand side.  
Pull out ABS electronic relay (Bosch) with Special Tool 61 1 250 and replace.

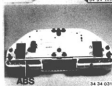
**High Version Power Distributor**  
K 10 = ABS relay



34 34 034



34 34 130



34 34 031

**62 99 080 REPLACING INDICATOR LAMP (FOR ABS)**

Remove instrument cluster — see 62 11 000.

Pull out indicator lamp socket.  
Replace indicator lamp.

**Low Version Power Distributor**  
K 10 = ABS relay



34 34 030

## TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Brakes pull to one side	<ul style="list-style-type: none"> <li>a) Tire inflation pressure incorrect</li> <li>b) Uneven tire tread wear</li> <li>c) Oil on pads/liners</li> <li>d) Pad/liner type not as specified</li> <li>e) Caliper repeats dirty</li> <li>f) Rear wheel alignment maladjusted</li> <li>g) Corrosion on calipers</li> <li>h) Shock absorbers without action</li> <li>i) Pad of one caliper worn</li> <li>k) Pad glazed</li> </ul>	<ul style="list-style-type: none"> <li>a) Correct tire inflation pressure</li> <li>b) Change or replace tires</li> <li>c) Replace brake pads/liners and eliminate cause</li> <li>d) Replace brake pads/liners</li> <li>e) Remove, clean and install calipers</li> <li>f) Check/adjust wheel alignment</li> <li>g) Remove and install, repair or replace calipers</li> <li>h) Check or replace shock absorbers</li> <li>i) Replace brake pads; check calipers</li> <li>k) Replace brake pads; check calipers</li> </ul>
Brakes excessively hot while driving	<ul style="list-style-type: none"> <li>a) Compensation bore in master cylinder clogged</li> <li>b) No play between push rod and master cylinder piston</li> <li>c) Rubber parts swell from contact with wrong type of brake fluid</li> <li>d) Vent hole in brake fluid tank clogged</li> <li>e) Corroded calipers</li> <li>f) Parking brake lever not released fully</li> </ul>	<ul style="list-style-type: none"> <li>a) Check or replace master cylinder</li> <li>b) Adjust push rod</li> <li>c) Overhaul or replace master cylinder</li> <li>d) Clean brake fluid tank</li> <li>e) Remove and install, repair or replace calipers</li> <li>f) Check parking brake and parking brake cables, repairing if necessary</li> </ul>
Braking effect inefficient despite of great force on pedal Brake pedal travel - normal	<ul style="list-style-type: none"> <li>a) Brake pads coated with oil or burnt; wrong type of brake pads</li> <li>b) Brake booster malfunctions</li> <li>c) One brake circuit failed due leaks or damage</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace brake pads</li> <li>b) Check seal on brake master cylinder, replacing if necessary Check brake booster</li> <li>c) Check brake system for leaks</li> </ul>
short		
long		

## TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Brake pedal motion too soft and spongy	<ul style="list-style-type: none"> <li>a) Air in brake system</li> <li>b) Insufficient brake fluid in brake fluid tank</li> <li>c) Overheated brake fluid – vapor lock due to excessive water content in brake fluid or excessive brake loads</li> </ul>	<ul style="list-style-type: none"> <li>a) Add or replace brake fluid and bleed brakes</li> <li>b) See a)</li> <li>c) See a)</li> </ul>
Brake pedal travel excessive even though brakes have been bled and adjusted	<ul style="list-style-type: none"> <li>a) Primary cup in master cylinder damaged</li> <li>b) Separating cups on floating piston of tandem master cylinder leak</li> <li>c) Leak in brake system</li> </ul>	<ul style="list-style-type: none"> <li>a) Overhaul or replace brake master cylinder</li> <li>b) See a)</li> <li>c) Check brake system for leaks</li> </ul>
Uneven pad wear	<ul style="list-style-type: none"> <li>a) Wrong type of brake pads</li> <li>b) Caliper recess dirty, lips damaged</li> <li>c) Corrosion in calipers</li> <li>d) Rubber ring for piston control swollen</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace brake pads</li> <li>b) Remove and install, repair or replace calipers</li> <li>c) See b)</li> <li>d) See b)</li> </ul>
Brake pads worn at angle	<ul style="list-style-type: none"> <li>a) Wheel bearing play excessive</li> <li>b) Brake disc not aligned with caliper</li> <li>c) Corrosion in calipers</li> <li>d) Brake disc wear angular</li> <li>e) Pads worn less than minimum thickness</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace wheel bearings</li> <li>b) Check caliper installation</li> <li>c) Remove and install, repair or replace calipers</li> <li>d) Grind or replace brake discs</li> <li>e) Replace brake pads</li> </ul>

## TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Seized brake pads, pads stuck on brake disc	<ul style="list-style-type: none"> <li>a) Caliper recesses dirty, caps damaged</li> <li>b) Corrosion in calipers</li> <li>c) Compensation bore in master cylinder clogged</li> </ul>	<ul style="list-style-type: none"> <li>a) Remove and install, repair or replace calipers</li> <li>b) See a)</li> <li>c) Overhaul or replace master cylinder</li> </ul>
Brakes squeal or knock	<ul style="list-style-type: none"> <li>a) Wrong type of brake pads</li> <li>b) Caliper recesses dirty</li> <li>c) Brake disc not aligned with caliper</li> <li>d) Brake disc runout</li> <li>e) Excessive thickness deviation within braking surface</li> <li>f) Rust on edges of brake discs</li> <li>g) Pads loose</li> <li>h) Wheel bearing play excessive</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace brake pads</li> <li>b) Remove and install, repair or replace calipers</li> <li>c) Check caliper installation</li> <li>d) Check brake disc runout, replacing discs if necessary</li> <li>e) Measure brake disc thickness and grind or replace</li> <li>f) Grind or replace brake discs</li> <li>g) Replace brake pads</li> <li>h) Replace wheel bearings</li> </ul>
Brake pedal dead travel excessive	<ul style="list-style-type: none"> <li>a) Wheel bearing play excessive</li> <li>b) Brake disc not aligned with caliper</li> <li>c) Brake disc runout</li> <li>d) Excessive thickness deviation within braking surface</li> <li>e) Brake system has a leak</li> <li>f) Air in brake system</li> <li>g) Wrong type of brake pads</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace wheel bearings</li> <li>b) Check caliper installation</li> <li>c) Check brake discs for runout, replacing if necessary</li> <li>d) Measure brake thickness deviation and grind or replace discs</li> <li>e) Check brake system for leaks</li> <li>f) Bleed brakes</li> <li>g) Replace brake pads</li> </ul>

## TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Seized pistons in calipers	<ul style="list-style-type: none"> <li>a) Caliper recesses dirty, cups damaged</li> <li>b) Brake disc not aligned with caliper</li> <li>c) Corrosion of pistons in calipers</li> </ul>	<ul style="list-style-type: none"> <li>a) Remove and install, repair or replace calipers</li> <li>b) Check caliper installation</li> <li>c) See a)</li> </ul>
Pulsating effect on brake pedal	<ul style="list-style-type: none"> <li>a) Wheel bearing play excessive</li> <li>b) Brake disc not aligned with caliper</li> <li>c) Brake disc runout</li> <li>d) Excessive thickness deviation within braking surface</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace wheel bearings</li> <li>b) Check caliper installation</li> <li>c) Check brake discs for runout, replacing if necessary</li> <li>d) Measure disc thickness and grind or replace</li> </ul>
Parking brake effect insufficient	<ul style="list-style-type: none"> <li>a) Oil on brake shoes</li> <li>b) Excessive dead travel between brake shoes and brake drums</li> <li>c) Excessive dead travel in cables</li> <li>d) Cables misaligned</li> <li>e) Corroded transmitting elements</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace brake liners and eliminate cause</li> <li>b) Adjust parking brake</li> <li>c) See b)</li> <li>d) See b)</li> <li>e) Remove and install parking brake and expander links; check cables, replacing if necessary</li> </ul>

## 35 Pedals

	Notes .....	35-	0/1
	Arrangement of pedals .....	35-	0/2
	Control dimensions for spacing between pedals .....	35-	0/3
35 11 000	Console for pedals, complete unit – remove and install .....	35-	11/1
001	Console for pedals – replace .....	35-	11/2
35 21 ...	Pull rod for brake actuation – adjust .....	35-	21/1
...	Brake pedal – adjust .....	35-	21/1
000	Brake pedal – remove and install .....	35-	21/2
051	Console for brake system – remove and install or replace .....	35-	21/3
055	Console for pivot lever – remove and install or replace .....	35-	21/7
35 31 000	Clutch pedal – remove and install .....	35-	31/1
35 41 000	Accelerator pedal – replace .....	35-	41/1
010	Accelerator pedal shaft – remove and install/replace .....	35-	41/1
421	Bowden cable for throttle valve actuation – replace .....	35-	41/2
...	Bowden cable for throttle valve actuation – adjust .....	35-	41/4
...	Bowden cable for throttle valve actuator – adjust (on ASC+T) .....	35-	41/4
480	Kick-down switch – replace (EH transmission) .....	35	41/5

## GENERAL INFORMATION

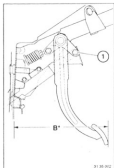
## Cars with Interlock System:

The following function test must be carried out if a component of the interlock system has been removed and installed or the position of the interlock cable changed.

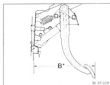
1. Move selector lever of automatic transmission into "P".
2. Remove ignition key.
3. Press lock button on selector lever.
4. If the selector lever can be moved out of "P", the interlock cable must be adjusted - refer to Group 25.
5. Switch on ignition.
6. Press lock button on selector lever.
7. If the selector lever cannot be moved out of "P", the interlock cable must be adjusted - refer to Group 25.



## PEDAL ASSEMBLY LAYOUT DRAWINGS



Brake Pedal



Clutch Pedal

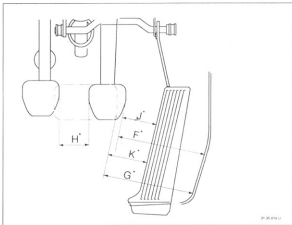


Accelerator Pedal

• Refer to Specifications

• Refer to Specifications

## DIMENSIONS TO CHECK SPACING BETWEEN PEDALS





### 35 11 000 REMOVING AND INSTALLING COMPLETE PEDAL CONSOLE

Remove accelerator pedal shaft - refer to 35 41 010.  
Remove complete steering column - refer to 32 31 090.  
Remove clutch master cylinder - refer to 21 52 000.

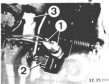
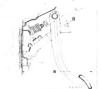
**Adjusting Clutch Pedal Eccentric Bolt:**  
Turn eccentric bolt until dot on bolt is opposite the clutch master cylinder.

#### Installation:

Distance (B') must be reached.  
If distance (B') is not reached in the above mentioned adjustment, turn eccentric bolt 180°.

#### Important!

Intermediate positions of the eccentric bolt are not acceptable.



Pull off plugs (1 and 2).

Version with Automatic Cruise Control:  
Disconnect plug (3).



Version with Electronic Pedal Valve Sensor:  
Disconnect plug.

Refer to Specifications



Lift out retainer (4) and pull out shaft (5).



#### Installation:

Adjust brake pedal at brake master cylinder push rod (7) to distance (A').  
Adjust brake light switch - refer to Cr. 61.

#### Important!

Movement must be limited in the brake master cylinder and not, for example, by the brake light switch (distance "B").

Check function of brake lights!



Unscrew nuts on engine compartment wall.

#### Installation:

Replace self-locking nuts.  
Tightening torque\*



Unscrew bolts at top.  
Remove pedals.

#### Installation:

Tightening torque\*.  
Lubricate all sliding surfaces lightly with grease\*\*.

\* Refer to Specifications

\*\* Refer to Operating Fluids



37 25 019

## 35 11 001 REPLACING PEDAL CONSOLE

Remove pedal console - refer to 35 11 000.

Refer to Group 12 for information on removal, installation and adjustment of the pedal value sender.



37 25 019

Transfer brake light test switch (1) and brake light switch (2).

**Note:**

Plunger and sleeve must be pressed out to remove brake light switch (2). Compress retainers and pull out switch.

**Installation:**

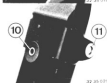
Mount switch with protruding strip inserted into opening in holder.



37 25 019

**Installation:**

Check for correct installed position of spring (9).



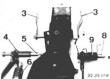
37 25 019

Transfer spacer (10) and bearing sleeves (11).

Check bearing sleeves, replacing them if necessary.

**General Note:**

All sliding surfaces must be given a light coat of grease\*\*.



37 25 019

Transfer steering column lever (3), clutch pedal (4) together with spacer (5) and over-center spring (6) as well as brake pedal (7) together with spacer (8) and spring (9).

### 35 21 ... ADJUSTING BRAKE OPERATING PULL ROD



Loosen nut (1) using Special tool 13 5 020. Turn pull rod (2) until distance (A)\* is reached.

**Note:**  
Check for correct seating of rubber stop (3).



Counterhold on pull rod (2) and tighten nut (1) using Special tool 13 5 020. Tightening torque\*.

Check distance (A)\*, repeating the adjusting procedure if necessary.

**Note:**  
Support was removed for better illustration.

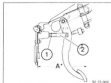
Check brake pedal adjustment - refer to 35 21 ...

\* Refer to Specifications

### 35 21 ... ADJUSTING BRAKE PEDAL

**Requirement:**  
Correct adjustment of brake operating pull rod - refer to 35 21 ...

Remove dashboard trim panel at bottom left - refer to Group 85.



Loosen nut (1). Turn push rod (2) until distance (A)\* is reached.

Counterhold on push rod (2) and tighten nut (1). Tightening torque\*.

Check function of brake lights and adjustment of brake light switch, adjusting it if necessary - refer to Group 81.

\* Refer to Specifications



### 35 21 000 REMOVING AND INSTALLING BRAKE PEDAL

Remove dashboard trim panel at bottom left - refer to 31 45 180.  
Lift out retainer (4) and pull out shaft (5).



#### Installation:

Adjust brake pedal at brake master cylinder - push rod (7) to distance (A)\*.  
Adjust brake light switch - refer to Gr. 61.

#### Important!

Movements must be limited in the brake master cylinder and not, for example, by the brake light switch (distance "B").

Check function of brake light!



#### Detach spring (6).

Unscrew nut (7) and pull out shaft bolt as far as clutch pedal.  
Remove brake pedal together with spacers and spring.

#### Installation:

Tightening torque\*\*.



Check installed position of spring (6).

#### Installation:

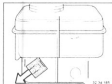
Lubricate all sliding surfaces with grease\*\*.

\* Refer to Specifications.

\*\* Refer to Operating Fluids.

**35 21 091 REMOVING AND INSTALLING  
OR REPLACING CONSOLE  
FOR BRAKE BOOSTER**

Remove left headlight - refer to Group 43.

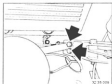


Lift out retainer and remove brake fluid tank.  
Suspend tank from car on piece of wire.

**Caution!**  
Don't bend supply pipes to the brake master cylinder.

Don't lift supply pipes to brake master cylinder out of seat in brake master cylinder.

Keep brake fluid off of painted surfaces on car as it would destroy the paint finish.



Unlock retainer for pipe to oil supply tank.  
Unscrew screws.



Unscrew screw.  
Remove support.

**Note:**  
View from front passenger's side.



Loosen nut (1) of pull rod (2) using Special Tool T3 5 020.  
Screw pull rod out of swivel heads and remove.



Lift out retainer and pull out shaft.



Unscrew brake booster mounting nuts.

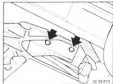


Remove holder for brake pipes.

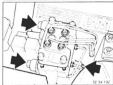


Unscrew screws.

Note:  
View from front passenger's side.



Unscrew nuts.



Loosen ABS hydraulic control unit mounting nuts and lift ABS hydraulic control unit out of holder.

Caution!  
Don't damage the brake pipes!



Push brake booster towards front wall and remove console.

Caution!  
Don't damage the brake pipes!



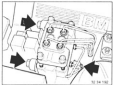
Install console.

Screw on nuts, but do not tighten!  
Replace self-locking nuts!



Screw in screws, but do not tighten.

Note:  
View from front passenger's side.



Place ABS hydraulic control unit in holder and tighten nuts and screws. Tightening torque\*.

\* Refer to Specifications





Install support.  
Screw in screw, but do not tighten!

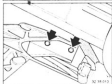
Note:  
View from from passenger's side.



Screw in and tighten screws.  
Tightening torque\*.



Tighten screw.  
Tightening torque\*.



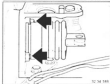
Tighten nuts.  
Tightening torque\*.

\* Refer to Specifications



Tighten screws.  
Tightening torque\*.

Lock retainer for pipe to oil supply tank.



Place brake booster in console and tighten nuts.  
Replace self locking nuts.  
Tightening torque\*.



Secure holder for brake pipes.

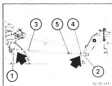
Important!  
Check for correct routing of brake pipes.  
Brake pipes must not rub!



Insert shaft and install retainer.

Important!  
Check for correct seating of retainer.  
Replace a damaged retainer.

\* Refer to Specifications



Insert pull rod (3) and screw uniformly into both swivel heads (1 and 2).

4 = Nut

Installation:

Pull rod and swivel heads have left-hand and right-hand threads!

Important!

Check installed position of pull rod (3). Surfaces (5) for counterholding pull rod (3) are located at the reversing lever console end!

Ensure sufficient and uniform screwed-in depth of the pull rod in the swivel heads!



Install brake fluid tank and insert retainer.

Important!

Check for correct seating of retainer. Replace a damaged retainer.

Check for correct routing of brake pipes. Brake pipes must not rub.

Check for correct seating of supply pipes in brake master cylinder and on brake fluid tank.

If necessary, reconnect brake pipes and then bleed the brake system - refer to Group 34.



Turn pull rod (2) until distance (A)\* is reached.

1 = Nut

Note:

Check for correct seating of rubber stop (3).



Counterhold on pull rod (2) and tighten nut (1) using Special Tool 12 5 020. Tightening torque\*

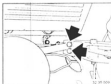
Check distance (A)\*, repeating the adjustment if necessary.

\* Refer to Specifications

Check function of brake lights and adjustment of brake light switch, connecting it if necessary - refer to Group 61.

### 35-21-000 REMOVING AND INSTALLING OR REPLACING CONSOLE FOR REVERSING LEVER

Remove dashboard trim panel at bottom left - refer to Group 51.



Unlock retainer for pipe to oil supply tank. Unscrew screws.



Unscrew screw.  
Remove support.



Loosen nut (1) of pull rod (2) using Special Tool 13-3-020.  
Unscrew and remove pull rod in swivel heads.



Lift out retainer and pull out shaft.



Unscrew nuts on engine compartment wall.  
Take off bellows and remove console.



Check gasket (1) for console on firewall, replacing it if necessary.

Insert console and mount bellows.

Installation:

Check for correct seating of bellows.



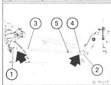
Replace and tighten self-locking nuts on engine compartment wall.  
Tightening torque\*

\* Refer to Specifications.



Insert shaft and install retainer.

**Important!**  
Check for correct seating of retainer.  
Replace a damaged retainer.



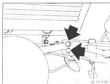
Insert pull rod (3) and screw uniformly into both swivel heads (1 and 2).

4 x Nut

**Installation:**  
Pull rod and swivel heads have left-hand and right-hand threads!

**Important!**  
Check installed position of pull rod (3).  
Surfaces (5) for counterbalancing pull rod (3) are located at the reversing lever console end.

Ensure sufficient and uniform screwed-in depth of the pull rod in the swivel heads!



Screw in and tighten screws.  
Tightening torque\*

Lock retainer for pipe to oil supply tank.

**Important!**  
Support must not be installed with tension,  
if necessary correct the centering of the  
brake booster console.



Tighten screw.  
Tightening torque\*



Install support.  
Screw in screw, but do not tighten!

**Note:**  
View from front passenger's side.



Turn pull rod (2) until distance (A)\* is reached.

1 x Nut

**Note:**  
Check for correct seating of rubber stop (5).

\* Refer to Specifications



Counterhold on pull rod (2) and tighten nut (1) using Special Tool 13 5 020. Tightening torque\*.

Check distance (A), repeating the adjustment if necessary.

Check adjustment of brake pedal, correcting it if necessary - refer to 25 21 ...

Check function of brake lights and adjustment of brake light switch, correcting it if necessary - refer to Group 65.



### 35 31 000 REMOVING AND INSTALLING CLUTCH PEDAL

Remove dashboard trim panel at bottom left - refer to 51 45 100.  
Remove eccentric bolt (1).

Models with Automatic Cruise Control:  
Unscrew holder for clutch switch.  
Testing and adjusting - refer to Group 65.

#### Installation:

**Tightening torque:**  
Lubricate eccentric bolt lightly before installation.

**Adjusting Clutch Pedal Eccentric Bolt:**  
Turn eccentric bolt until dot on bolt is opposite the clutch master cylinder.



#### PRECAUTION:

Distance (B) must be reached.  
If distance (B) is not reached in the above mentioned adjustment, turn eccentric bolt 180°.

#### Important!

Intermediate positions of the eccentric bolt are not acceptable.

#### Installation:

Engage over-center spring (3) in guide on pedal assembly before installing piston rod (2).



35 31 004

\* Refer to Specifications



Lift out retainer (4) and pull out shaft (5).

#### Installation:

Adjust brake pedal at brake master cylinder push rod (7) to distance (A).  
Adjust brake light switch - refer to Gr. 65.

#### Important!

Movement must be limited in the brake master cylinder and not, for example, by the brake light switch (distance "B").

Check function of brake light!



Detach spring (6).  
Unscrew nut (7) and pull out shaft bolt.

#### Installation:

**Tightening torque:**

Remove clutch and brake pedals together with spacers, over-center spring and spring



Check installed position of spring (6).

#### Installation:

All sliding surfaces must be lubricated lightly with grease\*\*.

\* Refer to Specifications

\*\* Refer to Operating Fluids

### 35-41-000 REPLACING ACCELERATOR PEDAL

#### Installation:

Always replace a removed accelerator pedal.  
Retainers of the old part could be damaged and let the accelerator pedal slide out of the connector.  
Danger of accidents!

Push down on carpet.  
Unbend retainers and remove accelerator pedal by prying up.

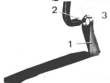
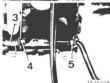
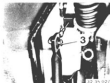
Installation:  
Install accelerator pedal with pocket over the connector on the floor plate and ensure engagement of the retainers.

Important!  
Always recheck for correct engagement of the retainers.

Turn accelerator pedal (1) far enough that linkage tab (2) of the accelerator shaft engages in opening (3).  
Pull accelerator pedal off of accelerator shaft.

Installation:  
Lubricate sliding surface on accelerator shaft lightly with grease\*\*.

\*\* Refer to Operating Fluids



### 35-41-010 REMOVING AND INSTALLING OR REPLACING ACCELERATOR PEDAL SHAFT

Remove dashboard trim panel at bottom left - refer to 51-45-100.  
Disconnect throttle cable (2).

#### Installation:

Check rubber grommet, replacing it if necessary.

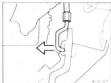
Lift out retainer (2).

Detach spring (3).  
Move bearing sleeves (4 and 5) to the side.  
Lift out accelerator pedal shaft.

Installation:  
Check bearing sleeves, replacing them if necessary.  
All sliding surfaces must be lubricated lightly with grease\*\*.

Turn accelerator pedal shaft and guide tab (2) through opening (3) in accelerator pedal (1).

\*\* Refer to Operating Fluids



### 35 41 421 Replacing bowden cable for throttle valve actuation

Remove lower left trim from instrument panel, refer to Group 51.

**M40:**  
Refer to Repair Manual, 3 Series E38.

Remove Bowden cable from pedal shaft.



**M50:**  
Lift off covers (1).  
Unscrew nuts (2).

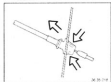
**Installation:**  
Tightening torque\*

If necessary, remove grommet from Tempomat Bowden cable.

Remove mounting cover.



**M50:**  
Detach Bowden cable from bracket on firewall.

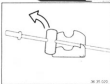


Press together retaining lugs and withdraw Bowden cable from engine firewall in direction of engine compartment.

\* Refer to Technical Data



**M 20, M 30:**  
Lift locating nipple (1) off throttle valve lever.



Press nipple out of nipple mounts.  
Remove Bowden cable out of nipple mounts.



Lift rubber grommet (2) out of counter support.  
Remove Bowden cable from here.

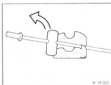


**M 50:**  
Compress nipple mounts on both sides and press out of operating lever.

**Note:**

Intake pipe was removed for picture to improve demonstration.





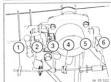
Press ribble out of ribble holders.  
Take cable out of ribble holders.



Pry out cap using a screwdriver.  
Pull out cable towards rear.  
Take rubber pad out of holder.

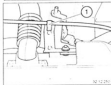
**Installation:**

Guide in cable completely as far as stop.



**Survey of Throttle Cable to Throttle Valve:**

- 1 Ribble
- 2 Throttle cable
- 3 Cap
- 4 Rubber pad
- 5 Screws
- 6 Setscrew



**MSD:**

Take cable out of holder for collector cover (1).



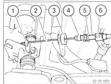
Compress ribble holder on both retainers  
and press out of operating lever.



Pull out cable towards rear.  
Take rubber pad out of holder.

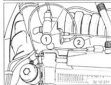
**Installation:**

Guide in cable completely as far as stop.



**Survey of Throttle Cable to Throttle Valve:**

- 1 Ribble
- 2 Throttle cable
- 3 Rubber pad
- 4 Screws
- 5 Locknut
- 6 Setscrew



**Models with Cruise Control:**

Route cruise control cable (1) underneath  
throttle cable (2).

### 35 41 ... Adjusting bowden cable for throttle valve actuation

Throttle cable adjusting procedure:

Manual transmission:

1. Fully depress accelerator pedal
2. Move throttle valve into idle setting
3. Adjust Bowden cable with no tension.
4. Set adjusting screw on full throttle detent, adjust pedal so that 0.5 mm of clearance is still present at full throttle detent of throttle valve when accelerator pedal is fully depressed. (unscrew adjusting screw 1.5 turns - equivalent to 0.5 mm clearance). Lock full throttle stop with nut.

Automatic transmission:

- 1 - 3. as for manual transmission
4. Check inspection dimension D\*.
5. Adjust full throttle detent in such a way that in kick-down setting (full throttle detent) there is still clearance of 0.5 mm at the throttle valve. (unscrewing full throttle detent 1.5 turns is equivalent to clearance of 0.5 mm. Lock nut on kick-down detent.
6. Depress accelerator pedal until transmission pressure point and adjust guide sleeve of full throttle detent in such a way that the transmission pressure point matches the full throttle detent.

### 35 41 ... Adjusting bowden cable for throttle valve actuator (on ASC+T)

Bowden cable must be set with no clearance or tension.  
Perform adjustment using adjusting screw.

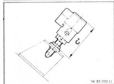
\* Refer to Technical Data



#### 35 41 480 REPLACING KICKDOWN SWITCH (EH Transmission)

Testing – refer to BMW Test Plan for Group 24.

Pull off the male plug (1).  
Unscrew nut (2).  
Unscrew switch.



#### Installation:

Adjust nut to control distance C.  
Make final adjustment after installation.  
Tightening torque\*

\* Refer to Specifications

## 36 Wheels and tires

36 10 008	Front wheel, left or right – balance electronically .....	36-	10/1
058	Rear wheel, left or right – balance electronically .....	36-	10/2
209	Wheel – check lateral and radial runout .....	36-	10/3
300	Wheel, front or rear – remove and install .....	36-	10/4
508	Wheel – balance dynamically .....	36-	10/5
713	Wheel, front or rear – check for lateral and radial runout .....	36-	10/6
715	Wheel rim – check for lateral and radial runout .....	36-	10/7
36 12 01	Tire for front, rear or spare wheel – replace .....	36-	12/1
081	Tires for all wheels – replace .....	36-	12/4
36 13 . . .	Wheel bolt lock – service install .....	36-	13/1
551	Wheel rim blades – remove and install or replace .....	36-	13/2



**36 10 008 BALANCING LEFT OR RIGHT FRONT WHEEL ELECTRONICALLY (Finish Balancer)**

Always first balance wheels stationary prior to electronic balancing - see 36 10 594.

Set up gage for balancing on the control arm end.  
Use a suitable take-up fork or additional fork (see Service Information or Workshop Equipment files).

Set up gage on control arm as close as possible to the control arm end.



Connect leads for tester.

**Important!**

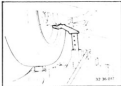
Balance wheel to the instructions supplied with the balancing machine. Balancing must be carried out on a solid base (concrete floor without a basement or sublevel underneath). Also refer to Service Information of Group 35.

If more than 15 grams of imbalance are displayed during finish balancing, the possible causes (e.g. insufficient stationary balancing, centering pin, etc.), also refer to Service Information 36 8 483 (194), must be eliminated prior to finish balancing and the finish balanced wheel rechecked.



Make a chalk mark on the side of the tire, opposite the valve.

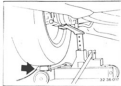
## 36-10/2



### 36 10 058 BALANCING LEFT OR RIGHT REAR WHEEL ELECTRONICALLY (Finish Balancer)

Always first balance wheels stationary (see 36 10 508) prior to electronic balancing.

Unscrew and suspend output shaft from car on a piece of wire.  
Set up gage for balancing on trailing arm as close as possible to the wheel.



Connect leads for tester.

#### Important!

Balance wheel according to the instructions supplied with the balancing machine.

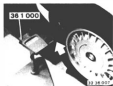
Balancing must be performed on a solid foundation (concrete floor without cellar).

Also refer to Service Information of Group 36.

If more than 15 grams of imbalance are displayed for one wheel during finish balancing, the possible causes (e.g. inaccurate stationary balancing, centring, etc.), also refer to Service Information 36 0 483 (195), must be eliminated before finish balancing and a previously finish balanced wheel must be rechecked.

Make a chalk mark on the side of the tire, opposite the valve.





**36 10 029 CHECKING WHEEL FOR LATERAL AND RADIAL RUNOUT**

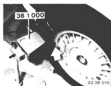
Wheel bearings must be in perfect condition.  
Lift car.  
Check wheel for lateral runout\* with Special Tool 36 1 000.



Check wheel for radial runout\* with Special Tool 36 1 000.



If necessary, remove balance weights.  
Pry off the ornamental ring, if applicable.  
Check lateral runout\* of rim with Special Tool 36 1 000.

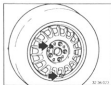


Check radial runout\* of rim with Special Tool 36 1 000.

### 36 10 300 REMOVING AND INSTALLING FRONT OR REAR WHEEL

#### Important!

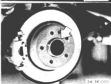
Wheel was balanced electronically. Use the following procedures to avoid transforming errors and imbalance.



- Loosen wheel bolts.
- Position wheel with valve at bottom and install in same position.
- If several wheels are removed at the same time, mark installed location of wheels on tires with chalk.
- Mark position of wheel to wheel hub (to avoid transforming errors).
- Mark position of wheel lock to wheel (to avoid imbalance).
- Unscrew wheel bolts.



34 38 000



34 38 000

#### BMW Wheel:

Press the BMW emblem in against the spring force. Grab hold of the hub cap with fingers inserted through the visible openings and pull the cap off towards the outside.

#### Installation:

Remove dirt and oil grease from the wheel centering shoulder and rim bearing surfaces and coat wheel center with Plastilube™ before installing a wheel.

Inspect wheel bolt threads and tapered for wear, replacing wheel bolts if necessary. Lubricate wheel bolt threads lightly with grease, but keep grease off of the tapered.

\* Refer to Operating Fluids



34 38 000



34 38 000

#### MS Wheel Installation:

The wheels must run in a certain direction due to the blade wheels. Identification of the wheel running direction is provided on the surface of the blade wheel shown by the arrow.

- L = Left
- R = Right

Tighten wheel bolts crosswise.

Tightening torque\*

If new wheel rims are mounted for the first time, the tightening torque\* must be checked after 1,000 km.

Place a pertinent information label or tag in car where the driver can see it.



- a) Wheel bolt - galvanized
- b) Wheel bolt - black chrome plated
- c) Wheel bolt - black chrome plated and lockable (special equipment)

#### Note for Wheel Bolt Locks:

If the adapter is missing, use a suitable adapter from the wheel bolt adapter set, Special Tool 36 1 300, to unscrew the locked wheel bolts.

Refer to Specifications





32 26 049

### 36 10 508 BALANCING WHEEL DYNAMI- CALLY (Wheel Removed)

Remove old balance weights, stones in treads and large pieces of dirt.  
Check inflation pressure and tires for damage or flat spots (caused by parking a car with hot tires for a long time). If necessary, check wheel and tire for radial and lateral runout - see 36 10 209.

Use a suitable center of pertinent balancing machine supplier.

- 1 = Basic flange
- 2 = Center
- 3 = Type flange

Also refer to Workshop Equipment and Planning.

32 26 014

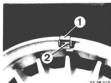


#### Important!

It is necessary to mount the wheel on the balancing machine in the same manner as it will be mounted on the car afterwards (e.g. valve facing down). In order to avoid clamping-over errors, balance wheel according to the instructions supplied with the pertinent balancing machine.

Pry the tire wall away from the rim flange slightly with a tire piers\*\* at a suitable point and insert a retainer in the case of light alloy rims.  
Remove the tire piers and slide a balance weight underneath the retainer and let it engage.

\*\* See Workshop Equipment and Planning

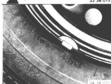


32 26 015

### Arrangement of Balance Weights for Cast Light Alloy Wheel Rims:

- 1 = Spring clip
- 2 = Balance weight

Max. imbalance per wheel and side\*.



32 26 016

### Arrangement of Balance Weights for Steel Wheel Rims:

Max. imbalance per wheel and side\*.

\* See Specifications



32 26 047



## 36 10 713 CHECKING FRONT OR REAR WHEEL FOR RADIAL OR LATERAL RUNOUT (Wheel Removed)

Remove wheel – see 36 10 306.  
Mount wheel on the balancing machine in the same manner as it will be mounted on the car afterwards (e.g. valve facing down), in order to avoid clamping-over errors.

Use a suitable center of the pertinent balancing machine supplier.

- 1 = Basic flange
- 2 = Center
- 3 = Type flange

Also refer to Workshop Equipment and Planning.

36 10 614



Apply Special Tool 36 1 000 on tread surface of the tire.  
Turn the wheel by hand and measure the max. tire radial runout\*.

*Note:*  
Special tool must be perpendicular to the tread surface of the tire.



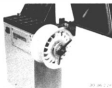
Apply Special Tool 36 1 000 on side wall of the tire.  
Turn the wheel by hand and measure the max. tire lateral runout\*.

*Note:*  
Special tool must be perpendicular to the tire's side wall.  
Don't measure on the printed surface!

If necessary, check radial and lateral runout of the wheel rim – see 36 10 715.

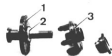
### 36 10 715 CHECKING WHEEL RIM FOR RADIAL AND LATERAL RUNOUT

Remove wheel - see 36 10 300.  
 Pull tire off of wheel rim.  
 Remove old balance weights.  
 Remove dirt on rim well and rim flange.



36 10 2 07

Mount wheel rim on balancing machine.

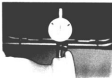


37 36 014

Use a suitable center for pertinent balancing machine.

- 1 Basic flange
- 2 Center
- 3 Type flange

Also refer to Workshop Equipment files.



38 36 027

Apply dial gage on rim well.  
 Turn wheel rim by hand and measure maximum radial runout\*.  
 Measure runout on both sides of the rim well.

Note:  
 Dial gage must be perpendicular to the rim well.

\* See Specifications



39 10 024

Apply tester on rim flange.  
 Turn wheel rim by hand and measure maximum lateral runout\*.  
 Perform test on both rim flanges.

Note:  
 Dial gage must be perpendicular to the rim flange.

Important!  
 Avoid errors in rechucking during installation afterwards.  
 Also refer to 36 10 568.

\* See Specifications



### 36 12 001 Replacing tires for front wheels, rear wheels or spare wheel

Note Service Information Group 36!  
Asymmetric rims, refer to 36 12 081.

Refer to the Operating Manual for the relevant tire-fitting device for instructions on how to fit tires correctly. Also make sure that the machine is in perfect condition and that the wheel rim and tire are not damaged.

#### General tire removing/fitting instructions

##### Removing

To remove a tire, first remove the valve.  
After the tire has been forced off the rim flange, remove balancing weights, press the bulges into well and apply good coat of tire mounting paste\*.

Clean wheel rim thoroughly and inspect rim for damage before mounting the tire.  
The valve and valve insert must be replaced each time a tubless tire is removed and installed.

#### Caution!

It will be necessary to loosen the bead at several points on the bead periphery from the inside and outside with the pressing-off blade on the rim flange before pressing off the tire.  
If it is very difficult to press off the tire, loosen tire from rim flange as well as possible with the pressing-off form and then apply a coat of tire-mounting paste between the tire and rim flange.  
Repeat this procedure around the entire circumference of the tire.  
Then press off tire completely.

TD tires require higher levels of force for removal because their rim flanges are slightly higher.

#### Caution!

TD rim lips can suddenly jump into the Denko groove, causing the forcing-off blade to deflect backwards!

#### Assembly

Coat the tire rims with tire mounting paste\*.

Make sure tire is mounted on correct side, especially in case of asymmetric tires.

The "outside" of these tires is marked.

Mount tire with minimum possible rim distortion because otherwise there is a risk of damaging the tire - or the rim lips in the case of TD tires.

On TD tires, start assembly on the side opposite the valve.

Allow the tire bead - coming from the well - to first clear the flange of the rim shoulder.

Build up pressure gradually, maintaining constant watch.

Maximum "jumping pressure": 3.3 bar.

If the tire is not seated on the rim correctly in the first place, tire seating will not be improved by simply increasing the inflation pressure!

Instead it will be necessary to press off both tire beads, apply another coat of mounting paste and reinflate the tire.

Only when the tire beads are securely located on the rim shoulders, slowly increase inflation

pressure to enable the tire to "seat down".

Maximum "seating pressure": 4.0 bar.

After jamping up the tire, perform visual inspection of tire seating, assessed on the basis of bead characteristics.

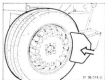
For approved tires, tire sizes and special equipment, refer to Service Information, Group 36.

#### Caution!

TD tires may only be mounted on TD rims!

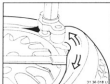
If incorrectly mounted TD tires or rims for other tire concepts (including TR) are used, damage can be caused to tires which may cause them to fail in service.

Tires of this kind must not be reused, not even on a TD rim!



#### Mounting Tires with a Mounting Machine

Unscrew valve and deflate tire.  
 Press all beads from rim flange all around on outside and inside using pressing-off horn of machine.  
 If tire beads fit too tight, first only loosen line from flange at several points with the pressing-off horn prior to the actual pressing-off.  
 Push both tire beads into rim well completely until they are loose.  
 Pull off balance weights on rim and clean rim to remove large pieces of dirt.  
 Coat tire beads with mounting paste<sup>1)</sup>.  
 Clamp wheel on mounting machine.  
 Narrow rim shoulder always faces up.



Let mounting machine run back a short distance (counterclockwise) so that the tire bead can slide fully on to the mounting finger.

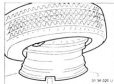
Then let mounting machine run forward (clockwise) a short distance. In so doing always check, whether the bottom bead is fully in the well and the tire is given enough time to move. Stop the machine and let it run back slightly, if the bead clamps.



Swing mounting pincer into position or fold and let it engage.  
 Adjust mounting head, whereby it must be pressed on the rim edge fully and turn down the lever for the clamp; normally the distance of the mounting head will set in automatically.  
 Valve should be about 10 cm to the right of the mounting head.  
 Lift tire bead over mounting finger using tire iron.  
 It is recommended to use coated or slotted (if hose covered) tire irons for light alloy rims.



If the upper bead is pulled off of the rim, now also lift the bottom bead over the mounting finger with the tire iron.  
 Let machine run back a short distance again and then forward (clockwise) briefly, until there is complete separation of the tire from the rim.



Release lock and tilt back or swing away the mounting pillar.  
 Unclamp and clean the rim.  
 Replace the valve.  
 Coat the rim flange and tire beads with mounting paste.  
 Clamp the rim on the mounting machine.  
 Slide on the tire with the lower bead over the rim flange partially.  
 Valve is 10 cm to the right of the mounting head.



Press the upper tire bead underneath the mounting finger.  
 Tire bead should seat in rotors next to the mounting finger.

**Important!**  
 Don't pinch or damage the bead.

Run the mounting machine forward (clockwise) a short distance, while checking that the lower tire bead remains in the well.



Swing or tilt the mounting pillar into position and lock.  
 Check adjustment of the mounting finger, readjusting if necessary and clamp.  
 Press the tire underneath the mounting finger by hand.  
 Tire bead should seat in the roll next to the mounting finger.  
 Let the mounting machine run forward (clockwise) a short distance.  
 The lower tire bead will drop into the well.



After mounting, first release the clamps and then inflate the tire (without valve). Increase pressure up to 3.5 bar in steps (jumping pressures).  
 If the tire bead does not slide on to the rim edge all around, do not increase the pressure.  
 Instead the tire must be deflated and the tire bead pressed off, then coat the rim flange with mounting paste again and inflate again up to 3.5 bar.  
 If the beads bear perfectly on the rim shoulders, increase the pressure to maximum 4.0 bar to "seat" the tire. Screw in the valve and correct the tire pressure.

## 36 12 081 REPLACING TIRES OF ALL WHEELS

Valid for "asymmetric hump rims".

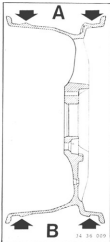
Recognition of Asymmetric Hump Rims:  
There will be "AH" or "AH 2" after the rim size data in the wheel disk.

Example:  
6 J x 17 AH 2

**Feature of Asymmetric Hump Rims:**

The profile of the hump changes around the periphery of the rim.  
This provides sections where removal of the tire is easier.

- A Rim profile in area of valve with flat hump profile
- B Rim profile offset 180° from valve with steep hump profile



**Removing Tire:**

The removal of tires from asymmetric hump rims is different.

The pressing off of the tire from the inner and outer rim flanges must always be begun at the valve seat.  
The springing over of the tire bead is easier due to the flat hump profile.

Otherwise the procedures are the same as for tires on symmetric hump rims.

**Installing Tire:**

The installation of tires on asymmetric hump rims is different.

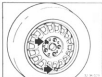
A bead compressor\* should be used to make installation easier.

Maximum "jumping pressure": 3,5 bar.  
Release the pressure if the tire beads have not jumped over the hump with 3,5 bar pressure.

Coat tire beads with tire mounting paste\* again, reposition the tire and inflate the tire again.

Otherwise the procedures are the same as for tires on symmetric hump rims.

\* Source of Supply: BMW Parts



### 36 13 ... SERVICE INSTALLING WHEEL BOLT LOCK

Loosen wheel bolts.  
Lift car until wheel can be turned.  
Loosen wheel bolts until wheel can be moved easily on the wheel hub.  
Have valve of wheel face down.  
Remove top wheel bolt and install the wheel bolt lock.

Imbalance could be produced by play in the wheel center and actual weight of the wheel.

This imbalance is kept at a minimum by installing the slightly heavier wheel bolt lock in the position of the top wheel bolt.

Tighten the wheel bolts hand tight clockwise in this position (wheel bolt lock at top and valve at bottom).  
Lower car and tighten wheel bolts clockwise.  
Tightening torque\*.

Wheels will have to be finish balanced if a customer complains about wheel imbalance after installation of wheel bolt locks.

\* See Specifications





36-13-012

**36-13-551 REMOVING AND INSTALLING  
OR REPLACING BLADES  
ON WHEEL RIM  
(Wheel Removed)**

Unscrew bolts.  
Take off inner and outer blades.

Installation  
Tightening torque\*.

Installation:  
Only install blades with identical identification (see arrow)

L = Left  
R = Right

on one wheel.

1 = Inner blades  
2 = Outer blades

Important:  
Install outer blades without identification in such a manner that the blades face forward at an angle in the turning direction of the wheel and are parallel to the inside blades.



36-13-014



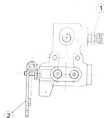
36-13-015

## 37 Integrated suspension systems

	General information .....	37-	0/1
	Ride level control with LAD / circulating system – layout drawing .....	37-	0/2
37 12 010	Car ride level height – adjust .....	37-	12/1
100	Rear spring strut / shock absorber assembly, left or right – remove and install .....	37-	12/3
210	Ride level height control valve – remove and install or replace .....	37-	12/4
37 14 005	Wheel camber warning switch –check (with BMW Service Tester) .....	37-	14/1
510	Wheel camber warning switch – replace .....	37-	14/2
37 21 005	Ride level control pump – check .....	37-	21/1
030	Pressure reservoir, left or right – replace .....	37-	21/2
500	Charge pressure in left or right pressure reservoir – check .....	37-	21/3
	Ride level control with LAD – troubleshoot .....	37-	90/1



Regulating down position = lever moved back.  
Circulating pressure\*.  
(Rear end of car lowered.)

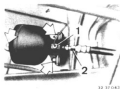


### 37 21 035 REPLACING LEFT OR RIGHT PRESSURE RESERVOIR

Unscrew pressure discharging plug (1) on the regulating valve and discharge the pressure.

**Note:**  
Place a pan underneath.  
Never loosen the clamping screw on lever (2)

**Installation:**  
Conform with filling and bleeding procedures on page 37 - 99/3.  
Check pipe connections for leaks.

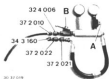


Unscrew pipes (1 and 3).  
Unscrew mounting bolts.  
Take off pressure reservoir.

**Installation:**  
Replace rubber mounts if necessary.  
Tightening torque\*.

\* See Specifications

\* See Specifications



30 37 016

## 37 21 500: CHECKING PRESSURE IN 37 21 501: LEFT-RIGHT PRESSURE RESERVOIR

Assemble tester 32 4 006.  
Connect adapters on tester.  
Close valves (A and B).

Unscrew pressure discharging plug (1)  
on the regulating valve and discharge  
the pressure.

**Note:**  
Place a pan underneath.

**Installation:**  
Conform with filling and bleeding pro-  
cedures on page 37 - 80/3.  
Check pipe connections for leaks.



30 37 016



30 37 016



37 31 029



30 37 016

Unscrew nut and disconnect regulat-  
ing rod on the stabilizer.

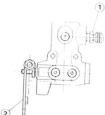
**Installation:**  
Tightening torque\*.

Start engine and regulate the system  
upward (lever on regulating valve  
moved forward).  
Max. pressure\* (ride level regulating  
valve).  
Stop engine.

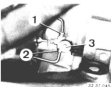
Regulate the system downward (lever  
on regulating valve moved back).  
Min. pressure\* (ride level regulat-  
ing valve).

Open shutoff valve (B) slowly and let  
hydraulic oil run into the pan.  
The pressure, at which the pressure  
gauge needle drops suddenly to 0, is  
the gas charging pressure of the  
pressure reservoir (nominal value\*).  
Repeat test.

\* See Specifications



37 31 029

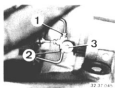


30 37 045

Unscrew plug (1) and connect tester to  
check the left pressure reservoir.

Remove tester.  
Connect pipe (2).

Installation:  
Tightening torque\*.



Checking Right Pressure Reservoir:  
If applicable, discharge pressure.  
Unscrew pipe (1) and connect tester by  
unscrewing bolt (3) and pushing the  
branch aside.  
Now perform the test in the same  
manner as for the left pressure  
reservoir.

Installation:  
Tightening torque\*.

## TROUBLESHOOTING RIDE LEVEL HEIGHT CONTROL WITH LAD (Load Dependent Absorption)

Condition	Cause	Correction
Measured car ride level height too high or too low	<ul style="list-style-type: none"> <li>a) Ride level height maldadjusted</li> <li>b) Regulating rod not mounted correctly</li> </ul>	<ul style="list-style-type: none"> <li>a) Adjust ride level height - refer to 37 12 010</li> <li>b) Check regulating rod installation, repairing if necessary, and adjust ride level height - refer to 37 12 010</li> </ul>
Rear end of car drops below nominal ride level height with payload and engine running	<ul style="list-style-type: none"> <li>a) Car overloaded</li> <li>b) Hydraulic oil level too low</li> <li>c) Regulating rod not mounted correctly</li> <li>d) Feed pipe damaged</li> <li>e) Pump pressure too low</li> <li>f) Ride level regulating valve defective</li> <li>g) Spring strut shock absorbers defective</li> </ul>	<ul style="list-style-type: none"> <li>a) Check payload, reducing weight to maximum permissible axle load if necessary</li> <li>b) Check / correct hydraulic oil level</li> <li>c) Check regulating rod installation, repairing if necessary, and adjust ride level height - refer to 37 12 010</li> <li>d) Check feed pipe, repairing or replacing as necessary</li> <li>e) Check pump - refer to 37 21 005, repairing or replacing as necessary - refer to Group 32</li> <li>f) Check ride level regulating valve - refer to 37 21 500/501 (Checking Pressure of Pressure Reservoirs), replacing if necessary - refer to 37 12 210</li> <li>g) Check spring strut shock absorbers (shock absorber test), replacing if necessary - refer to 37 12 100</li> </ul>

## TROUBLESHOOTING RIDE LEVEL HEIGHT CONTROL WITH LAD (Load Dependent Absorption)

Condition	Cause	Correction
Rear end of car does not rise/drop to nominal ride level height when unloaded	<ul style="list-style-type: none"> <li>a) Regulating rod not mounted correctly</li> <li>b) Feed return pipes damaged</li> <li>c) Ride level regulating valve defective</li> <li>d) Spring strut shock absorbers defective</li> <li>e) Pump pressure too low</li> </ul>	<ul style="list-style-type: none"> <li>a) Check regulating rod installation, repairing if necessary, and adjust ride level height - refer to 37 12 010</li> <li>b) Check feed return pipes, repairing or replacing as necessary</li> <li>c) Check ride level regulating valve - refer to 37 21 500/501 (Checking Pressure of Pressure Reservoirs), replacing if necessary - refer to 37 12 210</li> <li>d) Check spring strut shock absorbers (shock absorber test), replacing if necessary - refer to 37 12 100</li> <li>e) Check pump - refer to 37 21 005, repairing or replacing as necessary - refer to Group 32</li> </ul>
Pipes between pressure reservoirs and LAD module damaged	<ul style="list-style-type: none"> <li>a) Ride level regulating valve defective</li> <li>b) Gas charging pressure valve in pressure reservoir</li> </ul>	<ul style="list-style-type: none"> <li>a) Check ride level regulating valve - refer to 37 21 500/501 (Checking Pressure of Pressure Reservoirs), replacing if necessary - refer to 37 12 210</li> <li>b) Check pressure reservoir - refer to 37 21 500/501, replacing if necessary - refer to 37 21 030</li> </ul>
Car suspension harder than normal	<ul style="list-style-type: none"> <li>a) LAD module defective</li> <li>b) Gas charging pressure loss in pressure reservoir</li> </ul>	<ul style="list-style-type: none"> <li>a) Check LAD module (shock absorber tester), replacing shock absorbers if necessary</li> <li>b) Check pressure reservoir - refer to 37 21 500/501, replacing if necessary - refer to 37 21 030</li> </ul>
Weak shock absorbers, knock from rear axle	<ul style="list-style-type: none"> <li>a) Spring strut shock absorbers defective</li> </ul>	<ul style="list-style-type: none"> <li>a) Check spring strut shock absorbers (shock absorber test), replacing if necessary - refer to 37 12 100</li> </ul>

## TROUBLESHOOTING RIDE LEVEL HEIGHT CONTROL WITH LAD (Load Dependent Absorption)

Condition	Cause	Correction
Permanent display of wheel camber warning switch Instrument cluster display, ride level height control	a) Car overloaded	a) Check payload, reducing weight to maximum permissible axle load if necessary
	b) Hydraulic oil level too low	b) Check - correct hydraulic oil level
	c) Regulating rod not mounted correctly	c) Check regulating rod installation, repairing if necessary, and adjust ride level height - refer to 37 12 010
	d) Feed pipe damaged	d) Check feed pipe, repairing or replacing as necessary
	e) Pump pressure too low	e) Check pump - refer to 37 21 005, repairing or replacing as necessary - refer to Group 32
	f) Ride level regulating valve defective	f) Check ride level regulating valve - refer to 37 21 500/501 (Checking Pressure of Pressure Reservoirs), replacing if necessary - refer to 37 12 210
	g) Adjustment/installation of wheel camber warning switch incorrect	g) Check adjustment, adjust wheel camber warning switch if necessary - refer to 37 12 010 (adjusting ride level height)
	h) Fuse no. 29 blown	h) Check circuit (troubleshoot electrical systems), replace fuse
	i) Wheel camber warning switch defective	i) Check wheel camber warning switch - refer to 37 14 005, replacing if necessary - refer to 37 14 010



# 41 Body

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503 Wheel house outer section, rear, right – replace (side panel removed) .....	41-14/53
41 31 001 Roof panel – replace (version without double sunroof) .....	41-31/50
011 Roof panel – replace (version with double sunroof) .....	41-31/53
41 33 001 Front panel complete with front wall – replace .....	41-33/1
41 34 041 Tail panel – replace .....	41-34/1
041 Tail panel – replace .....	41-34/50
41 35 000 Side panel, front, left or right .....	41-35/1
105/115 Side panel, rear, left or right – replace (partial replacement C-pillar) .....	41-35/1.1
337/338 Side panel, rear, left or right – replace (partial replacement up to wheel house) .....	41-35/2
115 Side panel, rear, right – replace (partial replacement C-pillar) .....	41-35/50
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41 52 080 Rear door, left or right – remove and install .....	41-51/2
41 61 000 Engine hood – remove and install .....	41-61/1
014 Engine hood – adjust .....	41-61/2
545 Engine hood hinge – remove and install or replace (engine hood removed) .....	41-61/4
41 62 000 Trunk lid – remove and install .....	41-62/1
014 Trunk lid – adjust .....	41-62/2

## INTRODUCTION

This repair manual for body jobs is supplied for skilled workers and consequently it is assumed, that persons referring to this manual will be well qualified, conscientious workers with the necessary amount of responsibility.

Instructions are therefore limited to information on factory approved repair methods as well as related tips and working aids.

The described body repair jobs refer to the complete or partial replacement of parts with original BMW replacement parts or sections of replacement parts. Straightening and dent removal must be adapted to a pertinent damage scope. Concerned welding and spot welding seams must be inspected and, if necessary, repaired.

Refer to the cut out parts for the quantity and location of welding spots, inert gas welded seams and brazed connections. Use inert gas plug welding instead of spot welding in non-accessible areas.

Most pictures show a rough, unpainted bodyshell. Remove or cover all car parts, which are in the repair zone and are in danger of being subjected to heat, sparks or dust.

Disconnect the ground lead on the battery or body connection point. Protect electric leads against dangers of mechanical or thermal influence.

Conform with safety precautions for cars with SRS.

Conform with fire and accident prevention regulations.

Welding can be performed after removal of control units, if

- there is guarantee of about 1 meter (3 feet) distance between welding and ground connections and
- there is guarantee of good electric connection between welding and ground points (no rubber mounts or anything similar).

If not, thermal development must be considered especially in case of autogen welding (decisions must be made for each individual case).

In spite of continuous quality control in welding by the factory, it is still possible that some welded points could be faulty. They will be repaired in the factory subsequently, either with inert gas spot welding or, when not accessible, with 15 mm (0.590") long inert gas welded seams on the flange end. Consequently repaired welded seams on the body do not always indicate repairs by a third party.

For example: left engine carrier member resistance spot welded - right engine carrier member welding repaired with inert gas welding.

### Important!

The steering gear must be inspected and maybe replaced after an accident or accident-similar driving conditions - see Service Information 32 01 58 (828).

Seal all welding seams, which had been sealed originally with a body sealing compound, correctly and immediately after repairing. Replace damaged anti-drumming insulation.

Seal new sheet metal parts or the cavities, seams, creases and folds produced by new sheet metal parts with a body sealing compound immediately.

Source of supply for workshop equipment, aids, sealing materials, cements and similar products: HWD (a Business Division of BMW AG).

**REMOVING PVC MATERIAL IN REPAIR ZONE**

Corrosion inhibition after repairing begins already with the professional removal of PVC undercoating, anti-drumming compound and seam sealing compound in the repair zone.

Remove PVC material with a rotating steel brush, or heat PVC to maximum 180° C (355° F) with a hot air blower and scrape off with a spatula.

Burning off the PVC material or heating it above 180° C (355° F) with a gas flame torch or similar tool would produce strong corrosion-promoting hydrochloric acid.

Health impairing vapors would also be set free.

New undercoating would not have sufficient adhesion on burnt PVC material and consequently underside rusting would be possible.

**WELDING GALVANIZED SHEET METAL**

Hot galvanized and galvanized sheet metal is used to a greater extent for components of the body, which are especially subject to corrosion.

Conformance with the following points is necessary when working with these parts.

The welding smoke contains poisonous zinc oxide, so that especially good extraction is necessary in the welding bay.

Do not grind off zinc coat for resistance spot welding and inert gas welding.

The zinc coat, however, must be ground off for brazing jobs.

If at all possible welded connections should be made with resistance spot welding.

Welding current is boosted by at least 10 % as compared with blank sheet metal. Apply as high as possible electrode contact force (make break out test on sample sheet metal). A coat of spot welding paste can be applied for better sealing.

Inert gas welding should be preferred to autogen welding in areas not accessible for resistance spot welding, because of the lower heat dispersion.

Machining or forming of galvanized sheet metal in warm state is normal.

Make sure of thorough extraction of poisonous vapors.

Remove burnt residual zinc completely.

Align, grind down and tin out visible joints as normally.

## RECOMMENDED WORKING METHODS AND TOOLS

## 1. Cutting Out Damaged Parts:

Determine the location of mating surfaces with help of the replacement part before beginning with the work. Cut out damaged part roughly within the mating surfaces.

**Caution!**

Don't damage sheet metal located underneath.

Remove sealing compound, anti-drumming compound and, if applicable, paint to neutralize the connection points. Drill out spot welding. Make sure holes are drilled in the cut out part while drilling. Don't drill in the connection flanges remaining for installation of the new part.

Grind off welded seams with a disc grinder carefully. Heat brazed connections with an argon gas torch (don't heat excessively!). Lift off scrap metal. Remove residual brazing solder with a steel brush. Straighten and grind all connection points thoroughly.

## 2. Installing New Parts:

Prepare connection points to pertinent repairing instructions.

Always perform repairs, which concern the suspension points of the engine, transmission, axes or running gear, on a straightening bench with the attachments belonging to the car type. There are also attachments for different body parts. Check curvature and dimensions of windshield and rear window by installing an original window. Refer to pertinent drawings for the gaps of doors, engine hood and trunk lid.

Coat mating surfaces intended for resistance spot welding with zinc dust paint. Only remove the protective paint from galvanized replacement parts. Drill 5 mm (0.315") dia. holes with same spacing as the drilled out welded spots in connections not accessible for the spot welding tongs and insert gas plug weld.

Produce inert gas welded seams according to the part cut out.

Produce brazed connections with as little as possible heat dispersion and without excessive heat. Procedures deviating from standard connections will be described in the repair manual. Grind down welded seams visible on outside surfaces.

**Caution!**

Don't grind down the sheet metal too thin.

Straighten and tin out irregularities. Tinning out is supposed to prepare the surface to such an extent, that only a coat of fine filler has to be applied prior to spraying on paint.

Seal off all welding seams, which had been sealed in original state with a body sealing compound, correctly and immediately after repairing. Replace damaged anti-drumming compound. Seal new sheet metal parts or the cavities, seams, creases and folds produced by new sheet metal parts with a body cavity sealing compound immediately.



#### SAFETY PRECAUTIONS FOR WORKING ON BODY OF CARS WITH AIRBAG

Disconnect both poles of car's battery before working with an electric welder.  
Cover battery poles.

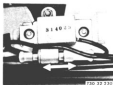
Parts of the airbag system must not be subjected to heat greater than 180° C (370° F), not even briefly.

If there is danger that working on the body could subject parts of the airbag system to strong vibrations, they should be removed as a precautionary measure.

In case of deformations or when installing the holders for both crash sensors on the front wheel fenders on left and right sides, make sure that the holders are aligned parallel to the car's longitudinal axis precisely.

Also refer to the repairing and safety regulations concerning the airbag system in Group 32.

Disconnect plugs of both front sensors (C).



130 33 330

Unscrew lower casing section.  
Pull (orange) plug out of holder and disconnect.



33 33 036



61 00 001

#### Components:

- a) Airbag steering wheel with impact shell and impact pad, in which airbag, gas generator and ignition pill are integrated.
- b) Contact ring = gearless power supply to the ignition pill.
- c) Two crash sensors (left and right front on wheel fender) and safety switch left.
- d) Electronic diagnosis unit (instrument panel trim left) with integrated safing sensor (prevents unwanted activation).
- e) Airbag indicator lamp integrated in check control unit.

## Frame alignment control dimensions, BMW 5 Series E34 Sedan

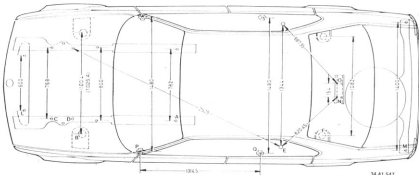
- Sheet 1 -

Dimensions in mm, tolerance: - 2.0 mm.  
Differing dimensions for 4WD in brackets.

**Note:**

Only use the following values for a rough inspection.

Repairs can only be carried out correctly with the approved set of attachments and a straightening bench.



34 41 547

A = Bore in rear engine carrier

B = Front spring mount

C = Front axle take-up

D = Front axle support

E = Rear axle take-up at side

F = Spring mount, rear

G = Hinge axis front lower

H = Hinge axis front upper

I = Hinge axis rear lower

K = Hinge axis rear upper

L = Bore, front crossmember

M = Bore, crossmember rear

N/O = Rear axle support, center

P = Front car jack take-up

Q = Rear car jack take-up

## Frame alignment control dimensions, BMW 5 Series E34 Sedan

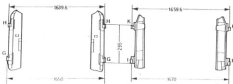
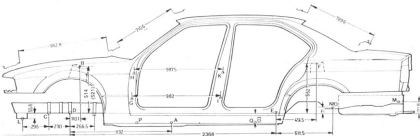
- Sheet 3 -

Dimensions in mm, tolerance : 3.0 mm,  
 Differing dimensions for 4WD in brackets.

## Note:

Only use the following values for a rough  
 inspection.

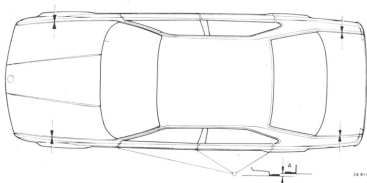
Repairs can only be carried out correctly  
 with the approved set of attachments and  
 a straightening bench.



# 41-0/7

## GAPS OF DOORS / ENGINE HOOD / TRUNK LID

Door and hood/lid gaps:  $0.5 \pm 0.5$ -  $1.0$  mm ( $0.020 \pm 0.020$ -  $0.040$ " ).  
Permissible deviation (s parallel): 1 mm (0.040").  
Plane displacement A for each body part adjacent to the rear =  
max. 1 mm (0.040") toward inside.





## WINDOW AND DOOR GAPS OF FRONT AND REAR DOORS

All dimensions in mm



Schnitt B-B	
a	212 ±1
b	111 ±0,5
c	86 ±1



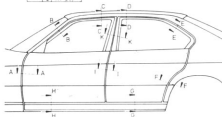
Schnitt C-C D-D	
a	212 ±1
b	95 ±0,5
c	111 ±1



Schnitt K-K	
a	121 ±1
b	121 ±1



Schnitt E-E	
a	121 ±1
b	95 ±0,5
c	116 ±1



Schnitt A-A	
a	203 ±0,5
b	181 ±0,5



Schnitt H-H G-G	
a	201 ±0,5



Schnitt I-I	
a	201 ±0,5
b	203 ±0,5
c	101 ±0,5
d	177 ±0,5
e	81,5 ±1



Schnitt F-F	
a	201 ±0,5
b	191 ±1



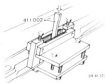
34 41 119

#### DIE STAMPING VEHICLE IDENTIFICATION NUMBER

The chassis number must be die stamped again, if it had been removed during body repairs.

##### Note:

The chassis number can also be die stamped in a completely assembled car, but then the coolant reservoir, cover on separating wall, windshield wiper arms and air inlet grills must be removed.



34 41 123

Place impact numbers 41 1 000 in special tool separately and die stamp the chassis number. Die stamp "x" in front of the chassis number instead of the BMW emblem to indicate replacement of parts or body in a workshop.



34 41 120

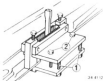
Assemble Special Tool 41 1 001 in such a manner, that smooth side of the baseplate faces the stamp guide.

Screw in bolts only far enough, that the spacing in brackets can be installed later.



34 41 121

Install and stamp Special Tool 41 1 003 on left and right sides.



34 41 122

Have special tool fixture bear on concerned surface.

Align baseplate to be parallel with the stamp guide with both (1).

Align special tool fixture.

Tighten bolts (2).

# 41-0/10

## COMPLETING REPLACEMENT PART ENGINE CARRIER MEMBER WITH WHEEL HOUSE OR FRONT WHEEL HOUSE

To make storing easier, wheel houses are supplied without the brackets, differing according to vehicle type.

Brackets can be used from the cut out part or ordered new separately.



34 41 127

Grind down wheel house only on points used for plug spot welding, so that marks required to position the bracket are not removed.



34 41 124

Positions of brackets are marked on the wheel house.



34 41 125

Drill holes for plug spot welding when using new brackets.



34 41 126

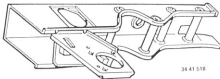
Hold brackets on pertinent marks. Draw holes.

# 41-11/1

## 41 11 043: REPLACING LEFT OR RIGHT ENGINE CARRIER FRONT SECTION 41 11 044 (Without Wheel House)

Procedures are described for the left side of the car.  
Procedures are analogous for the right side of the car.

Refer to "Introduction" on page 41 - 5/1.



Remove or disconnect/detach the following parts:

### Left Side of Car:

- Ground connection on ground pole of battery or body ground point
- Front axle with engine and transmission, fuel and brake pipes/hoses as required
- Hydraulic control unit
- Brake booster with hoses
- Cooling coil for power steering
- Cover for radiator
- Carbon canister
- Heater valve and positive pole connection point
- All electric leads in front panel
- Wiper arms and grille
- Front bumper
- Radiator grill, turn signals and headlights
- Engine hood with lock and cable
- Horn
- Front/wall assembly
- Front cross member
- Pedal base assembly complete with steering column
- Heater and air conditioner
- Both front seats (complete)
- Front carpets (complete)
- Insulation sheets

### Right Side of Car:

- Additional heat protection sheet on engine compartment wall
- Windshield washing fluid tank and air cleaner

## REPLACING FRONT ENGINE CARRIER SECTION

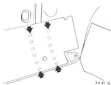
### Note:

Most of the spot welded points on the engine carrier will not be accessible with spot welders common in workshops. Produce holes while drilling off spot welds in such a manner, that they can be used for plug spot welding later.



34 41 140

Drill off spot welds on inside and bottom.



34 41 141

Drill off rows of spot welds from the passenger compartment.



34 41 142

Drill off only the indicated spot welds on the outside.



34 41 143

Drill off connections on the cross member.

Take up engine carrier and cross member on a straightening bench for welding.



34 41 147

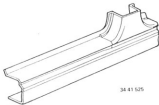
### Installation:

Cramp the spot welding flange in zone C (= 30 mm / 1 3/16") toward inside by an angle of approx. 30° to guarantee clearance of wheels when the steering wheel is turned against lock.  
Distance D = approx. 75 mm (3").  
Zone E on left and right sides: approx. 48 mm (1 9/16").

## 41-11/3

### 41 11 350 REPLACING COVER FOR LEFT OR RIGHT FRONT SIDE MEMBER (PARTIAL REPLACEMENT A AND B PILLARS)

Refer to "Introduction" on page 41 - 0/1.

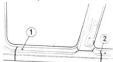


34 41 525

Remove or disconnect/detach the following parts.

- Ground pole on battery
- Front and rear doors
- Front and rear covers (on outside of entrance)
- Trim panel for B-pillar
- Seat belt
- Front seat
- Rear seat cushion
- Front and rear plates (on inside of entrance)
- Edge guard
- Radio loudspeaker cover
- Wire harness (A pillar)
- Front and rear carpets (partially)
- Pipe installations

## 41-11/4



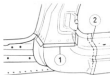
24-41 5.24

Draw cutting lines according to size of the replacement part.

*Note:*

A vertical running reinforcement plate is located in front of hole (1) - provide sufficient distance.

Connection (2) is brazed in the corner.



24-41 5.25

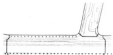
Plug weld connection (1) with the reinforcement plates.  
Produce the connection at joint (2) in the same manner as the original connection.



24-41 5.26

*Note:*

The B-pillar has double-panel walls. The inside panel must not be damaged while cutting off.



24-41 5.27

Cut out old section.



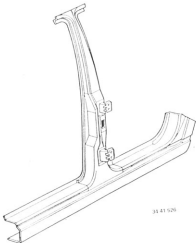
24-41 5.28

Produce and weld in reinforcement plates having a width of about 45 mm (1 9/16").

# 41-11/5

## 41-11-300 REPLACING COVER FOR LEFT OR RIGHT SIDE MEMBER WITH CENTER DOOR PILLAR (PARTIAL REPLACEMENT A AND B PILLARS)

Refer to "Introduction" on page 41 - 0-1.



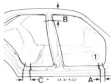
34 41 526

Remove or disconnect/detach the following parts.

- Ground pole on battery
- Front and rear doors
- Front and rear covers (on outside of entrance)
- Trim panel for B-pillar
- Seat belt
- Front seat
- Rear seat cushion and backrest
- Front and rear covers (on inside of entrance)
- Edge guard
- Radio loudspeaker cover
- Wire harness (A pillar)
- Front and rear carpets (partially)
- Pipe installations
- Roof liner



# 41-11/6



Draw cutting lines.  
 Distance A = to replacement part size  
 Distance B = 175 ± 20 mm  
 (6.890 ± 0.787")  
 Distance C = at least 50 mm (2")

Note:  
 A vertical running reinforcement plate is located in front of hole (1) - provide sufficient distance.

Keep cutting line (C) out of the bend whenever possible ( - paint finish).



24 41 529

B-pillar reinforcement plates:

- A Inside plate
- B Outside plate



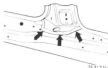
24 41 535

Align the replacement section with the floors.



24 41 531

Cut out old section.



20 41 534

Seal off the end plate on the B-pillar with a joint sealing compound before welding in the replacement section.



24 41 530

Produce and weld in reinforcement plates having a width of about 40 mm (1.571").

## 41 11 . . . REPLACING FRONT CROSS MEMBER

Refer to "Introduction" on page 41 - 0 1.

This repair will normally occur together with work on the engine carrier members.

Remove or cover all car parts, which are in the repair zone and subject to damage from heat, sparks or dust.

Set up car on a straightening bench. Insert cross member.

*Important!*

Check location of member - the end of the member could be inserted inversed.

Check for perfect spot welding.

**Sheet Metal Thickness:**

Engine carrier      1.2 mm (0.047")

Cross member      0.8 mm (0.031")



04 41 05



04 41 07



04 41 08

# 41-14/1

## 41 14 151 REPLACING LEFT REAR WHEEL HOUSE OUTER SECTION AND SIDE PANEL

Procedures are described for the left side of the car.  
Procedures are analogous for the right side of the car.

Refer to "Introduction" on page 41 - 01.

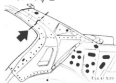


34 41 527

Remove or disconnect/detach the following parts.

- Side panel (see 41 35 105)
- Fuel tank complete with expansion tank
- Wire harness on C-pillar

## 41-14/2



Place out in the middle of the rear window frame (C-pillar) whenever possible.

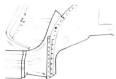
**Note:**  
Note installed position of the antenna amplifier/trap circuit.



Drill off spot welds in wheel house.



Drill off spot welds on the inside side member panel.  
Bend open the inside panel and drill off the spot welds underneath.



Straighten the inside side member panel and insert the outer wheel house section.

**Installation:**  
Produce connections in the same manner as the original connections.



Produce a reinforcement plate having a width of about 40 mm (1 5/16").

**Note:**  
Mount the reinforcement plate on the outside of the rear window frame (→ Installed direction of antenna amplifier/trap circuit).



Fit in the rear window frame (C-pillar).

**Installation:**  
Produce connections in the same manner as the original connections.



Seal off the end plate with a joint sealing compound before welding in the side panel.



**41-14 ... REPLACING RIGHT REAR WHEEL HOUSE INNER SECTION (Side Panel and Wheel House Outer Section Removed)**

Touring

Refer to "Introduction" on page 41-0-1.

Remove or disconnect the following parts:

Same scope of work as for the right rear wheel house outer section.

Remove or cover all other car parts, which are in the repair zone and subject to be damaged from heat, sparks or dust.



Break the welding seams for the seat belt holder take-up.



Break the welding seams for the seat belt holder take-up.  
Remove the seat belt holder.



Uncover the front top wheel house joint.

Drill off welding spots.



Uncover the rear top wheel house joint.

Drill off welding spots.



Uncover the inside wheel house, bottom side member, wheel house extension and spring support joint.

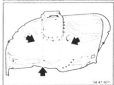
Drill off welding spots.



Remove the wheel house inner section. Remove scrap metal. Straighten and grind the mating surfaces.



Install and clamp the wheel house inner section with set of attachments. Mark the mating surfaces. Mark the location of holes for plug welding.



Remove the wheel house inner section. Clean the mating surfaces. Drill holes for plug welding. Coat the mating surfaces with zinc dust paint.



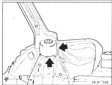
Install and clamp the wheel house inner section with the set of attachments and spot weld.



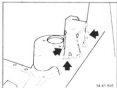
Plug weld the wheel house extension, side member at front top and wheel house inner section.



Weld the wheel house joint at top front. Grind down the welding spots.



Weld the wheel house joint at top rear. Grind down the welding spots.



Clamp and weld the take-up for the seat belt holder.



Weld the seat belt holder take-up.  
Grind down the welded surfaces.



41-14-503 REPLACING RIGHT REAR  
WHEEL HOUSE OUTER SEC-  
TION (Side Panel Removed)

Touring

Refer to "Information" on page 41-0-1.

Remove or disconnect the following parts:  
Seat side entrance covers  
Battery  
Right trunk floor plate wire harness

Remove or cover all other car parts, which  
are in the repair zone and subject to be  
damaged from heat, sparks or dust.



Drill off welding spots on wheel house and  
support member.  
Drill off welding spots on C-pillar support  
member extension.



Break the welding seam on the wheel  
house at top.  
Remove the support member together with  
the support member extension.



Uncover and drill off welding spots on the  
wheel house outer section.

**Important!**  
The wheel house inner section, wheel  
house outer section and side member are  
welded together in area (1).

Remove the wheel house outer section.  
Remove scrap metal.  
Straighten and grind the mating surfaces.





Install and clamp the wheel house outer section, mark the welding surfaces and remove the wheel house outer section again.  
Clean and coat the welding surfaces with zinc dust paint.

**Important!**

The wheel house inner section, wheel house outer section and side member are welded together in area (1).  
Drill corresponding plug welding holes in the connecting parts.



Weld the wheel house outer section.

**Important!**

The wheel house inner section, wheel house outer section and side member are welded together in area (1).  
Plug welding must join all connecting parts together!

Grind the welded surfaces.

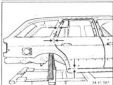


Install and clamp the wheel house outer section.  
Install and clamp the side panel.



**C-pillar Support Member**

Clean and coat mating surfaces on the wheel house outer section with zinc dust paint.



Align the side panel and wheel house outer section with the adjacent body parts.  
Remove the side panel again.



Clean and coat mating surfaces on the support member with zinc dust paint.



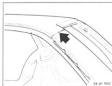
41 31 001 REPLACING ROOF PANEL  
(Version without Double Sun  
Roof)

Tearing

Refer to "Information" on page 41-0-1.

Remove or disconnect the following parts:  
 Windshield  
 Roof liner  
 Rear seat cushion  
 Battery ground lead  
 All rain molding strips and channels  
 Both rear side windows  
 Both front seats  
 Tailgate seal  
 Both rear seat backrests  
 Front and rear roof liner wires

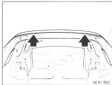
Remove or cover all other car parts, which  
 are in the repair zone and subject to be  
 damaged from heat, sparks or dust.



Uncover the D-pillar joints.



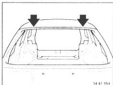
Uncover the A-pillar joints.



Cut through the rear roof frame roughly in  
 front of the joints.



Cut through the side roof frames roughly in  
 front of the joints.



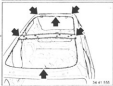
Cut through the front roof frame roughly in front of the joints.



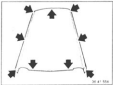
Remove the roof panel.

*Important!*

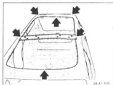
The roof panel may be heated at the surfaces coated with sealing compound to make removal of the roof panel easier. Extract the caused vapors!



Remove scrap metal. Straighten and grind the mating surfaces. Remove sealing compound.



Fit in new roof panel and clean the mating surfaces. Coat the mating surfaces with zinc dust paint.



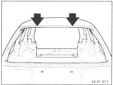
Coat the roof frame with sealing compound\*.



Install and clamp the roof panel.

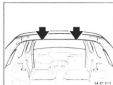


Spot weld the roof panel along the sides.



Spot weld the windshield frame.

\* Source of Supply: BMW Parts



Spot weld the roll-over frame.



Braze the A-pillar mating surface, tin it out and grind the surface.



Braze the D-pillar mating surface, tin it out and grind the surface.



Braze the roll-over frame at top.  
Grind the brazed surfaces.  
Grind the welded surfaces.



41-31-011 REPLACING ROOF FRAME  
(Version with Double Sun Roof)

Touring

Refer to "Information" on page 40-011.

Remove or disconnect the following parts:  
 Windshield  
 Steel sun roof  
 Rear seat cushion  
 Battery ground lead  
 All rain molding strips and channels  
 Both rear side windows  
 Both front seats  
 Tailgate seat  
 Both rear seat backrests  
 Front and rear roof liner wires  
 Roof liner

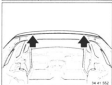
Remove or cover all other car parts, which are in the repair zone and subject to be damaged from heat, sparks or dust.



Uncover the D-pillar joints.



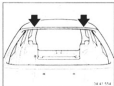
Uncover the B-pillar joints.



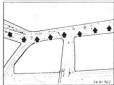
Cut through the rear roof frame roughly in front of the joints.



Cut through the side roof frames roughly in front of the joints.

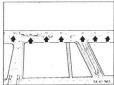


Cut through the front roof frame roughly in front of the joints.



Grind the front roof panel mating surfaces on the roof frame.

**Note:**  
The picture is a view of the right roof frame as seen from inside of the car.



Grind the center roof panel mating surfaces on the roof frame.

**Note:**  
The picture is a view of the right roof frame as seen from inside of the car.



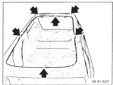
Grind the rear roof panel mating surfaces on the roof frame.

**Note:**  
The picture is a view of the right roof frame as seen from inside of the car.



Remove the roof panel.

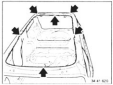
**Important!**  
The roof panel may be heated at the surfaces coated with sealing compound to make removal of the roof panel easier.  
Extract the caused vapors!



Remove scrap metal.  
Straighten and grind the mating surfaces.  
Remove sealing compound.



Fit in new roof panel and clean the mating surfaces.  
Coat the mating surfaces with zinc dust paint.



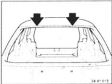
Coat the roof frame with sealing compound!



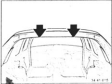
Install and clamp the roof panel.



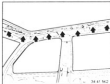
Spot weld the roof panel along the sides.



Spot weld the windshield frame.



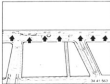
Spot weld the tailgate frame.



Weld the roof panel on the front roof frame.

Note:

The picture is a view of the right roof frame as seen from inside of the car.



Weld the roof panel on the center roof frame.

Note:

The picture is a view of the right roof frame as seen from inside of the car.



Weld the roof panel on the rear roof frame.

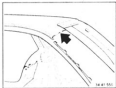
Note:

The picture is a view of the right roof frame as seen from inside of the car.



Brace the A-pillar mating surface, fit it out and grind the surface.

41-31/56



Brace the D-pillar mating surface, fit it out and grind the surface.



Brace the tailgate frame at top.  
Grind the braced surfaces.  
Grind the welded surfaces.



# 41-33/1

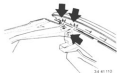
## 41 33 001 REPLACING FRONT PANEL COMPLETE WITH FRONT WALL

Refer to information on 41 - 0/1.

Front panel can be removed and installed without removal of side panels.

The following parts must be removed or disconnected.

Ground lead on battery, splash guard, front bumper assembly, all radiator grill sections, both double headlights with turn signals and electric leads, air cleaner with air flow sensor, washing fluid tank, radiator complete with coolant hoses, fan cover and brackets, cooling coil on power steering, both horns, wire harness on front wall, engine hood, engine hood lock and hinge console for engine hood.



41 41 110

Unscrew left and right bolts.  
Cut through sealing compound.



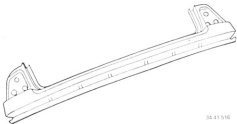
41 41 111

Unscrew bolts.  
Lift off from panel.

# 41-34/1

## 41 34 041 REPLACING TAIL PANEL

Refer to "Introduction" on page 41 - 0-1.



34 41 016

Remove or disconnect/detach the following parts.

- Ground lead on battery
- Rear bumper assembly
- Both bumper brackets complete with impact absorbers
- Trunk lid rubber seal
- Trunk trim panels
- Left and right stale air extractions
- Tank flap drive motor
- Both tail light assemblies with electric leads
- Both electric lead covers on trunk floor
- Spare wheel
- Trunk lid lock lower section
- Fuel tank complete with expansion tank



34 41 506

#### REPLACING TAIL PANEL

The "tail panel" replacement scope consists of the tail panel with spot welded shells for tail light assemblies.

A complete tail panel can only be installed after removal of one side panel.



34 41 507

#### Procedures with Installed Side Panels

Drill out welded spots on the connection between the tail panel and tail light shell, and lift off the shell.



34 41 508

First install the tail panel with the remaining shell.



34 41 509

Check arrangement of overlapped sheet metal.



34 41 510

The metal connector on the box for an extraction is located above the tail panel.



34 41 511

Install the cut out shell last.  
Check arrangement of overlapped sheet metal.



34 41 512

When sealing, make sure that the gap between the trunk floor plate and tail panel is filled out completely on the inside and outside.



## 41 34 041 REPLACING TAIL PANEL

Touring

Refer to "Information" on page 41-0-1.

Remove or disconnect the following parts:  
 Battery ground lead  
 Rear bumper and brackets  
 Tailgate seal  
 Both tail light assemblies  
 Luggage compartment liners  
 Fuel tank  
 Spare wheel  
 Digital trim panels  
 Washing fluid tank for tailgate window

Remove or cover all other car parts, which are in the repair zone and subject to be damaged from heat, sparks or dust.



Cut out the tail panel roughly in front of the joints in the luggage compartment to the right.



Cut out the tail panel roughly in front of the joints in the luggage compartment to the left.

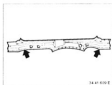


Cut out the tail panel roughly in front of the D-pillar joint.



Cut out the tail panel roughly in front of the side panel joint.

Remove scrap metal.  
Straighten and grind the mating surfaces.



Clean the tail panel/luggage compartment  
floor plate mating surfaces and drill holes  
for plug welding.



Clean the tail panel/spare wheel well mating  
surfaces and drill holes for plug welding.

Coat the mating surfaces with zinc dust  
paint.



Fit in and clamp the tail panel from inside  
of the car.



Weld the tail panel to the side panel mating  
surface.

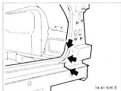


Weld the tail panel to the mating surfaces  
in the luggage compartment to the right.



Weld the tail panel to the mating surfaces  
in the luggage compartment to the left.

41-34/52



Brace the light bulb holder-D-pillar mating surface.

Grind the mating surfaces.

# 41-35/1

## 41 35 000 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT FRONT SIDE PANEL L

Refer to information on 41 35/1.

Remove or disconnect the following parts:

Front bumper with side bracket, both windshield wiper arms (only for left side panel), heater air grills, rubber seal between side panel and inside wheel trim. Transfer rubbing strip on side panel.



Unscrew screws.



**Note:**  
Be careful not to damage the paint finish, if the door is installed.



Unscrew screws.



Unscrew screw (M 6).



Unscrew screws.



Lift off side panel.



**Installation:**  
Align side panel with the door gap and engine hood.

34 41 106

## 41-35/1.1

41 35 105\* REPLACING LEFT/RIGHT REAR SIDE PANEL  
41 35 115 (PARTIAL REPLACEMENT (C-PILLAR))

Procedures are described for the left side of the car.  
Procedures are analogous for the right side of the car.

Refer to "Introduction" on page 41 - 0/1.



34 41 019

Remove or disconnect/detach the following parts.

### Left Side:

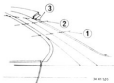
- Ground lead on battery or body ground point
- Trunk lid, rubber seal (trunk lid), trunk lid wire harness (partially)
- All trunk trim panels, car jack, wheel wrench, spare wheel
- Bumper assembly
- Tail light assembly
- State air extraction cover
- Complete rear seat cushion, seat belt lock
- Hetrack
- Roof liner
- Rear window
- Cover and carpet on entrance
- Wire harness (partially)
- Rubbing strip (side panel), plate (C-pillar), rain molding strip
- Rear wheel and wheel house panels

### Right Side (Additionally):

- Tank flap
- Fuel tank complete with expansion tank
- Central lock (tank flap)



## 41-35/1.2



Locate cutting line (1) as close as possible to the middle of the C-pillar. Uncover braze seam (3) when a cutting line is required close to the roof joint and locate the cutting line (2) about 30 mm (1 3/16") below the braze seam.



Locate cutting line. Distance A = at least 50 mm (2").



Bend down the cringed-up spot welding flange in the area of the wheel opening.

### Installation:

Cringle the spot welding flange in zone B = 325 mm (12.795") toward the inside by an angle of 65°.

Zone A = 50 mm (2").

Distance C = 25 mm (0.787").



Produce reinforcement plates having a width of about 40 mm (1 9/16") and weld them in at pertinent points.



Braze the front trunk joint (connection with the rear window).



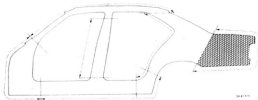
Check arrangement of overlapped sheet metal on the tail panel when installing the side panel.

## 41-35/2

### 41 35 337: REPLACING LEFT/RIGHT REAR SIDE PANEL 41 35 338 (PARTIAL REPLACEMENT UP TO WHEEL HOUSE)

Procedures are described for the left side of the car.  
Procedures are analogous for the right side of the car.

Refer to "Introduction" on page 41 - 01.

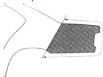


Remove or disconnect details in the following parts.

- Ground lead on battery
- Rear bumper assembly
- Side bumper bracket
- Rubber seal for trunk lid
- Trunk mat
- Trunk trim panels
- State air extraction plate
- Wheel house panel
- Tail light assembly
- Tail panel
- Wire harness (partially)

Additionally for Right Side Panel:

- Tank flap
- Complete fuel tank
- Expansion tank
- Central lock for tank flap



34 41 514

#### SECTION REPAIR ON REAR SIDE PANEL

The panel section is cut out of a complete rear side panel in the factory. Location of cut – also refer to plan for side rib sections.



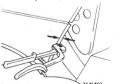
34 41 501

**Important:**  
Locate the cut as far away from the rear window as possible.



34 41 502

Whenever possible, the original connection should be used for connection with the trunk opening at the front.



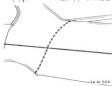
34 41 500

Cut connection to side allowing 10 mm (0.394") for overlapping and shoulder with a shearing pliers.



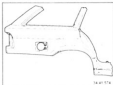
34 41 513

Check arrangement of overlapped sheet metal on tail panel when installing the side panel.



34 41 504

Spot weld the joint until a continuous seam is produced.



#### 41 28 115 REPLACING RIGHT REAR SIDE PANEL (C-pillar Partial Replacement)

Touring

Refer to "Information" on page 41-0/1.

Remove or disconnect the following parts:

- Battery ground lead
- Rear bumper
- Right rear side window
- Rear light assembly
- Roof liner
- Fuel tank
- Rubbing strip on side panel
- Right rear seat belt
- Luggage compartment inlets
- Strip on right rain channel
- Tailgate gas pressure props

**Important!**  
Support the tailgate!

Remove or cover all other car parts, which are in the repair zone and subject to be damaged from heat, sparks or dust.



Determine, mark and cut the C-pillar along the cutting line.

Distance A = 45 mm.



Determine, mark and cut the D-pillar along the cutting line.

Distance A = 200 mm.

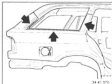


Determine, mark and cut the side member entrance along the cutting line.

Distance A = 70 mm.



Drill off the welding spots in the door opening.



Uncover and drill off side window mating surface welding spots.



Cut off side panel roughly in front of the mating surfaces.  
Remove the side panel.



Drill off welding spots of bracket (1) and remove the bracket.

Remove scrap metal.  
Straighten and grind the mating surfaces.



Unbend edge of the wheel house.



Produce, fit in and coat a reinforcement plate for the D-pillar with zinc dust paint.  
Width = 60 mm.



Uncover and drill off welding spots on wheel house and wheel house extension.



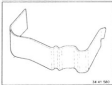
Drill holes in the D-pillar for plug welding.  
Coat the mating surface with zinc dust paint.  
Insert and weld the reinforcement plate (30 mm).  
Grind the welded surface.



Produce, fit in and coat a reinforcement plate for the C-pillar with zinc dust paint.  
Width = 50 mm.

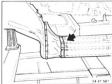


Drill holes in the C-pillar for plug welding.  
Coat the mating surface with zinc dust paint.  
Insert and weld the reinforcement plate 30 mm.  
Grind the welded surface.

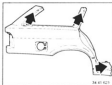


Produce, fit in and coat a reinforcement plate for the side member entrance with zinc dust paint.

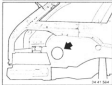
Width = 50 mm.



Drill holes in the side member entrance for plug welding.  
Coat the mating surface with zinc dust paint.  
Insert and weld the reinforcement plate 30 mm.  
Grind the welded surface.



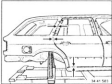
Cut the side panel to size and fit in it.  
Drill holes for plug welding.



Apply sealing material\* around the opening for the tank filler neck.



Install and clamp the side panel.  
Align the side panel to the tailgate.

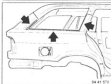


Align the side panel to the rear door and side member.

\* Source of Supply: BMW Parts



Spot weld the side panel in the area of the door opening.



Spot weld the side panel in the area of the side window.



Spot weld the side panel in the area of the tailgate.



Brace the light bulb holder/D-pillar mating surface.



Plug weld the reinforcement plate at the D-pillar mating surface. Afterwards produce single welding spots so close together that a continuous seam is produced.

**Important!**  
Always let the one welding spot cool off slightly, before producing the adjacent one. Danger of distortion!



Plug weld the reinforcement plate at the C-pillar mating surface. Afterwards produce single welding spots so close together that a continuous seam is produced.

**Important!**  
Always let the one welding spot cool off slightly, before producing the adjacent one. Danger of distortion!



Plug weld the reinforcement plate at the side member-entrance mating surface. Afterwards produce single welding spots so close together that a continuous seam is produced.

**Important!**  
Always let the one welding spot cool off slightly, before producing the adjacent one. Danger of distortion!



Weld the wheel house and wheel house extension mating surfaces.

Grind the welded surfaces.



Grind the edge of the wheel house.



Tin the D-pillar mating surface and grind.



Tin the C-pillar mating surface and grind.



Tin the side member/entrance mating surface and grind.



Position and weld the bracket on the side window.  
Grind the welded surfaces.

Distance A : 25 mm  
Distance B : 20 mm  
Distance C : 25 mm



### 41 51 ... REPLACING BEARING SLEEVES FOR DOOR HINGES

Remove front or rear door -- see 41 51 080 or 41 52 080.

Note:

The bearing sleeve fitted with a hinge section is located on the door in case of the upper hinge and on the body in case of the lower hinge.

The hinge section must be unlocked on the door to replace the upper bearing sleeve.

Mark position of door hinge.  
Repair damaged paint finish.

Lift off retainer and washer.  
Pull out shaft bolts.

Remove old bearing sleeve.



32 41 547



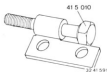
32 41 548



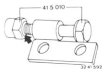
32 41 549



32 41 550



32 41 551



32 41 552



32 41 553

Insert new bearing sleeve.

Slide in shaft bolt of Special Tool 41 5 090.

Screw on nut of Special Tool 41 5 010 with the conical end.  
Lock the sleeve.  
Unscrew nut.

Screw on nut of Special Tool 41 5 010 with the flat end.  
Press end of sleeve flat.  
Installation:  
Lubricate bearing surface with grease.

41 51 380/ REMOVING AND INSTALLING  
41 52 380 LEFT OR RIGHT, FRONT OR  
REAR DOOR

Procedures described here were performed on a front door.  
Procedures are analogous for rear doors.

Unscrew hexagon head bolts at top and bottom.



41 41 110

Pull gift retainer.  
Driver out pin upwards.



41 41 114

Lift door out of hinges and place on a suitable surface.



41 41 115



41 41 116

**Caution!**  
Be careful not to damage the door, front panel or paint finish.  
Cover with tape if necessary.  
Keep loads off of leads from the door wire harness.

Unscrew holding frame.

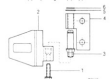


41 41 117

Pull plug out of A or B gilder.  
Pull up clamp - this will disconnect the plug.



41 41 118



- 1 Hexagon head bolt
- 2 Body end hinge
- 3 Hinge pin
- 4 Door end hinge with bearing sleeve\*
- 5 Washer
- 6 Retainer

\* Sketch shows the top hinge. Bearing point is on the opposite end for the bottom hinge.

41 61 000 REMOVING AND INSTALLING  
ENGINE HOOD

## Note

The hose and electric wire for the windshield water spray nozzles are not provided with connection points.

Prior to removal of the engine hood, the windshield washing fluid hose and nozzle heating wire harness must be removed from the engine hood.

Disengage the left and right engine hood  
bolters.

## Installation

Clip in the plastic washers.

Unscrew the left and right shaft bolts.  
Lift the engine hood off.

## Installation

Tightening torque = 5 Nm.



41 61 000



41 61 001



41 61 002



41 61 003

41 61 014 ALIGNING ENGINE HOOD

*Note:*

Engine hood, trunk lid and doors are aligned and bolted in an unfinished (bodyshell). Unpainted surfaces could become visible after subsequent alignment.

Both surfaces must be touched up with paint in permanent body color.

Aligning Engine Hood in Body Opening

Remove left and right radiator grill sections - see 51 13 040.

Loosen screws on lock.

Loosen bolts on left and right hood hinges.



Align engine hood with the front side panels and on the side.



Front Height Adjustment of Engine Hood

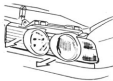
Screw on lock only finger tight. The lock will be aligned in forward direction by lowering the engine hood. Tighten screws.



Adjust the engine hood in height by loosening or tightening the lock, until the engine hood is approx. 1 mm (0.039") deeper than the side panel.



After finishing adjustments, unscrew stop pads far enough that the engine hood leans on them lightly and is in same plane with the side panels.



41 61 014



41 61 015



41 61 016

**Adjusting Rear Guide Roller:**

Loosen screws.



34-61101

Adjust holder sideways until the guide roller slides into the catch correctly.  
Check gap between side panel and engine hood on left and right sides.



34-61102

**Rear Height Adjustment of Engine Hood:**

Loosen bolts (1) and (2).  
Adjust catch with bolt (2) so that the closed engine hood is in same plane with the side panels.



34-61103

## 41 61 545 REMOVING AND INSTALLING OR REPLACING ENGINE HOOD HINGE

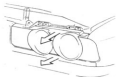
— Engine Hood Removed —

### *Note:*

Engine hood, trunk lid and doors are aligned and bolted in an unfinished bodyshell. Unpainted surfaces could become visible after subsequent alignment. These surfaces must then be painted with pertinent body color paint.

Remove left and right radiator grill sections

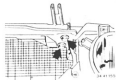
— see 61 13 040.



61 41 154

Unscrew hinges on left and right sides.

Align engine hood — see 61 61 014.



61 41 155

**41 62 000 REMOVING AND INSTALLING  
TRUNK LID****Warn:**

Engine hood, trunk lid and doors are aligned and bolted in an unfinished bodyshell.

Unpainted surfaces could become visible after subsequent alignment.

These surfaces must be touched up with paint in the body color.

The electric supply lead for the trunk lid does not have a disconnection point. This means that the wire harness has to be taken out of the trunk lid.

Remove trunk lid after unscrewing bolts of hinges on the left and right sides.



38 41 020

Align trunk lid – see 41 62 014.

## 41 62 014 ALIGNING TRUNK LID

**Note:**

Engine hood, trunk lid and doors are fitted and bolted in an unfinished body shell. Unpainted surfaces should become visible after subsequent alignment. These surfaces must be touched up with paint in the pertinent body color.



41 61 121

**Aligning Trunk Lid in Body Opening:**

Unclip lid in trim panel.  
Loosen lock, unscrewing completely if necessary.



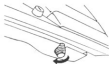
41 61 122

Loosen bolts on left and right sides.



41 61 124

Align trunk lid with the side panels at the top and rear.



41 61 123

**Rear Height Adjustment of Trunk Lid:**

Screw in stop pads on left and right sides completely.



41 61 125

If applicable, unclip lid in trim panel.



41 61 127

Loosen bolts until the lock can be adjusted. There must be uniformly wide gaps on left and right sides after closing the trunk lid. Trunk lid should be approx. 1 mm (0.039") deeper than the side panels at the rear.



41 61 126

Unscrew stop pads far enough that the trunk lid bears on them lightly and is in the same plane with the side panels.



# 51 Body equipment

51 0	...	Notes on repairing plastic components	51-	0/1
51 11	...	Front bumper – remove and install and disassemble	51-	11/1
	...	Overview of front bumper and mounting parts	51-	11/2
	...	Spoiler (M5) – remove and install	51-	11/5
	...	Impact box and impact absorber – remove and install/check	51-	11/6
51 12	...	Rear bumper – remove and install and disassemble	51-	12/1
	...	Rear bumper and mounting parts	51-	12/2
	...	Impact absorber – remove and install/check	51-	12/4
51 13	000	Center trim grille section – remove and install	51-	13/1
	040	Side trim section – remove and install	51-	13/1
	305	Railing, left or right – remove and install or replace	51-	13/2
	336	Front left or right rain channel trim strip – replace	51-	13/3
	365	Left or right finisher on rear roof pillar (C-pillar) – remove and install	51-	13/4
	366	Finisher on roof pillar (C-pillar) – replace	51-	13/4
51 14	000	Front BMW emblem – remove and install	51-	14/1
	010	Rear BMW emblem – remove and install	51-	14/1
	110	Rear model emblem – replace	51-	14/2
51 16	000	Rear view mirror on left or right front door – remove and install or replace	51-	16/1
	026	Mirror glass for rear view mirror – replace	51-	16/2
	060	Interior rear view mirror – remove and install or replace	51-	16/2
	...	Mirror mounting bracket – bond	51-	16/3
	200	Oddments tray – remove and install	51-	16/4
	360	Right glovebox – remove and install	51-	16/6
51 21	...	Outside door handle complete with lock cylinder of front door functional description – remove and install and disassemble	51-	21/1
	003	Front door catch, left or right – replace	51-	21/7
	090	Front door lock, left or right – remove and install or replace	51-	21/8
	280	Front door retainer – remove and install	51-	21/9
66 10	...	Batteries for infrared transmitter – change	51-	21/10
	...	IR receiver – remove and install	51-	21/10
	...	IR logic stage – remove and install – remove and install	51-	21/11
	...	Display – remove and install	51-	21/11
	...	Key bit – remove and install	51-	21/11
51 22	001	Rear left or right catch (door lock striker) – replace (adjust)	51-	22/1
	090	Door lock of left or right rear door – remove and install	51-	22/2
	170	Outer handle of left or right rear door – remove and install or replace	51-	22/3
	260	Retarder of left or right rear door – remove and install or replace	51-	22/4
51 24	...	Rear lid (touring) – adjust	51-	24/1
	004	Luggage compartment lock (touring) – adjust	51-	24/1
	040	Luggage compartment lid lock and lock support bracket (touring) – remove and install or replace	51-	24/2
	040	Luggage compartment lid lock and lock support bracket – remove and install or replace	51-	24/3
	100	Luggage compartment lid lock (lock cylinder) – remove and install or replace	51-	24/4
	140	Rear window lock (touring) – remove and install or replace	51-	24/5
	300	Left or right gas pressurized spring for luggage compartment lid – remove and install or replace	51-	24/5
	321	Left or right gas pressurized spring for rear window – remove and install or replace	51-	24/6
51 26	...	Front left/right outer door handle with lock cylinder – check function	51-	26/1
	...	Luggage compartment lid lock / lock cylinder – check function	51-	26/2
	...	Central locking drives, front and rear doors – check/adjust	51-	26/3
	...	Central locking drive for luggage compartment lid – check/adjust	51-	26/3
	...	Central locking drives for front left/right doors – adjust	51-	26/4
	...	Central locking drives for rear/left doors – adjust	51-	26/5
	...	Central locking drive for luggage compartment lid – adjust	51-	26/5
	000	Switch for front left or right door lock (central locking drive) – replace	51-	26/7
	010	Switch for rear left or right door lock (central locking drive) – replace	51-	26/7
	020	Switch for luggage compartment lid lock (central locking drive) – replace	51-	26/8
51 31	...	Notes on mounting windows	51-	31/1
	000	Windscreen – remove and install	51-	31/3
	200	Rear window – remove and install	51-	31/8
	...	Connection diagram rear window antenna	51-	31/11
	200	Rear window (touring) – remove and install	51-	31/12
	201	Rear window (touring) – adjust	51-	31/12
	221	Rear window (touring, broken window) – replace	51-	31/15
	...	Stone chip damage on laminated glass windscreens (clear and tinted) – repair	51-	31/16
51 32	154	Front door window, left or right – adjust	51-	32/1
	170	Front door window, left or right – remove and install	51-	32/2
51 33	000	Power window regulator in front door – remove and install	51-	33/1
51 34	154	Rear door window – adjust	51-	34/1
	171	Rear door window, left or right – replace	51-	34/2
	191	Door window fixed in left or right rear window frame – replace	51-	34/4
51 36	070	Rear left or right side window (touring) – remove and install	51-	36/1
	071	Rear side window (touring), left or right – replace	51-	36/6
51 37	000	Power window regulator in left or right rear door – remove and install	51-	37/1
	240	Window recess cover strip on outside of rear side window (touring) – remove and install or replace	51-	37/2
	251	Window recess cover on inside of left or right rear side window (touring) – replace	51-	37/3
54 41	000	Front left or right door trim panel – remove and install	51-	41/1
51 42	000	Rear left or right door trim panel – remove and install	51-	42/1
51 43	252	Left or right trim panel for rear roof pillar (D-pillar) – replace	51-	43/1
51 44	011	Headlining (version with sunroof) – (remove and install or) replace	51-	44/1
	041	Front section of headlining (version with sunroof) – (remove and install or) replace	51-	44/3
	042	Left or right side section of headlining (version with sunroof) – (remove and install or) replace	51-	44/4
	043	Rear section of headlining (version with sunroof) – (remove and install or) replace	51-	44/5
51 45	030	Trim panel for instrument cluster – remove and install	51-	45/1
	180	Bottom left trim panel for instrument cluster – remove and install	51-	45/3
51 47	151	Luggage compartment trim panel for left wheel housing – remove and install or replace	51-	47/1
	161	Luggage compartment trim panel for right wheel housing – remove and install or replace	51-	47/2
51 49	000	Trim panel for luggage compartment lid – remove and install or replace	51-	49/1
51 71	000	Weatherstrip on left or right front door – remove and install	51-	71/1
	...	Installation instructions for bonded door weatherstrips	51-	71/1
	200	Weatherstrip on left or right rear door – remove and install or replace	51-	71/3
	407	Rear spoiler (touring) – replace	51-	71/3
	447	Trim for cover on left or right side member – remove and install	51-	71/5

## 51 8 . . . INFORMATION FOR REPAIRING PLASTIC PARTS

The conditions mentioned below for plastic part repairs conform with legislation in Germany. Always conform with pertinent legislation in other countries.

These repairing instructions are provided for qualified workers and assume their skill, conscientiousness and sense of responsibility. The instructions are limited to factory approved repairing materials and methods as well as associated tips to make the work easier. Only general working procedures are described in these instructions. The scope of work and order of procedures will always have to be adapted to the pertinent damage condition.

**Note:**

Repairs are an economical solution, so that optical deficiency cannot be excluded. Consequently repairs should only be carried out after receiving customer's approval.

The following E 34 parts are made of plastic and can be repaired with 3M 5990 plastic repairing material:

- M-Technic body attachments
- Bumpers

**Important!**

Only such damage, which does not have influence on the strength and rigidity of the bumper, may be repaired. The following types of damage may not be repaired in the interest of safety...

- Damage on body mounting points.
- Damage in immediate vicinity of body mounting points.
- Peel-offs.
- Splinters.
- Cracks extending from corners and edges.
- Continuous cracks with a length of more than 100 mm.
- Holes of size 100 mm<sup>2</sup> or more.

Parts with these types of damage must be replaced!

Refer to the BMW Painting Manual for information on painting plastic parts.

**Required Materials:**

- Corundum filter discs, grain size P 26 and P 80
- Sandpaper, grain size P 180
- 3M Coarse Resinover 6994
- 3M Aluminium Adhesive Tape Scotch 434
- 3M Glass Grind Fabric 9330
- 3M 5990 plastic repairing material
- Mask
- Gloves

**Source of Supply: BMW Parts****Safety Precautions:**

- Extract sanding abrasion.
- Wear mask and gloves while grinding.
- Work only in well ventilated rooms.
- Wash hands frequently.
- Store food separately.
- Don't eat, drink or smoke while working.
- Don't inhale vapors.

**First Aid:**

Take off dirty clothes immediately. If dust has gotten in eyes, rinse out with water thoroughly and go to a physician.  
If a large amount of vapors is inhaled, go outdoors into the fresh air and, if necessary, visit a physician.

**Information on Toxicology:**

Irritates eyes, skin and the respiratory track. No damaging effects are known as long as handling is correct.

**Measures in Case of Fire:**

Fire extinguishing agents: powders, foam, CO<sub>2</sub>, halon, water mist.

**Disposal:**

Never let it get into drink water systems.  
Single components of the repair material must be disposed as special refuse.  
After mixing the single components and hardening, it can be brought to the normal refuse station.

**Procedures:**

1. Clean the repair area with plastic cleaner.

*Note:*

Allow the cleaned surface to air dry at room temperature about 10 minutes before applying the repairing material.

2. Smooth down the repair surface (grain size: P 80). Sand out the damaged spot V-shaped (grain size: P 36). In case of deep damage, clean the back of the repair area with plastic cleaner and sand smooth (grain size: P 36).
3. Remove sanding abrasion.
4. Paste aluminum adhesive tape on the face of the damaged spot.
5. Cut glass grid cloth to size of the damaged spot.
6. Mix the repairing material to instructions of the suppliers.
7. Apply a coat of repairing material on the back of the damaged spot. Place glass grid cloth on spot, cover it with repairing material and let it harden at room temperature about 20 minutes.
8. Pull off the aluminum adhesive tape and, if necessary, sand and clean the repair area again.
9. Apply coat of repairing material on face of the damaged spot and let it harden.
10. Smooth down the repaired surface (grain size: P 80); fine grind with grain size P 180 sandpaper.

*Important!*

The specified grain sizes are absolutely necessary to produce perfect results (thermal development).

**Procedures for Repairing Minor Bruises and Scratches:**

1. Grind down damaged zone generously (down into the substrate) with dry sanding paper (grain size: 400 ... 500).
2. Clean ground zone with a plastic cleaner.
3. Apply coat of plastic adhesion solution. Apply several coats of BMW rapid filler + 20 % BMW softface additive on the cleaned surface until the shape of the part can be restored after grinding.
4. Grind down filled surface with wet sanding paper (grain size: 800 ... 1000). Continue as described in point 3, if ground through spots or damaged spots are still visible.
5. Grind down entire part if applicable (depending on extent of damage).
6. Apply final coat of paint with two-component BMW acrylic paint + 20 % BMW softface additive; for double-layer metallic paint finishes 20 % softface additive is mixed with the BMW acrylic clear lacquer.

Refer to the BMW Paint Spraying Manual for spraying instructions, materials and so on.

*Caution!*

Use mask and ensure sufficient ventilation.

Conform with accident prevention regulations for working with paints.

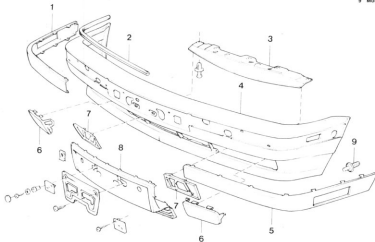
Conform with local and national legislation concerning safety at work and accident prevention as well as working material ordinances.

Refer to instructions supplied by the manufacturers!

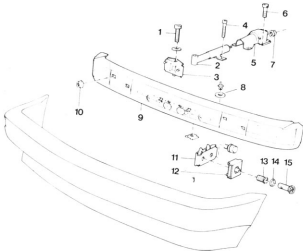
51 11 ... REMOVING AND INSTALLING  
AND DISASSEMBLING  
FRONT BUMPER

Survey of Bumper and Mounting Parts

- 1 Rubber guard, right
- 2 Rubber seal
- 3 Plate
- 4 Panel
- 5 Rubber guard, left
- 6 Cover (front fog lamp)
- 7 Cover (lower eye)
- 8 License plate holder
- 9 Mounting plug



## Survey of Bumper and Mounting Parts



- 1 Filler head bolt
- 2 Impact absorber
- 3 Bracket
- 4 Mounting bolt
- 5 Impact box
- 6 Mounting screw
- 7 Hexagon nut
- 8 Mounting plug
- 9 Member
- 10 Hexagon nut
- 11 Bracket
- 12 Slide
- 13 Threaded sleeve
- 14 O-ring
- 15 Retaining cap

# 51-11/3



34 51 000

Lift off rubber guards on left and right sides.



34 51 004

**Installation:**  
Hook and clip in rubber guards on sides.



34 51 005

Unscrew bolts on left and right sides.  
**Installation:**  
Tightening Torque\*  
Distance "A" = 5 to 6 mm (0.197 to 0.236")  
all around.  
Check, adjusting if necessary.



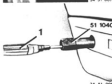
34 51 006

Pull off front bumper forward.  
If applicable, disconnect plug for front fog lamps and connection for headlight cleaners.



34 51 007

**Installation:**  
If necessary, adjust bumper to be flush with the body with Special Tool 51 10-40.



34 51 008

**Note:**  
Turn threaded sleeve with Special Tool 51 10-40 and hold retaining cap tight with a screwdriver (1).

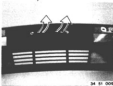


34 51 004

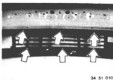
If applicable, lift out leads for front fog lamps and temperature sensors. Lift out front fog lamps. Lift out headlight cleaners.

\* See Specifications

51-11/4



Lift out expansion rivets.



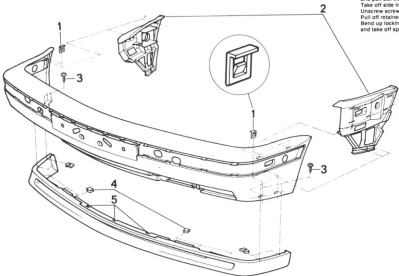
Lift out clamps.  
Unscrew license plate holder.



Lift out mounting plugs.  
Take off trim panel.

51 11 ... REMOVING AND INSTALLING  
SPOILER (M 3)

Remove front bumper – see 51 11 ...  
 Press locking hooks into wedges (1)  
 and pull out wedges from above.  
 Take off side inserts (2).  
 Unscrew screws (3).  
 Pull off retainers (4) toward rear.  
 Bend up locking hooks (5) on spoiler  
 and take off spoiler forward.







34 51 024

**51 11 ... REMOVING AND INSTALLING  
OR CHECKING IMPACT BOX  
AND IMPACT ABSORBERS**

Remove bumper - see 51 11 ...

Unscrew screws.

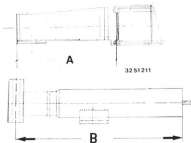
Remove impact box.

Installation:

Tightening torque\*.

Control distance "A" = 166 ± 2 mm  
(6.535 ± 0.079") must not be exceeded,  
if the front bumper was replaced  
after repairing a car damaged in an  
accident (Impact box is shown  
schematically).

Distance "B" for impact absorbers =  
271 ± 2 mm (10.669 ± 0.079").



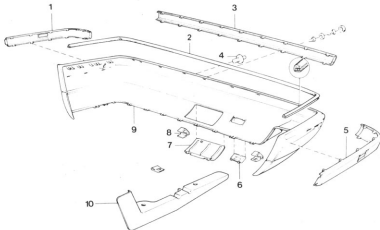
32 51211

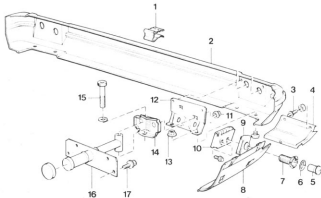
34 51 160

51 12 ... REMOVING AND INSTALLING  
AND DISASSEMBLING REAR  
BUMPER

Survey of Bumper and Mounting Parts

- 1 Rubber guard, right
- 2 Rubber seal
- 3 Rubber guard, center
- 4 Mounting plug
- 5 Rubber guard, left
- 6 Cover for towing hook
- 7 Cover for trailer hitch
- 8 Mounting clip
- 9 Trim panel
- 10 Heat shield



51 12 ... SURVEY OF REAR BUMPER  
AND MOUNTING PARTS

- 1 Mounting clip
- 2 Member
- 3 Mounting plug
- 4 Heat shield
- 5 Retaining cap
- 6 O-ring
- 7 Threaded sleeve
- 8 Heat shield
- 9 Slide
- 10 Bracket
- 11 Hexagon nut
- 12 Bracket
- 13 Hexagon nut
- 14 Bracket
- 15 Fillister head bolt
- 16 Impact absorber
- 17 Hexagon head screw

# 51-12/3



34 15 148

Lift off rubber guard carefully.



34 51 014

If applicable, lift off rubber guards on left and right sides.



34 51 014

Installation:  
Hook and clip in rubber guard on sides.



34 51 015

Unscrew bolts on left and right sides.  
Remove bumper.  
Installation:  
Tightening torque\*.  
Check distance "A" = 5 to 8 mm (0.197 to 0.236") all around, adjusting if necessary.

\* See Specifications



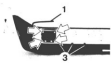
34 51 016

Installation:  
If necessary, adjust bumper to be flush with the body with Special Tool 51 1040.



34 51 017

Note:  
Turn threaded sleeve with Special Tool 51 1040 and hold retaining cap tight with a screwdriver.



34 51 018

Pull off rubber seal (1).  
Unscrew bolts.  
Remove reinforcement (2).  
Lift out clips (3).  
Installation:  
Tightening torque\*.



34 51 018

Lift out mounting plugs.  
Remove rear shields.

\* See Specifications



34 51 020

Lift out mounting plugs.  
Take off trim panel.



34 51 021

#### 51 12 ... REMOVING AND INSTALLING OR CHECKING IMPACT ABSORBERS

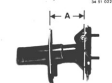
Remove bumper - see 51 12 ...  
Unscrew bolts.  
Lift out impact absorbers.

Installation  
Tightening torque\*.



34 51 022

Installation  
Align bracket on impact absorber  
when necessary by loosening bolt (1).  
Mount bumper and align bracket.  
Take off bumper again.  
Tighten bolt (1).  
Tightening torque\*.



34 51 023

Checking Impact Absorbers:  
Check that distance "A" is 88 ± 0.5 mm  
(3.496 ± 0.020") after repairing a car  
which was damaged in an accident.



### 51 13 000 REMOVING AND INSTALLING CENTER RADIATOR GRILL SECTION

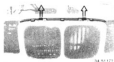
Raise engine hood.  
Unscrew screw.



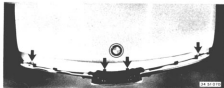
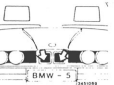
Guide screwdriver (max. length  $\approx$  approx. 250 mm or 10" / max. blade width  $\approx$  8 mm or 0.315") on left and right sides through opening (1) and bore (2).  
Press down locking hook (3), while pulling the front panel forward.

Note:  
Headlight assembly was removed for the picture.

Bend up clips and top of front panel forward.



Press down clips and take off front panel forward.



### View of Mounting Clips

Installation:  
Clip on sides of radiator grill first.

Bend open retainers.  
Take off radiator grill.



34 51 172



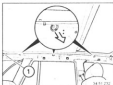
### 51 13 040 REMOVING AND INSTALLING SIDE RADIATOR GRILL SECTION

Remove center radiator grill section - see 51 13 000.  
Unscrew screws.  
Take off grill.

34 51 084

51 13 308 REMOVING AND INSTALLING /  
REPLACING LEFT OR RIGHT  
REELING

Remove roof liner at front and rear - refer  
to 51 44 041 and 51 44 043.  
Remove left or right roof liner section -  
refer to 51 44 042.



Remove rubber plugs and unscrew screws.  
Loosen rear hose clamp (1) and pull the  
water drain hose off.



Press the water hose downwards and  
unscrew the screw.  
Remove the roof reeling.





### 51 13 336 REPLACING LEFT OR RIGHT FRONT RAIN CHANNEL STRIP

**Removing:**  
Apply Special Tool 51 1 110 in the rain channel and swing it upwards.

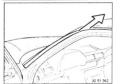


**Caution:**  
Don't scratch the rain channel (paint).

Push the clips separately forward into the cowl panel (A-pillar).



Open the rear door and unclip the plate (C-pillar).

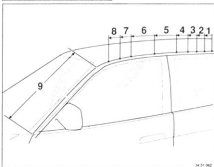


Open the front door, pull the rain channel strip forward slightly and pull it upwards off of the cowl panel.



Slide the clips out of the rain channel strip.

**Installation:**  
Always replace damaged clips!



**Installing:**  
Insert clips on the rain channel.

#### Clip Spacing Distances:

1	= 42 mm	from strip-plate- (C-pillar) joint
2 / 3	= 60 mm	
4 / 5 / 6	= 195 mm	
7 / 8	= 60 mm	
9	= 4 clips spaced uniformly	

Gap between the C-pillar plate and rain channel strip: max. 0.2 mm.

Apply the rain channel strip and clip the C-pillar plate in.  
Beginning at the rear, press down on the rain channel strip until it snaps into the clips.



- 51 13 365 REMOVING AND INSTALLING  
PANEL ON LEFT OR RIGHT  
REAR ROOF PILLAR (C-Pillar)  
51 13 366 REPLACING PANEL ON ROOF  
PILLAR (C-Pillar)



Pull off edge guards in rear door opening  
and on side window partially.  
Unclip C-pillar panel.



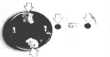
Unclip (1) and lift out (2) backrest side  
section.



Lift out caps and unscrew screws.  
Remove C-pillar panel on outside and pull  
it out of seat.

51 14 000 REMOVING AND INSTALLING  
FRONT BMW EMBLEM

Lift out emblem carefully.

*Installation:*Replace plastic clip, if necessary.  
Use Tenostat tape, if necessary.

00 51 140

51 14 010 REMOVING AND INSTALLING  
REAR BMW EMBLEM

Lift out emblem carefully.



00 51 140

*Installation:*Replace plastic clip, if necessary.  
Use Tenostat tape, if necessary.

00 51 140

# 51-14/2

## 51 14 110 REPLACING REAR MODEL SIGN

The model sign is cemented and cannot be reused.

Coat a nylon string or gear with Tenaxite (e.g. dish washing detergent) and "saw through" coat of cement between trunk lid and model sign.

Remove residual cement on trunk lid with gasoline.

Model signs may only be installed at room temperature.

Locate tape up to upper edge "C" and mark distances according to table.

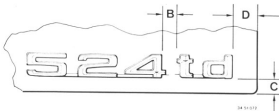
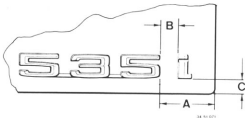
Heat model sign to approx. 40 ... 50° C (105 to 120° F) and press on firmly 5 to 10 seconds.

Distances in mm (inches).

BMW Models	A	B	C	D
520 i - 525 i	58 (2.283)	18 (0.709)	18 (0.709)	26 (1.024)
524 td		21 (0.827)	18 (0.709)	26 (1.024)

Note:

Model sign must be removed when baking paint at temperatures above 80° C (176° F).





**51 16 000 REMOVING AND INSTALLING  
OR REPLACING MIRROR ON  
LEFT OR RIGHT FRONT DOOR**

Unclip cap at bottom.  
Push up and remove cap.



**Models with Sound System:**

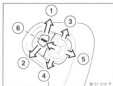
Unscrew screw.  
Unclip loudspeaker at top and remove.  
Pull plug off of loudspeaker.



Pull foam rubber strips out of cover.



Unscrew screw and remove cover.



**Installation:**  
Switch on ignition and check function.

**Switch positions:**  
1 = Left outside mirror  
2 = Right outside mirror

**Mirror adjustments:**  
3/4 = Vertical plane  
5/6 = Horizontal plane



Unscrew screw.  
Disconnect plug and remove mirror.

## 51-16/2



### 51 16 025 REPLACING GLASS FOR MIRROR

Insert screwdriver in housing opening (bottom) and turn the retaining ring.

- 1 = Unlocked
- 2 = Locked

Note:

Unlocking and locking will be noticed strongly when turning the retaining ring.

Heated Outside Mirror:

Pull off flat male plug and connect it on the new mirror glass.



### 51 16 060 REMOVING AND INSTALLING OR REPLACING MIRROR ON INSIDE OF CAR

Pull mirror back off of the mirror socket.



Preparation:

1. Connect mirror base on the mirror socket with an approx. 45° turn.
2. Turn mirror base until it engages on the mirror socket.

## 51 16 ... CEMENTING MIRROR BASE

## Material Requirements:

Mirror base cementing repair kit<sup>1)</sup>  
Primer 330 375\*

## 1. Preparations

1.1 Cement at room temperature and make sure that in cold weather the window glass and base are brought to room temperature in the workshop long enough, in order to prevent moisture on the surface.

1.2 Mark position of mirror base on outside of the windshield.  
Scratch off old cement on glass and base with a sharp tool.

1.3 Thoroughly clean cementing surface on glass and base with a clean sheer wool cloth and alcohol acetone and let surface dry!  
Never use paint thinners!

## 2. Primer Coat

Apply colorless, diluted primer on surface of windshield intended for cementing with help of cotton tips (Q-Tips or something similar).

Air drying time: at least 1 minute, max. 5 hour.

## 3. Cement Coat

## 3.1 Mixing Cement

Cut off sealing lips on containers of cement and hardener using a knife. Make sure that both openings are equal in size, as otherwise there would be mistakes in mixing.

The sealing cap for subsequent plugging of the double injector is located between both pistons of the injector. Break off sealing cap.

The required amount of cement and hardener is removed by applying light pressure on the pistons. The mixing ratio for cement and hardener is 1 to 1 (weight and volume). It is important that the same volumes of cement and hardener are removed (increase size of openings if necessary).

Both components react chemically with each other. Thorough, intensive and homogeneous mixing is a requirement for this reaction and for the quality of cementing.

Consequently both components must be mixed in such a manner, that there is an uniform, free from streaks mixture color.

## 3.2 Application

At 20 to 25° C the mixture has an application time (potlife) of about 5 to 10 minutes. Apply a thin (approx. 0.5 mm thick) and uniform coat of cement on the base using a spatula and press the base on the glass in such a manner, that the cement has good contact with the glass over the entire surface.

## Note

The temperature for the hardening process should not be lower than + 10° C.

## 3.3 Fixing Bonded Parts

Epoxy resin cements do not have an initial strength property. This makes the fixing of bonded parts necessary (adhesive tape or something similar). The joining and fixing of bonded parts must be accomplished within the potlife. Check that the anastizing button is positioned correctly on the mirror base, so that the mirror (mounted later) will be straight (long side of mirror base hexagon parallel to upper edge of window).

## 3.4 Hardening of Cement

Hardening speed depends on the ambient temperature. Consequently the mirror base must be fixed with adhesive tape or something similar for at least 3 to 4 hours. Button on the mirror at the earliest after 12 hours.

## 4. Working Hygiene

## Caution!

Cement is dangerous for health when vapors are inhaled or through contact with the skin. As is the case for all epoxide resins, sensitive persons might be confronted with an allergy through contact with the skin.

If the product gets on the skin, wash off with water and soap immediately.  
If it gets in an eye, rinse the concerned eye thoroughly in water and go to a physician.

Make sure that the room is well ventilated and gloves are worn for the application of cement.

<sup>1)</sup> Source of Supply: BMW Parts

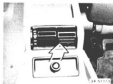
51 16 300 REMOVING AND INSTALLING  
CENTER CONSOLE

Remove trim panel for dashboard at  
bottom left.

M 5:  
Remove rear seat center armrest - see  
Group 52.  
Lift out plate.  
Pull off plugs.

Unscrew screws.  
Remove center console.

Lift out plate.



32 51 020



32 51 024



32 51 022



32 51 026



32 51 028



32 51 029



32 51 030

Pull off plugs.  
Unscrew screws.

If applicable, lift out cassette box and  
pull off electric leads for lighting.

Lift trim panel off of parking brake  
lever.  
Lift out plate (1).  
Unscrew screws.  
Lift out rear center console section.

Unscrew screw.  
Lift out switch.

# 51-16/5



Pull off plugs.



Cars with Manual Transmission:  
Pull off shift lever knob.  
Lift out dust cover.  
Remove cover.



Cars with Automatic Transmission:  
Unscrew screw.  
Pull off selector lever.



Lift out cover.  
Pull off plug.



If applicable, remove radio - see Group 55.



Lift out heater controls.  
Pull off plugs.  
Refer to Group 64.



Unscrew screws and lift out trim panels on left and right sides.



Lift out plate.  
Unscrew screws.  
Lift out center console.





24 51 008

**51 16 390 REMOVING AND INSTALLING GLOVE BOX**

Lift out clips.  
Pull off retaining straps.



24 51 009

Unlock handles on left and right sides.  
Lift out glove box.

Installation:  
Slide in lock with tab facing forward.



24 51 007

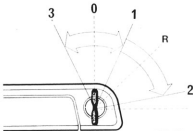
Installation:  
Align and clip in glove box in closed state  
(shown removed in picture).

### 51 21 ... REMOVING AND INSTALLING AND DISASSEMBLING FRONT DOOR OUTSIDE HANDLE COMPLETE WITH LOCK CYLINDER / INCLUDING DESCRIPTION OF FUNCTION

Electronic central locking (ZV) unlocks and locks all four doors, trunk lid and tank flap. It can be initiated from the locks of the front doors and trunk lid.

Central arresting (ZS) prevents the pulling up of catch buttons on the doors. Central arresting (or double locking) is only possible from the locks of both front doors.

Three microswitches each are operated via the lock cylinder mechanisms of both front doors.



34 51 160

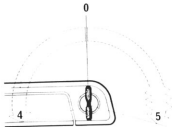
- 1 = Locking, the first microswitch responds. Key turned about 25° and the "locking" function is activated.
- R = Catch, intermediate position for "arresting", the second microswitch responds. Key turned about 45° and the "arresting" function is activated.
- 2 = Arresting, key turned about 85°.
- 3 = Unlocking, the second microswitch responds again. Key turned counter-clockwise about 25° and the "unlocking" function is activated. Key can be pulled out only in position "0".

### Unlocking or Locking Mechanically:

Both front doors can be unlocked or locked mechanically in case of faults in the central locking system or failure of the car's battery.

#### NOTE:

If locked, only the front passenger's door of cars produced after 9/99 can be unlocked mechanically.



34 51 161

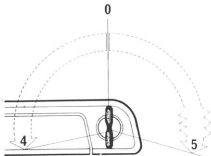
- 4 = Mechanical unlocking, door handle lifted and key turned past noticeable resistance to position "4" (about 110°).
- 5 = Mechanical locking, key turned past noticeable resistance to position "5" (about 110°).

**SYNCHRONIZATION OF LOCKS:**

Synchronization of the lock is necessary if the locking system is "asynchronous".

The locks are "asynchronous", if for example:

- The lock of a door in an activated locking system was unlocked mechanically (only still possible on the front passenger's door of vehicles produced since 9/99).
- The locks had been locked centrally with the driver's door open (in vehicles produced since 9/99 central locking with an opened driver's door is possible, without making the locks "asynchronous").



34 51 161

Synchronizing Locks (only still possible on the front passenger's door of vehicles produced since 9/99):

- Lock the locks mechanically (double-lock) by turning the key beyond noticeable resistance into position (3) (approximately 110°).



51 11 500 0

**Caution!**

The lock cylinder can only be removed and installed with the main key!

**Installation note:**

Check function,  
refer to 51 26 ...

Remove door trim panel at front,  
refer to 51 41 000.

Close door window.

**Caution!**

For safety reasons, disconnect plug connector  
from window regulator motor.

Lift out covering.

Push forward catch with special tool 51 3 190.

**Note:**

Secure handle finisher panel to prevent it  
dropping.

**Installation note:**

Ensure the rubber seal is fitted correctly.  
Press handle finisher panel against body.



22 51 188



22 51 190



22 51 190



22 51 190



22 51 190

**Installation note:**

Put in catch with special tool 51 3 190.

**Lift out retainer.**

Detach linkage.

**Installation note:**

Rotary latch in position "closed", lock in  
position "closed".

**Release screw.**

Release nut with tool 51 2 070.  
Lift out complete door handle.

Disconnect plug connector.

**Installation note:**

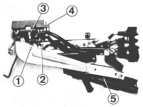
Formed plug connectors only fit in mating  
socket.



Push the retainer back.  
Put the plug off.



Unscrew the screws.  
Remove the metal panel.



34 51 070

**View of Door Handle Assembly:**

- 1 = Lock cylinder
- 2 = Door lock heater
- 3 = Microswitch (locking contacts)
- 4 = Microswitch (door lock heater)
- 5 = Central lock drive (basic setting about the center of the slot)



Cut off wire strap.  
Open the plug receptacle.  
Disconnect the plug.

- 1 = Door lock heater microswitch
- 2 = Door lock heater
- 3 = Locking contact
- 4 = Terminal 30 and burglar alarm

**Installation:**  
Check for correct seating of the locking hooks.

30 51 175



**Caution!**  
Clamp has strong spring force.  
Wear protective goggles.

Lift the clamp out.  
Remove the microswitch.



**Caution!**  
Clamp has strong spring force.  
Wear protective goggles.

Lift the clamp out.  
Remove the microswitch together with the housing.

**Installation:**  
Microswitches are marked with  
L for left or  
R for right.

32 51 171

Remove microswitch.



32 51 178



Unscrew screws.  
Lift the drive out.

**Installation:**  
Adjust drive - refer to 51-26 ...

34 51 092



**Disassembling Lock Cylinder:**  
Insert the master key into the lock cylinder.

**Note:**  
Correct removal and installation of the lock cylinder are only possible with the master key!

**Important!**  
Don't damage the notched pin and bore.  
Press the notched pin out using a pointed plane (don't knock it out!).

34 51 078



Squeeze the lock cylinder together (slight tension).

32 51 181



Lift the cam sleeve off carefully so that the spring remains in the cam sleeve.

32 51 183

**Installation:**  
Insert the cam sleeve correctly.



34 51 077



34 51 076



34 51 078

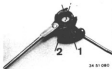
**Installation:**  
Insert the spring correctly.

Lift the complete emergency unlocking mechanism off of the linkage and do not disassemble further if possible.

**Note:**  
The emergency unlocking mechanism is only installed on the front passenger's side of vehicles produced since 9/89. This emergency unlocking mechanism is then a single component which cannot be disassembled.

**Installation:**  
Assemble the emergency unlocking mechanism in normal position.

- 1 = Normal position
- 2 = Emergency unlocked position



34 51 080

**Installation:**  
Adjust groove (1) to the center of opening (2).  
The letter (L for left or R for right) on the washer faces up.



34 51 081



34 51 082



34 51 083

**Installation:**  
Insert the catch in such a manner that the wedge tip points away from the spring (see an arrow).

**Installation:**  
Assemble the emergency unlocking mechanism.

Lift the sleeve out carefully.

**Installation:**  
Install the sleeve with tongue (1) facing up.



34 51 187

Put the lock cylinder out carefully.

**Installation:**  
Push the key restainer down using a pointed item.  
Push the lock cylinder in completely and hold it in until the notched pin is inserted into the cam sleeve.



34 51 188



Hold the spring and ball in position with grease\*.  
Check for correct seating of the ball and spring.

**Installation:**

The flat side of the lock cylinder faces up.  
Lubricate the tumblers with grease\*.



32 51 100



34 51 084

When using a repair kit lock cylinder, the old tumblers must be used as samples. Take the tumbler out of the old lock cylinder and note the stamped number. Insert new tumbler having the same stamped number in the pinning chamber together with new spring and supplied grease. Proceed in the same manner with the remaining tumblers.

\* Source of Supply: BMW Parts



**31 21 003 REPLACING LEFT OR RIGHT FRONT DOOR STRIKER**

Mark the installed position of the door striker with a pencil.

**Important!**

Prevent the threaded plate in the B-pillar from falling down.

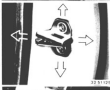
Unscrew screws and remove the door striker.

**Installation:**  
Tightening torque\*

Disconnect the plug.

**Installation:**  
Check the switch.

Switch opened = continuity.  
Switch pressed = break.



**Installation:**

Screw the door striker on lightly and align it with the door lock.

**Installation:**

Adjust the door striker that the outside surface of the closed front door is 1 mm further out than the outside surface of the rear door.



\* Refer to Specifications



**51 21 090 REMOVING AND INSTALLING /  
REPLACING LEFT OR RIGHT  
FRONT DOOR LOCK**

**Installation:**  
Check function.

Remove front door trim panel - refer to  
51 41 008.  
Raise the door window.

**Caution!**  
Disconnect the power window motor plug  
in the interest of safety.

Pull the lower window guide out of the  
window guide rail.  
Unscrew screw.  
Pull the window guide rail downwards.

**Installation:**  
Attach the window guide rail at top in the  
opening of the door panel with the hook.  
Check for correct seating.

Remove the retainer.  
Disconnect the linkage.

**Installation:**  
Rotate latch in "locked" position and lock in  
"locked" position.

Pull the rubber door seal off partially.  
Unscrew screws.  
Remove the door lock.



51 51 184

**Installation:**  
Lubricate the door lock with grease\*.  
Check function.



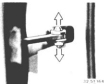
51 41 008



51 51 173



51 51 190



#### 51 21 200 REMOVING AND INSTALLING FRONT DOOR RETARDER

Remove front door trim panel - refer to  
51 41 000.

##### *Caution!*

Disconnect the power window motor plug  
in the interest of safety.

Unscrew the lockplate.  
Drive the pin out upwards.



Lift the rubber cover out.  
Unscrew screws and remove the door  
retarder towards the inside.

##### *Installation:*

Lubricate the door retarder with grease\*.

### 66 10 ... REPLACING BATTERIES FOR INFRARED-SENDER

Fold the key out.  
Unscrew screw.



66 10 220

Fold the key in.  
Swing the cover out.



66 10 221

**Important!**  
If the battery replacement described below is accomplished within one minute, the system does not have to be initialized again!

Unscrew screw.  
Remove batteries.



66 10 222

**Insulation:**  
Insert the batteries correctly.



66 10 223

### 66 10 ... REMOVING AND INSTALLING INFRARED RECEIVER

Pull the receiver out.



66 10 224

Disconnect the plug.



66 10 225



32 51 226

#### 66 10 .... REMOVING AND INSTALLING INFRARED LOGIC UNIT

Remove the left rear seat (or rear seat cushions) - refer to Group 52.  
Pull the infrared logic unit out.



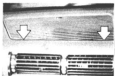
32 51 224

#### 66 10 .... REMOVING AND INSTALLING KEY BIT

Spare infrared senders can be supplied without the key bit.  
To exchange the key bit, unscrew the screw and transfer the key bit.

Installation:

Use a new screw and lock at end of threads.



32 51 227

#### 66 10 .... REMOVING AND INSTALLING DISPLAY UNIT

Unscrew screws.  
Remove ventilation grill.



32 51 228

Disconnect the plug.  
Unscrew screws and lift the display unit out.

51 22 001 REPLACING (ADJUSTING)  
LEFT OR RIGHT REAR DOOR  
STRIKER



**Installation:**  
Adjust door striker that outside surface of closed door is 1 mm further out than outside surface of rear side panel.  
Tighten door striker screws.  
Tightening torque\*.



22 51 014

**Note:**  
If necessary, mark installed position with a pencil.

Unscrew screws and lift out door striker.

**Installation:**  
Tightening torque\*.



22 51 015

Disconnect plug.

**Installation:**  
Check switch.

Switch opened = power flow  
Switch pressed = interruption



22 51 016

**Installation:**  
Screw on door striker only finger tight and align with door lock.

\* Refer to Specifications

\* Refer to Specifications

## 51 22 000 REMOVING AND INSTALLING LEFT OR RIGHT REAR DOOR LOCK

Installation:  
Check function.

Remove door trim panel - refer to 51 42 000.

1

Caution!  
Disconnect plug on power window motor in the interest of safety.

Unscrew screw.

Lift out clip.  
Disconnect cable.

Unscrew screws.  
Remove lock.

Installation:  
Tightening torque<sup>1)</sup>.

<sup>1)</sup> Refer to Specifications



54 51 000

Installation:  
Lubricate door lock with grease<sup>2)</sup>.  
Check function.



54 51 000



54 51 000



54 51 000

<sup>2)</sup> Source of Supply: BMW Parts

### 51 22 170 Removing and installing or replacing outer handle of left or right rear door

Installation note:  
Check function.

Remove door trim panel, refer to 51 42 000.

#### Caution!

For safety reasons, disconnect plug connector from window regulator motor.



32 51 082

Installation note:  
Pull in catch with special tool 51 3 190.

Release screws and remove outside handle.



32 51 084

Lift out covering.  
Push forward catch with special tool 51 3 190.

Note:  
Secure handle finisher panel to prevent it dropping.



32 51 081

Installation note:  
Check handle finisher panel is fitted correctly and press against body.



32 51 082

**51 22 280 REMOVING AND INSTALLING  
OR REPLACING LEFT OR  
RIGHT REAR DOOR  
RETARDER**

Remove door trim panel - refer to  
51 41 000.

**Caution!**

Disconnect the power window motor plug  
in the interest of safety.



51 22 280.1

Unscrew lockplate.  
Drive out pin upwards.



51 22 280.2

Lift out rubber cover.  
Unscrew screws and remove door retainer  
towards the inside.



51 22 280.3

**Installation:**

Lubricate door retainer with grease<sup>1)</sup>.

<sup>1)</sup> Source of Supply: BMW Parts



## 51-24/1



### 51 24 ... ADJUSTING TAILGATE (Touring)

Remove tailgate gas pressure props - refer to 51 24 200.

Raise the tailgate.

Lift the plate out towards the rear.



Unscrew left and right screws.



Adjust the tailgate to have equal size gaps on the left and right sides and be flush with the body.

### 51 24 004 ADJUSTING TAILGATE LOCK (Touring)

The following parts must be removed or disconnected.

Requirement — tailgate adjusted correctly.

- Tailgate lock lower section (adjust)
- Stop pads

51 24 040 REMOVING AND INSTALLING /  
REPLACING TAILGATE LOCK  
AND LOCK SHACKLE  
(Touring)

The following parts must be removed or disconnected:

- Tailgate lock (adjust)
- Tailgate trim panel (remove)
- Lock upper section
- Operating rod
- Microswitch
- Drive motor
- Tailgate lock lower section



**51 24 040 REMOVING AND INSTALLING /  
REPLACING TRUNK LID LOCK  
AND LOCK SHACKLE**

**Installation:**  
Check function.

Pull the trim panel off partially.



Unscrew screws.

Disconnect the linkage.  
Disconnect the plug.  
Lift the trunk lid lock out (removed in the  
picture).



**Installation:**  
If necessary, eliminate the linkage play by  
turning the ball socket.



Lift the plate out.  
Unscrew screws.



Adjust the lock shackle by sliding it in the  
slots.



Adjust the rubber pads by turning them to  
have the trunk lid bear on them with slight  
preload.



**Checking:**  
The top surface of a closed trunk lid should  
be in the same plane as the edges of the  
side panels.

## 51-24/4



### 51 24 100 REMOVING AND INSTALLING / REPLACING TRUNK LID LOCK (LOCK CYLINDER)

**Installation:**  
Check function.

Pull the trim panel off partially.



Disconnect the plug.  
Disengage the linkage.



**Installation:**  
Eliminate linkage play by turning the ball  
socket on the trunk lid lock.  
Adjust central lock drive - refer to 51 26 ...

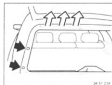


Unscrew screws.  
Remove lock.

51 24 140 REMOVING AND INSTALLING /  
REPLACING TAILGATE WIN-  
DOW LOCK (Towing)

The following parts must be removed or  
disconnected:

- Tailgate trim panel
- Lock lower section
- Drive motor
- Microswitch



51 24 134



51 24 225



51 24 226



51 24 227

51 24 300 REMOVING AND INSTALLING /  
REPLACING LEFT OR RIGHT  
GAS PRESSURE PROP FOR  
TAILGATE (Towing)

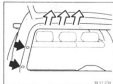
Open the tailgate window.  
Remove rubber pads (1) and unscrew the  
screws.  
Remove the plate upwards.

Raise the tailgate.  
Unscrew screw (1) on the side and remove  
the plate.

Installation:  
Replace damaged clips if necessary.

Remove the spring retainer.  
Lift the gas pressure prop out.

Unscrew screw and remove the gas pres-  
sure prop.



51 21 234

**51 24 321 REMOVING AND INSTALLING / REPLACING LEFT OR RIGHT GAS PRESSURE PROP FOR TAILGATE WINDOW (Teuling)**

Open tailgate window.  
Lift out rubber pads (1) and unscrew screws.  
Lift out panel at top.



51 21 235

Raise tailgate.  
Unscrew screw (1), lift out at side and remove panel.

Installation:  
If necessary, replace damaged clips.



51 21 236

Loosen wire strap (1).  
Unzip the clip towards the inside and remove the holder.



51 21 238

Push the hose aside slightly.  
Unscrew screws and remove holder.

Installation:  
Route the hose correctly.



51 21 240

Pull off retainer (1).  
Pull off gas pressure prop (2).



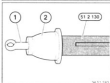
51 21 241

Slide Special Tool 51 2 130 over the gas pressure prop with the slot at bottom, until the mark is aligned with the pin.



51 21 242

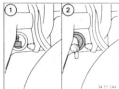
Push the rear end of the special tool down to unlock the gas pressure prop.



51 21 243

Installation:  
Slide new gas pressure prop (1) into the special tool and put on rubber grommet (2).  
Replace a damaged rubber grommet if necessary.

## 51-24/7



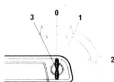
**Install on:**  
Press new gas pressure prep onto nipple (1) and pull off installing rod carefully.  
Check for correct seating of rubber grommet (2).

**51 26 ... CHECKING FUNCTION OF  
LEFT OR RIGHT FRONT  
DOOR OUTSIDE HANDLE  
WITH LOCK CYLINDER**

*Note:*

The various functions can only be checked insofar as the special equipment is installed in the car.

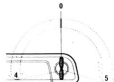
Turn on ignition.  
Lower all windows.  
Open the power sun roof.  
Turn off ignition.  
Unlock and lock driver's door.  
Lock all other doors, trunk lid and tank flap.



51 27 502

Lock doors – key position (1).  
Double-lock doors – key position (2) (loud click heard twice). Catch buttons cannot be pulled up and burglar alarm is set.  
Unlock doors – key position (3), burglar alarm is deactivated.  
Check unlocking of tank flap and trunk lid, insofar as the trunk lid lock is not in "double-locked" position (2) (also refer to checking function of trunk lid lock/cylinder).  
Unlock door manually – position (4).

Lock door manually (includes synchronization of the locking system) – key position (5).



51 27 501

Switch on door lock heating and inside light delay by

- locking doors again.
- waiting at least 35 seconds after locking and
- lifting the door handle at least 5 seconds – the inside lights will be switched on and off again after about 5 seconds.

Door lock heating is switched on for about 40 seconds. It can be switched on again afterwards by lifting the door handle. Door locking heating can be activated only 3 times within 10 minutes. Interlocking is activated for 15 minutes afterwards, but this can be cancelled by unlocking and locking the car.

Check heating of lock cylinder with a thumb, rechecking door lock heating if necessary.

*Note:*

Door locking heating and inside light delay can only be operated from the driver's door lock.

Operate the comfort closing of power windows and power sun roof by holding the key in position (1) or (2).

Check locking of trunk lid and tank flap.

*Note:*

See Group 51 Test Plan in case of faults.



51 27 502





34 51 104

51 26 . . . CHECKING FUNCTION OF  
TRUNK LID LOCK/LOCK  
CYLINDER

Lock – key position (1).

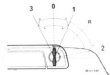
Double-lock – key position (2).

Trunk lid remains locked, if door lock  
is unlocked.

Unlock – key position (3).

Note:

Refer to Group 51 Test Plan in case of  
faults.



34 51 164

**51 26 . . . CHECKING ADJUSTING OF  
CENTRAL LOCK DRIVES  
FOR FRONT AND REAR  
DOORS**

Lower all windows.  
Close all doors, trunk lid and tank flap.  
Lock and double-lock doors – key  
position (2) (loud click heard twice).

Move catch button on each door up  
and down.

Central lock drive is adjusted correctly,  
if there is slight play.  
A play of more than 5 mm (0.197") is  
excessive.

Unlock doors.

**Note:**  
Adjust pertinent central lock drive in  
case of deviation – see 51 26 . . .



34 51 164

**51 26 . . . CHECKING ADJUSTMENT OF  
CENTRAL LOCK DRIVE  
FOR TRUNK LID**

Lock car from the trunk lid lock – key  
position (1).  
Note switching point, marking it on the  
lock cylinder if necessary.  
Unlock car – key position (3).  
Note switching point, marking it on the  
lock cylinder if necessary.

Central lock drive is adjusted correctly,  
if "V" (switching points 1 and 3) is  
symmetric to position 0 (key position-  
ed perpendicularly).

**Note:**  
Adjust central lock drive in case of  
deviation – see 51 26 . . .



34 51 175



### 51 25 ... ADJUSTING CENTRAL LOCK DRIVE OF LEFT OR RIGHT FRONT DOOR

#### Requirements:

Use master key.

Locking system is synchronized – see

51 21 ...

Close door window.

Remove door trim panel – see

51 41 606.

#### Caution!

Pull off plug on power window motor in the interest of safety.

Loosen central lock drive screws.

Turn striker (D) to closed position 2 (2nd catch).

1 = Opened

2 = Closed

Double-lock car on the opened door – key position (2) (loud click heard twice).

Compress central lock drive and pull forward without force until there is no play.

Tighten screws of central lock drive in this position.

Tightening torque = 2 Nm (1.5 ft. lbs.).

Unlock car – key position (3).

Lift door handle and turn striker back into opened position 1 with a pencil or something similar.

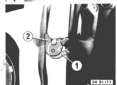
1 = Opened

2 = Closed

Check function.



34 51 170



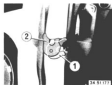
34 51 171



34 51 163



34 51 163



34 51 171

### 51 26 ... ADJUSTING CENTRAL LOCK DRIVER OF LEFT OR RIGHT REAR DOOR

**Requirements:**  
Use master key.  
Locking system is synchronized – see  
51 21 ...

Close door window.  
Remove door trim panel – see  
51 42 000.

**Caution!**  
Pull plug off of power window motor in  
the interest of safety.

Double-lock car from lock of driver's or  
front passenger's door – key position  
(2) (loud click heard twice).

Loosen screws of central lock drive.

Compress central lock drive and pull it  
down without force until there is no  
play.  
Tighten screws of central lock drive in  
this position.  
Tightening torque = 2 Nm (1.5 ft. lbs.).

Check function.

### 51 26 ... ADJUSTING CENTRAL LOCK DRIVE OF TRUNK LID

**Requirements:**  
Use master key.  
Locking system is synchronized – see  
51 21 ...

Raise trunk lid.  
Lift off trim panel partially.

Turn key in trunk lid lock (lock  
cylinder) to "double-locked" position  
(2) – key horizontal.

Remove key.

**Important!**  
Don't leave the key in the trunk!



34 51 000



34 51 000

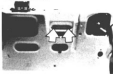


34 51 000



34 51 104

51-26/6



34 51 178

Loosen screws of central lock drive.



34 51 179

Pull central lock drive to the left (away from the lock) without force until there is no play.

Tighten screws of central lock drive in this position.

Tightening torque = 2 Nm (1.5 ft. lbs.).

Check function.

**51 26 000 REPLACING SWITCH FOR  
LEFT OR RIGHT FRONT  
DOOR LOCK (CENTRAL  
LOCK DRIVE)**

Remove front door trim panel – see  
51 41 000.

*Caution!*

Pull off plug on power window motor  
in the interest of safety.

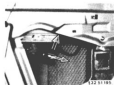
*Installation:*

Adjust central lock drive – see  
51 26 ...

Pull back retainer.  
Lift out plug.

Unscrew screws.  
Lift out drive.

*Installation:*  
Check for correct seating of linkage on  
the drive (shown removed).



**51 26 010 REPLACING SWITCH FOR  
LEFT OR RIGHT REAR  
DOOR LOCK (CENTRAL  
LOCK DRIVE)**

Remove rear door trim panel – see  
51 42 000.

*Caution!*

Pull off plug on power window motor  
in the interest of safety.

*Installation:*

Adjust central lock drive – see  
51 26 ...

Pull back retainer.  
Lift out plug.

Unscrew screws.  
Lift out drive.

*Installation:*  
Check for correct seating of drive on  
the striker (shown removed).

51 26 600 REPLACING SWITCH FOR  
TRUNK LID LOCK  
(CENTRAL LOCK DRIVE)

Disconnect trim panel partially.

Installation:

Adjust central lock drive – see  
51 26 . . .



34 51 101\*

Disconnect linkage.



34 51 502

Unscrew screws.  
Remove drive.

## 51 31 ... Notes on window installation

The windshield and rear window (also rear side windows on E34 touring) are cemented (positively fitted) with the body. This improves the torsional strength of the vehicle. The mounting procedure described in the following must be complied with in order to guarantee correctly cemented windows.

Two different repair cases are described:

1. When replacing the windshield or rear window, the retaining clips of the ornamental trim frame are already fitted on the window glass.
2. When removing and installing the windshield or rear window, the retaining clips of the ornamental trim strips must be fitted by hand.

**Note:**

When using Sikaflex - Ultrafast (hot treatment) the cement cartridge must be heated to 80°C for one hour in a cartridge heating oven\*.

Before placing cartridge in oven, place aluminium cover at rear end.

**Removal:**

The cement beading of the window glass is cut through with an electric cutting tool with an oscillating blade<sup>1</sup> without damaging paintwork around the body aperture, protective peggles and gloves must be worn when cutting out windows.

Paintwork damage at the body aperture must be repaired with BMW EP prime filler<sup>2</sup>. Large damaged spots must be ground down to bare metal and coated with BMW EP prime filler (2K) (layer thickness 20 – 40 µ). If complete build-up of paint finish is required in a visible area, the prime-coated cement flange must be covered with adhesive tape prior to application of the final coat of paint.

**Preparing for assembly:****Note:**

When using Sikaflex - Ultrafast (hot treatment)

Before applying, cement cartridge must be heated to 80°C for one hour in oven<sup>1</sup>.

Sealed cement can be heated several times and remain stable at 80°C for approx. 10 hours.

The window is coated with a UV-impermeable glass ceramic material on the inside edges to protect the cement beading.

A PVC lip is applied over the entire circumference of the side window (E34 touring). This lip must have no irregularities which could disturb the application of the cement beading.

As the result of glassblower drift in the PVC, the PVC coating must be treated as follows in the cementing area when replacing a side window (E34 touring):

- Roughen surface with sanding paper, 220 grain size
- Clean twice with 2-propanol (100% alcohol)
- Drying time approx. 1 minute
- Apply black primer 5001\* (Gurt-Esses)
- Drying time approx. 15 minutes
- Use cement Sikaflex 235 FC or Sikaflex - Ultrafast

**Caution!**

The PVC coating on the side window (touring) must not be treated with Silca Cleaner 200<sup>3</sup>.

Thoroughly coat glass ceramic surface of windshield or rear window with cleaner (Cleaner 295 repair kit). The primer must be allowed to air for at least 10 minutes. Clean body aperture with 2-propanol (100% alcohol, available from glassmakers). Only use the 4-component polyurethane cements approved by BMW (Sikaflex 235 FC for cold treatment or Sikaflex - Ultrafast for hot treatment). To apply uniform cement bead to window, use cartridge gun (operated with compressed air or electric power).

**Assembly:****Caution!**

Assembly must be completed within 10 minutes otherwise the cement beading will form a skin film preventing satisfactory beading. Before it hardens, remove all cement residue with cleaner (Silca remover 208<sup>3</sup>). While cleaning, do not press out the window glass again. Hardened cement can only be removed by machine.

The vehicle can be towed or driven without a windshield, rear or side window.

A side window should be opened to prevent pressure building up in the passenger compartment when closing doors.

\* Source of supply: BMW Parts Service

<sup>3</sup> Source of supply: BMW Parts Service



The cement hardens by means of a reaction with air moisture at room temperature. The minimum hardening time is achieved at 22°C and 58 % relative humidity, refer to table.  
The vehicle must not be subjected to one-sided loads during the minimum hardening time (for example having one wheel up on the hoist, workshop hoist etc.). Park on level ground in the workshop.

#### Cements and minimum hardening times:

Cement	Minimum hardening time without front passenger's airbag (vehicle can be driven)	Minimum hardening time with front passenger's airbag (countries without compulsory belt regulation)
SikaFlex 255 FC* (cold treatment)	4 hours	20 hours**
SikaTack - Ultrafast (hot treatment)	2 hours	12 hours**

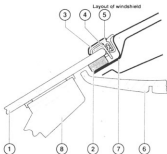
#### \*\* Note:

In the case of vehicles with front passenger's airbag, the vehicle can be handed over to the customer after the hardening time has elapsed (vehicle can be driven), dependent on cement with the following warning:

All passengers must wear seat belt after cementing windshield, specifying minimum hardening time (refer to table, countries without compulsory belt regulations).

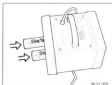
### 51 31 000 Removing and installing windshield

Observe notes on cementing windows, refer to 51 31 ...  
Remove both wiper arms, refer to 51 51 100.



- 1 Windshield  
2 Cement beading  
3 Adhesive film  
4 Clip  
5 Ornamental trim frame  
6 Headlining panel  
7 Body  
8 Inner rear view mirror

51 31 010



Only for treatment with SiluTask - Ultrastart  
Before inserting cartridge in oven, pierce aluminium cover at rear end, heat cement cartridge to 80°C for one hour in oven.

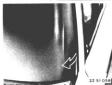


Lift out clips.  
Remove covering.

Slide covering to one side.



Lever out trim mouldings.  
Replace defective trim mouldings if necessary.





Lift out sun visor and release screws.  
Remove sun visor and hinged bracket.

Version with interior light package:  
Disconnect plug connector from sun visor and  
hinged bracket.

32 51 040



Partly remove door weatherstrip.

32 51 043



Lift out A-pillar trim panel.

32 51 044



Pull mirror back and remove from mirror  
socket.

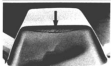
31 51 060



Installation note:

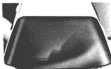
1. Fit mirror base on mirror socket turned by approx. 45°.
2. Turn mirror base until it engages on the mirror socket.

31 51 060



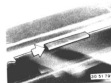
Slightly pull down headlining.

32 51 046



Mask off body.

32 51 047



Lever out clips.

32 51 049



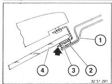
Fit knife blade\* on tool.  
If necessary, resharpen knife blade with machine running.



Carefully insert knife\* between body and windshield.



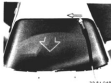
Guide web of knife parallel to windshield.



Cut through cement bead as close as possible to the windshield.

- 1 Body aperture
- 2 Cement bead
- 3 Knife
- 4 Windshield

\* Source of supply: BMW Parts Service



Cut through cement bead all round and lift out windshield with special tool 51 3 510.



Cut off old cement in body aperture down to a thickness of approx. 0.5 mm.

Cut off old cement carefully with a general-purpose knife (sharp or razor blade) to avoid damaging the paint finish in the body aperture.



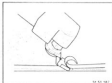
**Caution!**

Damaged paint finish must always be repaired to guarantee long-term corrosion protection! For this purpose, use BMW EP prime filler (2K).

Remove residual cement, sand out scratches in areas not visible and touch up with BMW EP prime filler.

Large damaged spots must be ground down to bare metal and coated with BMW prime filler (2K) (layer thickness 30 ... 40 µm). If complete build-up of paint finish is required in a visible area, the prime-coated cement flange must be covered with adhesive tape prior to application of the final coat paint.

\* Source of supply: BMW Parts Service



22 51 181

When re-using the windshield,  
Remove cement residue on windshield with knife  
to approx. 0.5 mm.



22 51 175

**Caution!**  
The BMW EP prime filler must be completely  
hardened!

Coat windshield and body in area of bonding  
surface with primer (repair kit)\*.

**Note:**  
Drying time approx. 10 minutes.

When re-using the windshield:  
Fit clips by hand.  
Pull off protective film from adhesive strips.



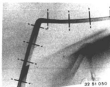
22 51 806

Moisten adhesive film in water to facilitate  
mounting.



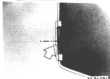
22 51 807

\* Source of supply: BMW Parts Service



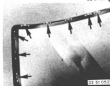
22 51 050

Mark windshield corresponding to cutouts in  
trim mouldings.  
Centre of trim moulding cutout = center of clip.



22 51 061

Fit clip corresponding to marks.



22 51 054

Clip in ornamental moulding.



22 51 053

Fit adjusting blocks (repair kit)\* in body ap-  
erture.

\* Source of supply: BMW Parts Service



30 51 812



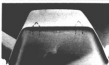
30 51 008

**Note:**  
By turning the adjusting blocks, 3 different heights can be set in steps of 1.5 mm.

Insert windshield in body aperture with special tool 51 3 010 and fit in position.

**Note:**  
Ornamental trim mouldings and clips can be shifted slightly (until moisture evaporates) thus adjusting them to the body aperture.

Turn adjusting blocks until the windshield rests evenly.



30 51 055



30 51 815

Lift out windshield with special tool 51 3 010. Cut off lugs on clips.



30 51 192

Open cartridge (repair kit), fit in applicator gun and screw on corresponding nozzle.

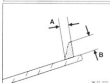
**Note:**  
Note "use by" date of cement.



30 51 190

If necessary, produce a sample bead before cementing. The cartridge must be perpendicular to the windshield.

Apply cement bead with uniform advance bead putting rate.



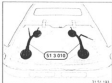
30 51 190

Shape of cement bead  
A = 10 mm  
B = 12 mm



30 51 190

Apply cement bead (1) all round windshield. Maintain distance (A) to edge of windshield (2). A = 5 mm.



Carefully fit windshield with special tool 51 31 010 and press in position. Ensure even spacing between body and trim moulding. Secure windshield in this position with fabric adhesive tape (e.g. Tesu).

Length: 300 mm  
Width: 50 mm



50 11 500 0



50 11 500 0

**Caution!**  
Before it hardens, remove residual cement with Sika cleaner (remover) 208. Do not press windshield back out before it has hardened. Hardened cement can only be removed by machine.

**Note:**  
Leaks can be localized by spraying water under the sealing lip or by using an ultrasonic leak detection device. The leaks can then be sealed off with the aid of a corresponding needle\*.



50 11 300



34 01 007



34 01 008

## 51 31 200 Removing and installing rear window

The same conditions as for the windshield apply to the rear window.

Only hot treatment with SikaTack - Ultrafast: Before inserting cartridge in oven, pierce aluminium cover at rear end. Heat cement cartridge to 80°C for one hour in oven\*.

Secure trunk lid to prevent dropping down and detach left/right damper.

Release left/right screw

\* Source of supply: BMW Parts Service



34 51 030

Pull back trunk lid as far as it will go and pull out rubber seal.



34 51 129

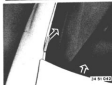
On vehicles as of Fall 1988, it is no longer possible to pull forward the trunk lid. Release screws and place trunk lid in luggage compartment.

Installation note:  
Align and fit trunk lid in position, refer to 41 52 014.



34 51 040

Side covering to one side and unclip ornament on trim frame.



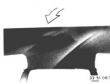
34 51 042

Lift out clips and adjusting blocks.



52 51 050

Unclip left and right C-pillar trim panels to inside, disconnect plug connectors from interior lamps and remove C-pillar trim panels by pulling forward.  
Disconnect plug connector from heated rear window and antenna.



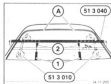
51 51 047

Slightly pull down headlining.

Mask off trunk lid and body.

The further procedure is identical to job instructions 51 31 906.



**Installation note:**

Carefully fit rear window in position with special tool 51 3 040 in conjunction with special tool 51 3 010. Position the suction lifters as far as possible on the outside. Attach positioning hooks (1) at bottom of rear window frame and screw in knurled screws (2) until dimension (A) is set between the ornamental trim resulting at the top roof joint and the body. Position rear window with belt. Check dimension (A) once again and correct if necessary. Fit rubber seal at bottom.

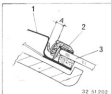
Dimension (A) = 6 mm

**Caution!**

If the rear window was destroyed, glass splinters must be cleaned out of the safety belt automatic-retracting extender.

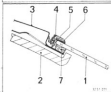
**Note:**

Leaks can be localized by spraying water under the sealing lips or by using an ultrasonic leak detection device. The leaks can then be sealed using an appropriate nozzle (repair kit)\*

**Layout of rear window cementing joint:**

- 1 Body
- 2 Ornamental trim frame
- 3 Rear window

Dimension (A) = 6 mm



- 1 Rear window
- 2 Headlining
- 3 Body
- 4 Ornamental trim frame
- 5 Clip
- 6 Adhesive film
- 7 Cement bead

### 51 31 200 Removing and installing rear window (fouling)

Open rear window.

Unclip panel on left and right and remove adhesive tape.

Installation instruction:  
Secure cable with adhesive tape.

Lift out rubber grommet and detach plug for rear window heating.

Installation instruction:  
Function test

### 51 31 201 Adjust rear window (fouling)

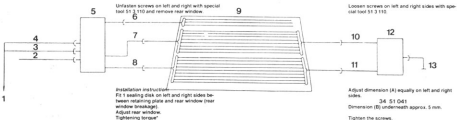
Removing trim for trunk lid, see 51 48 000.

Prerequisite is that trunk lid is correctly set.

Open rear window.

Unclip panel on left and right and remove adhesive tape.

Installation instruction:  
Secure cable with adhesive tape.



\* Refer to Specifications



### 51 31 200 Removing and installing rear window (touring)

Open rear window.

Unclip finisher on left and right and remove adhesive tape.

Installation note:  
Secure cable with adhesive tape.

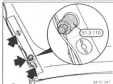
51 31 200



Lift out rubber grommet and disconnect plug connector for rear window heating.

Installation note:  
Check function.

51 31 201



Release screws on left and right with special tool 51 3 110 and detach rear window.

51 31 202



Installation note:  
Place a sealing disk between the retaining plate and rear window on the left and right (rear window breakage).  
Adjust rear window.  
For tightening torque 51 31 1A2

51 31 203

\* Refer to Technical Data

### 51 31 201 Adjusting rear window (touring)

Remove trim panel for trunk lid, refer to 51 49 000.

Precondition, turn lid set correctly.

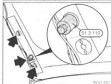


Open rear window.

Unclip finisher on left and right and remove adhesive tape.

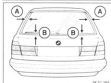
Installation note:  
Secure cable with adhesive tape.

51 31 204



Release screws on left and right with special tool 51 3 110.

51 31 205



Adjust dimension (A) evenly on left and right.

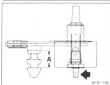
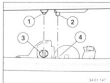
Dimension (B) at bottom approx. 5 mm.

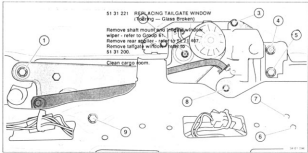
Firmly tighten screws.

51 31 206



Loosen screws (1 ... 9).  
 Close the lidgate window.  
 The lockpin must be adjusted to correct  
 depth distance!  
 Tighten screws (1 ... 9).  
 Tightening torque\*.  
 Check the wiped zone - refer to Group 51.  
 Check function.





### 51 31 ... REPAIRING STONE DAMAGE ON LAMINATED SAFETY GLASS WINDSHIELDS (CLEAR OR TINTED GLASS)

These instructions are meant for skilled workers, who are well qualified, work conscientiously and accept full responsibility for their work. Instructions are limited to factory approved repair materials<sup>1)</sup>, repairing methods as well as associated tips to make the work easier. Instructions only describe general procedures. The actual scope of work will have to be adapted to the degree of damage. The repair is an economical solution, so that optical impairment cannot be excluded. Consequently repairing should only be carried out when ordered by the customer.

Conditions stated below for the repairing of laminated safety glass windshields conform with legislation in Germany. Always conform with legislation valid in other countries.

#### Important!

- Only damage on outside surface of windshields may be repaired. Inside of window and plastic sheet must not be damaged in any manner whatsoever.
- Repairing should be carried out as soon as possible after occurrence of the damage. The penetration of moisture or dirt must not be visible in the damaged spot.
- Impact spot cavities must not exceed a diameter of 5 mm.
- Cracks leading away from the impact spot must not be longer than 50 mm. They must not end in the rubber window frame or ornamental strip.
- Repairs must only be carried out outside of the field of vision (see sketch). Visibility through the repaired surface must be clear, permeant for light and without distortion as well as possible.
- Conform with working instructions!

- A = 240 mm
- B = 290 mm
- C = Limited by wiped zone

### 51 31 ... Repairing stone chip damage on laminated safety glass windshields (clear or tinted glass)

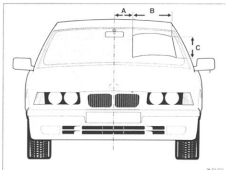
These repair instructions are intended for qualified skilled workers who work professionally, conscientiously and who accept full responsibility for their work. These repair instructions are restricted to BMW approved materials (JOUKOBOARD®), the repair method as well as related tips to simplify the work involved. These instructions can only illustrate the general procedure. The actual scope of work should be adapted to suit the extent of damage. The repair constitutes a cost-effective and fast solution although the final appearance may be impaired. The repair should be offered to the customer on inspection or for used vehicles and on special customer request.

The conditions listed below for repairing laminated safety glass windshields conform with legislation in Germany.

Always conform with prevailing national legislation.

#### Caution!

- Only damage on outer surface of windshield should be repaired. Inside of window and plastic film between inside glass and outside glass must not be damaged in any way.
- Repairs should be carried out as soon as possible after the damage has occurred. The penetration of moisture or dirt must not be visible in the damaged area.
- Impact spot cavities must not exceed a diameter of 5 mm.
- Cracks leading away from the impact spot must not be longer than 50 mm. They must not end in the rubber weatherstrip or in the ornamental trim frame.
- Repairs must only be carried out outside the field of vision (refer to diagram). Visibility through the repaired surface must be clear, transparent and with minimum distortion.
- Note handling instructions!



A = 240 mm  
B = 290 mm  
C = Limitation by wiper zone



51 31 001

**Note:**  
Allow vehicle to assume room temperature  
(+20 °C), heat front shield from inside.



51 31 002

Thoroughly coat suction cup (1) of concentrating mirror reflector with gel and position suction cup on the windshield from the inside such that the damaged point (3) can be viewed from the outside in the concentrating mirror reflector (2).



51 31 003

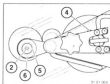
Using a marking tool, remove all glass splinters from the impact point working from the outside so that a roughened surface is obtained.

**Caution!**  
Do not enlarge hole of impact point.



51 31 004

Thoroughly coat suction cup of tool holder with gel.



51 31 005

Position tool holder (4) on windshield from the outside so that the opening (3) of the sputnik head (5) is located exactly above the impact point (2).



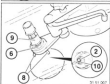
51 31 006

First turn back knurled screw (7). Move locking lever forward and then back again (suction cup holds firm).



51 31 007

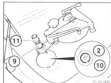
Turn knurled screw (7) until the feet (8) of the sputnik head rest firmly on the windshield (do not screw in too tight, this may cause tension and crack the windshield).



51 31 008

Screw cylinder (9) into sputnik head (5) until rubber seal (10) firmly surrounds impact point (2) on the windshield and the feet of sputnik head (8) just begin to lift a little (do not screw in too much, tension can occur, causing the windshield to crack).





Unscrew injector (11) out of cylinder (9), then screw into cylinder (9) from above and check whether rubber seal (10) is positioned centrally above the impact point (2). Correct position if necessary.



Open resin bottles and fill approx. 1/3 of the contents into the cylinder.

**Caution!**  
Reseal resin bottles immediately after use and protect from UV light.



Stir out any air bubbles in the filled resin with a wooden stick.



Screw injector (11) up to dimension (A) into the cylinder (slight resistance can be felt) and leave set-up for approx. 5 minutes. Dimension (A) = 5 mm.

**Note:**  
A pressure of approx. 10 bar is exerted in this position. While observing the impact point it can be seen that the air at this point disappears slowly (indicated by black shadow).



Quickly unscrew injector (11) to dimension (B). Dimension (B) = 12 mm.

**Note:**  
In this position, a vacuum is now effective which "draws out" the remaining air from the impact point.

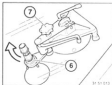


Once again screw injector (11) into cylinder up to dimension (A) (slight resistance can be felt) and leave everything rest for several minutes. Dimension (A) = 5 mm.



Repeat this alternative pressure/vacuum procedure several times and then leave the injector (11) for a time in an intermediate position between dimension (A) and dimension (B).

**Note:**  
If not all air is completely removed, while applying pressure, heat up the windshield with a lighter for several seconds (not too long, tension can occur causing the windshield to crack). Hold the flame as close to the glass as possible, but without touching it.



Release knurled screw (7), swivel spout head (6) to one side and observe the repair point from the top and from various angles in the concentrating reflector mirror. There must now be no more visible air inclusions. If, however, air inclusions are still visible, swivel spout head (6) back over the impact point and screw in knurled screw (7) as before. Repeat alternating pressure vacuum procedure.



Push locking lever forward and remove tool holder from windshield.



Allow one drop of resin to drip onto the impact point and cover with transparent film.

**Note:**  
Only place transparent film on impact point. Do not press!



Mount UV lamp over repair point and press into position (press suction cups one after the other). Connect UV lamp and allow resin to harden for approx. 10 minutes.



Remove UV lamp, peel off transparent film and scrape off surplus resin with a razor blade.



Once again allow a drop of resin to drip onto the impact point and cover with a piece of transparent film.



Carefully pass razor blade over transparent film so that surplus resin emerges from the sides.



Once again mount UV lamp over repair point and press down firmly (press suction cups one after the other).  
Connect UV lamp and allow resin to harden for approx. 10 minutes.



Remove UV lamp, peel off transparent film and scrape off surplus resin about the repair point with a razor blade.

**Caution!**  
Do not scrape over impact point (2)!



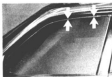
Polish repair point with a lint-free rag and polish until surface is clean and smooth.

## 51 32 154 ADJUSTING LEFT OR RIGHT FRONT DOOR WINDOW

Remove front door trim panel – see 51 41 000.



Note:  
Rubber seal must bear uniformly on the door window glass (to prevent wind noise).



Door window must be parallel to the window frame and submerged to an uniform depth on the top window seal.



The window can be adjusted parallel to the window frame by adjusting the guide rails.



The door window is limited at the top by the adjustable stop.

### 51 32 173 REMOVING AND INSTALLING FRONT DOOR WINDOW

Remove mirror – see 51 16 000.  
Remove door trim panel – see 51 41 000.

Installation:  
Adjust front door window – see 51 32 154.

Lower door window.

Caution!  
Pull off plug on power window motor in the interest of safety.

Pull out retainer from the side.

Disengage window lifting arms in slides.

Lift out window recess seal and ornamental strip.



Lift out ornamental frame.



Lift out rubber guide.  
Unscrew screws.  
Lift off plate.

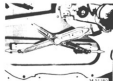


Lift out ornamental strip.



Pull out window glass from above.

Installation:  
Insert window glass in guides on left and right sides.



### 51 33 000 REMOVING AND INSTALLING POWER WINDOW REGULATOR IN FRONT DOOR

Remove front door trim panel – see  
51 41 000.

Installation:

If necessary, adjust front door window  
– see 51 32 054.

Lower door window.  
Lift out microswitch.  
Pull off plug.

Pull out retainer from the side.

Disengage window lifting arms in  
sides.



Loosen screws; drill off rivets if  
applicable.  
Lift out complete window regulator.

Installation:

If applicable, replace drilled off rivets  
with M 6 x 10 screws, 6-4 washers and  
M 6 hexagon nuts.  
Tightening torque = 9 Nm (6.5 ft. lbs.).

Unscrew screws.  
Take off gearbox/motor.



## 51 34 154 ADJUSTING REAR DOOR WINDOW

Remove rear door trim panel — see 51 42 000.



34 51 154

*Note:*  
Rubber seal must bear uniformly on the door window glass (to prevent wind noise).

Door window glass must be parallel to the window frame and run into the upper window seal uniformly.

The window can be adjusted parallel to the momental frame by adjusting the guide rails.

Door window glass is limited at the top by an adjustable stop.



32 51 120



34 51 154



34 51 154

51 34 171 REPLACING LEFT OR RIGHT  
REAR DOOR WINDOW

Remove door trim panel - see  
51 42 000.

Installation:

If necessary, adjust rear door window  
- see 51 34 154.

Lower door window.

Caution!

Pull off plug on power window motor  
in the interest of safety.

Pull out retainer from the side.

Disengage window lifting arms in the  
slides.

Lift off plates (1 and 2).

Unscrew screws.  
Lift off plate.

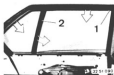
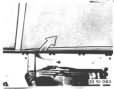
Lift off ornamental strip.

Lift off window recess seal.

Installation:

If necessary, replace clips.

Lift off plate.  
Pull out window guide.







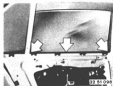
Uncrew screws.  
Lift off plate.



Installation:  
Coat rubber seal (1) with a lubricant for  
rubber parts.  
Engage and press down plate.



Pull out window glass from above.



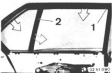
Installation:  
Insert window glass in guides on the  
left and right sides.

## 51-34/4



### 51 34 101 REPLACING WINDOW FRAME IN LEFT OR RIGHT REAR DOOR WINDOW FRAME

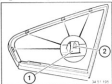
Remove rear door trim panel - see  
51 42 000.  
Remove ornamental strip.  
Lift out ornamental strip on outside.



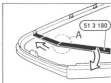
Lift off frame (1).  
Lift off plate (2).



Unscrew screws and lift off plate.



Note:  
Clips (1) on the rubber blocks of the  
window rubber frame have a tab (2) on  
one side. These tabs of the clips en-  
gage in openings in the door frame.



Apply tip of Special Tool 51 3 180 on  
the edge of the clip from the inside  
and press in clip firmly. In so doing  
support the tool on the window at (A)  
and press out the window glass in this  
manner.

— Showed Removed —



Apply the same procedures on the re-  
maining clips and press out the win-  
dow glass step by step.

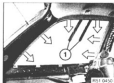


Installation:  
Rub in rubber frame with a lubricant\*  
and let clips on the rubber frame en-  
gage in the openings of the door frame.

### 51 36 070 Removing and installing rear left or right side window (touring)

Note information on mounting windows, refer to 51 31 ...

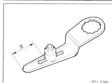
Remove outer window cavity cover strip, refer to 51 37 248.  
Remove inner window cavity cover strip, refer to 51 37 261.  
Remove outer trim finisher on C-pillar, refer to 51 13 365.



Completely remove edge protective strip of side window and mask off this area with fabric adhesive tape.

Only with side window antenna:

Mask off antenna wires with fabric adhesive tape (1) (risk of damage).



Fit straight knife blade\* with adjustable setting roller on roof\* and set dimension (X).

Top from C-pillar to D-pillar  
Dimension (X) = 28 mm

Front from top to bottom of C-pillar  
Dimension (X) = 35 mm

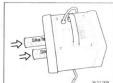


Carefully insert knife\* between body and side window weatherstrip at top of C-pillar. Guide web of knife parallel to side window weatherstrip.  
Cut through cement bead as close as possible to body aperture.

Note:  
When cutting, try not to damage the spacer knibs on the PVC coating.  
If they are damaged, the utmost care must be taken during installation.



\* Source of supply: BMW Parts Service



Only hot treatment with SikaTack - Ultrastick!

Before inserting cartridge in oven, pierce aluminum cover at rear end.  
Heat cement cartridge to 60 °C for one hour in cartridge cover.



Only LH side with side window antenna:

Disconnect antenna plug connector (1).

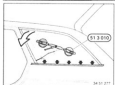
Version, anti theft system with interior protection:

Disconnect plug connector (2)  
If necessary, secure cable with cable tie to side window.

\* Source of supply: BMW Parts Service



Cut through cement bead from top of C-pillar down and then up to the D-pillar.

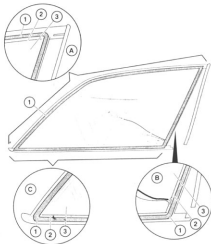


Lift out side window with special tool SI 3 010. Carefully cut through cement bead at the bottom with a scalpel (surgical knife) or with knife blade\* (11 mm long).



Cut off remaining cement in body aperture down to a thickness of approx. 0.5 mm.

Cut off old cement carefully with a general purpose knife (razor sharp) in order to avoid damaging the paint finish in the body aperture.



W1 1 9000

The remaining cement (1) must be cut off flush all round with the PVC web (2). Height of PVC web (2) with respect to PVC coating all round (without cement) is approx. 3.5 mm. Height of PVC web (2) to side window (1) is:

- (A) top approx. 8 mm
- (B) vertically to C-pillar, approx. 6.0 mm
- (C) bottom approx. 6.4 mm

**Caution!**

Damaged paint finish must always be repaired to guarantee long-term corrosion protection. Remove residual cement. Sand out scratches in areas not visible and touch up with BMW EP prime filler (2 K)\*.

Large damaged spots must be ground down to bare metal and coated with BMW EP prime filler (2 K)\* (layer thickness 50 ... 40 µm). The BMW EP prime filler must be allowed to harden.

**(A) Applying cement on existing cement bead:**

- Coat residual cement bead on side window and body aperture with cleaner (Cleaner 205)\*
- Drying time approx. 1 minute

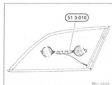
**(B) Applying cement on PVC coating (only where old cement bead peeled off):**

As the result of glazier drift in the PVC, the PVC coating on the side window must be treated as follows in the cementing area:

- Roughen surface with sanding paper, grain size 320
- Clean twice with 2-propanol (100% alcohol, available from pharmacies)
- Drying time approx. 1 minute
- Apply black primer 9001 (Saurt Excess)
- Drying time approx. 15 minutes
- Clean body aperture with 2-propanol
- Drying time approx. 1 minute

**Caution!**

The PVC coating on the side window must not be treated with Sixaxis Cleaner 205.



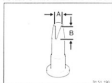
Secure special tool 91 3 010 on outside of window.

**Note:**

Moisten suction surfaces.



Remove outer window cavity cover strip, for this purpose, place side window in body aperture (without cement) and align.



Cut nozzle to size.

Application on PVC coating:

- (A) = 6 mm
- (B) = 11 ... 12 mm

Application on old cement:

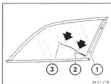
- (A) = 6 mm
- (B) = 8 mm

**Note:**

To apply uniform cement bead, use cartridge pistol\* (operated with compressed air or electric power).

Note "use by" date of cement!

If necessary adjust the height of the cement bead in the case of height differences of the old cement by varying the application speed.



Fit C-pillar finisher (3) in weatherstrip. If necessary, secure antenna wire (2) and wire for interior protection (1) with adhesive tape.

\* Source of supply: BMW Parts Service

\* Source of supply: BMW Parts Service



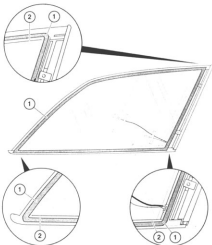
50 11 530 U

Mask off bottom of body aperture with an approx. 10 mm wide (thin) strip of masking tape.



50 11 762

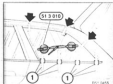
If necessary, produce a sample bead before cementing. Cartridge must be perpendicular to side window.



50 51 279

The cement bead (1) should be started at the bottom rear corner of the window.

Apply cement bead (1) all round side window (in one operation without stopping). Maintain distance of approx. 1 mm to PVC web (2). Join bead at joint with wooden spatula.



Using special tool 51 3 910, place side window in body aperture, fit in position and secure with fabric adhesive tape.  
If necessary place polystyrene (1) on bottom trim moulding.

**Note:**

Ensure the side window is aligned flush with the outer skin panel.

**Caution!**

Before it hardens, remove residual cement with Sikaflex Cleaner (remover) 359\*. While cleaning, do not press side window back out before it has hardened.



Firmly tighten screws of C-pillar finisher and fit caps.

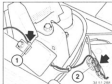


**Note:**

Leaks can be localized by spraying water under the sealing lips or by using an ultrasonic leak detection device\*. Leaks can then be sealed with the aid of an appropriate nozzle (repair kit)\*.



\* Source of supply: BMW Parts Service



**Installation note:**

Connect valve (1) for window antenna.

Tie back cable (2) (rattling noise) on vehicles without interior protection facility.

\* Source of supply: BMW Parts Service

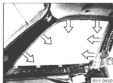
### 51 36 071 Replacing rear left or right side window (tinting)

Note information on mounting windows, refer to 51 31 ...

Remove outer window cavity cover strip, refer to 51 37 240.

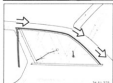
Remove inner window cavity cover strip, refer to 51 37 281.

Remove outer trim finisher on C-pillar, refer to 51 13 060.



Completely remove edge protective strip of side window.

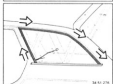
Mask off body and outer trim moulding all round side window.



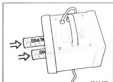
Cut off PWC coating with knife blade (razor sharp) along top trim moulding.



Fit knife blade\* (24 mm) long on roof. Carefully insert knife\* between body and side window. Guide web of knife parallel to side window. Cut through cement bead as close as possible to rear window glass.



Cut through cement bead.



Only hot treatment with Sikaflex® - Ultratec®: Before inserting cartridge in oven, pierce aluminium cover at rear end. Heat cement cartridge to 60 °C for one hour in cartridge oven!



Only LH side with side window antenna:

Disconnect antenna plug connector (1).

Version, anti-theft system with interior protection:

Disconnect plug connector (2).

If necessary, secure cable with cable tie to side window.

\* Source of supply: BMW Parts Service

\* Source of supply: BMW Part Service





Lift out side window at top with special tool SI 3 010 and carefully cut through cement bead with general purpose knife (razor sharp).



Cut off remaining cement in body aperture down to a thickness of approx. 0.5 mm.

Cut off residual cement carefully with a general purpose knife (razor sharp) in order to avoid damaging the paint finish in the body aperture.

**Caution!**

Damaged paint finish must always be repaired to guarantee longterm corrosion protection.

Remove residual cement. Sand out scratches in areas not visible and touch up with BMW EP prime filler (Z K).

Large damaged spots must be ground down to bare metal and coated with BMW EP prime filler (Z K) (layer thickness 30 ... 40 µm). The BMW EP prime filler must be allowed to harden.

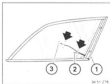
Clean body flange with 2-propanol (100% alcohol) (drying time approx. 1 minute)

As the result of plasticizer drift in the PVC, the PVC coating on the side window must be treated as follows in the cementing area:

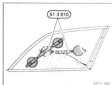
- Roughen surface with sanding paper, grain size 220
- Clean twice with 2-propanol (100% alcohol, available from pharmacies)
- Drying time approx. 1 minute
- Apply black primer 5001 (Dunll Essex)
- Drying time approx. 15 minutes

**Caution!**

The PVC coating on the side window must not be treated with Sikaflex Cleaner 265.



Fit Capillar finisher (1) in weatherstrip. If necessary, secure antenna wire (2) and wire for interior protection (3) with adhesive tape.



Secure special tool 51 3 010 (with joint) on outside of window.  
Secure special tool 51 3 010 (without joint) on inside of window.

**Note:**  
Moisten suction areas.



Cut nozzle to size.

Application on PVC coating:  
(A) = 8 mm  
(B) = 11 ... 12 mm

**Note:**  
To apply uniform cement bead, use cartridge primer\* (operated with compressed air or electric power).

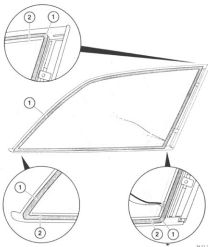


**Note:**  
Note "use by" date of cement!

Firmly tighten locking lug at B-pillar (required for tensioning after fitting side window).



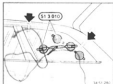
If necessary, produce a sample bead (before cementing). Cartridge must be perpendicular to side window.



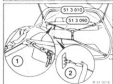
The cement bead (1) should be started at the bottom rear corner of the window.

Apply cement bead (1) all round side window (in one operation without stopping). Maintain distance of approx. 1 mm to PVC web (2). Join bead at joint with wooden spatula.

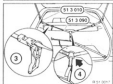
\* Source of supply: BMW Parts Service



Using special tool S1 3 010, place side window in body aperture, fit in position and secure with fabric adhesive tape.



Secure special tool S1 3 010 (without joint) on inside of window.  
Secure special tool S1 3 090 (remaining strap) to top of special tool S1 3 010 (1).  
Attach tensioning strap diagonally in bottom lashing lugs and firmly tighten (2).



Tighten belt tensioner in center (4) so that the lug is located approx. 400 mm above the floor mat (4).  
Tighten top belt tensioner (3) so that lug can be pulled back approx. 20 mm (4).



**Caution!**  
Before it hardens, remove residual cement with Silaflex Cleaner (remover 208)\*. While cleaning, do not press side window back out before it has hardened.

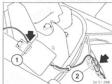
\* Source of supply: BMW Parts Service



Firmly tighten screws of C-pillar finisher and fit caps.



**Note:**  
Leaks can be localized by spraying water under the sealing lips or by using an ultrasonic leak detection device\*. Leaks can then be sealed with the aid of an appropriate repair (repair kit)\*.



**Installation note:**  
Connect wire (1) for window antenna.

Tie back cable (2) (rattling noise) on vehicles without interior protection facility.

\* Source of supply: BMW Parts Service

**51 37 000 REMOVING AND INSTALLING  
POWER WINDOW REGULATOR  
IN LEFT OR RIGHT  
REAR DOOR**

Lower door window.  
Remove rear door trim panel - see  
51 42 000.

Installation:  
Adjust rear door window - see  
51 34 020.

Pull off clip.  
Lift out microswitch.  
Disconnect plug.

Pull out retainer from the side.

Disengage window lifting arms in the  
sides.



Unscrew screws; drill off rivets if  
applicable.  
Remove complete window regulator.

Installation:  
If applicable, replace drilled off rivets  
with M 6 x 10 hexagon heads screws,  
5.4 washers and M 6 hexagon nuts.  
Tightening torque = 9 Nm (6.5 ft. lbs.).

Unscrew screws.  
Remove gearbox/motor.



51 37 248 REMOVING AND INSTALLING /  
REPLACING WINDOW RECESS  
STRIP ON OUTSIDE OF LEFT  
OR RIGHT REAR SIDE WIN-  
DOW (Touring)

**Note:**

Ornamental strips are cemented on side windows of cars produced up to May/June of 1992 and on replacement side windows produced up to September of 1992.

**Cemented Strips:**

Cover painted surface below strip with adhesive tape.

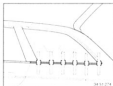
Press out strip at rear top slightly using a creaser and cut through cement on strip using a standard knife (sharp as razor blade).

Cut off bead on PVC sprayed on rear side window but for about 1 mm.

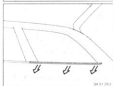
Refer to 51 37 ... for information on installing windows.

Clean strip and sprayed PVC coat with primer\* and air dry about 10 minutes.

Apply window cement in strip opposite the securing beads.



Press on and align strip.  
Place a wooden block on each side of the air securing beads and clamp down with adhesive tape.  
Hardening time: at least 4 hours.



**Cropped Strips:**

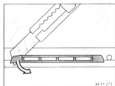
Prior to removing, ensure that strip is not cemented by carefully lifting the rear end of the strip using a creaser.

Unclip strip from rear to front end using a creaser.



**INSTALLER:**

Clips must seat centered and must not be damaged.  
If applicable, replace damaged clips.



51 37 361 REPLACING WINDOW RECESS  
STRIP ON INSIDE OF LEFT OR  
RIGHT REAR SIDE WINDOW  
(Touring)

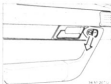
Remove cargo room wheel house trim  
panel - refer to 51 47 151 or 51 47 161.



Roll off ornamental strip.

*Installation:*

Ensure that strip snaps into clips correctly.

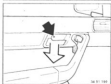


**51 41 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT DOOR TRIM PANEL**

Pull the outside mirror adjusting knob off. Remove the mirror switch using Special Tool 51 1 300 and disconnect the plug.



Unscrew screw.



Remove the screw cover. Unscrew screw and pull the opener release plate out.



Unscrew the catch button.



51 41 105



51 41 120



51 41 124

Lift the plate out. Unscrew screw and remove the window winder.

Installation:  
Install the window winder with the window closed as shown.

Unclip the trim panel.

Important!  
Unclip each clip separately.

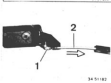
Lift the trim panel out towards the rear.

Installation:  
Replace damaged clips.

1 = Cable core  
2 = Cable sleeve

Pull the cable sleeve back and disconnect the cable core.

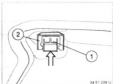
Installation:  
Check for correct seating of the cable sleeve.



51 41 182



Squeeze locking hook (2) with a pliers and pull off clamp (1).



**Installation:**  
Insert clamp (1) in holder (2) on the door trim panel.

**Important!**  
Note the direction of insertion.



**Installation:**  
Check the butyl cord prior to installation of the trim panel, replacing if necessary.





**51 42 500 REMOVING AND INSTALLING  
LEFT OR RIGHT REAR  
DOOR TRIM PANEL**

Lift out power window switch.  
Pull off plug.



Lift out plates.  
Unscrew catch button.



Unscrew screws.



Lift off plate.  
Unscrew screw and take off window  
winder.



Installation:  
Mount window winder as shown with  
the window closed (raised).



Unclip trim panel.

Important!  
Unclip each clip separately.

Lift out trim panel from above.

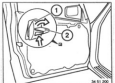
Installation:  
Replace damaged clips.



1 = Cable core  
2 = Cable sleeve

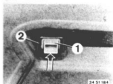
Pull back cable sleeve and disconnect  
cable core.

Installation:  
Check that cable sleeve seats correctly.



Squeeze locking hook (2) with a pliers  
and pull off clamp (1).

## 51-42/2

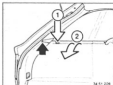


**Installation:**  
Insert clamp (1) in holder (2) on the door trim panel.

**Important!**  
Note the direction of insertion.



**Installation:**  
Check butyl string, replacing if necessary, prior to installation of the trim panel.

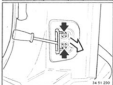


**51-43-208 REPLACING TRIM PANEL FOR LEFT OR RIGHT REAR ROOF PILLAR (D-PILLAR)**

Unlock (1) the side trim panel, fold it up and take it out (2).  
Unscrew screw.



Remove plate.



Unscrew screws and remove escutcheons.



Unclip the D-pillar trim panel at top and remove it.



### 51 44 011 Removing and installing or replacing complete headlining (sunroof version)

Remove sun visors and support brackets on left and right.  
If necessary, disconnect plug connector for mirror light.



Unclip panel, pull down and disconnect plug connector.



Unclip interior light and disconnect plug.



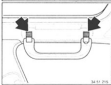
Partly remove edge guard strip on left and right in front door, rear door and at rear side window.

**Note:**  
If edge guard strip is fitted too loosely in area of B-pillar, fix a approx. 200 mm long strip of fabric adhesive tape over the body flange.

If necessary remove holder for net partition.



Unclip A-pillar trim panels on left and right.



Unclip finishers, release screws and remove all grab handles.

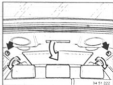


Completely remove edge guard strip from sunroof.

Remove front section of headlining.



Partly unclip B-pillar and C-pillar trim panel at top.



Unclip rear inside lights at left and right, and disconnect plugs.  
If applicable, remove holders for network outlets at left and right-hand sides.

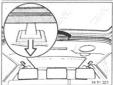


**Caution!**  
Unclip carefully to avoid damaging sun roof cassette.

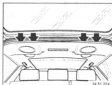
Unclip and remove left and right roof liner side sections.



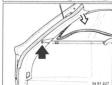
Remove left and right rivets.



Press down on roof liner rear section slightly and unclip.



If applicable, unclip left and right loud-speaker covers.



Unscrew left and right screws.  
Unclip D-pillar trim panel partially and remove roof liner rear section.



**51 44 041 REMOVING AND INSTALLING /  
REPLACING ROOF LINER  
FRONT SECTION  
(Version with Sun Roof)**

Unscrew the left and right sun visors and holders.  
If applicable, disconnect the plug of the inside light for the mirror.



Unclip the cover downwards and disconnect the plug.



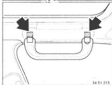
Unclip the inside light and disconnect the plug.



Pull the edge guards off partially in the front door openings.



Unclip the left and right A-pillar trim panels.



Unclips covers, unscrew screws and remove the left and right grab handles.



Pull the edge guard off partially and remove the roof liner front section.

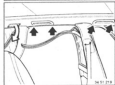
**51 44 042 REMOVING AND INSTALLING /  
REPLACING LEFT OR RIGHT  
ROOF LINER SIDE SECTION  
(Version with Sun Roof)**



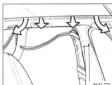
Pull off edge guards partially in front and rear door openings as well as on rear side windows.  
If applicable, remove holder for network cutout.



Unclip B and C pillar trim panels at top partially.



Unclips covers, unscrew screws and remove grab handles.  
Unclip inside lights and disconnect plug.

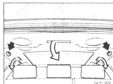


Pull off edge guards partially.



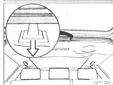
**Caution!**  
Unclip carefully to avoid damaging the sun roof cassette.

Unclip and remove roof liner side section.

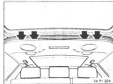


**51-44-043 REMOVING AND INSTALLING /  
REPLACING ROOF LINER  
REAR SECTION  
(Version with Sun Roof)**

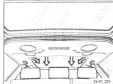
Unclip rear inside light at left and right,  
and disconnect plugs.  
If applicable, remove holders for network  
circuitry at left and right-hand sides.



Press down on the roof liner rear section  
slightly and unclip.



If applicable, unclip left and right loud-  
speaker covers.



Loosen edge guard partially.  
Pull edge guards off of C-pillar trim panels  
and rear side windows partially.



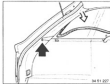
Unclip left and right C-pillar trim panels  
partially.

**Caution!**  
Unclip carefully to avoid damaging the sun  
roof cassette.

Unclip rear roof liner section at left and  
right sides partially.



Press down on the rear of the roof liner  
side section slightly and remove rivets.



Unscrew left and right screws.  
Unclip C-pillar trim panel partially and  
remove roof liner rear section.



51 45 030 REMOVING AND INSTALLING  
DASHBOARD TRIM PANEL

Remove center console -- see 51 18 200.  
Remove glove box -- see 51 16 260.  
Remove instrument cluster -- see 51 51 000.

Unscrew screws.  
Remove trim panel.  
If applicable, disconnect plug for radio  
speaker.

Pull off rubber seals for left and right doors  
carefully.

Lift trim panel off of left and right A pillars.



Unscrew screws on left and right sides.



Unscrew screws on left and right sides.



Disconnect plug.



Disconnect wire connector.





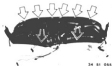
Disconnect wire connector.  
Pull off plug.



Unscrew screw.  
If applicable, pull off plug.



Lift out dashboard  
installation.  
Check for correct seating of mounting  
clips on body.  
Align instrument panel.



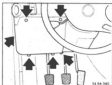
Unscrew screw.  
Remove air ducts.



Unscrew screw.  
Lift out air grill.



Disconnect wire connector.  
Remove wire harness.



**51-45 180 REMOVING AND INSTALLING  
DASHBOARD TRIM PANEL AT  
BOTTOM LEFT**

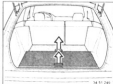
Lift out plugs.  
Unscrew screws.



Lift off trim panel.



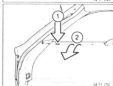
Unscrew screws.  
Lift off trim panel.



51 47 131 REMOVING AND INSTALLING / REPLACING LEFT WHEEL HOUSE TRIM PANEL IN CARGO ROOM

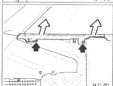
Remove the front and rear trunk covers.  
Remove the interior divider.

51 47 240



Unlock (1) the side trim panel, fold it down and remove it (2).

51 47 250



Unscrew screws and remove the grill upwards.

Installation  
Clip the grill in correctly.

51 47 261



Lift (1) the backrest side section out and remove it upwards (2).

51 47 262



Put the edge guard off of the rear door partially.

51 47 270



Unclip the C-pillar trim panel.

51 47 280



Unscrew screws and unclip the cover for the automatic seat belt rest.  
Take the belt strap out.

51 47 290

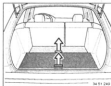


Lift the securing plugs out.  
Lift the covers off of the escutcheon.

51 47 300



Unscrew screws.  
Lift the escutcheon out and remove the side trim panel.



#### 51 47 181 REMOVING AND INSTALLING / REPLACING RIGHT WHEEL HOUSE TRIM PANEL IN CARGO ROOM

Remove the front and rear trunk covers.  
Remove the interior divider.



Unlock (1) the side trim panel, fold it down and remove it (2).



Pull the edge guard off partially.  
Unclip and remove the C-pillar trim panel.



Lift (1) the backrest side section out and remove it upwards (2).



Unscrew screws and unclip the cover for the automatic seat belt reel.  
Take the belt strap out.



Unscrew screws and remove the grill upwards.

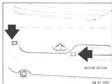
Installation:  
Clip the grill in correctly.



Lift the securing plug out.  
Lift the covers off of the escutcheon.

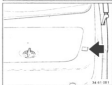


Unscrew screws.  
Lift the escutcheon out and remove the side trim panel.



51-49-000 REMOVING AND INSTALLING /  
REPLACING TRIM PANEL FOR  
TAILGATE

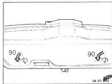
Unclip caps on screws.



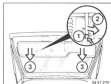
Unclip cap on screws.



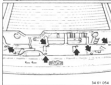
Unscrew screws.



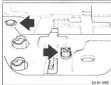
Open the toolbox.



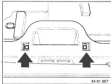
Push (1) the latch and lift (2) the retaining  
strap out.  
Remove the toolbox downwards (3).



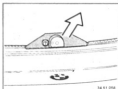
Remove clips.



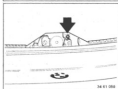
Unscrew left and right screws.



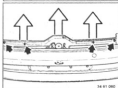
Unscrew screws.  
Unscrew screws of handle recess plate.



Shut the tailgate.  
Uncrew the cap on the wiper crank.

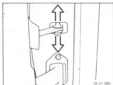


Uncrew screw.



Take trim panel out of the clips carefully.  
Remove the trim panel.





51 71 200 REMOVING AND INSTALLING / REPLACING SEAL ON LEFT OR RIGHT REAR DOOR

Lift out door retainer and, if necessary, cover.

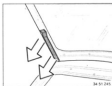


Lift out panels



Pull off seal carefully. If necessary, clean cementing surface with gasoline.

Other steps are identical with those described in 51 71 200.



51 71 407 REPLACING REAR SPOILER (floating)

Open tailgate window. Unclip panels on left and right hand sides and pull off adhesive tape.

Installation:  
Secure wires with adhesive tape.



Unscrew screw on left and right hand sides using Special Tool 51 3 110.



Pull wiring (1) out of spoiler (2).



Cut through cement bead with a straight oscillating knife\*. Cut outside with knife only up to (A) (screw).

Distance A = 40 mm.

\* Source of Supply: BMW Parts



51 71 000/2

Note information on mounting windows, refer to 51 31 ...

Remove cement residue on rear window.  
Clean rear window and spoiler and coat (mounting surface with primer (repair kit)).

Note:  
Drying time approx. 10 minutes.

Only hot treatment with SikaTack - Ultrastick:

Before inserting cartridge in oven, pierce aluminum cover at rear end.  
Heat cement cartridge to 80°C for one hour in oven.\*

Cut nozzle to size:

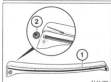
Dimension:  
(A) = 6 ... 7 mm  
(B) = 5 ... 6 mm

Note:  
To apply uniform cement bead, use cartridge gun\* (operated with compressed air or electric power).



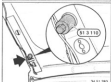
51 71 700

If necessary, produce a sample bead before cementing.  
Cartridge must be perpendicular to rear window.



51 71 200

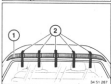
Apply cement bead (1) in groove of spoiler.  
Press grammet (2) onto screws on left and right.



51 71 250

Fill spoiler on rear window, press down, align and firmly tighten with special tool 51 71 110.

For tightening torque, refer to Technical Data 51 71 2A2

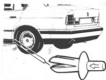


51 71 260

Tension rear spoiler (1) with wooden blocks and fabric adhesive tape (2).

For hardening time, refer to 51 31 ..., table of minimum hardening times.

\* Source of supply: BMW Parts Service



**51 71 447 REMOVING AND INSTALLING  
PANEL FOR COVER ON  
LEFT OR RIGHT SIDE  
MEMBER**

Remove rear wheel - see Group 35.  
Knock out plug (1) in the expander  
rivet.  
Pull out expander rivet.



Unscrew screws (1).  
Pull panel out of clips from behind.

Squeeze clamping parts on the sides  
in the clamps with a circlip pliers and  
pull out.

**Installation:**  
Replace damaged expander rivets,  
clamps and clips.



24 51 187

**Installation:**  
Check for correct seating of clamps  
and clamping parts.

- 1 Sheet metal fold on side member
- 2 Panel (plastic)
- 3 Clamp
- 4 Clamping part

**Installation:**  
Squeeze clamping part and clamp on  
the sheet metal fold with a pliers.



24 51 188



24 51 187

# 52 Seats

52 0	...	General information .....	52-	0/1
52 10 000		Front seat, left or right – remove and install .....	52-	10/1
	...	Front seat, left or right – disassemble and assemble (seat removed) .....	52-	10/2
	...	Front power seat, left or right – disassemble and assemble (seat removed) .....	52-	10/4
	...	Seat rails and drives .....	52-	10/5
205		Armrest on front seat – remove and install .....	52-	10/8
52 11 501		Covers for left or right front seat – replace .....	52-	11/1
52 20 000		Rear seat cushion and backrest – remove and install .....	52-	20/1
	...	Rear seat center armrest – remove and install (M5) .....	52-	20/2
	...	Load-through mechanism .....	52-	20/3
	...	Split rear seat cushion and backrests – remove and install .....	52-	20/4
070		Rear seat backrest, left or right (touring) – remove and install or replace .....	52-	20/6
075		Rear seat backrest side section, left or right (touring) – remove and install or replace ...	52-	20/6

# 52-0/1

## 52 0 ... GENERAL INFORMATION

### Power Seats

Troubleshooting - refer to Car Electric/Electronic Test Plan 52 00.

### Caution!

The seat belt lock tensioner must first be deactivated before removing this type of front seat - refer to Group 12.

## 52 10 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT SEAT

**Caution!**  
Deactivate seat belt lock tensioner - refer to Group 72.



52 62 001

Unscrew bolts - if necessary, run seat forward.

**Installation:**  
Tightening torque\*.

Pull out headrest with one jerk.



52 62 002

**Note:**  
A power seat can be adjusted manually in forward/back direction with help of a screwdriver (4 mm wide blade) in case of power control failure.

Insert screwdriver into hole of potentiometer or motor and turn until the bolts are accessible.



52 10 001

\* Refer to Specifications



52 52 000

Run seat up to "high" position.  
Disconnect cable for seat belt height adjustment.  
Unscrew seat belt.

**Installation:**  
Tightening torque\*.



54 62 001

Lift rear end of seat and slide seat forward out of the front brackets (A).  
If applicable, disconnect plugs.  
Remove seat.

\* Refer to Specifications



32 52 001

### 52 10 DISASSEMBLING AND ASSEMBLING FRONT SEAT

Use clip and unscrew trim panels on left and right sides with Special Tool 00 2 100. Operate all levers to move all springs into final position.



33 52 002

**Seat Rails:**  
Disconnect cable.



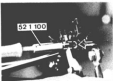
34 52 003

**Backrest:**  
Push up trim panel, pull out of clips at bottom and remove.  
Remove headrest with one jerk.



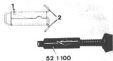
33 52 012

Press down levers on left and right sides with a pliers and pull up backrest.



34 52 005

Insert Special Tool 52 1 100 in bearing pins (four) and drive them out.



52 1 100

30 52 029

**Installation:**  
Pins must be replaced.  
Drive in pins against stop with Special Tool 52 1 100.  
Check whether restainer(1) engages and that stops (2) are not damaged.



33 52 024

**Seat Cushion:**  
Unscrew levers.  
Take off seat cushion cover.



33 52 025

Unscrew console.



*Note:*  
Return spring with clip.



Put off retainers.  
Take off gas pressure spring.



*Installation:*  
Connect gas pressure spring with Special  
Tool 00 5 600 and secure with new  
retainers.





**52 10 ... DISASSEMBLING AND ASSEMBLING FRONT POWER SEAT**  
 - Seat Removed -

**Seat Rails**

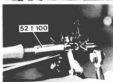
Unclip and unscrew trim panels on left and right sides with Special Tool 52 2 130.



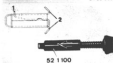
Unscrew control unit - pull off plug.

**Installation:**

Plug connections are coded.  
 Control unit bears in rubber mounts (1).



Guide Special Tool 52 1 100 into bearing pins (four) and drive them out.

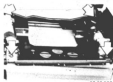


**Installation:**

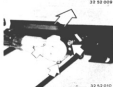
Pins must be replaced.

Drive in pins against stop with Special Tool 52 1 100.

Check whether retainer (1) engages and that stops (2) are not damaged.



Drill out rivets - remove plate.



Unscrew motor (front seat height).

Unscrew bolts - take off rails.

**Installation:**

Lubricate gear wheel with grease.

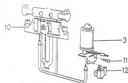


**Installation:**

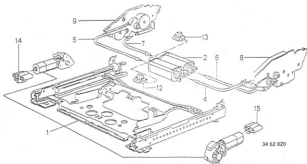
Same distance (A) on left and right rails and toothed element (1) in same position.

Lubricate splines with grease.

Install sleeves (2).



- 1 Seat rails with drives
- 2 Up/down seat drive
- 3 Drive
- 4 Up/down seat drive shaft, left
- 5 Up/down seat drive shaft, right
- 6 Backrest drive shaft, left
- 7 Backrest drive shaft, right
- 8 Gearbox, left
- 9 Gearbox, right
- 10 Headrest gearbox
- 11 Oval head screw
- 12 Headrest and up/down seat drive regulator
- 13 Backrest drive regulator
- 14 Forward/back seat drive regulator
- 15 Seat inclination drive regulator





32 52 013

Unscrew motor (forward/back).  
 Installation:  
 Lubricate splines with grease.  
 Connect spring before tightening the nuts.



34 52 002

Backrest:  
 Push up backrest trim panel and pull it out of clips at bottom.



32 52 012

Pull off plug and disconnect leads on backrest.  
 Press down levers on left and right sides with a pliers — take off backrest.  
 Installation:  
 Connect plugs/leads that colors match.



32 52 014

Pull out headrest.  
 Unscrew cover partially.  
 Unscrew bolts — take off gearbox.  
 Drive shaft is connected permanently on the gearbox.



32 52 018

Unscrew motor.



32 52 020

Unscrew potentiometer.



32 52 015

**Seat**

Loosen seat cover partially.  
Unscrew bolts and pull shaft out of both motors.

**Installation**

Position of backrest and seat height same on left and right sides, correct by turning shafts if necessary.



32 52 016

**Unscrew corner**

Lift out cover.

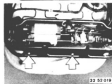
Remove backrest fittings.



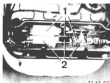
32 52 017

**Installation**

Lubricate splines with grease.  
Insert sleeve (1).



32 52 018

**Unscrew motors.**

32 52 021

**Note**

- 1 Motor for backrest with black plug and potentiometer 1 379 095 9
- 2 Motor for seat up/down with white plug and potentiometer 1 379 094 9



52 10 205 REMOVING AND INSTALLING  
ARMREST ON FRONT SEAT

Push up trim panel, pull out of clips at  
bottom and remove.



Unscrew nuts – take off armrest.



34 52 006

**52 11 501 REPLACING SEAT CUSHION COVER FOR LEFT OR RIGHT FRONT SEAT**

- Seat Removed/Backrest Taken Off of Seat -

**Seat Cushion:**

Bend hooks to unlock and disconnect cover. Disconnect tensioning string (A) and take off cover.

Bend open clips (use pliers for cyclops) and separate cover from the padding.

Install new cover (both tongues) with clips and Special Tool 52 0 050 on the padding (steel wire).

Install cover on both sides with clips and Special Tool 52 0 050 on the padding (steel wire).



34 52 010



34 52 011

Connect cover in hooks with uniform tightness and without folds, beginning at the front. Bend hooks to lock.

Secure cover on seat frame with the string under light tension.

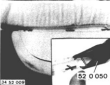


34 52 007



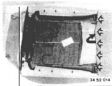
52 0 050

34 52 008

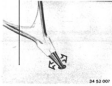


52 0 050

34 52 009



**Backrest:**  
Bend open all hooks and disconnect cover.



Bend open all clips which connect the cover on the frame (see plan for cutlines).



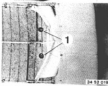
Bend open all clips.  
Separate cover from padding.



Pull new cover over padding and clips.  
Secure cover on padding (head) with clips and Special Tool 52 0 050, beginning at the top.



If applicable, transfer cover.



Secure padding and tensioning tongues (1) on the frame with clips.

Connect cover in hooks with uniform tension and without folds, beginning at top.  
Bend hooks to lock.

## 52-20/1



### 52 20 000 REMOVING AND INSTALLING REAR SEAT CUSHION AND BACKREST

Pull up seat cushion out of clips (1).  
Pull out headrests from above.

Fold down center armrest.  
Unscrew nuts (2).  
Lift out seat belt strap covers (3).  
Pull up backrest out of holders.

M 5:  
Pull separate seats out of clips (1) as above.  
Pull up headrests to remove.



Turn retainers 90°.  
Lift out cover from above.



Open console (middle).  
Compress tabs.  
Remove console.

Lift out seat belt strap covers (3).  
Unscrew nuts (2) and lift backrest out of holders from above.







**52 20 . . . REMOVING AND INSTALLING  
REAR SEAT CENTER  
ARMREST (M 5)**

Open console (middle).  
Compress tabs and remove console.



Pull up separate seat cushions out of  
clips (1).



Unscrew screws on left and right sides.  
Remove cover from above.



Unscrew screws on left and right sides.  
Take out drawer.

## CARGO ROOM CONVERSION SYSTEM



### 52 20 . . . REMOVING AND INSTALLING SPLIT REAR SEAT CUSHION AND BACKREST

Lift rear seat cushion on the pulling strap and tilt it forward.

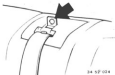
*Note:*  
Position front side forward slightly if necessary.

Compress both unlocking levers and lift out seat cushion forward.

The rear seat backrest is unlocked automatically and can be tilted forward.

*Note:*  
If locked unintentionally, press the lever – releasing the lever will unlock the backrest.

Tilt the rear seat backrest forward, unlock retainers with a screwdriver and lift out the backrest.



24 52 024



24 52 026

*Installation:*  
Check for correct locking of the rear seat backrest (seat belt function).  
Checking: red pin must be fully recessed.

**Removing Seat Belt Lock:**  
Unscrew cover on backrest.  
Unscrew cover on rear wall.

Lift out seat belt lock/cover.  
Lift out seat belt lock from above.  
Disconnect cable on the rear wall.



24 52 027

*Installation:*  
Adjust cable in such a manner that the backrest is unlocked after pressing down and releasing the unlocking lever.



24 52 021



24 52 022



24 52 023



24 52 025



**Note:**

**Unlocking the Seat Backrest in Case of**

**Failure:**

Take off top seat belt cover and press down on lever with a screwdriver.

Picture was taken on a removed seat backrest with its rear wall taken off.



**52 20 075 REMOVING AND INSTALLING / REPLACING COMPLETE LEFT OR RIGHT REAR SEAT BACKREST (Touring)**

Remove rear seat backrest side section - refer to 52 20 076.  
Fold both backrests forward.  
Remove the plate between the backrests upwards.

**Left Backrest:**

Unscrew screw on outside.

**Installation:**  
Install the screw with Lockite\*\*.  
Tightening torque\*.



**Right Backrest:**

Unscrew screw on outside.

**Installation:**  
Install the screw with Lockite\*\*.  
Tightening torque\*.



Push the lock back and remove the backrest upwards.



**52 20 076 REMOVING AND INSTALLING / REPLACING LEFT OR RIGHT REAR SEAT BACKREST SIDE SECTION (Touring)**

**Left Backrest Side Section:**

Lift (1) backrest side section out and remove upwards (2).



**Right Backrest Side Section:**

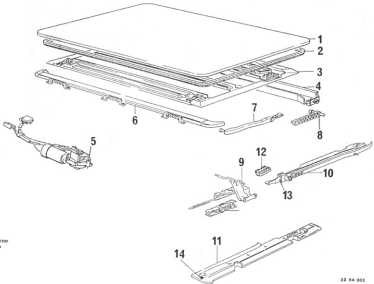
Lift (1) backrest side section out and remove upwards (2).

\* Refer to Specifications  
\*\* Source of Supply: BMW Parts

## 54 Hood, sunroof

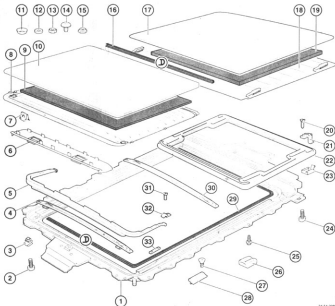
	Arrangement of slide/tilt sunroof .....	54-	0/1
54 0	... Arrangement of double slide/tilt sunroof .....	54-	0/2
	... Function description of double slide/tilt sunroof (touring) .....	54-	0/4
	... Emergency closing mechanism – slide/tilt sunroof (touring) .....	54-	0/5
	... Initialization of slide/tilt sunroof (touring) .....	54-	0/6
	... Operating logic of slide/tilt sunroof (touring) .....	54-	0/7
	... Notes on the repair of cemented gaskets on slide/tilt sunroof .....	54-	0/9
54 12 004	Slide/tilt sunroof – adjust .....	54-	12/1
005	Slide/tilt sunroof lid (touring) – adjust at front .....	54-	12/2
006	Slide/tilt sunroof lid (touring) – adjust at back .....	54-	12/2
100	Slide/tilt sunroof lid – remove and install .....	54-	12/3
102	Slide/tilt sunroof lid (touring) – remove and install at front .....	54-	12/4
103	Slide/tilt sunroof lid (touring) – replace at front .....	54-	12/4
104	Slide/tilt sunroof lid (touring) – replace at back .....	54-	12/5
106	Slide/tilt sunroof lid (touring) – remove and install at back .....	54-	12/6
120	Gasket on slide/tilt sunroof lid – replace .....	54-	12/7
121	Gasket for slide/tilt sunroof lid (touring) – replace at front .....	54-	12/7
122	Gasket on slide/tilt aperture (touring) – replace .....	54-	12/8
132	Headlining for slide/tilt sunroof lid (touring) – remove and install or replace at front .....	54-	12/8
133	Headlining for slide/tilt sunroof lid (touring) – remove and install or replace at back .....	54-	12/9
210	Slide/tilt sunroof (frame, touring), complete unit – remove and install .....	54-	12/10
230	Gearbox (manual) for slide/tilt sunroof – remove and install or replace .....	54-	12/12
241	Both drive cables for slide/tilt sunroof actuation – replace .....	54-	12/13
245	Both drive cables at front for slide/tilt sunroof actuation – remove and install/replace .....	54-	12/14
246	Both drive cables at back for slide/tilt sunroof actuation – remove and install/replace .....	54-	12/15
255	Both actuating units / actuators – replace .....	54-	12/15
496	Wind deflector (touring) – remove and install/replace .....	54-	12/16
512	Microswitch (reversing type) for slide/tilt sunroof motor – replace .....	54-	12/17
54 13 005	Coupling on gearbox unit (touring) at front – remove and install/replace .....	54-	13/1
006	Coupling on gearbox unit (touring) at back – remove and install/replace .....	54-	13/1
010	Motor and gearbox for slide/tilt sunroof actuation – remove and install .....	54-	13/2
011	Motor for slide/tilt sunroof actuation (touring) at front – remove and install or replace .....	54-	13/2
012	Motor for slide/tilt sunroof (touring) at back – remove and install .....	54-	13/3
015	Module for slide/tilt sunroof (touring) at back – remove and install or replace .....	54-	13/3
	Slide/tilt sunroof – troubleshooting .....	54-	90/1

## SUN ROOF LAYOUT DRAWING



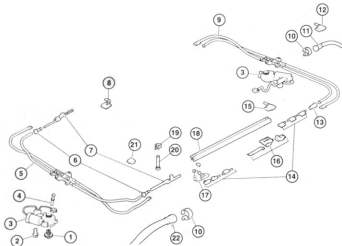
- 1 Lid\*
- 2 Seal
- 3 Roof liner frame
- 4 Water drain
- 5 Motor/gearbox
- 6 Wind deflector
- 7 Linkage for wind deflector
- 8 Linkage for water drain
- 9 Drive cable
- 10 Gate
- 11 Cover rail
- 12 Slide
- 13 Retainer
- 14 Rubber pad

## 54 0 ... DUAL LID SUN ROOF



- 1 Frame lower section
- 2 Screw
- 3 Nut clip
- 4 Front cross member
- 5 Wind deflector
- 6 Plate
- 7 Retainer
- 8 Front roof liner frame
- 9 Front soundproofing sheet
- 10 Front lid
- 11 Center lid molded washer (version status)
- 12 Lid washer
- 13 Center lid nut (version status)
- 14 Center lid screw (version status)
- 15 Center lid nut
- 16 Foam lid seal
- 17 Rear lid
- 18 Rear roof liner frame
- 19 Rear soundproofing sheet
- 20 Oval head screw
- 21 Clamp
- 22 Lid frame
- 23 Retainer
- 24 Oval head screw
- 25 Self-tapping screw
- 26 Slide
- 27 Countersink screw
- 28 Cover
- 29 Sun roof opening seal
- 30 Cross member
- 31 Oval head clsk. screw
- 32 Wind deflector holder
- 33 Threaded plate





- 1 Coupling
- 2 Hexagon screw
- 3 Front/rear actuator motor
- 4 Rivet
- 5 Guide tube, front
- 6 Tube seal, front L/R
- 7 Operating cable, L/R
- 8 Slide leaf spring
- 9 Guide tube, rear
- 10 Hose clip
- 11 Water hose, rear
- 12 Slide, rear
- 13 Pipe seal, rear
- 14 Operating cable, right
- 15 Slide, center
- 16 Control lever, L/R
- 17 Slide, front
- 18 Guide rail
- 19 Lock weather
- 20 Stud
- 21 Pipe clip,
- 22 Water hose, front

## 54 0 ... Functional description, dual sliding/tilting sunroof, touring

The dual tilt/slid sunroof has diagnostic capabilities.

### o Control logic (one-touch function)

The following sunroof cover positions can be set automatically by briefly pressing (one touch) the control switch:

- front vent position (tilt end position)
- front end position open
- rear end position open (block)
- comfort ventilation, both sunroof covers open (block center)
- convenient close from any cover position

When taking up the various positions (also convenient closing) the selected function can be stopped with the one-touch function or by pressing up the button.

All positions can be set manually.

### o Trap guard (finger guard)

The trap guard is active:

- during convenient closing via control switch or door switch
- one-touch close function for front and rear cover
- parking shift forward or back

The trap guard is not active:

- 4 mm before end position
- during automatic one-touch open function
- during initialization
- during manual opening and closing
- closing the vent position (front tilt position)

### o Emergency closing (mechanical)

Should the electrical drive fail, the sliding/tilting sunroof can be closed mechanically with a hand crank (hexagon socket screw is in front panel of control switch).

Note:

The sliding/tilting sunroof must be initialized after repair.

### o Consumer load cutout

All sliding/tilting sunroof functions are interrupted during the starter procedure. On completion of the start procedure, the interrupted functions are not continued.

### o Initialization

Initialization is necessary after emergency operation, completed repairs on the sliding/tilting sunroof or after a break in the power supply. Initialization is carried out in absolute zero position (both sunroof covers closed against mechanical limit stop and headlining frame, duration approx. 20 seconds).

Caution!

The trap guard is not active during initialization and no automatic one-touch function can be carried out.

### o Convenient closing

Convenient closing via door lock:

Initially, all windows are closed with electric window regulators. The sliding/tilting sunroof is slowly closed from any position for as long as the key is turned in the "lock and arrest" position.

Convenient closing via control switch:

The sliding/tilting sunroof is closed from any position when the control switch is briefly pressed upward.

## 54 0 ... EMERGENCY (MANUAL) CLOSING SUN ROOF (Touring)

Sun roof lids can be closed by hand if the electric drive fails.

**Installation:**

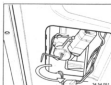
After working on the sun roof initialization must be carried out - refer to 54 00 ...



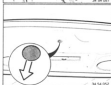
Remove panel.



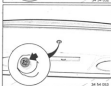
Unscrew screw (1) and pull out clutch (2) downwards.



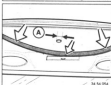
Insert manual winder (hexagon socket key) and turn counterclockwise to close from 90 (until 0° position is reached).



Remove rear plug downwards.

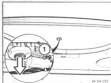


Unscrew screw.

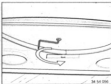


Pull off edge guard partially, if plug diameter is < (A).

Diameter (A) = 20 mm



Remove coupling (1) by pulling downward. If necessary with the aid of the crank handle of the hexagon crank.



Fit hand crank (key for hexagon socket screw) and close rear sunroof cover by turning in counterclockwise direction.

## 54 0 ... Initialising sliding/tilting sunroof, touring

Initialization is necessary on completion of repairs, after emergency sunroof operation or after an interruption in the power supply. Initialization is carried out in absolute zero position (both covers against mechanical limit stop).

### Caution!

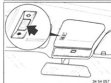
The bag guard is not active during initialization. - Risk of jamming -

The one-touch function is not active during initialization.



### Operation:

- (A) briefly press
- (B) press permanently
- (C) cover movement
- (D) sequence of (A) and (B)



Completely close sliding/tilting sunroof. When both sunroof covers and headliner frame are closed, continue to press close for a further 20 seconds. Initialization is now completed.



#### 54 0 ... SUN ROOF OPERATING LOGIC (Tilting)

##### Operation Explanations:

- A: Brief tipping (automatic tip operation)
- B: Constant pressing (manual operation)
- C: Movement of lid
- D: Sequence of A and B

##### Note:

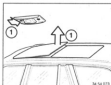
All of the lid positions described below can also be operated manually (B) until the desired position is reached.

All tip operations can also be stopped by tipping the selected operation a second time or tipping upwards.

Both lids can be closed completely from any position (comfort closing).

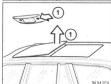
##### Note:

Clamping protection is active during comfort closing and is switched off 4 mm before reaching final position (neutral).

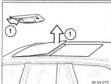


Front Lid in Fan Position (Final Lift Position):

- 1 Final lift position (can also be operated from the other side - see next picture)

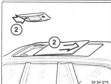


- 1 Final lift position

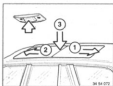


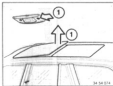
Open Front Lid (Final Position)

- 1 Final lift position



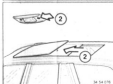
- 2 Open from lid (final position)



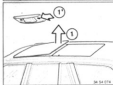


Open Rear Lid (Final Position, Produce Block):

1 Final lift position

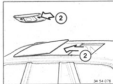


2 Open rear lid (final position)

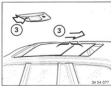


Comfort Venting (Both Lids Open):

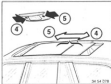
1 From lid to final lift position



2 Open rear lid (final position)



3 Open both lids to block (final position)



4 Move block towards rear (variable)

5 Move block towards front (variable)

## 54 5 . . . INSTRUCTIONS FOR REPAIRING CEMENTED SEALS ON SUN ROOF

## 1. Types of Damage

## 1.1 Partially Loosened Seals

- Up to 120 mm repaired by hand
- Up to 200 mm repaired with pressing-on tools on straight surfaces

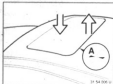
## 1.2 More Serious Damage (Mechanical Injuries, Largely Loosened Seals)

## 2. Possible Repairs

## 2.1 Partially loosened seals consisting of rubber/adhesive tape or adhesive tape/paint cemented joints can be recemented with cyanoacrylate cement (Loctite No. 380\*).

## Precautions:

- a) Clean damaged surfaces.
    - Remove grease and other residues from the cemented surface.
    - Use cotton or lintless paper towels (one-time use).
  - b) If solvents are used, air dry the repair surface at least 2 minutes.
  - c) Apply a very thin bead of cyanoacrylate cement on the adhesive tape using a fine nozzle.
    - Avoid contact on skin!
    - Do not smear cement on visible painted surfaces.
  - d) Press on rubber seal. Pressing-on time at least 30 seconds. Only contact pressure is necessary, which must be maintained for the 30 seconds. The cement can be subjected to loads only after 2 minutes. This waiting time is absolutely essential.
- 2.2 Complete replacement of the rubber seal is necessary in case of a largely loosened seal and/or damaged rubber profile - refer to 54 12 121 and 54 12 122.
- Procedures:
- a) Peeling off damaged rubber seal:
    - Pull off rubber seal slowly at an angle of 15 to 20°, ensuring that the mastic (bond between adhesive tape and seal) is maintained.
    - If the mastic itself has become loose, pull the adhesive tape off of the roof opening edges and/or lid carefully and slowly at an angle of 15 to 20°.
    - If necessary, peel off older seals with help of a hot air blower (don't damage the paint finish), whereby the rubber seal/adhesive tape bond should not be separated.
  - b) Pull liner (protective film on adhesive surface) off of rubber seal section by section. Take hold on tab!
  - c) Apply rubber seal on roof opening edge beginning at rear center. Use upper lip as application edge. Press on seal continuously by hand. Unwind and press seal in rails carefully without tension (critical area). If positioned incorrectly, the seal can still be pulled off, repositioned and pressed on again.
  - d) Mark the butt joint by pressing the loose end of the flock on the already cemented end (small particles of flock stick on the adhesive tape) and cut off seal straight and press on the loose end at the same height.
  - e) Press on seal using a roller. Pressing-on force: approx. 30 N.
  - f) Tear off the rear and side tearing-off lips in area of the narrow flange.
- Important!**  
Never touch the uncovered adhesive surface after pulling off the liner.
3. Checking Rubber Seal:
- Cemented seals must be checked for correct position and perfect adhesion. The adhesion can be checked by pushing back the sealing lip. The force required to peel off the seal immediately after cementing must be greater than 10 N/cm.
4. General Information on Rubber Seal Profiles:
- Seals, which are supplied with partially loosened liners, must not be installed.
  - Store seals at 15 to 20° C.
  - If the liner becomes looser during handling prior to cementing, the seal may still be installed.
  - Cement at ambient and object temperature of + 18° C. Temperatures between 40 and 60° C will increase the initial adhesion considerably.
  - Seals, which are subjected to temperatures above 80° C after cementing, will be very difficult to remove.



## 54 12 004 ADJUSTING SUN ROOF

## Ideal Adjustment:

## Height:

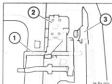
Front = 1 mm deeper than roof panel

Rear = 1 mm higher than roof panel

## Length:

Equal distance (A) between lid and roof at front and rear - check with a plastic page.

A = approx. 0,2 mm



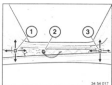
Arrest the sun roof in "0" position at left and right using a 4 mm hexagon key (1). Lid was removed in picture for better understanding.

Key (1) arrests the drive, cable (2) and gate (3).

If necessary, remove the motor/gear unit to be able to move the drive cables.



Open the sun roof about 10 cm.



Loosen screws (1 ... 3) at the left and right using Special Tool 00 2 130.

Adjust the lid.

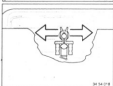
If applicable, install the motor/gear unit in "0" position - refer to 54 13 015.

Remove the hexagon key.

## Installation:

Install new screws.

Tightening torque = 3,5 Nm.



Spread left and right clamps apart and slide the roof liner frame back.  
Shut the sun roof.

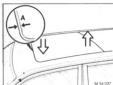


### 54 12 005 ADJUSTING FRONT SUN ROOF LID (Touring)

Remove front roof liner frame - refer to 54 12 132.

### 54 12 006 ADJUSTING REAR SUN ROOF LID (Touring)

Remove front and rear roof liner frames - refer to 54 12 132 and 54 12 133.



#### Ideal Adjustment:

Equal distance (A) of lid to roof at front and rear lid.

#### Height:

Front flush or up to 1.5 mm deeper  
Rear flush or up to 1.5 mm higher



#### Loosen screws.

Installation:  
Tightening torque\*



Unscrew all four nuts (2) and push the four adjusting wedges (1) in or out far enough until the ideal adjustment is reached.

Installation:  
Tightening torque\*

\* Refer to Specifications



#### Ideal Adjustment:

Equal distance (A) of lid to front lid and roof at rear.

#### Height:

Front flush or up to 1.5 mm deeper  
Rear flush or up to 1.5 mm higher



#### Loosen screws.

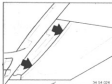
Installation:  
Tightening torque\*



Unscrew all four nuts (2) and push the four adjusting wedges (1) in or out far enough until the ideal adjustment is reached.

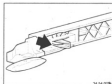
Installation:  
Tightening torque\*

\* Refer to Specifications

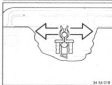


#### 54 12 100 REMOVING AND INSTALLING SUN ROOF LID

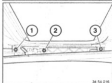
Open sun roof about 10 cm.



Spread left and right clamps apart and slide roof liner frame back.



Shut roof and loosen screws (1 and 3) using Special Tool 00 2 1-30. Unscrew screw (2). Remove lid.



Installation:  
Adjust lid - refer to 54 12 004.  
Replace screws.  
Tightening torque = 3.5 Nm.

Pull left and right retainers towards inside and remove lid upwards.

### 54 12 102 Removing and installing front sliding / tilting sunroof cover (touring)

Remove front headlining frame, refer to 54 12 132.

Switch off ignition.

Release screws.

**Installation note:**  
Refer to installation note in 54 12 103.  
Replace screws (micro-encapsulated).  
For tightening torque, refer to Technical Data 54 12 2AE.

Release nuts and remove sliding/tilting sunroof cover by pulling upward.

**Installation note:**  
Adjust front sliding/tilting sunroof cover, refer to 54 12 005.  
Replace nuts (micro-encapsulated).  
For tightening torque, refer to Technical Data 54 12 2AE.



50 11 000 1

### 54 12 103 Replacing front sliding/tilting sunroof cover (touring)

**Caution!**  
Note serial number (status), refer to BMW Service Information 54 00 90 (314).

Note repair instructions for bonded seals on sliding/tilting sunroof, refer to 54 9 ...  
Remove front sunroof cover, refer to 54 12 102.

Remove front rain channel.

**Note:**  
The front sunroof cover features a (V) stamped on the front side and has a weatherstrip (1) at the rear.

**Clean bonding surface.**  
(A) Adhere weatherstrip (1) flush with respect to upper edge of sunroof cover (2).  
(B) Weatherstrip (1) must protrude slightly at outside left and right sunroof cover (2).



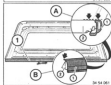
54 12 043



54 12 041



54 12 005



54 12 001



54-12 104

**Installation note:**

- 1.a) Tilt slide sunroof cassette without embossing (1 ... 4) on cross member and weld nuts (5) and (6) on both sunroof covers:
- Install 4 formed washers (7) on cross members.
- 1.b) Tilt slide sunroof cassette without embossing (1 ... 4) on cross member and weld stud (5) and (6) on both sunroof covers:
- cannot be installed
  - replace cassette

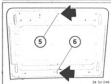


54-12 104 G

**54-12 104 Replacing rear sliding/tilting sunroof cover (touring)****Caution!**

Note serial number (status), refer to BMW Service Information 54-03 02 (314).

Remove rear sliding/tilting sunroof cover, refer to 54-12 106.



54-12 106



54-12 104

- 2.a) Tilt slide sunroof cassette with embossing (1 ... 4) on cross members and one weld stud on rear touring cover (6) through cross member (4):
- 3 bonded washers (1 ... 3), adhere 1 formed washer (7) on cross member (4).
- Fit MS nut for weld stud (5) with Lactite 210\*

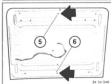
- 2.b) Tilt slide sunroof cassette with embossing (1 ... 4) on cross members and weld nuts (5) and (6) on both sunroof covers:
- remove old washers (bonded) and fit 4 formed washers (7) on cross members.



54-12 104

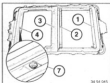
**Note:**

Rear sunroof cover features a (H) stamped on the front side and has no weatherstrip.



54-12 106

\* Source of supply: BMW Parts Service



54 12 005

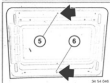
**Installation note:**

1.a) Tilt side sunroof cassette without embossing (1 ... 4) on cross member and weld nuts (5) and (6) on both sunroof covers:

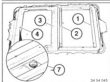
- install 4 formed washers (7) on cross members.

1.b) Tilt side sunroof cassette without embossing (1 ... 4) on cross member and weld stud (5) and (6) on both sunroof covers:

- cannot be installed
- replace cassette



54 12 006

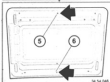


54 12 007

2.a) Tilt side sunroof cassette with embossing (1 ... 4) on cross members and one weld stud on rear sunroof cover (5) through cross member (4).  
3 bonded washers (6 ... 8), adhere 1 formed washer (7) on cross member (4).

Fit M6 nut for weld stud (5) with Loctite 299\*.

2.b) Tilt side sunroof cassette with embossing (1 ... 4) on cross members and weld nuts (5) and (6) on both sunroof covers: remove old washers (bonded) and fit 4 formed washers (7) on cross members.



54 12 008



54 12 009

Release screws.

**Installation note:**

Replace screws (micro-encapsulated).  
For tightening torque, refer to Technical Data 54 12 0A2.



54 12 010

Release nuts and remove sliding/tilting sunroof cover by lifting upward.

**Installation note:**

Observe installation note in 54 12 104. Adjust rear sliding/tilting sunroof cover, refer to 54 12 006.

Replace nuts (micro-encapsulated).  
For tightening torque, refer to Technical Data 54 12 0A2.

\* Source of supply: BMW Parts Service

## 54 12 106 Removing and installing rear sliding/tilting sunroof cover (touring)

Remove front and rear headlining frame, refer to 54 12 132 and 54 12 133.

Switch off ignition.

**Installation note:**

Grease slide rails of cross members, (Planis GL1, Fuchs).



54 12 120 U

#### 54 12 120 Replacing weatherstrip for sliding / tilting sunroof cover

**Note:**  
If weatherstrip is peeling off, it can be repaired with cyan acrylic adhesive (Loctite 380)\*, refer to 54 0 ... Repairing bonded weatherstrips on sliding/tilting sunroof.

Remove and install sliding/tilting sunroof cover, refer to 54 12 100.



54 12 121 U

#### 54 12 121 Replacing front weatherstrip for sliding / tilting sunroof cover (touring)

**Note:**  
If weatherstrip is peeling off, it can be repaired with cyan acrylic adhesive (Loctite 380)\*, refer to 54 0 ... Repairing bonded weatherstrips on sliding/tilting sunroof.

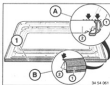
Remove front sliding/tilting sunroof cover, refer to 54 12 100.



54 12 120

Remove weatherstrip from sunroof cover. Remove remnants of adhesive.

**Installation note:**  
Install weatherstrip with adhesive\*. Sealing lip facing forward.



54 12 121

Remove weatherstrip (1).  
Clean bonding surface.  
(A) Bond weatherstrip (1) flush with upper edge of sunroof cover (2).  
(B) Weatherstrip (1) must project a little at outer left and right sunroof cover (2).



54 12 100 0

### 54 12 122 Replacing weatherstrip at sliding / tilting sunroof aperture (touring)

#### Note:

If weatherstrip is peeling off, it can be repaired with cyan acrylic adhesive (Loctite 880)\*, refer to 54 0 ... Repairing bonded weatherstrips on sliding/tilting sunroof.

Remove front and rear sliding/tilting sunroof cover, refer to 54 12 102 and 54 12 106.

Remove weatherstrip.

Start disassembly and assembly at rear center.

\* Source of supply: BMW Parts Service

### 54 12 132 Removing and installing or replacing front headlining frame for sliding / tilting sunroof cover (touring)

Open front sliding/tilting sunroof.

#### Note:

The front finisher need only be removed for adjustment work, removal or replacement of the front sunroof cover.

As of production date mid-March '92, the finishers are only clipped on (similar to A-pillar trim panel). These finishers cannot be mounted on "old" sunroof covers.

Date of production before mid-March '92:

If necessary, release front screws. Press back finisher (1) and unclip at bottom.

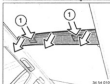
Installation note:  
Fit finisher at front, push forward (1) and clip in at rear.

If clips on finisher defective and no suitable finisher is available: Drill 2 holes through rear finisher and through headlining panel.

Protect headlining panel from corrosion. Secure finisher with 3 self-tapping screws (on front).



54 12 100 0



54 12 100 0



54 12 100 0



54 12 100 0

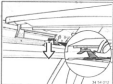


54 12 100 0



Production date after mid-March '93:

Unclip finisher at bottom.



Press down spring on left and right and slide headliner frame forward.

Installation note:

Engage left and right spring correctly.



Pull forward headliner frame.

Press out front sliding blocks over recess and upward, slide headliner frame back a little until it can be lifted over the wind deflector.

Pull headliner frame forward again and also press out center sliding blocks.



Turn headliner frame and pull upward.

Installation note:

Check function.

### 54 12 133 Replacing and installing or replacing headliner frame for sliding / tilting sunroof cover (touring)

Remove front headliner frame, refer to 54 12 132.



Close sliding/tilting sunroof.

Press down spring on left and right and pull headliner frame forward a little.



Press up headliner frame on right and remove by pulling down to left.

Installation note:

Engage spring on left and right correctly. Check function.



### 54 12 210 REMOVING AND INSTALLING COMPLETE SUN ROOF FRAME (Touring)

#### Important!

Check manufacturing number (version status) - refer to Service Information of Group 54.

Switch off ignition.

Remove roof liner tensioners - refer to Group 51.

Loosen hose clamps at front and rear, left and right.

#### Note:

Secure clamps to prevent them from falling into the A-pillars.

Pull off water drain hoses.

#### Installation:

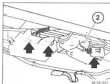
Check function and for leaks.

Pull complete wire harness off of sun roof cassette.

Disconnect rear plug and unscrew screw (3).

Installation:  
Tightening torque\*.

\* Refer to Specifications



Disconnect plugs (also refer to "Replacing Module" in 54 13 010).  
Unscrew screw (2).

#### Installation:

Tightening torque\*.  
After disconnecting plug on module the sun roof must be initialized - refer to 54 00 - - -



Unscrew screws.

#### Installation:

Tightening torque\*.



Unscrew left and right screws.

#### Installation:

Tightening torque\*.



Unscrew rear screws.

#### Installation:

Tightening torque\*.

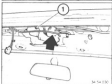
\* Refer to Specifications



54 14 010



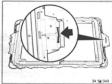
54 14 010



54 14 010



Unclip retainers at left and right sides and lift out sun roof cassette towards rear through the tailgate opening with help from a second person.



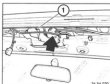
**Installation:**  
Paste approx. 10 cm long strip of Merton tape\* at front.



**Installation:**  
Insert front end of sun roof cassette (1) into sheet metal slot (2).



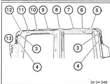
**Installation:**  
Clip rear end in retainers on left and right sides.



**Installation:**  
Tighten front screw (1).  
Tightening torque\*.



**Installation:**  
Tighten rear screw (2).  
Tightening torque\*.



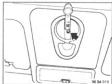
**Installation:**  
Keep to following screw tightening sequence:

- |            |                      |
|------------|----------------------|
| (1)        | front left and right |
| (4)        | front left and right |
| (5 ... 12) | each left and right  |
| (3)        | rear left and right  |
| (4)        | rear left and right  |
| (13)       | last one             |

Tightening torque\*.

\* Source of Supply: BMW Parts

\* Refer to Specifications



**54 12 230 REMOVING AND INSTALLING / REPLACING GEAR UNIT FOR MANUAL SUN ROOF**

Shut the roof.  
Unscrew screw.



Unscrew screw and remove gear unit.

**Installation:**  
Install winder and turn the gear unit to "0" position (pressure point).  
Lubricate pinion lightly with grease\*.



Unscrew screws and remove winder recess plate.



Lift and remove trim panel.



Unscrew winder.

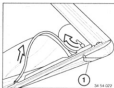
**54 12 261 REPLACING BOTH SUN ROOF DRIVE CABLES**

Remove sun roof lid - refer to 54 12 106.  
 Remove motor/gear unit - refer to 54 12 010, or remove gear unit - refer to 54 12 230.

Push drive cables back uniformly on both sides.  
 Remove cover.

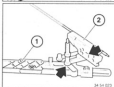
*Installation:*  
 Replace screws.  
 Tightening torque = 1.8 Nm;  
 for both rear screws = 2.0 Nm.

*Installation:*  
 Pull drive cables forward on both sides.  
 Arrest drive cable (2) and gate (3) in "0" position using key (1).  
 Install motor/gear unit.



Pull drive cables out of guide pipes.  
 Press off linkage (1).

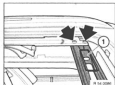
*Installation:*  
 Braided drive cables may not be lubricated.



Press drive cable (2) off of gate (1) in center position.  
 Drive cable (2) is marked:  
 L = left  
 R = right

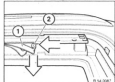
#### 54 12 245 Removing and installing or replacing both front drive cables for activation of sliding/tilting sunroof

Remove front sliding/tilting sunroof, refer to 54 12 102.  
Remove front motor, refer to 54 12 011.

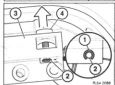


Unfasten screws on left/right and remove transverse traverse (1).

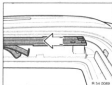
Note:  
If necessary, stick down washer.



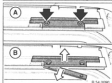
Press down spring (1) on left/right and slide sliding member backwards (2).



Remove retaining ring (1) on retaining pin (2) on left/right sides.  
Drive out retaining pin (2) with punch.  
Remove guide rail (3) from guide carriage (4) by lifting upwards.



With guide carriage at front, slide guide rail backwards until the assembly cover is exposed.



(A) Unfasten screws.  
(B) Remove assembly cover and threaded plate on left/right sides.

Installation:  
Replace screws (micro-encapsulated).

With guide carriage at front, pull guide rail forwards (neutral position).



Pull drive cables backwards: these are marked for left and right sides.



Installation:  
After fitting the assembly covers, slide left/right drive cables forwards to default position (basic settings).  
Apply a drop of oil to the drive cables.  
Fit motor and retaining pin.  
Initialization: refer to 54 0 ...  
Check function.

54 12 248 Removing and installing or replacing both rear drive cables for actuation of sliding/tilting sunroof

54 12 255 Replace both actuating units/folding units

Remove wind deflector, refer to 54 12 496.  
Remove front drive cable, refer to 54 12 285.  
Remove rear sliding/tilting sunroof cover, refer to 54 12 136.



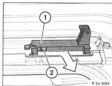
Remove front cover frame from actuating unit/folding unit on left/right sides.

Remove rear motor, refer to 54 13 012.



Unscrew screws and remove holding-down device on left/right sides.

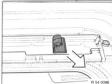
**Installation:**  
Coat underside of holding-down device with grease.



Remove sliding carriage (1) on left/right sides of front cover from sliding rails.

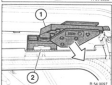
**Caution!**  
Do not lose aluminum pads (2) (bevel faces towards rear).

**Installation:**  
Apply grease to underside of sliding carriage.



Extend spring bracket on left/right sides and remove from sliding rails.

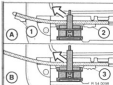
**Installation:**  
Apply grease to underside of spring bracket.



Extend actuating unit/folding unit (1) on left/right sides as far as assembly aperture. Slightly raise rear drive cable (2) and remove actuating unit / folding unit (1) on left/right sides from sliding rails.

**Installation:**  
Apply grease to underside of folding unit.

**Note:**  
This job 54 12 255 (replacing both actuating units / folding units) ends here.  
Observe the following installation instructions:



Shift rear cover frame such that sliding blocks fall out of bracket.

Pull forward rear operating cable on left/right. Remove front (A) and rear (B) slides from sliding rails.

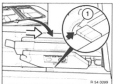
Disconnect both operating cables.

**Installation note:**

The rear slide (B) is longer.  
All slides and operating cable holders are coded.

- 1 Coding for tilt control
- 2 Coding for front slide
- 3 Coding for rear slide

Lubricate operating cable with one drop of oil. Grease bottom of slides.



**Installation note:**

Push back operating cable with slides and tilt control until guide pin (1) engages in bracket of tilt control (basic setting).

**Remove rear motor.**

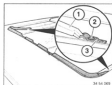
Operating cables can now no longer be adjusted.

Initialize, refer to 54 0 ...

Check function.

### 54 12 496 Removing and installing or replacing wind deflector (fouring)

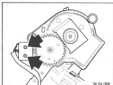
Open front sliding/tilting sunroof cover.



Release left/right screw (2).

Remove left/right mount (3) and detach wind deflector (1).

For tightening torque, refer to Technical Data 54 12 TA2



**54 12 512 Replacing microswitch for sliding/tilting sunroof motor**

Removing and installing motor/gearbox unit, refer to 54 13 010.

Drill out hollow rivets and rivet new microswitch into place.





34 34 005

#### 54 13 005 Removing and installing or replacing coupling on front gearbox (touring)

Ignition off.  
Lift out cover with folding leg.  
Unclip hand crank from the cover.  
Completely close sunroof (neutral position).  
If necessary, close sunroof with help of emergency operator, refer to 54 0 ...



34 34 006

If necessary, unfasten screw (1) (old construction status).  
Lift coupling (2) out with hand crank pointing downwards.



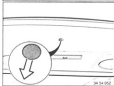
34 34 006

#### 54 13 006 Removing and installing or replacing rear coupling on gearbox unit (touring)

Ignition off.  
Lift out cover with folding leg.  
Unclip hand crank from cover.  
Sliding/rising sunroof must be in neutral position, if necessary close using emergency operating mode: refer to 54 0 ...

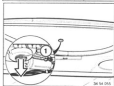
Lift out plug by pulling downwards.

Note:  
If the plug diameter is < 20 mm, partially remove edge trim.



34 34 007

If necessary, unfasten screw on the coupling (old construction status).  
Lift coupling (1) out with hand crank pointing downwards.

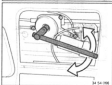


34 34 008

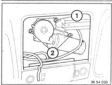


**54 13 010 REMOVING AND INSTALLING SUN ROOF MOTOR AND GEARBOX**

Switch off ignition.  
Lift out cover using a creaser.



Shut roof.  
If necessary, shut roof manually using the hexagon socket key.



Unscrew screws (1 and 2).  
Disconnect plug and remove motor/gearbox unit.

Installation:  
Screw (1) is longer.  
Tightening torque = 2.8 Nm.



Installation:  
Install motor/gearbox unit only with closed roof and motor in zero position = bore (1) on one line with shafts (2).  
If necessary, turn with help of hexagon socket key.



**54 13 011 REMOVING AND INSTALLING / REPLACING FRONT SUN ROOF LID MOTOR (Tearing)**

Switch off ignition.  
Lift out cover using a creaser.



Shut roof completely (zero position).  
If necessary, emergency (manual) closing - refer to 54 00 - ....



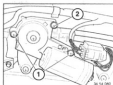
Unscrew screws.  
Disconnect plug and remove motor/gearbox unit.

Installation:  
Tightening torque\*  
Install sun roof - refer to 54 00 - ....

**54 13 012 REMOVING AND INSTALLING /  
REPLACING REAR SUN ROOF  
LID MOTOR (Touring)**

Switch off ignition.  
Remove rear roof liner section - refer to  
Group 51.

Shut roof completely (zero position).  
If necessary, emergency (manual) closing -  
refer to 54 00 . . .

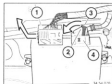


Unscrew screws (1 and 2).  
Disconnect plug and remove motor/gear-  
box unit.

Installation:  
Screw (1) is longer.  
Tightening torque = 2.8 Nm.

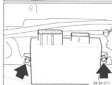
**54 13 015 REMOVING AND INSTALLING /  
REPLACING SUN ROOF  
MODULE (Touring - Rear)**

Switch off ignition.  
Remove rear roof liner section - refer  
Group 51.



Disconnect plug (1).  
Press down retainer (2) and lift out plug (4)  
together with arrow (3) to the left.

Installation:  
Carry out installation.



Unscrew screws and remove module.

## TROUBLESHOOTING SUN ROOF

Condition	Cause	Correction
Rattling noise	a) Front sliding shoes loose / defective b) Sun roof misadjusted c) Rubber stop missing	a) Tighten / replace front sliding shoes b) Adjust sun roof c) Install rubber stop (cover rails, gate, drive cables)
Whistling noise	a) Excessive gap between roof and lid (front/rear)	a) Adjust lid, replace seal if necessary
Water entering car through roof liner	a) Sun roof misadjusted in 0 position b) Seals loose / damaged c) Wrong seal installed. Different seal profiles front/rear d) Drain hoses plugged	a) Adjust in 0 position b) Tighten / replace seals c) Install original parts d) Clean drain hoses
Roof lid lifts unsteadily	a) Drive cables misadjusted	a) Adjust drive cables in 0 position
Sun roof lid moves too slow (motor runs slowly)	a) Misadjustment b) Transmission defective	a) Adjust sun roof in 0 position b) Replace motor/gearbox unit

# 61 Electrical system

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## GENERAL INFORMATION

## Important When Disconnecting Battery:

Disconnecting the battery will erase fault memories of control units, so that fault memories should first be interrogated and any possible faults printed.

The radio can only be operated after disconnection of the battery by entering the radio code again, so that the customer should first be asked for his radio code card.

Note stored stations so that they can be stored again after connection of the battery.

The stored date of the on-board computer and clock will also be lost.

If car is fitted with an intruded locking system, all keys must be re-coded - refer to Car Electric/Electronic Test Plan for additional information.

To disconnect the battery (located underneath rear seat), remove cover on rear seat base at right bottom and unacrew ground cable at ground connection point.

Disconnect battery ground lead if battery is located in engine compartment.

## Important With Connected Battery:

Working on components, wire connections and so on could cause faults to be stored in fault memories of concerned control units.

If instructions in this Repair Manual specify disconnection of the battery, this must always be performed with in the interest of safety.

## Outside Starting Aid

Do not start the engine with help of starting sprays.

## Preparations:

Conform with the following when starting engine with starting cable.

Ensure that starting cable wires are of appropriate cross section size.

Only use fuse-protected starting cables.

Check whether the current supplying battery has 12 V voltage.

If engine is started from battery of another car, ensure that there is no contact between the bodies of both cars.

## Caution!

Never touch ignition system components under current - dangerous high tension!

## Procedures:

Always conform with the procedures to avoid injury to persons or damage to parts.

Select range P in cars with an automatic transmission and apply the parking brake. Move the shift lever of cars with manual transmission into neutral and apply the parking brake.

Ensure that the starting cables cannot get caught in rotating parts, e.g. fan.

First connect both positive poles of the batteries with one starting cable (red).

Use the positive connection point in the engine compartment for cars with the battery in the trunk.

Then connect the second starting cable (black) between the negative pole of the current supplying battery and engine or body ground of the car to be started.

## Caution!

Never connect the second starting cable (black) on the negative pole of the battery in the car to be started. Produced gas could be ignited by sparks - danger of explosion!

If the battery in the car supplying power is weak, start the engine of this car and let it run at idling speed.

After the engine of the car to be started has started up, first disconnect the starting cable on the negative pole - ground-connection. Then remove the starting cable from the positive poles.

## Outside Starting Aid and Car Telephone

## Siemens C 1:

When starting the car's engine with outside help from another car, remember that over-voltage could damage the Siemens C 2 telephone. Consequently always disconnect the sender and receiver from the electric system before using outside starting aids.

## Siemens C 3 and Motorola C 401:

Senders and receivers of Siemens C 3 and Motorola C 401 telephones are protected against overvoltage, but calls may not be made or received during outside starting.

Always pay attention to the operating instructions of different type and different make telephones. In case of doubt disconnect the sender and receiver from the car's electric system.

## Windshield Wipers (Wiping Motor)

In case of disturbance intermittent wiper and wiper speed step 1 are switched off by a protector.

This protection remains effective even after eliminating the fault and can be cancelled by switching off the ignition (terminals I5 and R) for 3 minutes.

## Windshield Wipers (Wiper Contact Force Motor)

In case of disturbance the wiper contact force regulating motor is switched off by a protector.

This protection remains effective even after eliminating the fault and can be cancelled by

- disconnecting the battery for 30 seconds (important: all fault memories will be erased)
- operating car (automatic cancellation).

## Instructions for Removing and Installing Electronic Control Units

**Important!**

Disconnecting the car's battery will cancel fault memories of control units, so that it is absolutely essential to interrogate fault memories prior to disconnection of the car's battery and to have the faults printed with the BMW Service Tester's printer. Stored faults must then be investigated.

Disconnection and connection of control unit plugs always requires that the ignition be switched off.

Removal and installation of components, relays, fuses, etc. could cause the storage of faults in fault memories of control units capable of self-diagnosis. Consequently after finishing work on the electrical system it is always necessary to interrogate fault memories, investigate stored faults and cancel the fault memories.

## Battery Care and Maintenance

The electrolyte level of present low-maintenance batteries should be checked at least annually or at intervals of 25,000 km and corrected to the max. mark specified by the battery supplier with distilled water when necessary. Discharging by the power consumption of control units even in standby mode is added to the natural self-discharging of a battery due to the increasing number of control units used in cars today. The batteries of cars in storage should be recharged at the latest every six weeks to maintain the service life and avoid excessive discharging (refer to battery recharging calendar). The time for self-discharging depends on the car model and equipment.

## Charging Battery:

If a standard or fast charger (e.g. Bosch SL 24 90\*) is used to charge a battery, the battery must be disconnected from the car's electrical system and removed in order to avoid damage to paint finishes and upholstery by the escaping gas. Excessively discharged batteries could be damaged or destroyed by the very high initial current (high temperature). The battery can remain connected when using an electronic charger (e.g. Siemens V8 80).

The electronics does not permit critical peak voltage. An electronic charger also charges an excessively discharged battery with reduced current until a certain basic voltage is reached. Refer to Service Information 51 58 58 if there is doubt as to whether or not the battery charger in the workshop is suitable.

**Important!**

Always first measure the open circuit voltage before charging a battery installed in the car. If this voltage is 10 V or less, it cannot be excluded that one or more cells are faulty or that the battery as a whole is already pre-damaged.

In this case it is always necessary to remove the battery as escaping gas while charging could damage interior equipment.

Attempt to regenerate the faulty cells with low charging current.

Remove plugs from the separate cells in the interest of safety.

Also refer to 51-211).

## Testing Battery:

An objective statement on the charged condition of a battery is only possible by way of a load test with cold testing current.

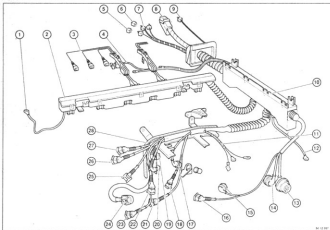
This test can be carried out with a battery tester, for example

Bosch T 12 220\* or preferably with  
Bosch T 12 200\*.

Additional information on load tests is contained in the pertinent operating instructions (refer to 51-201).

The acid density of a battery can also be used to determine the charged condition. This test, however, is not as positive due to the design-orientated dispersion range of acid density (e.g. charged standard battery version = acid density 1.28 kg/ltr. — tropic version = acid density 1.33 kg/ltr.).

Another interfering factor is the acid layer immediately after filling with distilled water. Battery wear with partially sulphated and/or strongly contaminated plates will also lead to incorrect acid density test results.



#### 61 11 051 REPLACING WIRE HARNESS SECTION FOR ENGINE (550)

- 1 Ground lead (a of ignition coils (primary end))
- 2 Injection pump wiring channel
- 3 Wires to ignition coils
- 4 Battery positive wires
- 5 Relay for DME, control unit
- 6 Relay for electric fuel pump
- 7 Relay for oxygen sensor heater
- 8 82-pin plug for DME, control unit
- 9 Plug for air conditioner
- 10 Firewall wiring channel
- 11 Connections for starter
- 12 Battery positive wire for starter
- 13 Connection for diagnostic plug
- 14 Connection for engine plug
- 15 Connection for air mass sensor
- 16 Connection for intake air temp. sensor
- 17 Connection for catalytic converter
- 18 Connection for cylinder idling sensor
- 19 Connection for TDC sensor (or DME)
- 20 Connection for throttle valve potentiometer
- 21 Connection for oil pressure switch
- 22 Connection for oil level switch
- 23 Connections for alternator
- 24 Connection for coolant temp. sensor (or DME)
- 25 Connection for temp. gauge sender
- 26 Connection of idling control
- 27 Wire harness carrier on engine block

The following plug connections could be installed:

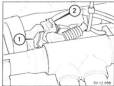
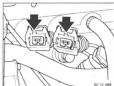
VAROS control unit (fied back in vicinity of the oil filter).  
Refer to 11 36 010.

Knock sensors 1 and 2

**Caution!**  
Mixing up both of these plugs will lead to engine damage!  
Refer to 12 14 500.



- Disconnect battery ground lead.
- Remove intake manifold.
- Remove cover from right fuse/relay plate.
- Remove cover from air conditioner pipes.
- Remove holder for wire harness from right wheel house.
- Remove cover for wire harness from firewall.
- Disconnect wire harness from right wheel house.
- Disconnect ground wire from body at right side.
- Disconnect battery positive lead.
- Remove holder for wire harness in right fuse/relay plate.
- Unscrew electric wire duct from firewall.
- Mark relays and plugs in fuse/relay plate.
- Remove complete wire harness from fuse/relay plate.
- Remove cover from valve cover.
- Pull all plugs off of ignition coils.
- Untidy wires in cover.
- Mark plugs and disconnect plugs from engine.
- Disconnect engine plug and diagnostic plug.
- Cut off wire straps from carrier on the engine block at the right and remove wire harness.



**Important!**  
The engine wire harness for Bosch DME and Siemens MS 40 are different.

New part numbers.

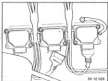
Changed coding of plugs for sensors (e.g. temperature sensor, idling speed control, engine control unit).

Additional connections for knock sensors (1 and 2) below the idling speed control (Siemens MS 40).

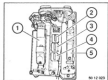


### ENGINE WIRE HARNESS PLUG CONNECTIONS

Mutual ground lead of ignition coils  
(primary circuit)

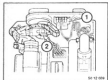


Plugs of ignition coils

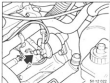


Electronic box plug connections

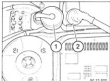
- 1 Motronic control unit plug (DME)
- 2 DME master relay
- 3 Fuel pump relay
- 4 Oxygen sensor heating relay
- 5 ABS control unit plug



- 1 Air conditioner additional wire harness plug
- 2 Cruise control additional wire harness plug



Connections of starter motor



1 Diagnosis plug



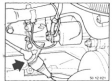
3 Engine plug



1 Air mass sensor



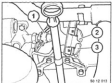
2 Tank vent valve



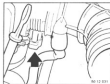
Plug of catalytic converter



Plug of intake air temperature sensor



- 1 Oil pressure sender
- 2 Cylinder identifying sender for DME
- 3 TDC sender for DME



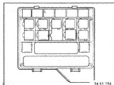
Plug for throttle valve potentiometer



Connections of alternator

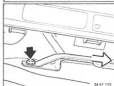


- 1 Coolant temperature sensor for DME
- 2 Temperature sender for temperature gage
- 3 Cylinder identification for DME
- 4 TDC sender for DME
- 5 Idle speed control

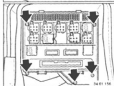


### 61 13 021 REMOVING AND INSTALLING FUSE/RELAY BOX

Disconnect battery ground lead.  
Mark and lift out all relays.  
See Test Plan for relay connection plan.



Mark installed position of cover holder.  
Unscrew screws and lift out cover holder.



Unscrew screws (with Torx socket) and lift upper box sections.



Push back clips on left and right sides of fuse plate and lift out plate downwards.



Lift lockpin out of holder.



Push back tab of pertinent plug with Special Tool 61 1 141 and pull out plug downwards.

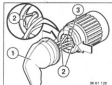


### 61-13 ... REMOVING AND INSTALLING WIRE CONNECTORS IN PLUG RECEPTACLES

Use set of Special Tools 61-1130 for this purpose.

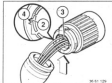
#### Application Information:

Only plugs with additional receptacle lock are described in these instructions. The pins of plugs not described in this section can be pressed out with a suitable pressing out tool. After repairing plugs it is always very important to make sure that the locks of plugs have engaged.

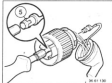


#### 7 and 8 Pin Round Male Plugs

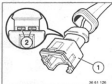
Pull rubber grommet (1) off carefully. Push back retainers (2) of interior plug (3) carefully.



Slide interior plug (3) in direction of arrow until retainers (2) lock in locking grooves (4).

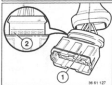


Push back steel spring locks (2) of permanent pin using Special Tool 61-1132 and pull out wire.



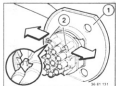
#### Ultrasonic Bonded Plugs

Pins of plug (1) are bonded ultrasonically and cannot be replaced. They can be recognized by the bonds (2) on the long side of the plug.



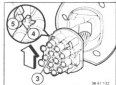
Pins of plug (1) are bonded ultrasonically and cannot be replaced. They can be recognized by the bonds (2) on the long side of the plug.

## 61-13/3



### 13 Pin Round Male Plug

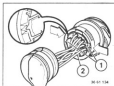
Pull rubber sleeve (1) off.  
Pull lock (2) out carefully in direction of arrow.



Move plug lower section (3) in direction of arrow far enough that retainers (4) lock in locking groove (5).

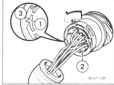


Push back steel spring locks (6) of permit pin using Special Tool 61-1-132 and pull out wire.



### 20 Pin Round Male Plug

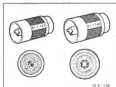
Push back retainers (1) of interior plug (2) carefully.



Turn interior plug (2) far enough that retainers (1) lock in locking groove (3).



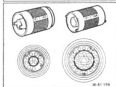
Push back steel spring locks (4) of permit pin using Special Tool 61-1-132 and pull out wire.



**Round Male Plugs with Single Core Seal**

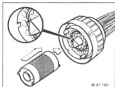
Special Tool 61 1 141 = unlocking tool for 4-pin plug.

Special Tool 61 1 142 = unlocking tool for 7-pin plug.

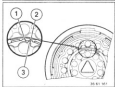


Special Tool 61 1 143 = unlocking tool for 12-pin plug.

Special Tool 61 1 144 = unlocking tool for 20-pin plug.



**Unlock plug.**  
Insert suitable connection end of special tool into plug and turn counterclockwise approx. 3 degrees.



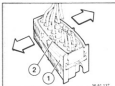
**Plug locked:**  
Position of retainer (2) in locking groove (1).

**Plug unlocked:**  
Retainer (2) in groove (1).



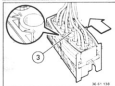
**Push back steel spring locks (4) of particular pin using Special Tool 61 1 132 and pull out wire.**

## 61-13/5

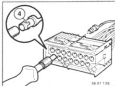


### 12 Pin Plug

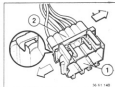
Pull exterior plug (1) out slightly in area of retainers (2) carefully.



Pull interior plug (3) in direction of arrow as far as stop.

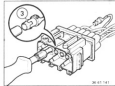


Push back steel spring locks (4) of pertinent pin using Special Tool 61-1132 and pull out wire.



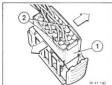
### 8 and 12 Pin Plugs

Move plug upper section (1) and plug lower section (2) against each other in direction of arrow.

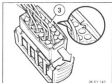


Push back steel spring locks (3) of pertinent pin using Special Tool 61-1132 and pull out wire.



**30 Pin Plug**

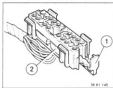
Pull exterior plug (1) out slightly in area of retainers (2) carefully.



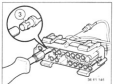
Pull interior plug (3) in direction of arrow as far as stop.



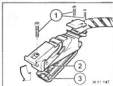
Push back steel spring locks (4) of interior pin using Special Tool 61 1 132 and pull out wire.

**25 Pin Relay Module Plug**

Pull locking slide (1) out of plug (2).



Push back steel spring locks (3) of interior pin using Special Tool 61 1 132 and pull out wire.

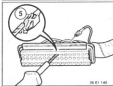


### 25, 35 and 55 Pin Control Unit Plugs

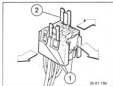
Unscrew Philips screws (1).  
Pull out pin socket (2) with seal (3) in direction of arrow.



Pull off seal (3).  
Pull out receptacle lock (4) in direction of arrow and unlock.

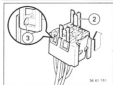


Push back steel spring lock (5) of pertinent pin using Special Tool 61 1 134 and pull out wire.



### Relay Carrier

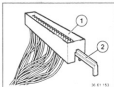
Carefully pull retainer (1) of relay holder (2) in direction of arrow.



Pull relay holder (2) in direction of arrow into first catch (3).



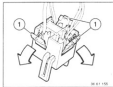
Push back steel spring lock (4) of pertinent pin and pull out wire.  
Press out size 6.8 double flat spring pins with Special Tool 61 1 135.  
Press out size 2.8 double flat spring pins with Special Tool 61 1 137.



30 61 133

**Fuse Plate**

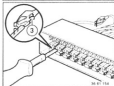
Pull concerned fuse out of fuse plate (1).  
(Mark positions when removing all fuses.)  
Pull locking slide (2) out of fuse plate (1)  
as far as stop.



30 61 135

**Main Relay Plug of DME**

Unlock locking flap (1) of concerned wire.



30 61 136

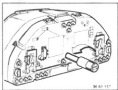
Push back steel spring locks (3) of pertinent pin using Special Tool 61 1 136 and pull out wire.



30 61 136

Push back steel spring locks (3) of pertinent pin using Special Tool 61 1 137 and pull out wire.

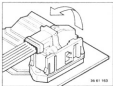
61-13/9



#### Display Lamp

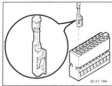
Apply Special Tool 61 1 138 on concerned display lamp, turn counterclockwise (in direction of arrow) 90° and take out display lamp.

# 61-13/10

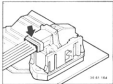


20 Pin Elo Plug (Electronic Plug since 9/91)

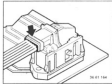
Unlock lock.



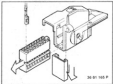
Unlock pin.



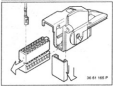
Loosen wire strap.



*Important!*  
Don't forget to install the wire strap.



Pull off cover.



Pull out pin carrier.



### 61 13 ... REPAIRING WIRE HARNESS WITH HELP OF ELECTRIC SYSTEM REPAIR ASSORTMENT IV (Special Tool 61 9 020)

#### Safety information:

Always find the cause of damage (e.g. sharp edge body parts, faulty equipment, seized mechanisms, corrosion from penetrated water, etc.) before repairing a wire harness.

Interrogate fault memories.  
Eliminate cause of damage.  
Disconnect battery ground cable.

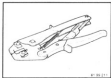
#### Important!

Only repair a wire harness if according to the wiring diagram no safety-relevant systems (e.g. ABS, active rear axle kinematics, airbag, etc.) are influenced. Otherwise replace the faulty wire harness or use repair wires (refer to Service Information of G1 34 and Parts).

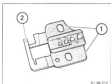
Check function and interrogate fault memories again after repairing a wire harness. Eliminate new faults if applicable and erase the fault memories.

Instructions are supplied with Special Tool 61 9 020.

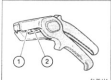
Information for ordering parts and a list of parts are also part of these instructions.



61 90 111



61 90 112



61 90 113



61 90 141

### SPECIAL TOOLS FOR WIRE HARNESS REPAIRS

Hand pliers without matrix 61 9 041 (part of Special Tool 61 9 020).

Matrix 61 9 042 for hand pliers 61 9 041 (part of Special Tool 61 9 020).

Applications:

- 1 Crimping stops on electric wires in cross section size from 0.5 to 2.5 mm<sup>2</sup>.
- 2 Pushing contact sleeves onto comb-type connectors.

Stripping pliers with wire cutter 61 9 043 (part of Special Tool 61 9 020).

Applications:

- 1 Stripping PVC insulation from wires in cross section size from 0.5 to 4.0 mm<sup>2</sup>.
- 2 Cutting copper and aluminum wires in cross section size up to 3 mm<sup>2</sup>.

Special Tool 61 1 156.

Set of unseizing tools for 2.5 mm plug system: pressing-out tools for pins.



61 90 107

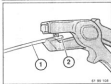
**STRIPPING WIRES**

Use Special Tool 61 9 043.

Guide in wire (1) until behind the knife.  
Length of wire behind the knife is equal to  
the stripped length.

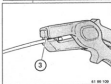
Stripped Length:

Wire Size in mm	Stripped Length in mm
0.35 to 0.50	4.0
0.75 to 1.00	4.5
1.00 to 2.50	5.0



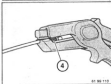
61 90 108

Squeeze pliers until the wire is held tight  
by jaws (3).

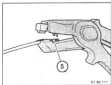


61 90 109

Squeeze pliers further as far as stop.  
This strips wire (4).



61 90 110



61 90 111

**CUTTING WIRES**

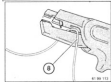
Use Special Tool 61 9 043.

Push upper grip of stripping pliers (6) in  
direction of arrow until the cutters are  
visible.  
Open pliers in final position and hold in  
this position.



61 90 112

Hold wire (8) between the cutters and  
squeeze pliers as far as stop.

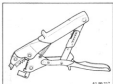


61 90 113

Refer to the instructions supplied with Special  
Tool 61 9 020 for further information.



34 67 101



61 99 217

### CRIMPING ON STOPS

Use Special Tools 61 9 041 and 61 9 042.

Strip wire.

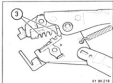


61 99 218

Unlock special tool:

Squeeze grips (1) tightly and push unlocking lever (2) in direction of arrow.

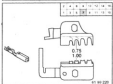
Or:  
Squeeze pliers as far as stop which unlocks the pliers automatically.



61 99 219

Designations on nests (3) of Special Tool 61 9 042 indicate which contacts can be used in which crimping nests. The following wire cross section sizes and their corresponding stops can be used.

0.35 to 0.5 mm<sup>2</sup>  
0.75 to 1.0 mm<sup>2</sup>  
1.5 mm<sup>2</sup>  
2.5 mm<sup>2</sup>

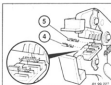


61 99 220

Example:

Contact sleeve 1.5 - 2.5 mm<sup>2</sup> for comb type connector.

Refer to the instructions supplied with Special Tool 61 9 042 for further information.



61 99 221

Place contact (stop) in previously determined nest.

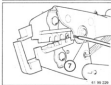


61 99 222

Press contact by squeezing the matrix in the hand pliers.

**Important!**

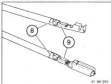
Only squeeze the hand pliers enough to prevent the contact from falling out of the matrix in the hand pliers.



61 99 223

Insert stripped wire end (7) into contact. Ensure that insulation and stripped wire end seat correctly in the contact.

Squeeze hand pliers as far as stop — the hand pliers unlocks automatically.



61 99 224

Take contact out of hand pliers.

Check insulation crimp (8) and wire crimp (9) for correct crimping as shown in the this and following figures.





61-09-201

**Correct Crimping:**  
Visible wire end (10).  
Visible insulation end (11).



61-09-202

**Incorrect Crimping:**  
Wire end (10) inserted too far.  
Insulation end (11) is wire crimp.  
If necessary, repeat crimping with a new contact.



61-09-203

Wire end (10) not visible.  
Insulation end (11) not visible.  
If necessary, repeat crimping with a new contact.

Refer to the instructions supplied with Special Tool 61-0-000 for further information.

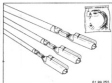


61-09-204

#### REPAIRING PLUG ON WIRE HARNESS

Ten different sets of tools are provided in Special Tool 61-0-000 for wire harness repairs.

Refer to the instructions supplied with Special Tool 61-0-000 for further information.



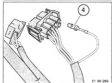
61-09-205

**Example:**  
Repair Set A for contact sleeves on comb type connectors.



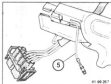
61-09-206

Select repair set and remove following parts.  
Prepared wire end in required wire cross section size (1), butt connector for selected wire cross section size (2), shrink-on sleeve (3).



61-09-207

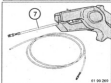
Unlock receptacle, using Special Tool 61-1-100 for this purpose.  
Also refer to instructions supplied with Special Tool 61-1-100.  
Insert damaged contact (4) with socket number of receptacle and press it out of the receptacle using the pertinent special tool contained in Special Tool 61-1-100.



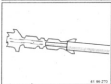
Cut off wire with faulty contact (5) at point which is easily accessible.  
**Important!**  
 Check maximum length of repair wire!  
 If more than one wire has to be repaired, the cuts of wire ends must be arranged offset so that the wire harness will not be too thick at the repaired point.



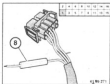
Strip wire harness wire end (6).



Cut off repair wire (7) to required length and strip end of wire.



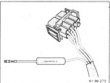
Crimp butt connector on wire harness end.



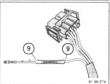
Install shrink-on sleeve (8) on crimped wire end.



Crimp crimped wire end with butt connector.



Pull shrink-on sleeve over butt connector.



Shrink the shrink-on sleeve with heat from a hot air blower until cement flows out of both ends (8 and 9) of the shrink-on sleeve uniformly.  
**Important!**  
 Don't burn the shrink-on sleeve.

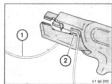
Install contact in receptacle.



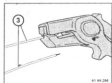
**INSTALLING COMB TYPE CON-  
NECTOR FOR SERVICE IN-  
STALLED EQUIPMENT**

Comb type connector, required insulating parts and tools are contained in Special Tool 61 9 020.

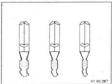
Refer to the instructions supplied with Special Tool 61 9 020 for further information.



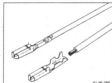
Cut through wire loop in wire harness using Special Tool 61 9 042.



Strip both wire ends.



Select contacts to fit wire cross section size.



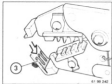
Crimp on contacts using Special Tools 61 9 041 and 61 9 042.



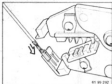
Take comb type connector out of Special Tool 61 9 020 and shorten it to the required number of pins.



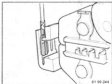
Use Special Tools 61 9 041 and 61 9 042.



Place sized comb type connector in Special Tools 61 9 041 and 61 9 042.



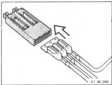
Slide wire with contact on comb type connector.



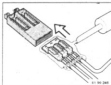
Squeeze special tool and push on contact as far as stop.



Installed comb type connector.



Slide assembled comb type connector into insulation receptacle until it locks. Mount insulation receptacle on body.



The insulation receptacle must be sealed if it is installed outside of the car's interior compartment. Seal the receptacle with silicone and mount it on the body.

Refer to the instructions supplied with Special Tool 61-9 600 for further information.



61 24 9 408 000

**TOOLS FOR WIRE HARNESS  
REPAIRS OR REPAIR ASSORT-  
MENTS I, II AND III**

These repair assortments are available from BMW Parts.

Repair assortment for electric system I  
Order No. 61 24 9 408 000

Repair assortment for electric system II  
Order No. 61 24 9 408 000

Repair assortment for electric system III  
Order No. 61 24 9 408 000

They are primarily required for repairs on models of E 12, E 21, E 23, E 24, E 26 and E 28 Series.



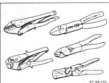
61 24 120

Hand pliers Super Champ FT from Electric System Box I  
Order No. 61 24 9 408 120



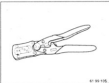
61 24 124

Hand pliers for ignition lead contacts from Electric System Box I  
Order No. 61 24 9 408 124



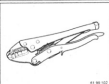
61 24 127

Survey of applied hand pliers in boxes for Electric Systems I, II and III.



61 24 125

Hand pliers for "Modu" (electronic contacts) from Electric System Box II  
Order No. 61 24 9 408 125



61 24 122

Hand pliers Compac II from Electric System Box I  
Order No. 61 24 9 408 122



61 24 126

Hand pliers for 2,5 mm contacts from Electric System Box II  
Order No. 61 24 9 408 126



Other installation and tool application information:  
Operating Instructions: Order No. 61 8 084  
Wire repairing tool of repair assortment for Electric Systems I, II and III.

- Contents of instructions among others:
- 1 Application of tools
  - 2 Reduced susceptibility to repairs
  - 3 Better repair process

Send orders for operating instructions to:  
Carlson GmbH  
Alfred-Brehm-Str. 5  
8070 Ingolstadt  
Germany

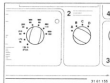
### BATTERY HIGH CURRENT TEST - for Starter Batteries -

Test with Bosch Tester 12 2900\*.



Connect the battery tester and set the cold testing current/rated capacity according to the battery specifications.

There is high current load of approx. 300 A, with electronic evaluation of the voltage curve during and after load.  
This test is presently the most dependable method of evaluating the charged condition and physical battery condition (such as cell shorts, sulphation).



Switch all consumers off.  
Switch the ignition off and wait 5 minutes.  
Start the test as described in the operating instructions.



Only scales B and C are required for the evaluation of batteries.

#### Test Procedure:

Connect the battery tester.  
Ground point of engine wire harness at electronic box in front of the engine compartment fitted.  
Remove cover.



\* Source of Supply: BMW Parts

## LIMITS FOR EVALUATION OF ALL BATTERIES (Except Telephone Batteries)

Charged Condition <sup>1)</sup>	Starting Power <sup>2)</sup>	Test Results		
		OK	Charge	Faulty
<b>Test Step 1 — Before Charging Battery</b>				
Not testable			X	
Less than 50 % <sup>3)</sup>			X	
More than 50 %	Less than 75 %		X	
More than 50 %	More than 75 % <sup>3)</sup>		X	
More than 80 %	More than 75 %	X		
<b>Test Step 2 — After Charging Battery</b>				
Not testable				X
Less than 50 % <sup>3)</sup>	Less than 75 %			X
More than 50 %	More than 75 % <sup>3)</sup>		X	
1) Charged condition and starting power must always be evaluated combined				
2) Test Charge      Longer than 5 hours with charger Gossen CG 2 or Siemens-Gossen VB 801				
3) Full Charge      Until charged condition is more than 80 %				

**Note:**  
If the battery was tested from the positive connection point in the engine compartment, repeat the test direct on the battery to be sure of correct test results.



### 61-20 . . . CHECKING BATTERY IN OPEN CIRCUIT CURRENT TEST

If the battery is okay after the high current test, battery discharging could be caused by excessive open circuit current consumption.

#### Before Open Circuit Current Test:

Vehicle must have been situated at least 3 hours.

Switch all consumers off which can be switched off (ignition, inside lights, reading lamps, seat heating, additional heater, additional ventilator, telephone, etc.)  
 Shut the glovebox, trunk/tailgate lid and engine hood.

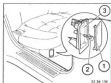


32-61-100



32-61-100

If the striker is lined with plastic, the cigar lighter ground wire in the rear of the car must be used.  
 Remove the panel.

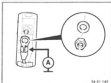


32-61-100

Keep to the following procedures so that possibly sensitive relays do not fail.

#### Connecting Ammeter:

Connect the positive lead of the ammeter to the disconnected ground connection.  
 Connect the ground lead of the ammeter to the door lock striker.



32-61-100

Remove the shrink-fit hose on the body end of the battery ground lead (see pictures) for a battery installed underneath the rear seat. Clip on a cable with an alligator clip at this point (Hirschmann AK 2 S clip together with test leads, red = Order No. 61 1 472 and black = Order No. 61 1 474). Clip a second cable on the striker of the right rear door, or of ground on the rear cigar lighter.

Close, lock and armal (double-lock) the driver's door, front passenger's door and left rear door.

The right rear door remains open.

Disconnect the battery ground lead with connected alligator clip on the ground connection point carefully 5 minutes after the locking step and bend it away. Static current now flows only via the multimeter.

Simulation of the closed car by pressing the door contact switch on the striker. Read static current value on the multimeter.

If the static current is more than

50 mA,

it can be assumed that a hidden consumer is loading the battery.

The hidden consumer can be pinpointed by pulling off fuses, possibly relays and control units one after the other.

When testing and possibly troubleshooting have been concluded, the multimeter must be removed in reverse order of installation so that the memories of the radio, on-board computer and various control units are not cancelled.

#### Static Current Test in Cars with Burglar Alarm:

In order to be able to measure the actual static current, the door contact of the open right rear door must be pressed 5 minutes after the locking step.

The door contact must not be released immediately after reading the static current, because then the burglar alarm horn would be active. This excessive current for the selected measuring range of the multimeter could destroy the instrument, but at least the installed fuse.

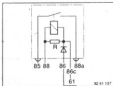
The ground lead must always be reconnected in reverse order of disconnection, in order to be able to deactivate and unlock the car correctly.

### 61 20 . . . REMOVING AND INSTALLING ADDITIONAL BATTERY

Disconnect ground leads of both batteries.  
Remove trim panel on tail panel.  
Bend trunk trim panel on right wheel house side.



- 1 Additional battery
- 2 Battery cut-off relay
- 3 Parked car heating control unit



Wiring diagram: battery cut-off relay

## 61 21 . . . CHARGING BATTERY

Only chargers with the following properties are suitable for charging the battery in the car with connected car power supply.

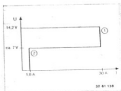
- Current limitation for strongly discharged batteries (regeneration of slightly predamaged batteries).
- Switchover or shutoff after reaching 14.4 V gassing voltage.
- Direct current voltage with harmonic wave less than 1 V.

Sample Chargers:

Siemens-Gossen VB 801

Gossen CG33

See voltage/induction charging curve.



## Voltage/Induction Charging Curve

Shows:

1. Charging with minimum current up to gassing limit voltage of 14.2 V, whereby charging in range of about 13.2 to 14.2 V could last relatively long, because in this limit range charging is with very low current.
2. Charging of strongly discharged batteries with an initial current of approx. 2 A up to a terminal voltage of approx. 7 V, at which maximum charging current cuts in.

Battery chargers without these properties lead to damage in the car.

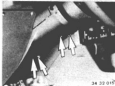
The battery must be disconnected from the car power supply system when using any other chargers.

Take battery out of the car when charging with non-regulated chargers (see Operating Instructions).



## 61 31 ... REPLACING ONE STEERING COLUMN SWITCH

Disconnect battery ground lead.  
Remove steering wheel - see 32 32 040.  
Remove trim panel for dashboard at bottom left - see 51 45 180.  
Unscrew screws and take off lower steering column casing section.



Cars with Airbag:  
Unscrew screws and take off lower steering column casing section.



Drive out pin and lift out expansion rivet.  
Take off upper steering column casing section.



## 61 31 018 REPLACING TURN SIGNAL/ HEADLIGHT DIMMER SWITCH

Remove casing sections - see "Replacing One Steering Column Switch".  
Pull on plug.



Squeeze locking hooks on both sides and pull out switch.  
Disconnect all plug connections.

Installation:  
Mount turn signal switch in turn signal indicating position and then install the steering wheel.



## 61 31 018 REPLACING CRUISE CONTROL SELECTING SWITCH

Remove casing sections - see "Replacing One Steering Column Switch".  
Press down on lever and pull out switch.  
Disconnect plug.

## 61-31/2



### 61 31 020 REPLACING IGNITION SWITCH

Remove casing - refer to "Replacing One Steering Column Switch".  
Compress retainers on both sides and pull out switch.  
Disconnect plug.

#### Important!

After installation carry out mechanical (lock cylinder) and electric (e.g. ignition, radio, etc.) tests.

#### Installation:

Check position of ignition switch to steering wheel lock and turn signal switch to steering wheel.



### 61 31 040 REPLACING WIPER SWITCH

Remove casing - refer to "Replacing One Steering Column Switch".  
Compress retainers on both sides and pull out switch.  
Disconnect plug.

#### Installation:

Check position of turn signal switch to steering wheel.

## 61-31/3

24 61 026



### 61 31 026 REPLACING LIGHT SWITCH

Push switch frame to the right and press in locking hook with a 1.0 mm thick feeler gage blade.

Remove switch frame.

Pull off plug.  
Press switch forward out of the switch frame.

Installation:  
Press in locking hooks with a feeler gage blade and engage switch frame in the dashboard.

### 61 31 070 REPLACING SWITCH FOR FRONT FOG LAMPS

See "Replacing Light Switch" in 61 31 026.

### 61 31 ... REPLACING SWITCH FOR DIMMING INSTRUMENT LIGHT

See "Replacing Light Switch" in 61 31 026.

### 61 31 ... REPLACING SWITCH FOR HEADLIGHT VERTICAL AIM CONTROL

See "Replacing Light Switch" in 61 31 026.



### 61 31 051 REPLACING SWITCH FOR HEATER BLOWER

See "Replacing Heater Controls" in  
64 11 205.

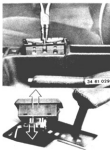


34 61 027

### 61 31 115 REPLACING SWITCH FOR POWER WINDOWS

Wrap adhesive tape around a round-  
edged pliers.  
Apply round-edged pliers on left and  
right sides of the middle bar and pull  
up on left and right sides separately to  
pull out the switch.

**Note:**  
Operate switch so that it will be easier  
to apply the round-edged pliers.



32 26 070

### 61 31 265 REPLACING PROGRAM SWITCH FOR TRANSMISSION CONTROL (EH)

Testing - see BMW Test Plan in Gr. 34.

**Checking:**  
Program switch is moved to position  
with the ignition "ON".



32 61 110

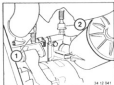
Pry out wood-ornament on center  
console.



32 61 115

Press out switch.  
Pull off plug.





### 61 31 200 REPLACING OIL PRESSURE SWITCH

**S 38:**  
Oil pressure switch (1) is on base of the oil filter.  
Unscrew oil filter cover to have the oil in the oil filter flow back into the oil pan.  
Pull off plug.

Unscrew switch.

**Installation:**  
Tighten oil filter cover.  
Install switch.



**M 21:**  
Pull off plug.  
Remove oil pressure switch.



**M 50:**  
Unscrew oil filter cover to have the oil in the oil filter flow back into the oil pan.  
Unscrew switch.

**Installation:**  
Tighten oil filter cover.  
Install switch.



**M 35:**  
Unscrew coolant expansion tank.  
Remove oil pressure switch.



**M 20:**  
Remove engine splash guard – see Group 15.  
Pull off plug.  
Remove oil pressure switch.



[a. 81 044]

### 61 31 252 REPLACING ENGINE OIL LEVEL SWITCH

M 30 and S 38:  
 Drain engine oil.  
 Disconnect plug on engine carrier.



[a. 81 071]

Unscrew screws.  
 Remove switch.

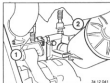
M 30:  
 Disconnect plug between engine block  
 and alternator.  
 Unscrew screws.  
 Pull out switch.



[a. 81 040]



[a. 81 041]



[a. 12 041]

### 61 31 ... REPLACING OIL TEMPERATURE SENDER

S 38:  
 Oil temperature sender (2) is on base  
 of the oil filter.  
 Unscrew oil filter cover to have oil in  
 the oil filter flow back into the oil pan.  
 Pull off plug.  
 Remove sender with Special Tool  
 00 9 160.



[a. 11 041]

Installation:  
 Tighten oil filter cover.  
 Install sender.

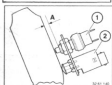


### 61 31 300 Replacing brake light test switch

Remove dashboard trim panel at bottom left - 51 45 180.  
Remove cable plug.  
Remove cover.



Unfasten nut (1), unscrew nut (2) and draw test switch backwards.



#### Installation:

Brake pedal in rest position.  
Adjust brake light test switch.  
Dimension A = 5,5 - 6,0 mm

- 1 = Brake light test switch
- 2 = Brake light test switch
- 3 = Brake pedal (in rest position)



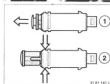
#### Note:

In cars whose switch has a 4-pin plug housing, the brake light switch and the brake light rest switch share the same housing. Adjustment as per 61 31 310.



### 61 31 310 Replacing brake light switch

Remove dashboard trim panel at bottom left - 51 45 180.  
Remove cable plug.



#### Depress brake pedal

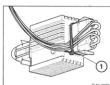
- 1 Pull tappet and sleeve straight forwards.
- 2 Press together retaining clips and pull switch backwards.

#### Installation:

Install switch as shown in 2. Adjustment is performed automatically. Release pedal slowly to neutral position.

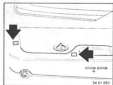
#### Caution!

Adjustment of the switch can be changed if brake pedal springs back. Check function.



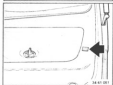
#### Caution!

On vehicles with electronic brake light switch (identified on radiator fins), always tie back lines to switch with cable clip (1).



**61 31 350 REMOVING AND INSTALLING /  
REPLACING TAILGATE GRIP  
MICROSWITCH**

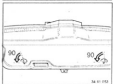
Remove the tailgate trim panel.  
Unclip caps of screws.



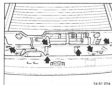
Unclip cap of screws.



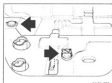
Unscrew screws.



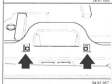
Open the toolbox.



Remove clips.



Unscrew left and right screws.



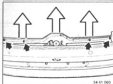
Unscrew screws.



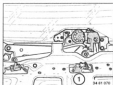
Shut the tailgate.  
Unscrew cap of the wiper crank.



Unscrew screws.



Take the trim panel out of the clips carefully.  
Shut the tailgate.



Tailgate Survey:

Disconnect plug (1).



Loosen the wire strap.  
Disconnect the plug.

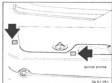


Push the retainer back.



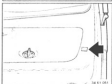
Remove the switch.

Installation:  
Check the isolated position of the micro-switch.  
Check function.



**61-31-052 REMOVING AND INSTALLING / REPLACING TAILGATE LOCK (LOCK CYLINDER) MICRO-SWITCH**

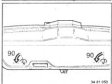
Remove the tailgate trim panel.  
Unclip caps of screws.



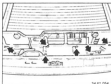
Unclip cap of screws.



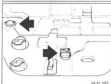
Unscrew screws.



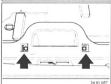
Open the toolbox.



Remove clips.



Unscrew left and right screws.



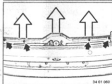
Unscrew screws.  
Unscrew screws of the grip recess plate.



Shut the tailgate.  
Unscrew cap of the wiper crank.



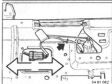
Unscrew screw.



Take trim panel out of the clips carefully.



Disengage the linkage.



Loosen the wire strap.  
Reconnect the plug.



Unscrew screws.  
Tightening torque\*.



Push the retainer back.

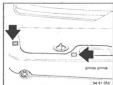


Remove cap.



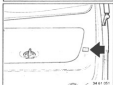
Installation:  
Check the installed position of the micro-switch.  
Check function.

\* Refer to Specifications



**61 31 350 REMOVING AND INSTALLING /  
REPLACING TAILGATE WINDOW  
LOCK MICROSWITCH**

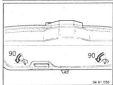
Remove the tailgate trim panel.  
Unclip caps of screws.



Unclip cap of screws.



Unscrew screws.



Open the toolbox.



Remove clips.



Unscrew left and right screws.



Unscrew screws.  
Unscrew screws of the grip recess plate

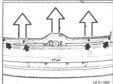


Shut the tailgate.  
Unscrew cap of the wiper crank.





Unscrew screw.



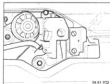
Take trim panel out of the clips carefully.



Unscrew screws.



Unscrew screws of the support.



Support removed.



Press the retaining hook back.  
Loosen the wire strap.  
Remove microswitch (1).

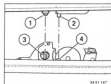


Disconnect the plug.

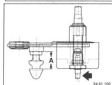


Disconnect the plug.

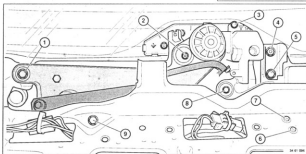
Installation:  
Check the installed position of the micro-switch.  
Check function.

**Installation:**

Lockpin (1) of the tailgate window lock and crankpin (2) of the wiper must engage in lock (3) and (4) of the tailgate.



The lockpin of the tailgate window lock must be adjusted to a depth distance  $A = 20.5$  mm so that the crankpin of the wiper arm will engage deep enough in the opening of the output disk.



Unscrew screws (1 ... 5).

Shut the tailgate window.

The lockpin should be adjusted to correct depth.

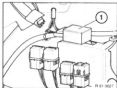
Tighten screws (1 ... 5).

Tightening torque\*

Check the wiped zone.

Check function.

\* Refer to Specifications



**61 31 437 Removing and installing or replacing wiper/wash control unit for rear window**

Remove wheel arch trim from right side of trunk, refer to 61 47 161.

Remove control unit (1).

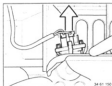
**61 31 440 REMOVING AND INSTALLING  
REPLACING TEMPERATURE  
SWITCH FOR HEATED WIND-  
SHIELD SPRAY NOZZLES**

**Description of Operation:**

The temperature switch is series connected with the heated spray nozzles.

ON temperature: 3 to 10° C

OFF temperature: 8 to 16° C



Disconnect plug.

Additional information:  
wiring diagrams for E 34 models.

**When Troubleshooting:**

Switch is open most of the time as the ambient temperature is usually higher than 16° C.

Application of cold spray will very seldom cause switching on, as a reaction time of several minutes is acceptable.

Remove front bumper - refer to Group 51.

**Location:**

Below impact absorber on right-hand side of car.



Unclip switch in holder.

### 61 31 870 REPLACING RELAYS/MODULE (UNDER REAR SEAT)

Interrogate the fault memories.  
 Disconnect the battery.  
 Remove the rear seat cushion - refer to  
 Group 57.

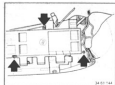
Unscrew screws.  
 Remove the cover.

Apply Special Tool 00 5 500.  
 Pull the module off.

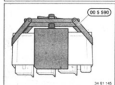
Removed in this picture.

#### *Caution!*

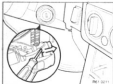
If the battery is not disconnected, wrong  
 equipment versions will be stored taking  
 the basic module as an example.  
 In this case some special equipment would  
 not be recognized.  
 For example, the power window regulators  
 would not work.



34 61 144



39 61 145



**61 35 900 Removing and installing or replacing ring antenna of electronic vehicle immobilizer**

Remove steering column shroud at bottom.  
Unclip ring antenna.



Disconnect plug connector (1) and remove ring antenna.

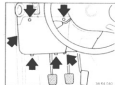


**61 35 900 Removing and installing or replacing transceiver module of electronic vehicle immobilizer**

Remove steering column shroud at bottom.  
Disconnect plug connectors (1 and 2).



Press clip towards module and remove module by pulling downward.



**61 35 910 Removing and installing or replacing control unit for electronic vehicle immobilizer**

Remove plug.  
Release screws.



Detach trim panel.  
Remove knee guard if necessary. (US)



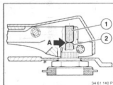
Release screws.  
Detach trim panel.



Disconnect plug connector, release screws  
and remove control unit.

### 61 61 ... Adjusting or checking windshield wiper arm angle of contact on windshield

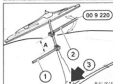
The approach angle of the wiper arm on the front windshield is the principal determining factor for wipe quality during intermittent operation and wipe quality at low road speeds.



For cars with contact pressure adjustment, the clearance between adjusting screw (1) and tappet (2) must be  $A \pm 0 - 0,2$  mm when the ignition is switched off and the wiper blade is tilted.



Special tool 00 9 210.  
(Latest version is gray in color and has two holes).  
Fit to the fulcrum point of the blade on the windshield.  
Point of windscreen glass application and vehicle designation are provided on the special tool.



If the approach angle is incorrect, the wiper arm must be turned to its correct position using special tool 00 9 220.  
Procedures:  
Select largest possible distance "A" between special tool 1 and special tool 2.  
Bend special tool 1 to ensure that no stress is applied to joint 3 while being bent.  
Twist special tool 2.

Check function.



### 61 61 270 REMOVING AND INSTALLING COMPLETE WIPER CONSOLE

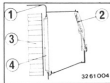
Run wipers to parked position.  
Remove heater blower - refer to 64 61 ...  
Take off cover.

**Important!**  
Set air volume control wheel to zero and switch ignition on and off before disconnecting cable in order to have the drive motor close the ventilation flaps.

Disconnect battery ground lead.  
Disconnect cable completely.  
Lift out linkage carefully.

Put off temperature sensor.

Remove retainers, lift cover slightly and remove inlet covers on left and right sides. Then remove cover.



**Installation:**  
Check installed direction of inlet covers.

- 1 Housing
- 2 Fresh air flap
- 3 Blower wheel (not yet installed)
- 4 Inlet cover

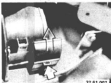
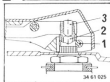
Unscrew screws.

Unscrew wiper arms.

**Left Wiper Arm:**  
Fold up cover, unscrew screw and take off wiper arm, widening the gap with a screwdriver if necessary.

**Installation:**  
Press on wiper arm fully as otherwise wiper contact force regulation will not work correctly.  
Tighten screw (1) to specified torque\*.  
Screw in stud (2) as far as pin (3) until there is no longer play.  
In cars without wiper contact force regulation tighten wiper arm nut to specified torque\*.  
Wait 15 minutes and tighten again to specified torque\*.

\* Refer to Specifications





**Right Wiper Arm:**  
Fold up cover, unscrew nut and take off wiper arm.

**Installation:**  
Tighten wiper arm nut to specified torque\*. Wait 15 minutes and tighten again to specified torque\*.

32 61 012

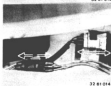


Lift out retainers and remove cover.



Unscrew nuts on both wiper shafts and pull down on wiper linkage.

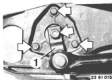
32 61 018



Disconnect plug and lift out complete wiper console.

32 61 014

\* Refer to Specifications



**Removing Wiper Motor:**  
Unscrew bolts and nut.

**Note:**  
Mark position of motor shaft to wiper linkage (1) when reinstalling the same motor.

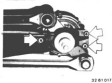
32 61 016



**Installation:**  
Connect motor briefly and run to neutral position (wipers parked) when installing a new motor.

Align parts (1) and (2) of wiper linkage that they are in a straight line and then install the motor.

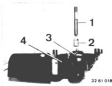
32 61 018



**Removing Wiper Contact Force Regulating Motor:**  
Unscrew bolts and remove motor.

**Installation:**  
Always only replace the wiper contact force regulating motor complete, as precise adjustment is not possible. Exchange motors are supplied adjusted.

32 61 017



32 61 018

## 61-61/4

### 61 61 285 REMOVING AND INSTALLING OR REPLACING WIPER CONTACT PRESSURE CON- TROL MOTOR

Remove left and right wiper arms.  
Unscrew left trim panel.



Disconnect white plug.  
Unclip wires in holder on cover of  
contact pressure control motor.



Unscrew screws.



Pull out plunger of contact pressure  
control system with a magnet and hold  
it with adhesive tape.



Remove wiper contact pressure con-  
trol motor.  
Cancel fault memory.  
Check function after installation.

## 61-61/5



33 61 024

### 61 61 000 REPLACING WASHING FLUID TANK FOR HEADLIGHT CLEANERS

Drain tank.  
Lift out pumps with hoses and leads (shown on removed tank in picture for better understanding).



33 61 026

Unscrew screw and lift tank.  
Pull off leads on level switch and lift out tank.



33 61 028



33 61 027

### 61 61 ... REPLACING LEVEL SWITCH

Drain tank.  
Pull off electric leads on level switch.  
Lift out switch.

Installation:  
Check that switch is positioned correctly.

61 62 . . . DESCRIPTION OF TAILGATE  
WINDOW WIPER OPERATION

The wiper has two modes of operation.

1. Intermittent function for tailgate window wiper.
2. Tip function: automatic washing of tailgate window.  
Washing fluid is sprayed onto the tailgate window and the wiper is switched on.

Wiper operation is interlocked when the tailgate window is opened.

In the tailgate window lock there is a micro-switch which is operated by the lockpin of the tailgate window.

The washing function is accomplished with help of a stroke-type nozzle.



#### 61 62 004 ADJUSTING WIPED ZONE OF TAILGATE WINDOW WIPER

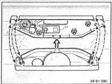
Let the wiper run to parked position.  
Parked position = wiper arm parallel to the heating wires.  
Switch the wiper off.  
Switch the ignition off.



Insert cap of screw.

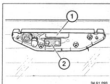


Unscrew screw.  
Tightening torque\*.  
Correct the parked position.  
Parked position = wiper arm parallel to the heating wires.  
Check the function.  
If it is not possible to adjust the wiped zone, the console of the tailgate window wiper must be adjusted.  
Continue with the following steps.

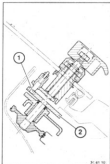


Open the tailgate window.  
Insert cap of the wiper shaft mount.

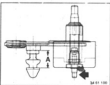
\* Refer to Specifications



Parked position of wiper shaft mount:  
crank (2) must bear on stop (1).

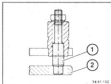


Side Section View of Assembly:  
1 Spring-loaded crankpin in wiper shaft mount to take the wiper arm  
2 Output disk of wiper motor



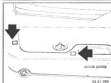
Side View of Wiper Shaft Mount

Shown removed in this picture.



Crankpin (1) must engage in output disk (2) of the wiper motor.

**Important!**  
Crankpin (1) must not protrude beyond output disk (2).  
Adjustments are made on the lockpin of the tailgate window lock.



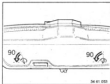
Remove the tailgate trim panel.  
Unclip caps of screws.



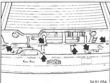
Unclip cap of screws.



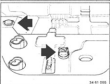
Unscrew screws.



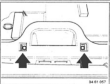
Open the toolbox.



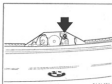
Remove clips.



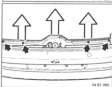
Unscrew left and right screws.



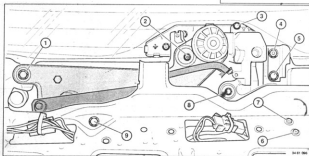
Unscrew screws.  
Unscrew screws of the grip recess plate.



Shut the tailgate.  
Remove the motor crank cover.  
Unscrew screw.

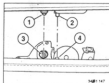


Take trim panel out of the clips carefully.  
Remove the trim panel.

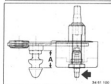


Unscrew screws of the console.  
Shut the tailgate window.

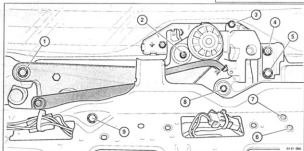




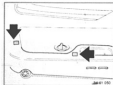
**Installation:**  
Lockpin (1) of the tailgate window lock and crankpin (2) of the wiper must engage in lock (3 and 4) of the tailgate.



The lockpin of the tailgate window lock must be adjusted to a depth distance A = 20.0 mm so that the crankpin of the wiper arm will engage deep enough in the opening of the output disk.

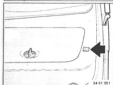


Uncrew screws (1 ... 9).  
Shut the tailgate window.  
The lockpin should be adjusted to correct depth.  
Tighten screws (1 ... 9).  
"Tightening tongue"  
Check the wiped zone.  
Check function.



**61-62-050 REMOVING AND INSTALLING / REPLACING TAILGATE WINDOW WIPER MOTOR**

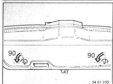
Remove the tailgate trim panel.  
Unclip caps of screws.



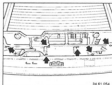
Unclip cap of screws.



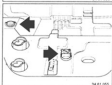
Unscrew screws.



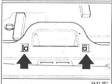
Open the toolbox.



Remove clips.



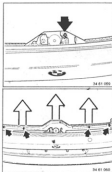
Unscrew left and right screws.



Unscrew screws.  
Unscrew screws of the grip recess plate.

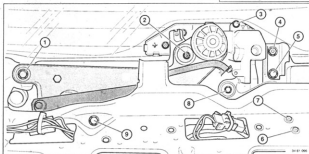


Shut the tailgate.  
Remove cap of the wiper crank.

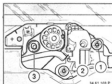


Unscrew screw.

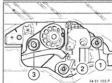
Take trim panel out of the clips carefully.  
Remove the trim panel.



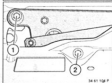
Unscrew screws (1 ... 9) of the console.



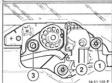
**Installation:**  
Long screw in rubber mount (1).



Wiper adjustments are made in the slots of the securing points.

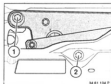


**Console Screws:**  
1 Long screw  
2 Short screw



**Important!**  
The screws with large washers must be used for rubber mounts (1 and 2).  
Tightening torque\*.

\* Refer to Specifications



Unscrew screws (1 and 2).  
Tightening torque\*.



Lift wiper assembly out of the body panel.

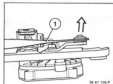


Loosen the wire strap.

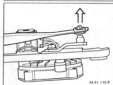


Disconnect the plug.

\* Refer to Specifications

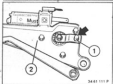


Lift wiper assembly out of the body completely.



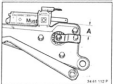
General Wiper Assembly View:

Lever the connecting rod out.

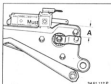


Pull the connecting rod off of the ball-headed pin.

**Important!**  
Don't damage the ball-headed pin bearing in the connecting rod.



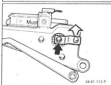
Mark the crank position of motor crank (1) to wiper console (2).



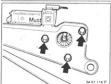
**Installation:**

**Motor Crank Adjustment:**

Run the wiper motor to parked position. Mount the wiper motor on the console. Mount the motor crank. Adjust distance (A) to 24 mm. Tighten the motor crank. Tightening torque.



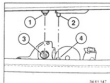
Unscrew screw. Lever the motor crank off. Tightening torque.



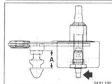
Unscrew screws. Tightening torque.

**Installation:**

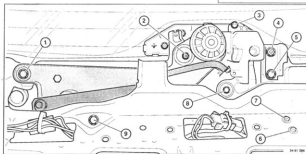
Adjust the wiped zone - refer to 61-62 004. Check the function.

**Installation:**

Lockpin (1) of the tailgate window lock and crankpin (2) of the wiper must engage in lock (3 and 4) of the tailgate.

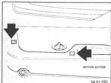


The lockpin of the tailgate window lock must be adjusted to a depth distance  $A = 20.5$  mm so that the crankpin of the wiper arm will engage deep enough in the opening of the output disk.



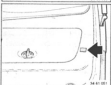
Unscrew screws (1 ... 9).  
Shut the tailgate window.  
The lockpin should be adjusted to correct depth!  
Tighten screws (1 ... 9).  
Tightening torque\*.  
Check the wiper zone.  
Check function.

\* Refer to Specifications



### 61-62-070 REMOVING AND INSTALLING CONSOLE (LEVERAGE) FOR TAILGATE WINDOW WIPER

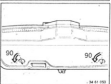
Remove the tailgate trim panel.  
Unclip caps of screws.



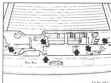
Unclip cap of screws.



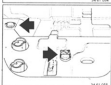
Unscrew screws.



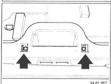
Open the toolbox.



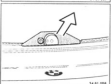
Remove clips.



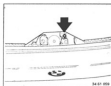
Unscrew left and right screws.



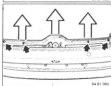
Unscrew screws.  
Unscrew screws of the grip recess plate.



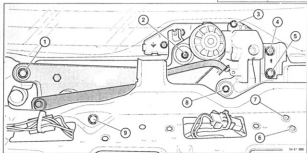
Shut the tailgate.  
Remove the motor crank cap.



Unscrew screw.

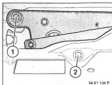


Take trim panel out of the clips carefully.  
Remove the trim panel.



Unscrew screws (1 ... 9).

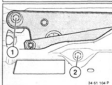


**Console Screws:**

- 1 Long screw
- 2 Short screw

**Important!**

The screws with large washers must be used for rubber mounts (1 and 2).



Unscrew screws (1 and 2).  
"Tightening torque".

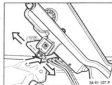


Lift wiper assembly out of the body  
completely.

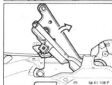


Loosen wire strap.

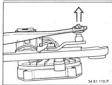
\* Refer to Specifications \*



Disconnect the plug.



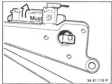
Lift wiper assembly out of the body com-  
pletely.



Pull the drive rod off of the ball-headed pin.

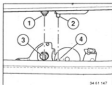
**Important!**

Don't damage the ball-headed pin bearing  
in the drive rod.

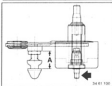


Unscrew the wiper motor screws.  
Remove the wiper motor.  
"Tightening torque".

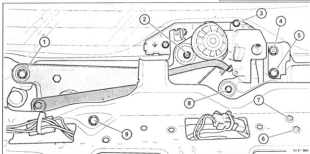
\* Refer to Specifications \*

**Installation:**

Lockpin (1) of the tailgate window lock and crankpin (2) of the wiper must engage in lock (3 and 4) of the tailgate.



The lockpin of the tailgate window lock must be adjusted to a depth distance A = 20.5 mm so that the crankpin of the wiper arm will engage deep enough in the opening of the output disk.



Unscrew screws (1 ... 8).  
Shut the tailgate window.  
The lockpin should be adjusted to correct depth!

Tighten screws (1 ... 8).  
Tightening torque\*.  
Check the wiped zone.  
Check function.

61 62 070 REPLACING CONSOLE (LINKAGE) FOR TAILGATE WINDOW WIPER

Refer to "Removing and Installing Console (Linkage) for Tailgate Window Wiper" in 61 62 070.

Unscrew nut of cable.

Installation:  
Replace the cable nut.

Installation:  
Inspect the cable for damage.  
If output disk (1) is damaged, it is absolutely essential to replace the cable in order to avoid pre-damaging the new console.

Unscrew the wiper motor screws.  
Remove the wiper motor.  
Tightening torque\*

\* Refer to Specifications

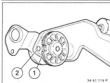


Loosen the wire strap.

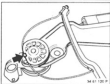


Cable installation:

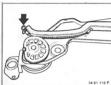
Work cable into drive rod (1).  
Install nut (2) on the threads.

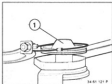


Adjusting Installed Position of Drive Disk:  
Align the center of the attaching eye opening (1) with the center of rivet (2).



Place the cable eye in the drive disk.

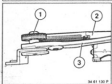




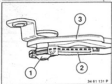
Routing of Cable on Drive Disk (1)



Place cable in drive disk (1).



Top View of Cable Routing on Drive Disk (1)

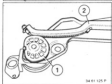


Install the drive cable on drive disk (1) with help of the drive rod.

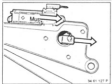
**Important!**  
Don't damage the drive disk.



Cable installed



Bring drive rod (2) into normal position.



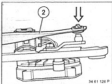
Run the motor to parked position.  
Mount the motor on the console.  
Tightening torque\*

\* Refer to Specifications

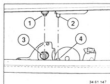


Install the wire strap.

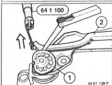
Installation:  
Installing Wiper Assembly:



Mount the drive rod on the motor crank.



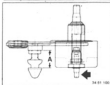
Installation:  
Lockpin (1) of the tailgate wiper lock and crankpin (2) of the wiper must engage in lock (3 and 4) of the tailgate.



Adjusting Cable Tension:

Drive linkage attached.  
Wiper in parked position.

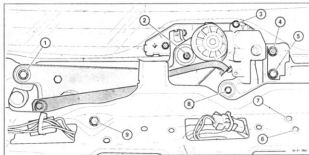
Apply Special Tool 64 1 100 (scale) on the cable connection point.  
Pull drive linkage (2) upwards vertically.



The lockpin of the tailgate wiper lock must be adjusted to a depth distance A = 20.5 mm so that the crankpin of the wiper arm will engage deep enough in the opening of the output disk.



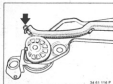
Nut (1) must be tightened in such a manner that with a force of 25 N the clearance between the drive linkage and drive disk is not more and also not less than 0.1 to 0.4 mm.



Unscrew screws (1 ... 9).  
 Shut the tailgate window.  
 The lockpin should be adjusted to correct depth.  
 Tighten screws (1 ... 9).  
 Tightening torque\*  
 Check the edged zone.  
 Check function.

**61 62 080 REMOVING AND INSTALLING /  
REPLACING DRIVE ROD FOR  
TAILGATE WINDOW WIPER**

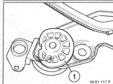
Refer to "Removing and Installing Console  
(Linkage) for Tailgate Window Wiper" in  
61 62 070.



61 62 116 P

Unscrew nut of cable.

**Installation:**  
Replace the cable nut.



61 62 117 P

**Installation:**  
Inspect the cable for damage.  
If output disk (1) is damaged, it is absolutely  
essential to replace the cable in order to  
avoid pre-damaging the new console.



61 62 118 P

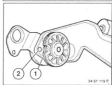
Lever drive rod (1) off the the ball-headed  
pin of the motor crank.  
Inspect the ball-headed pin of the motor  
crank for damage.  
Replace the drive rod.



61 62 119 P

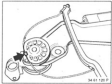
**Cable installation:**

Work cable into drive rod (1).  
Install nut (2) on the threads.



61 62 120 P

**Adjusting Installed Position of Drive Disk:**  
Align the center of the attaching eye opening  
(1) with the center of rivet (2).



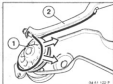
61 62 121 P

Place the cable eye in the drive disk.

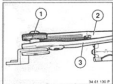


61 62 124 P

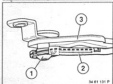
Routing of Cable on Drive Disk (1)



Place cable in drive disk (1).

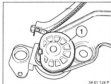


Top View of Cable Routing on Drive Disk (1)

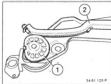


Install the drive cable on drive disk (1) with help of the drive rod.

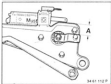
**Important!**  
Don't damage the drive disk.



Cable installed

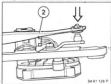


Bring drive rod (2) into normal position.



Run the motor to parked position.

Distance A = 24 mm.



Mount drive rod (1) on the ball-headed pin of the motor crank.  
Install the wiper console.  
Adjust the wiped zone - refer to 61-62 004.  
Check the function.



**61 62 085 REMOVING AND INSTALLING /  
REPLACING CABLE OF DRIVE  
ROD FOR TAILGATE WINDOW  
WIPER**

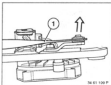
Refer to "Removing and Installing Console  
(Linkage) for Tailgate Window Wiper" in  
61 62 070.

Unscrew nut of cable.

Installation:  
Replace the cable nut.

Installation:  
It is absolutely essential to replace console  
(3), if cable roller (1) is damaged.

Disconnect cable (1) from drive rod (2).

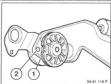


Lower drive rod (1) off the the ball-headed  
pin of the motor crank.  
Replace the drive rod.



Cable installation:

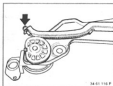
Work cable into drive rod (1).  
Install nut (2) on the threads.



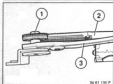
Adjusting Installed Position of Drive Disk:  
Align the center of the cable roller open-  
ing (1) with the center of rivet (2).



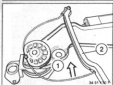
Place the cable eye in the drive disk.



61 62 130 P



61 62 130 P



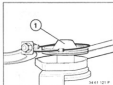
61 62 130 P

61 62 130 P

61 62 130 P

61 62 130 P

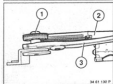
61 62 130 P



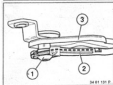
Routing of Cable on Drive Disk (1)



Place cable in drive disk (1).



Top view of Cable Routing on Drive Disk (1)

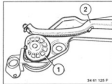


Install the drive cable on drive disk (1) with help of the drive rod (2).

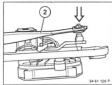
**Important!**  
Don't damage the drive disk.



Cable inserted



Bring drive rod (2) into normal position.



Mount drive rod (2) on the ball-headed pin of the motor (3).  
Install the wiper console.

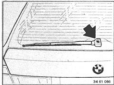




**61 62 090 REMOVING AND INSTALLING / REPLACING SHAFT MOUNT FOR TAILGATE WINDOW WIPER**

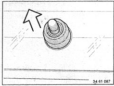
Operate the wiper to parked position. Switch the wiper off. Switch the ignition on.

SA 61 090



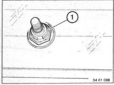
Unclip cap on the screw. Remove the wiper arm. Unscrew screw.

SA 61 090



Remove the outside shaft cover.

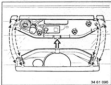
SA 61 091



Unscrew screw. Tightening torque\*.

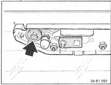
SA 61 090

\* Refer to Specifications



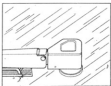
Unclip the inside cover.

SA 61 090

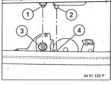


Unscrew screw. Remove the shaft mount.

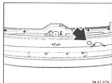
SA 61 090



Install the shaft mount. Lockpin (1) must engage in stirrer (2). Wiper crank (2) must engage in the output disk of wiper crank (4).

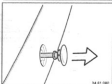


SA 61 100 P

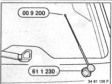


**61 62 100 ADJUSTING WATER SPRAY NOZZLE FOR TAILGATE WINDOW**

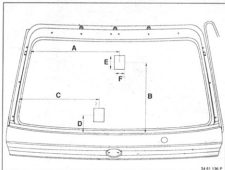
Shut the tailgate.  
Move the water spray nozzle out.



Hold the water spray nozzle tight in run out position.

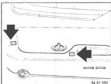


Arrest the water spray nozzle in run out position using Special Tool 61 1 230. Insert Special Tool 60 9 200 into the nozzle. Mark point of contact with the tailgate window.



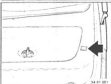
Adjustment Distances in mm:

- A = 600
- B = 275
- C = 645
- D = 120
- E = 60
- F = 60



**61-62 1-0 REMOVING AND INSTALLING /  
REPLACING WATER SPRAY  
NOZZLE FOR TAILGATE  
WINDOW**

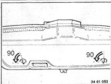
Remove the tailgate trim panel.  
Unclip caps on the screws.



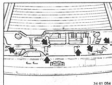
Unclip cap on the screws.



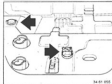
Unscrew screws.



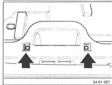
Open the roofbox.



Remove clips.



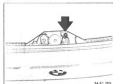
Unscrew left and right screws.



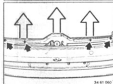
Unscrew screws.  
Unscrew screws of the grip recess plate.



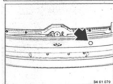
Shut the tailgate.  
Put the cap off of the motor crank.



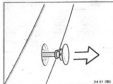
Unscrew screw.



Take trim panel out of the clips carefully.  
Remove the trim panel.



Shut the tailgate.  
Run the water spray nozzle out.

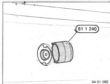


Hold the water spray nozzle tight in run-out position.



Hold tight on telescope rod (1) of the nozzle and unscrew the matched-color cap.

**Important!**  
Don't scratch the painted cap.



Unscrew the slotted nut using Special Tool BT 1 240, "lightening torque".



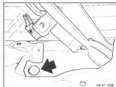
Raise the tailgate.  
Remove the water spray nozzle.



Loosen the hose clamp.  
Remove the water spray nozzle.

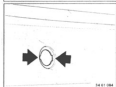
\* Refer to Specifications

61-62/28



**Installation:**

The water spray nozzle is coded mechanically so that it cannot be installed displaced by 180°.



Adjust the water spray nozzle - refer to 61 62 155.  
Fill the washing fluid tank.



61 62 130 REPLACING WASHING FLUID  
TANK FOR TAILGATE WINDOW

Remove the right rear side trim panel  
cover.

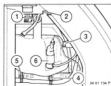
Empty the washing fluid tank.

61 62 130 REMOVING AND INSTALLING /  
REPLACING WASHING FLUID  
PUMP FOR TAILGATE WINDOW

Remove the right rear side trim panel cover.  
Empty the washing fluid tank.



Loosen the hose clamp on spill hose (2).  
Pull the hose off.  
Loosen the hose clamp on filler hose (3).  
Pull the hose off.  
Pull washing fluid pump (6) out of the tank.  
Unscrew screws (1, 4 and 5).



Pull washing fluid pump (6) out of the tank.  
Loosen the hose clamp.  
Pull the hose off.  
Disconnect the plug.  
Check the rubber seal in the washing fluid  
tank for damage, replacing it if necessary.



Remove fluid level switch (7).  
Remove the washing fluid tank.

**Installation:**  
Fit the washing fluid tank.  
Check the function.

**Installation:**  
Fit the washing fluid tank.  
Check the function.



**61 67 ... REPLACING WASHING FLUID  
PUMP FOR HEADLIGHT  
CLEANERS**

Disconnect air supply hose for the  
alternator - see Group 12.  
Remove headlight cover - see Gr. 63.



Empty supply tank.  
Unscrew mounting screws.  
Pull up tank, loosen hose clamp and  
pull off hose.

Remove pump.

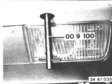
**Important!**  
Hose must not be bent after  
installation.



**61 67 040 ADJUSTING SPRAY JETS  
FOR HEADLIGHT  
CLEANERS**

Spray Contact Point:  
Middle of headlight.

Special Tool 00 9 100



**ADJUSTING SPRAY JETS FOR FRONT  
FOG LAMPS**

Spray Contact Point:  
Middle of fog lamp.

Special Tool 00 9 100

## 61 67 060 Replacing spray nozzle for headlight cleaning system

Release screw and lift off finisher.  
Remove bumper, refer to Group 61.



61 67 013

Detach retaining clip with screwdriver and lift out line from spray nozzle.



61 67 014

Release nut and remove spray nozzle from bumper.

Adjusting spray nozzles:  
Connect BMW Service Tester.  
Simulate S5A status list outputs, and adjust spray direction of nozzles with special tool (X2 09 100) connected. Refer to 61 17 040.

**61 71 004 AIMING WATER SPRAY  
NOZZLES FOR WINDSHIELD**

The water spray should contact the wind-  
shield in the middle of the zone.  
The dimensions are given for LHD models;  
dimensions for RHD models are inverse.

Adjustment distances in mm:

A1 = 215

A2 = 540

B1 = 442

B2 = 245

C1 = 465

C2 = 398

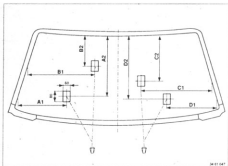
D1 = 330

D2 = 550



32-61 100

Mark the points of contact with pieces of  
tape.  
Adjust the aiming of water spray nozzles  
using Special Tool 00 9 200.



61 71 047

## 61 90 ... TROUBLESHOOTING DRIVE AND CONTROL UNIT FOR ELECTRIC SUN SHADE

## Testing Requirements:

Battery charged.

Fuses okay.

Terminal R switched on continuously.

## Test Step 1:

Remove sun shade switch.

Pull switch off of wire harness plug.

Measure voltage on wire harness plug  no  Repair wires.  
 between pins 5 and 4.

Specification: approx. battery voltage.

yes

Measure voltage on wire harness plug  no  Repair wires.  
 between pins 5 and 1.

Specification: approx. battery voltage.

yes

Measure voltage between pins 5 and 2,  no  Repair wires for switch light,  
 with term. 5B switched on.

Specification: approx. battery voltage.

yes

Continue with Test Step 2.

**Test Step 3:**

Check function of switch.  
Switch removed.

Bridge (short) pins 5 and 4 on wire harness plug. \_\_\_\_\_ no \_\_\_\_\_ Continue with Test Step 4.

Sun shade runs up.

yes

Bridge (short) pins 5 and 1 on wire harness plug. \_\_\_\_\_ no \_\_\_\_\_ Continue with Test Step 4.

Sun shade runs down.

yes

Continue with Test Step 3.

## Test Step 3:

Check switch.  
Switch removed.

Measure resistance between pins 4 and 5. Switch pressed in run up direction.  
Specification: approx. 0.2 ohm.

no → Actual value = ∞ = switch faulty.

yes

Measure resistance between pins 1 and 5. Switch pressed in run down direction.  
Specification: approx. 0.2 ohm.

no → Actual value = ∞ = switch faulty.

yes

Continue with Test Step 4.

**Test Step 4:**

Check leads from switch to 4-pin plug  
on right C-pillar.

Measure resistance of blue wire from  
switch to 4-pin plug.  
Specification: approx. 0.2 ohm.

no

Actual value = ∞ → check wire,  
repairing if necessary.

yes

Measure resistance of black wire from  
switch to 4-pin plug.  
Specification: approx. 0.2 ohm.

no

Actual value = ∞ → check wires for  
damage, repairing if necessary.

yes

Continue with Test Step 5.



# 61-90/5

## Test Step 5:

Check power supply of control unit.

Four-pin plug on C-pillar disconnected.  
Tested on wire harness end and plug.

Approx. battery voltage on red/white  
wire against car ground? no → Check / repair wire and fuse.

yes

Approx. battery voltage between red/  
white wire and brown wire? no → Check / repair ground wire.

yes

Continue with Test Step 6.

**Test Step 6:**

Check control wire from switch to control unit.  
Plug on C-pillar disconnected.

Operate switch in run up direction.  **no** Check wire, repairing if necessary.

Measure voltage on blue wire against car ground.  
Specification: approx. battery voltage.

**yes**

Operate switch in run down direction.  **no** Check wire, repairing if necessary.

Measure voltage on black wire against car ground.  
Specification: approx. battery voltage.

**yes**

Continue with Test Step 7.

## Test Step 7:

Check control unit power supply.

Four-pin plug on C-pillar connected.  
Complete hatch removed.

Pull 5-pin plug off of control unit.  
Measure voltage on wire harness plug  
between pin 5 and car ground.  
Specification: approx. battery voltage.

no

Repair 4-pin plug on C-pillar or wire  
from plug on C-pillar to control unit.

yes

Measure voltage between pins 5 and 3.  
Specification: approx. battery voltage.

no

Repair 4-pin plug on C-pillar or  
ground wire from plug on C-pillar to  
control unit.

yes

Continue with Test Step 8.

**Test Step 8:**

Check control voltage from switch to control unit.

Four-pin plug on C-pillar connected.  
Five-pin plug on control unit disconnected.

Operate switch in open direction.  
Measure voltage on 3-pin plug between pin 1 and car ground.  
Specification: approx. battery voltage.

no

Repair 4-pin plug on C-pillar or wire from plug on C-pillar to control unit.

yes

Operate switch in close direction.  
Measure voltage on 3-pin plug between pin 2 and car ground.  
Specification: approx. battery voltage.

no

Repair 4-pin plug on C-pillar or wire from plug on C-pillar to control unit.

yes

Continue with Test Step 9.

**Test Step 9:**

Check output voltage of control unit.

Five-pin plug connected.

Four-pin control unit plug disconnected.

Measure voltage on 4-pin control unit plug between pin 1 and car ground. Switch operated in run down direction. Specification: approx. battery voltage.

no Control unit faulty.

yes

Measure voltage between pin 2 and car ground. Switch operated in run up direction. Specification: approx. battery voltage.

no Control unit faulty.

yes

Continue with Test Step 10.

# 61-90/10

Test Step 10:

Check drive.

Requirements:

Drive not seized mechanically.

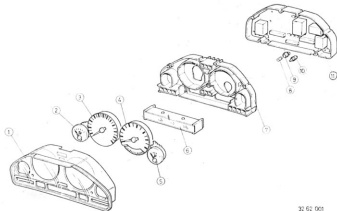
Drive removed from haltrack for testing.

Supply 12 V power to drive direct on the plug.

Drive functions? \_\_\_\_\_ no \_\_\_\_\_ Drive faulty.

## 62 Instruments

	Overview of instrument cluster .....	62-	11/1
62 11 . . .	Instrument cluster – remove and disassemble .....	62-	11/2
070	Coding plug (plug in wiring harness) – replace .....	62-	11/4
070	Coding plug (plug in instrument cluster) – replace .....	62-	11/4
62 16 071	Signal generator – replace .....	62-	16/1
62 99 . . .	Lights in instrument cluster – replace .....	62-	99/1

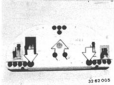


32 62 001

- 1 Instrument carrier
- 2 Fuel gage
- 3 Speedometer
- 4 Tachometer and economy control
- 5 Temperature gage
- 6 LCD module

- 7 System carrier
- 8 Light bulb
- 9 Bulb holder
- 10 Socket lamp
- 11 Baseplate





### 62 11 . . . REMOVING /DISASSEMBLING INSTRUMENT CLUSTER

Remove steering wheel - see 32 33 000.  
Unscrew screws.

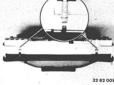
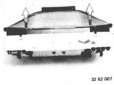
Pry out top of instrument cluster slightly and pull forward up to the steering column.  
Then fold it down completely and remove.

*Note:*  
Place a cloth on the steering column to avoid scratching the glass.

Press up levers next to the plugs and then pull off plugs.

*Installation:*  
Lever must be positioned up when inserting the plugs.

*(High Version)*  
Turn toggle screws 90° counterclockwise and fold up housing with electronic printed circuit board.

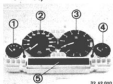


Pull both housing sections apart.

Pull off knobs.

Unscrew screws and pull system carrier off of the instrument carrier.

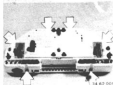
*Note:*  
Make sure that the LCD module does not fall out while pulling off.  
Note spacers on the bottom screws.



34 82 000

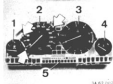
Pull up pertinent gage carefully to replace it.

- 1 Fuel gage
- 2 Speedometer
- 3 Tachometer and economy control
- 4 Temperature gage
- 5 LCD module



34 82 001

(Standard Version)  
Unscrew screws and pull off system carrier on the instrument carrier.



34 82 002

To replace, pull up pertinent instrument carefully.

First loosen screws when removing the speedometer.

- 1 Fuel gage
- 2 Speedometer
- 3 Tachometer and economy control
- 4 Temperature gage
- 5 Range display



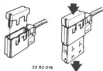
32 82 018

### 62 11 070 REPLACING CODING PLUG (Plug in Wire Harness)

Remove instrument cluster – see  
62 11 006.  
Remove back wall on coding plug  
carrier with a knife.

Insert unlocking tool (part of "coding  
plug" repair kit) in carrier from behind  
and press out the coding plug.

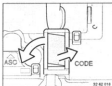
Slide replacement coding plug into  
carrier from front until it engages.  
Lock by sliding the replacement cover  
(orange) on to the carrier from behind.



32 82 018



32 82 017

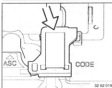


32 82 019

### 62 11 070 REPLACING CODING PLUG (Plug in Instrument Cluster)

Remove instrument cluster – see  
62 11 006.  
Cut out locking frame with a knife and  
pull out coding plug.

Insert new coding plug and clip on  
locking frame.

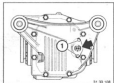


32 82 019

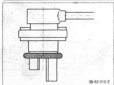


### 63 16 071 REPLACING PULSE SENDER

Compress retainers and disconnect plug.



Unscrew screws (1) and lift out pulse sender.



#### Installation:

Replace O-ring and dip it in or coat it with MLI-90 oil.

Slide O-ring on to speedometer sender shaft only up to slip phase (A).

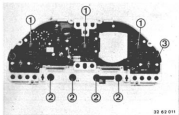
Place sender with O-ring in rear axle and tighten both screws uniformly.  
Tightening torque\*

\* Refer to Specifications

# 62-99/1

## 62 99 ... REPLACING LAMPS IN INSTRUMENT CLUSTER

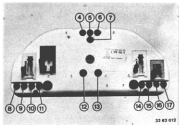
Remove instrument cluster - see 62 11 ...



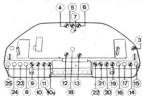
33 62 001

- 1 Lamp for instruments
- 2 Lamp for LCD module
- 3 Fuel reserve
- 4 Right turn signals
- 5 High beams
- 6 Left turn signals
- 7 Turn signals (trailer hitched)
- 8 SRS
- 9 ABS
- 10 Brake fluid level and brake pad wear
- 11 Parking brake
- 12 Engine oil pressure
- 13 Battery charge
- 14 Rear fog lights
- 15 Front fog lamps
- 16 Not used
- 17 Not used
- 18 ASC
- 19 Fuel filter
- 20 Not used
- 21 Preheating } Diesel
- 22 Start engine }
- 23 Fasten seat belts
- 24 Ride level height control
- 25 Electronic absorber control

(Standard Version)



30 62 002



34 62 001

## 63 Lights

63 10 004	Aiming headlights .....	63-	10/1
63 12 120	Left or right double headlight assembly complete with headlight carrier – remove and install .....	63-	12/1
250	Headlight (for high beam), left or right – replace .....	63-	12/2
280	Headlight (for low beam), left or right – replace .....	63-	12/2
63 13 435	Actuator motor for headlight vertical aim control – replace .....	63-	12/3
...	Left or right complete turn signal indicator lamp – remove and install .....	63-	0/1
63 17 ...	Fog light, left or right – replace .....	63-	0/1
63 21 ...	Tail light cluster, left or right – replace .....	63-	21/1
63 25 000	Auxiliary brake light – remove and install or replace .....	63-	25/1
63 26 000	License plate light, left or right – replace .....	63-	0/1
63 99 ...	Bulbs in left or right headlight assembly – replace .....	63-	99/1
315	Bulbs in left or right tail light – replace .....	63-	99/2

# 63-10/1

## 63 10 004 Adjusting headlights

### Test precondition:

Check tire pressure and adjust if necessary. Load down driver's seat with one person (approx. 75 kg). Fuel tank full or additional weight in trunk. Park vehicle on level surface. Align adjusting device to longitudinal axis of vehicle and parallel to parking surface. Adjust marking line to dimension  $e$  (e.g. 12 cm/10 in) on aimer. The scale graduations on the aimer correspond to a gradient in cm at a distance of 10 m. The figure shows a marking line on a vertical wall 10 m away from headlight glass lenses. The same figure is also provided in the adjusting device on an adjustable plate.

### Adjusting procedure:

For vertical adjustment, the light/dark boundary of the low-beam headlight must be aligned with the horizontal marking line of the adjusting device. For lateral adjustment, the linked line must start below the central mark on the horizontal marking line. The center point of the high-beam headlight is adjusted to the central mark.

### Key

$e = H - h = 12$  cm on vertical wall at 10 m distance, or adjustment value on aimer.

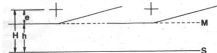
$H$  = Height of headlight center point above parking surface

$h$  = Height of marking line above parking surface

$\pm$  = Central mark = Centre point of headlights

$M$  = Marking line

$S$  = Parking surface



30 63 007



The headlight vertical aim is adjusted with screw (2) accessible from front grille.



Lateral adjustment takes place from the grille compartment (same as E30).



High-beam is adjusted from the front through the grille.

1 = Lateral adjustment

2 = Vertical adjustment



34 83 010

**63 12 120 REMOVING AND INSTALLING  
LEFT OR RIGHT DOUBLE  
HEADLIGHT COMPLETE  
WITH CONSOLE**

Remove radiator grill - see 51 13 000.  
Turn clips 90°, lift out alternator vent  
and pull out headlight cover from  
above.



32 83 010

Pull off plug.



34 83 000

Unscrew screws.



32 83 011

Unscrew screws and remove headlight  
with console.



**63 12 250 REPLACING LEFT OR RIGHT  
HEADLIGHT (HIGH BEAM)**

Remove radiator grill - see 51 13 . . .



Heat plastic sleeves with a hot air blower and lift out reflector.

**Installation:**  
First insert plastic bushings on ball-head pins and then press headlight on bushings.

1 = Lateral adjustment  
2 = Vertical adjustment

**63 12 260 REPLACING LEFT OR RIGHT  
HEADLIGHT (LOW BEAM)**

Remove radiator grill - see 51 13 . . .



Heat plastic sleeves with a hot air blower and lift out reflector.

**Installation:**  
First insert plastic bushings on ball-head pins and then press headlight on bushings.

1 = Lateral adjustment  
2 = Vertical adjustment



**63 12 450/455 Removing and installing  
or replacing headlight  
vertical aim control**

Remove front grille, refer to Group 51 13 ...

Heat up plastic bush with hot air blower and fit out ball head.

**Note:**  
Headlight installed. Shown on removed headlight for better illustration.

Disconnect plug connection.  
Turn actuator motor and fit out.

## 63-13/1



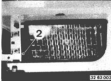
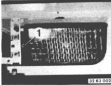
### 63 13 ... REMOVING AND INSTALLING LEFT OR RIGHT FRONT TURN SIGNAL ASSEMBLY

Pull off plug.  
Unscrew screws.



Pull turn signal forward and take out of  
holder on front side panel.

## 63-17/1



### 63 17 ... REPLACING LEFT OR RIGHT FRONT FOG LAMP

Lift out cover of towing eye.

Unscrew screw (1).  
Remove front fog lamp and pull off plug.

Installation:  
First attach front fog lamp on the side and then tighten the screw.

Aiming:  
Aim front fog lamps with a headlight aimer by turning screw (2).



### 63 17 ... REPLACING (ELLIPSOID) LENS FOR FRONT FOG LAMP

Remove front fog lamp - see 63 17 ...  
Unscrew screws and take off lens.



**63 21 . . . . REPLACING LEFT OR RIGHT  
TAIL LIGHT ASSEMBLY**

Turn clips 90° and lift them out.  
Push back side trim panel.



Pull off plugs.  
Unscrew nuts.  
Lift out tail light assembly.



Lift out clips and lift trunk lid trim  
panel.



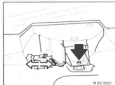
Pull off plugs.  
Unscrew nut.  
Lift out tail lights.



**63 25 000 Removing and installing or replacing auxiliary brake light**

**Lim**

Turn lamp socket (from trunk) and pull out.



**Remove** rear window shelf, refer to 61 48 000  
Disconnect plug connection.  
Release screws and remove brake light.

## 63-26/1



### 63 26 000 REPLACING LEFT OR RIGHT LICENSE PLATE LIGHT

Unscrew screws and remove light.

Pull off plug.

Note:  
Light bulb type\*.



\* See Specifications



34 43 012

### 63 99 . . . REPLACING LIGHT BULBS IN LEFT OR RIGHT HEADLIGHT ASSEMBLY

Turn clips 90°, lift out alternator vent and pull out headlight cover from above.



32 43 002

(High Beam Headlight)  
Turn cap counterclockwise and take off.



32 43 003

Pull off plug.  
Open holder and remove light bulb.

Note:  
Never take hold of light bulb on glass.

Light bulb type\*



34 43 018

(Turn Signal)  
Compress bulb holder on both clips and pull out toward rear.

Note:  
Picture was taken on removed bulb holder.

Light bulb type\*

\* See Specifications



32 43 001

(Low Beam Headlight)  
Turn cap counterclockwise and take off.



32 43 003

Pull off plug.  
Open holder and remove light bulb.

Note:  
Never take hold of light bulb on glass.

Light bulb type\*



34 43 012

Turn and pull out bulb holder toward rear.

(Parking Light)  
Pull light bulb out of holder and install a new light bulb.

Note:  
Light bulb type\*



32 43 009

\* See Specifications





**63 99 315 REPLACING LIGHT BULB(S)  
IN LEFT OR RIGHT TAIL  
LIGHT ASSEMBLY**

Turn clip 90° and lift out.  
Push back side trim panel.

Turn lamp socket counterclockwise  
and lift out lamp socket with light bulb.

- 1 Turn signal
- 2 Stop light
- 3 Tail light

*Note:*  
Pertinent light bulb type will be found  
on the lamp socket.

Lift out clips and lift trunk lid trim  
panel.

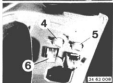
Turn lamp socket counterclockwise  
and lift out lamp socket with light bulb.

- 4 Backup light
- 5 Rear fog light
- 6 Trunk light



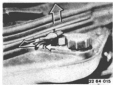
**63 99 451 REPLACING LIGHT BULB  
FOR TRUNK LIGHT**

Pull off lamp cover and lift out light  
bulb.



# 64 Heating and air conditioning

64 11 200	Heating system – remove and install (heating) .....	64- 11/1
205	Heating system – remove and install (air conditioning unit) .....	64- 11/2
207	Heater – replace (IHKA and IHKR) .....	64- 11/4
207	Heater – replace (HR) .....	64- 11/5
210	Heater fan – remove and install or replace .....	64- 11/6
	Splash wall – remove .....	64- 11/6
260	Auxiliary water pump – replace .....	64- 11/8
270	Valve insert for water valve – remove and install or replace .....	64- 11/9
271	Water valve – remove and install .....	64- 11/9
590	Output stage for fan motor – replace (IHKA, IHKR I) .....	64- 11/10
220	Resistance for fan motor – replace (HR, IHKR II and IHKR III) .....	64- 11/11
750	Operating unit – remove and install (heating and air conditioning HR, IHKR) .....	64- 11/11
750	Heater actuation – remove (automatic air conditioning system IHKA) .....	64- 11/12
61 31 551	Switch for fan – replace (heating) .....	64- 11/12
64 11 760	Control unit for heating control – replace (heating) .....	64- 11/12
765	Control unit for rear window – replace (air conditioning control) .....	64- 11/13
765	Control unit for heating and air conditioning – replace (IHKA, IHKR) .....	64- 11/14
775	Fan for interior temperature sensor – replace (only air conditioning control and automatic system) .....	64- 11/15
785	Printed circuit board for heating actuation – replace (only in automatic air conditioning system) .....	64- 11/15
...	LED's – replace .....	64- 11/16
...	One Bowden cable – replace (HR) .....	64- 11/17
...	Actuator motor – replace (IHKA, IHKR) .....	64- 11/17
933	External temperature sensor – replace .....	64- 11/18
939	Temperature sensor for heater, left or right – replace .....	64- 11/19
937	Condenser sensor – replace .....	64- 11/20
64 31 010	Microfilter – replace (heating) .....	64- 31/1
010	Microfilter – replace (air conditioning unit) .....	64- 31/2
	Function of refrigerant circuit (R12) .....	64- 50/1
	Service device (R12) .....	64- 50/2
64 50 009	Air conditioning unit – evacuate and fill (R12) .....	64- 50/3
	Air conditioner – suction-clean (R12) .....	64- 50/4
	Old refrigerator oil (R12) – drain .....	64- 50/4
	Air conditioner (R12) – discharge .....	64- 50/5
	System – fill .....	64- 50/6
	Leaks (R12) – detect .....	64- 50/6
	Refrigerant (R12) – clean .....	64- 50/7
	Troubleshooting using pressure measurement (R12) .....	64- 50/8
	Air conditioner – check efficiency (R12) .....	64- 50/9
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009	Air conditioning system – evacuate and fill (R134a) .....	64- 50/12
	Air conditioner – suction-clean (R134a) .....	64- 50/13
	Old refrigerant – drain .....	64- 50/13
	Air conditioner (R134a) – discharge .....	64- 50/14
	System (R134a) – fill .....	64- 50/15
	Leaks (R134a) – detect .....	64- 50/16
	Refrigerant (R134a) – clean .....	64- 50/17
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64 51 000	Evaporator – clean .....	64- 51/1
	Vehicles with IHKA .....	64- 51/1
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510	Evaporator – remove and install .....	64- 51/4
520	Expansion valve – remove and install or replace .....	64- 51/4
64 52 ...	Valve core – remove and install .....	64- 52/1
020	Compressor for air conditioning system – replace (M20, M30) .....	64- 52/2
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020	Compressor for air conditioning unit – replace (50) .....	64- 52/5
61 31 ...	Temperature switch for compressor – replace .....	64- 52/6
64 52 061	Compressor coupling – replace (M20, M30, M50 with Vee belt) .....	64- 52/7
061	Compressor coupling – replace (on Seiki compressor) .....	64- 52/8
061	Compressor coupling – replace (on Nippondenso compressor) .....	64- 52/9
64 53 510	Dryer flask for air conditioning system – replace .....	64- 53/1
520	Safety pressure switch (high, medium, low pressure switch) – replace .....	64- 53/2
550	Condenser for air conditioning system – remove and install or replace .....	64- 53/3



23 84 010

#### 64 11 206 REMOVING AND INSTALLING HEATER (Heating System)

Pull the profile rubber part up. Disconnect the plug and spill hose at the expansion tank.



23 84 014

524d, 530i and 535i:

Unscrew nuts on left and right sides of the expansion tank and lay the tank aside.

Note:

Don't bend the coolant hose.

520i and 525i:

If applicable, unscrew and lay the intensive cleaning fluid tank aside.



23 84 015

Cut the wire straps off.



23 84 018

Unscrew screws and pull the cover up.



23 84 026

Disconnect heater hoses (1 ... 3).

- 1 Water return
- 2 Water feed, right
- 3 Water feed, left

Important!

Blow air into return pipe (1) of the heater to remove residual water from the heater core.



23 84 020

Unscrew screws.



23 84 021

Unscrew screws and lift the left holder out.



23 84 028

Lift the left and right air ducts out. Remove the heater.

### 64-11-205 REMOVING AND INSTALLING HEATER (Air Conditioning System)

Suck refrigerant out of the air conditioner (refer to page 64-90/4 or operating instructions of pertinent sucking machine). Remove complete dashboard - refer to Group 51.



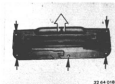
Pull the profile rubber part up. Disconnect the plug and split hose at the expansion tank.

S146d, S30f and S32c:  
Unscrew nuts on left and right sides of the expansion tank and lay the tank aside.

**Note:**  
Don't bend the coolant hose.

S30f and S32c:  
If applicable, unscrew and lay the intensive cleaning fluid tank aside.

Cut the wire straps off.



23 64 018



23 64 026

Unscrew screws and pull the cover up.

Disconnect heater hoses (1 ... 3).

- 1 Water return
- 2 Water feed, right
- 3 Water feed, left

**Important!**  
Blow air into return pipe (1) of the heater to remove residual water from the heater pans.



23 64 031

Unscrew nut.

**Installation:**  
Tightening torque.  
Replace the O-rings.



23 64 032

Unscrew screws.

• Refer to Specifications

64-11/3



Unscrew screws and lift the left holder out.



Lift the left and right air ducts out.  
Remove the heater.



#### 64 11 207 REPLACING HEATER CORE (HKA and HHR)

Remove center console and glovebox - refer to Group 51.  
Disconnect heater hoses (1 ... 3).

- 1 Water return
- 2 Water feed, right
- 3 Water feed, left

#### Important!

Blow air into return pipe (1) of the heater to remove residual water from the heater core.

#### Installation:

Add coolant and bleed the cooling circuit - refer to Group 17.



Unscrew screws.  
Lift the heater pipes out.

#### Installation:

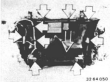
Replace the O-rings.



Lift the heater core out from the right side.



Lift the front ventilation drive motor out and pull plugs off of both heat exchanger sensors.



Unscrew screws, loosen wire straps and clamps, and remove the cover.

#### Installation:

Check for correct seating of the cover.

### 84 11 207 REPLACING HEATER CORE (HR)

Remove the dashboard trim panel at bottom left and the center console - refer to Group 01.



Disconnect heater hoses (1 ... 3).

- 1 Water return
- 2 Water feed, right
- 3 Water feed, left

**Important!**  
Blow air into return pipe (1) of the heater to remove residual water from the heater core.

**Installation:**  
Add coolant and bleed the cooling circuit - refer to Group 17.



Unscrew screws and lift the cover out.



Lift the heater core out.



Unscrew screws and lift the heater pipes out.

**Note:**  
The heater remains installed (heater was removed for this picture only in the interest of better understanding).



### 64 11 210 Removing and installing or replacing fan for heating system

Remove splash wall:  
S241d, S30, S35.  
Disconnect negative terminal (battery).  
Lift up rubber profile, if necessary,  
remove plug and overflow hose on  
expansion tank.

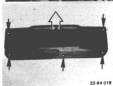


Unfasten nuts on left and right sides of expansion tank and place tank to one side.

Note:  
Do not bend coolant hose.  
S20L, S25L: if necessary, remove container for  
intensive cleaning and place to one side.



Cut off wire straps.



Unfasten screws and lift off cover.



On heating system:  
Remove fan:  
Unfasten clips and remove cover.



Unfasten screws and lift up bracket.



Unfasten fan motor and remove plug.



64-11/7



**On air-conditioning system:**  
Remove splash wall, refer to 64 11 210  
Disconnect Bowden cable and unclip from cover.  
Open plastic tab and remove cover.

**Pull off plugs.**  
Lift off metal tabs and remove fan.

**Installation:**  
The position of the fan motor is predetermined by the shape of the housing.

**Caution!**  
Do not remove or twist fan gears on motor shaft since the motor is balanced in a unit together with the fan gears.



#### 64 11 260 REPLACING ADDITIONAL WATER PUMP

Disconnect heater hoses (2 and 3).

Installation:  
Add coolant and bleed the cooling circuit - refer to Group 17.



Disconnect the additional hose from the additional water pump.



Version with Metal Upper Section:

Disconnect the plug.  
Unscrew nuts and lift the water valve out together with the pump.

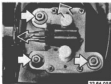


Version with Plastic Upper Section:

Disconnect the plug.  
Unscrew nuts and lift the water valve out together with the pump.



Loosen the clamp and unscrew screw.  
Remove the pump.



#### 64 11 278 REMOVING AND INSTALLING / REPLACING VALVE INSERT FOR WATER VALVE

Only for Version with Metal Upper Section:

Disconnect the plug and unscrew screws.



Unscrew screws and remove the cover.



Lift the complete valve insert out.



#### 64 11 271 REMOVING AND INSTALLING WATER VALVE

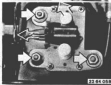
Disconnect heater hoses (2 and 3).

Installation:

Add coolant and bleed the cooling circuit - refer to Group 17.



Disconnect the additional hose from the additional water pump.



Version with Metal Upper Section:

Disconnect the plug.  
Unscrew nuts and lift the water valve out together with the pump.



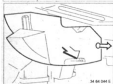
Version with Plastic Upper Section:

Disconnect the plug.  
Unscrew nuts and lift the water valve out together with the pump.

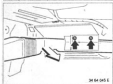


**64 11 200 REPLACING FINAL STAGE FOR BLOWER (BKA and BKR 1)**

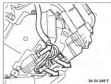
Remove the glovebox - refer to Group 01.  
Unscrew screws.  
Pull the trim panel forward out of the rear clips.



Pull the clip out and remove the cover.



Unscrew screws and lift the air duct out.



Disconnect all plugs on the control unit and final stage, and place the wire harness on top.



Unscrew screws and pull the final stage out.

## 64 11 220 Replace resistance for fan motor. (HR, 84KR 8 and 84KR 8)

on HR:

Remove glovebox and underside trim, refer to Gr. 51 ...



20 84 032

on 84KR 8 and 88:

Unfasten screw and remove trim on left side.



34 84 071

Remove plug.

Force apart clips and lift out resistance.



24 84 076

Reach through radio aperture and press together clips on operating section, lifting out operating section on left side.



20 84 070

Press together counter-support, unclip and lift out inner Bowden cable on operating lever.



34 84 058

Disconnect plug.

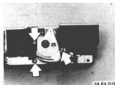
## 64 11 750 Removing and installing operating unit. (Heating and air conditioning control unit HR, 84KR)

Remove radio panel or radio, refer to Gr. 65.

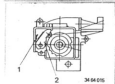


**64 11 750 REMOVING HEATER CONTROLS (Automatic Climate Control (HKA))**

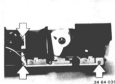
Remove the rear window defogger switch cover.  
Insert a screwdriver through the rear window defogger switch opening and push the lock back.  
Lift the control unit out and disconnect the plugs.



34 64 010



34 64 010



34 64 010

**61 31 551 REPLACING SWITCH FOR BLOWER (Heating System)**

Remove the heater controls - refer to 64 11 750.  
Unscrew screws and remove the blower switch.

**Important!**  
Ensure that the catch lever (2) and spring (3) do not slide out while removing the blower switch.

**64 11 760 REPLACING CONTROL UNIT FOR HEATING REGULATION (Heating System)**

Remove the heater controls - refer to 64 11 750.  
Remove the blower switch - refer to 64 31 551 above.  
Unscrew screws and remove the heating regulation control unit.



32 64 000

**64 11 765 Replacing control unit for rear window (air-conditioning control)**

Remove heating actuator, refer to 64 11 750  
To remove the fan, slightly raise the clips on the cover and remove lid.



33 64 003

Remove plug and lift out fan assembly.



34 64 025

Slightly raise clips on cable cover and lift off cover.



34 64 031

Remove operating knobs.



34 64 030

Press together clips and lift out cover.



34 64 033

Unfasten screws and lift out control unit together with Bowden cable unit.



20 64 140 2

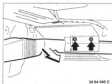
### 64 11 765 Replacing control unit for heating and air-conditioning control (38KA, 38CK)

Remove glovebox, refer to Group 51: unfasten screw and remove trim from left and right sides.



21 64 080

Remove plug from left side of control unit.



24 64 040 2



24 64 040 3

Remove all plugs on control unit and output stage and place wiring harness on top.



24 64 040 4

Unscrew bolts.  
Remove trim by pulling away from rear clip.



24 64 040 5

Press down clips and lift control unit out on right side.

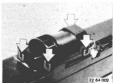
**Caution!**  
The new 38CK control unit must be coded! refer to Information Diagnosis/Encoding



24 64 040 6

Remove clip and lift out cover.

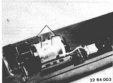




22-84-000

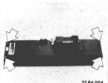
**64 11 775 REPLACING FAN FOR INSIDE TEMPERATURE SENSOR**  
(Only Air Conditioning System and Automatic Climate Control)

Remove the heater controls - refer to 64 11 750.  
To remove the sensor fan, lift the clips on the cover slightly and remove the cover.



22-84-001

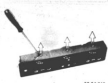
Disconnect the plug and remove the sensor fan.



22-84-004

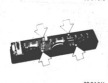
**64 11 780 REPLACING PRINTED CIRCUIT BOARD FOR HEATER CONTROLS**  
(Only Automatic Climate Control)

Remove the heater controls - refer to 64 11 750.  
Remove the sensor fan - refer to 64 11 775.  
Unscrew screws and remove the cover.



22-84-010

Push the retainer back on the pin and lift the pin out.



22-84-011

Unscrew screws and remove the printed circuit board.

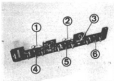
**Note:**  
Push the microswitch back while removing.



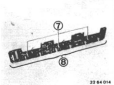
22-84-012

Simply pull control wheels or buttons out upwards to replace them.

**Installation:**  
Ensure correct position of the control wheel to the potentiometer.



22 84 013



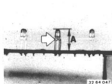
22 84 014

#### Printed Circuit Board Connections:

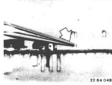
- 1 Microswitch - temperature (driver)
- 2 Microswitch - fan
- 3 Inside temperature sensor
- 4 Potentiometer - temperature (driver)
- 5 Potentiometer - fan
- 6 Potentiometer - temperature (front passenger)

7 Light bulbs

8 Light emitting diodes



22 84 047



22 84 048

#### 64 11 ... REPLACING LIGHT EMITTING DIODES

Check the installed direction and depth before unsoldering. Cathode is marked with a tab.

Distance A = approx. 12 mm

Make sure of good carrying off of heat (via pliers or tweezers) while unsoldering and soldering.



#### 64 11 ... REPLACING ONE CABLE (HR)

Remove the radio opening mask or radio - refer to Group 65.  
Squeeze the clip and lift the control panel out to the left.



Squeeze the clip of the concerned cable, lift it out of the counterholder and disconnect from the heater controls.



Remove the glovebox and bottom trim panel - refer to Group 51.  
Lift the internal cable out of the clip.  
Squeeze clip (1) and press the cable out of the holder.

The cables are adjusted automatically with a special clip by moving the control left to the left or right stop.

1 = Installed direction of internal cable  
2 = Special clip  
3 = Moved direction of internal cable



Note:  
Cables and levers are marked with different colors.

1 = red  
2 = blue  
3 = green  
4 = yellow



#### 64 11 ... REPLACING DRIVE MOTOR (HRK and HRK2)

Disconnect the plug.  
Press down on the retainer and lift the motor out.

Installation:  
Check for correct location of the stop.



32 64 015



33 64 016



33 64 017



33 64 018

### 64 11 833 REPLACING OUTSIDE TEMPERATURE SENSOR

324td, 326f and 329i:  
Disconnect the battery ground lead.  
Pull the profile rubber part up.  
Disconnect the plug and split nose at the expansion tank.

Unscrew nuts on left and right sides of the expansion tank and lay it aside.

**Note:**  
Don't bend the coolant hose.

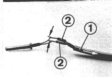
32Q and 325i:  
If applicable, unscrew and lay the intensive cleaning fluid tank aside.

Cut the wire straps off.

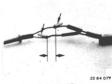
Unscrew screws and pull the cover up.



33 64 019



31 64 016



33 64 017



33 64 018

Cut through the wires about 3 cm away from the sensor and remove about 4 cm of the insulating hose.

Install shrink-fit hose (1) and insulating hose (2) on the wires.  
Connect the ends of wires from the new sensor with the wires.

Solder the ends of wires.

**Note:**  
Ensure that the soldered points are offset (stagger) or short circuit.

Push insulating hoses over the soldered points and shrink by heating with a hot air blower.

64-11/19



Push the shrink-fit boot over the wires and shrink by heating with a hot air blower.

64 11 026 REPLACING TEMPERATURE  
SENSOR FOR LEFT OR RIGHT  
HEATER CORE

Remove the center console - refer to Qr. 51.



Disconnect the plug and tilt the temperature sensor out.

**Note:**  
Shown in picture on a removed heater for better understanding.

64-11/20



**64 11 037 REPLACING EVAPORATOR  
TEMPERATURE SENSOR**

Unscrew screw and pull panel off of  
the center console.



Disconnect the plug and fit the evaporator  
temperature sensor out.

**Note:**

Shown in picture on a removed heater for  
better understanding.



64-31-041-1

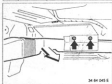
#### 64-31-010 REPLACING MICROFILTER (Heating System)

Remove the glovebox - refer to Group 31.  
Unscrew screws.  
Pull the trim panel forward out of the rear clip.



64-31-044-1

Pull the clip out and remove the cover.



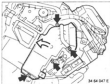
64-31-043-1

Unscrew screws and lift the air duct out.



64-31-046-1

Pull all plugs off of the control unit and  
place the wire harness on top.



64-31-047-1

Unscrew screws and remove the cover.



64-31-048-1

Pull the microfilter out.

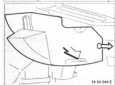
#### Note:

In P81D models the microfilter is split in length so that it can be pulled on to the steering column.

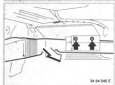


#### 64-31-015 REPLACING MICROFILTER (Air Conditioning System)

Remove the glovebox - refer to Group 51.  
Unscrew screws.  
Pull the trim panel forward out of the rear clip.



Pull the clip out and remove the cover.



Unscrew screws and fit the air duct out.



Pull all plugs off of the control unit and place the wire harness on top.

With Automatic Climate Control:  
Also pull plug off of the final stage.



With Automatic Climate Control:  
Unscrew screws and pull the final stage out.



Unscrew screw (1), turn holder (2) about 90° and remove the cover.



Pull the microfilter out.

Note:  
In RHD models the microfilter is split in length so that it can be pulled on to the steering column.



## DESCRIPTION OF REFRIGERANT CIRCUIT FUNCTION R 12)

After switching on the air conditioner the refrigerant circuit is activated in that the solenoid clutch receives current. This produces positive connection between the pulley and armature clutch plate and the compressor is driven.

The compressor, a major component of the system, increases the pressure of refrigerant vapors. Refrigerant vapors are drawn in on the intake side of the compressor. The refrigerant is compressed, whereby the vapor temperature rises. The high pressure vapors pass via a high pressure pipe to a condenser located on the face of the engine radiator. The hot refrigerant is cooled off by wind from driving and an additional fan. Refrigerant vapors condense and turn into liquid when reaching the dew point temperature. The high pressurized refrigerant is delivered to the drier. The drier removes moisture from the refrigerant and sometimes also acids, but the latter only in the amount of 5 to 10 grams for R 12 or 10 to 16 grams for R 134 a systems.

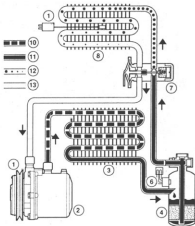
Refrigerant continues on to the expansion valve from the drier. The expansion valve makes up a point of separation in the system. The expansion valve meters the refrigerant. Volume of refrigerant is controlled by the temperature and pressure at the outlet of the evaporator. The refrigerant evaporates and cools off considerably in the evaporator. The fresh air - respectively circulated air - flowing past the cold evaporator, with blower support, is cooled accordingly and delivered into the passenger compartment via nozzles.

The evaporated refrigerant is drawn in again by the compressor, whereby the refrigerant circuit is completed.

Moisture from the fresh or circulated air, flowing past the evaporator, condenses on the cold fins. The condensation on the evaporator is discharged outdoors via rubber hoses on the transmission tunnel and could cause a puddle of up to 200 ml underneath a parked car depending on the atmospheric moisture. This is completely normal and does not indicate a leak.

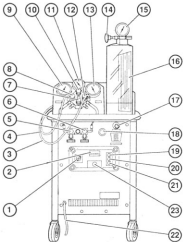
It could happen that the condensation water freezes on the fins of the evaporator. An evaporator temperature sensor prevents the formation of ice in that it switches the compressor off at 2° C. The compressor is switched on again with a reversing range of 2° C. A safety switch (high or low pressure presostat) switches the air conditioner off when pressure is too high or too low. This prevents damage to the air conditioner. A medium pressure presostat switches the second stage of an additional fan on at a pressure of about 18 bar.

In this manner the compressor is not switched off and on so often, as the maximum high pressure is not reached so fast.



- 1 Solenoid clutch
- 2 Compressor
- 3 Condenser
- 4 Drier
- 6 Safety switches (high/low pressure presostats)

- 7 Expansion valve
- 8 Evaporator
- 9 Temperature switch
- 10 High pressure gas
- 11 High pressure liquid
- 12 Low pressure liquid
- 13 Low pressure gas



SERVICE STATION (R 12)

- 1 Main switch
- 2 Operation hour counter
- 3 High pressure hose
- 4 Low pressure hose
- 5 Refrigerant inlet valve
- 6 Refrigerant outlet valve
- 7 Vacuum pump valve
- 8 Low pressure valve
- 9 Low pressure gage
- 10 Vacuum meter valve
- 11 Vacuum meter
- 12 High pressure valve
- 13 High pressure gage
- 14 Charging cylinder valve
- 15 Charging cylinder high pressure gage
- 16 Charging cylinder with scale
- 17 Refrigerant drain valve
- 18 Moisture indicator
- 19 Control lamp - red
- 20 Control lamp - yellow
- 21 Control lamp - green
- 22 Power supply cord
- 23 Charging cylinder push button switch

## 64 50 009 DISCHARGING AND CHARGING AIR CONDITIONER (R 12)

## Safety Precautions for Handling Refrigerant:

The air conditioning system is filled with safety refrigerant R12 or R134a gradually as from the beginning of 1993.

**Important!**

R 12 and R 134a must never be mixed as even the most minute mixed quantities would lead to decomposition in the system. Consequently systems for R 12 may only be filled with R 12 and vice versa. Different refrigerant oils are used for both systems and must also not be mixed. Vehicles with R 134a systems as well as parts for replacements are marked. The service station for R 134a is green and marked R 134a. The service station for R 12 is blue.

R12 is very dangerous for the environment because of fluorochlorohydrocarbon (FCH) and must be drawn out, cleaned and refilled in a system with a service station. R12 does not contain FCH, but it should also be drawn out, cleaned and refilled with a service station.

Although these refrigerants are non-toxic, non-flammable and non-explosive in any mixing ratio with air at normal temperature, there must be conformance with safety precautions.

Avoid any contact with liquid or gas refrigerants. Wear goggles and gloves when working on the refrigerant circuit. Refrigerant on the skin will cause frostbite. Wash off concerned parts of body with cold water thoroughly. If refrigerant gets in the eyes, also rinse out with water and then contact a physician immediately. R12 is heavier than air and could, if it gets into the atmosphere in spite of working with a service station, lead to asphyxiation - especially in working pits - which would not be readily noticed since the gas has no color or odor. Turn on available extraction systems.

Absolute cleanliness and as thorough as possible discharging of the air conditioner (at least 30 minutes extraction of moisture from the refrigerant circuit) are required for perfect air conditioner operation.

R12 and even more so R 134 a take on moisture very quickly. Plug opened pipes, condenser, evaporator, compressor or drier with plugs immediately.

**Important!**

Also in this case the plugs must not be mixed up and should be stored separately.

When replacing parts the plugs should be removed only immediately before connection of pipes.

In case of warranty claims, old parts must be fitted with plugs to be able to determine the cause of damage.

If an air conditioner is completely drained because of leaks or accident, the drier must always be replaced as too much moisture will have entered the unit.

There should never be welding on a filled air conditioner or in the close vicinity. There could be danger of an explosion because of the excessive pressure produced when refrigerant is heated.

In addition, refrigerants decompose at high temperature or when exposed to open flames. Decomposed products are injurious to health. Store full refrigerant cylinders that they are not subjected to direct sunshine or other sources of heat (max. 45° C).

**Important!**

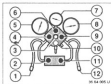
After each refilling check protective caps of charging valves for handtight fit. They serve as additional seals.

The following procedures describe sucking, discharging and charging air conditioners with help of a BECU service station from the company "Behr". Refer to pertinent operating instructions for changes in the service station design.

Before starting any operation, the service station must be brought into basic setting. **Basic setting** means: All shut-off valves of the service station and both hose valves must be closed.

**Important!**

When using a different service station, refer to the pertinent operating instructions.

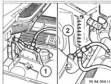


#### SUCKING REFRIGERANT (R 12) OUT OF AIR CONDITIONER

##### Description of pressure gage assembly

- 1 Low pressure hose (blue)
- 2 Refrigerant inlet valve
- 3 Sight glass
- 4 Low pressure valve
- 5 Low pressure gage
- 6 Vacuum meter valve
- 7 Vacuum meter
- 8 High pressure gage
- 9 High pressure valve
- 10 Refrigerant pump valve
- 11 Refrigerant outlet valve
- 12 High pressure hose (red)

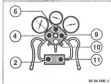
SA 64 504 L1



SA 64 504 L1

Bring service station into basic setting (refer to page 64-50/3).

Connect service station to vehicle.  
Connect blue hose to low pressure side (thick pipe).  
Connect red hose to high pressure side (thin pipe).

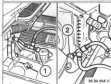


SA 64 504 L1

First suck out the service station to ensure that there is no residual refrigerant in the service station.

Open valves (2, 4 and 9) and start the sucking operation.

After the service station has been switched off, the red control lamp lights up, write or note the volume of refrigerant in the charging cylinder (information is required for fault finding to evaluate the system).

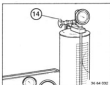


SA 64 504 L1

Open valves (1 and 2) on vehicle.

This causes refrigerant to flow into the service station and the red control lamp goes out.

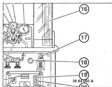
Operate start button again and suck refrigerant out of the entire system.  
The air conditioner systems of the vehicle is empty when the service station is again switched off.



SA 64 503

Bring service station into basic setting (refer to page 64-50/3).

Open valve (14) slowly until refrigerant flows into the service station. Start the sucking operation. Refrigerant is circulated (cleaned) in the service station. In this manner the complete refrigerant is converted into gas which had entered the oil trap. In liquid state during the sucking out operation. Close valve (14) again after about 10 minutes. The present volume can be read on the charging cylinder after the unit has switched off. Open valve (14) slowly until the red control lamp goes out.



SA 64 504

Drain old refrigerant oil (R 12).

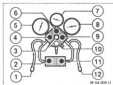
Open valve (17) slowly about 1/4 turn and drain the sucked out refrigerant oil into the measuring cup.

If there is no more oil in the oil trap, it will close automatically.  
Measure amount of drained refrigerant oil. Suck out system again afterwards and bring into basic setting.

##### Important!

If the oil running out foams very strongly, there is still liquid refrigerant in the oil. In this case the refrigerant must be cleaned again.

Never reuse drained refrigerant oil and dispose it as special refuse.  
The same amount of new refrigerant oil plus 10 cm<sup>3</sup> must be filled in the air conditioner after discharging.

**DISCHARGING AIR CONDITIONER:**

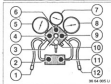
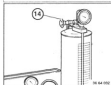
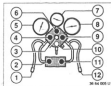
Bring service station into basic setting (refer to page 64-50/3).  
 Open valves (4, 6, 8 and 10).  
 Switch on vacuum pump. This only discharges the battery of pressure gauges. Maximum possible vacuum is reached after about 1 to 2 minutes. The needle of vacuum meter (7) must then be above or below the zero. This is strongly depends on current weather conditions. In high pressure weather zones the maximum possible vacuum will be lower than in deep pressure weather zones. The battery of pressure gauges has a leak if the zero point is not approximately reached or vacuum is not built up.

Close valve (10) and switch off vacuum pump after reaching maximum vacuum. The battery of pressure gauges does not leak if the pressure does not rise after about 1 to 2 minutes.

Afterwards set needle of vacuum meter (7) to zero (with adjusting screw on top of the vacuum meter) and close valve (6).

Open valves (1 and 2) slowly.  
 Then discharge the entire system briefly.

Close valve (5) and switch vacuum pump off.  
 Unscrew high pressure hose from pressure gauge assembly and connect to the supplied suction pipe.



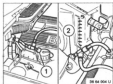
Switch on vacuum pump and using the suction pipe suck the previously measured amount of new refrigerant oil out of the measuring cup into the system. Switch off vacuum pump as soon as the total amount of oil is in the system, in order to avoid sucking in "moist" air. Reconnect high pressure hose to connection (12) and open valve (5). Switch on vacuum pump again and discharge system at least 30 minutes.

The previously sucked out refrigerant can be cleaned simultaneously to the discharging process.  
 This requires opening valve (14) slightly (1 to 1 1/2 turns) and switching on suction.

**Important!**

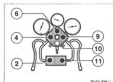
Stop the cleaning process after about 10 to 15 minutes. Discharging still runs.

After discharging, close valve (10) and switch off vacuum pump.  
 There is no longer moisture in the system if the needle of vacuum meter (7) remains at 0 over a period of at least 3 to 5 minutes. However, if the needle rises in small jumps this is indication of water drops which are evaporating and causing the pressure to rise. In such a case discharging must be continued.



## Filling the system:

Prerequisites for correct charging are sufficient refrigerant as well as pressure in the charging cylinder of at least 8 to 11 bar. If there is not enough refrigerant in the charging cylinder, this must be compensated by sucking refrigerant out of the pressure cylinder. Insufficient pressure can be increased by switching on the charging cylinder heater or by cleaning the refrigerant.



30 64 028 U

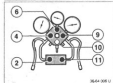
Adjust service station to basic setting.  
Open valves (4 and 5).

Open valve (11) briefly and close again so that refrigerant can flow up to the filler hoses.



30 64 029

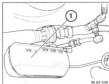
Read charging cylinder level (1), subtract specified fill quantity\* from this value and mark new volume level with a rubber band (2).



30 64 028 U

Open valves (1) and (2) on the filling hoses.  
Then open valve (11) again and observe the level in the charging cylinder. If there is an approximately correct filling volume\* in the system, close and open valve (11) in steps until the correct volume is in the system.

\* Refer to Technical Data



30 64 029

## Detecting Leaks (R 12):

In the vacuum leak test it is possible for leaks not to be detected at loose pipe connections because these might be pressed against the sealing surface, thus preventing them from leaking. Consequently leak detection is absolutely essential after filling the system. If leaks are determined while discharging the system, the system must be filled with about 200 to 300 grams of refrigerant.

Afterwards calibrate leak detector (1)\* according to the operating instructions.

Check air conditioner for leaks with leak detector (1).

Tighten loose pipes and mark location of leaks (paintline).

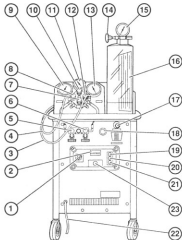
Suck out refrigerant, eliminate leaks and discharge again. If no leakage is detected, the system must be filled with the specified volume of refrigerant<sup>†</sup>. Run the engine, adjust the air-conditioning unit as for the A/C performance measurement to ensure that the pressure in the system rises to approx. 12 to 15 bar. Then switch off the engine and repeat the leak examination (starting on the pressure side).

## Note:

Always check before on assumed point of leakage on pipes and components as refrigerant is heavier than air.

\* Refer to Technical Data

† Refer to Workshop Equipment and Planning Documentaries



M 64 500

#### CLEANING REFRIGERANT (R 12):

Bring service station into basic setting (refer to page 64-50/3).

Open valve (14) on charging cylinder slightly (1 to 1 and 1/2 turns).

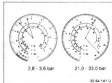
Switch on button and let cleaning run at least ten minutes.

Close valve (14) and wait until the compressor is automatically switched off.

In the cleaning process the refrigerant is pumped through a drier integrated in the service station where it is dried and cleaned to remove particles of dirt. A moisture indicator (19) shows the refrigerant's moisture content. Cleaning time should not exceed 10 to 15 minutes. If the moisture indicator still shows moisture after this time, the drier is saturated and must be replaced (refer to operating instructions of the service station). Afterwards the refrigerant must be cleaned again.

If the compressor is switched off during the cleaning process, the reasons for this could be as follows:

1. Insufficient/excessive pressure in intake of the compressor.  
This is applicable, if the charging cylinder valve is opened too little or too much.  
The intake pressure can be read on pressure gauge (8) during the cleaning phase by opening valve (5).
2. Excessive pressure (> 17 bar) in charging cylinder.  
This means non-condensable gas in the circuit. In this case close valve (14) and discharge the non-condensable gas via the Schrader valve on the charging cylinder. If there is no gas in the charging cylinder and the pressure is still too high, wait until the refrigerant in the charging cylinder has reached ambient temperature. Afterwards switch on cleaning again until the moisture indicator no longer indicates moisture. Then close valve (14) and wait until the compressor switches off automatically.



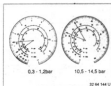
#### TROUBLESHOOTING BY MEASURING PRESSURE (R 12)

Connect service station to car and open both valves on the charging hoses. Adjust air conditioner on the control unit in such a manner as described for measuring air conditioner efficiency (refer to page 64-50/9). Run engine of car at approx. 3,000 rpm.

High inlet and outlet pressures indicate an overcharged system, contaminated condenser or defective additional fan.

#### Remedy:

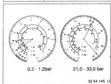
Suck out refrigerant, discharge and recharge system, clean condenser and check additional fan, replacing if necessary.



Low inlet pressure and normal outlet pressure indicate an insufficient charged volume or restricted low pressure side of the system.

#### Remedy:

1. Check whether evaporator has ice; then check evaporator sensor.
2. Suck out and measure refrigerant. If sucked out volume is approximately the same as specified charge volume\*, check flow of expansion valve, then discharge and recharge system.



Low inlet pressure and high outlet pressure indicate a restricted high pressure side.

#### Remedy:

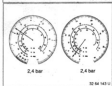
Check condenser, drier and expansion valve.



High inlet pressure and normal outlet pressure indicate a defective compressor.

#### Remedy:

Replace compressor.



Compressor does not run with equal inlet and outlet pressures.

#### Remedy:

If liling-up protector has switched the compressor off, check evaporator sensor or check power supply to the magnetic coupling (refer to Electric/Electronic Test for Group 64).

Otherwise check magnetic coupling mechanically (slips).



**CHECKING AIR CONDITIONER EFFICIENCY (R 12)**

The following conditions must be fulfilled for this test.

1. Modic or BMW Service Tester
2. Thermometer
3. Intake air temperature of about 50° C

**Ref. Point 1:**

Connect Modic or BMW Service Tester to car and have the evaporator temperature displayed.

**Ref. Point 2:**

Install temperature sensor approx. 5 cm below the car's roof liner at height of B-pillar and locate the display unit outside.

**Ref. Point 3:**

Set heater to maximum heating. Switch on and set air conditioner to circulated air mode. Set car's blower to speed step 4 or maximum speed. Shut all windows and doors. Start and run engine at approx. 2,000 rpm. Use a pedal prop to accelerate in cars with SM, DIE or M60 engine.

Afterwards heat up the passenger compartment to about 50° C. The compressor must no longer switch off. Now measure the passenger compartment temperature and evaporator temperature and subtract the values from each other. There should be a difference of about 40° C.

If this difference in temperature is not reached, connect the service station. Measure the low pressure and high pressure and compare with troubleshooting by means of a pressure test (refer to page 64-50/8).

## DESCRIPTION OF REFRIGERANT CIRCUIT FUNCTION (R 134a)

After switching on the air conditioner the refrigerant circuit is activated in that the magnetic coupling receives current. This produces positive connection between the pulley and armature clutch plate and the compressor is driven.

The compressor, a major component of the system, increases the pressure of refrigerant vapors. Refrigerant vapors are drawn in on the intake side of the compressor. The refrigerant is compressed, whereby the vapor temperature rises. The high pressure vapors pass via a high pressure pipe to a condenser located on the face of the engine radiator. The hot refrigerant is cooled off by wind from driving and an additional fan. Refrigerant vapors condense and turn into liquid when reaching the dew point temperature. The high pressurized refrigerant is delivered to the drier. The drier removes moisture from the refrigerant and sometimes also acids, but the latter only in the amount of 5 to 10 grams in R 12 systems or 10 to 16 grams in R 134a systems.

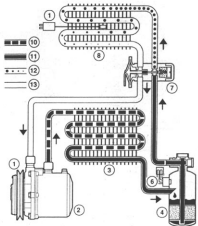
Refrigerant continues on to the expansion valve from the drier. The expansion valve makes up a point of separation in the system. The expansion valve meters the refrigerant. Volume of refrigerant is controlled by the temperature and pressure at the outlet of the evaporator. The refrigerant evaporates and cools off considerably in the evaporator. The fresh air - respectively circulated air - flowing past the cold evaporator, with driver support, is cooled accordingly and delivered into the passenger compartment via nozzles.

The evaporated refrigerant is drawn in again by the compressor, whereby the refrigerant circuit is completed.

Moisture from the fresh or circulated air, flowing past the evaporator, condenses on the cold fins. The condensation on the evaporator is discharged outdoors via rubber hoses on the transmission tunnel and (should) cause a puddle of up to 200 ml underneath a parked car depending on the atmospheric moisture. This is completely normal and does not indicate a leak.

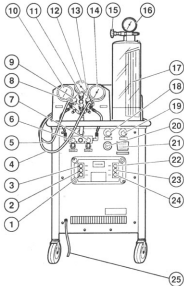
It could happen that the condensation water freezes on the fins of the evaporator. An evaporator temperature sensor prevents the formation of ice in that it switches the compressor off at 2° C. The compressor is switched on again with a reversing range of 2° C. A safety switch (high or low pressure presostat) switches the air conditioner off when pressure is too high or too low. This prevents damage to the air conditioner. A medium pressure presostat switches the second stage of an additional fan on at a pressure of about 18 bar.

In this manner the compressor is not switched off and on so often, as the maximum high pressure is not reached so fast.



- 1 Magnetic coupling
- 2 Compressor
- 3 Condenser
- 4 Drier
- 5 Safety switches (high and low pressure presostats)

- 7 Expansion valve
- 8 Evaporator
- 9 Temperature switch
- 10 High pressure gas
- 11 High pressure liquid
- 12 Low pressure liquid
- 13 Low pressure gas



## SERVICE STATION (SECU 134)

- 1 Main switch
- 2 SUCKING/CLEANING switch
- 3 SUCKING end control lamp
- 4 High pressure hose
- 5 Low pressure hose
- 6 Refrigerant inlet valve
- 7 Refrigerant outlet valve
- 8 Vacuum pump valve
- 9 Low pressure valve
- 10 Low pressure gage
- 11 Vacuum meter valve
- 12 Vacuum meter
- 13 High pressure valve
- 14 High pressure gage
- 15 Charging cylinder valve
- 16 Charging cylinder high pressure gage
- 17 Charging cylinder with scale
- 18 Refrigerant oil filter valve
- 19 Refrigerant oil drain valve
- 20 Moisture indicator
- 21 Measuring cup
- 22 VACUUM PUMP switch
- 23 Red control lamp
- 24 HEATER switch
- 25 Power cord

## 84 M 009 DISCHARGING AND CHARGING AIR CONDITIONER (R 134a)

### Safety Precautions for Handling Refrigerant:

The air conditioning system is filled with safety refrigerant R12 or R134a gradually as from the beginning of 1991.

#### Important!

R 12 and R 134a must never be mixed as even the most minute mixed quantities would lead to decomposition in the system. Consequently systems for R 12 may only be filled with R 12 and vice versa. Different refrigerant oils are used for both systems and must also not be mixed. Vehicles with R 134a systems as well as parts for replacements are marked. The service station for R 134a is green and marked R 134a. The service station for R 12 is blue.

R12 is very dangerous for the environment because of fluorochlorohydrocarbons (FCH) and must be drawn out, cleaned and refilled in a system with a service station. R134a does not contain FCH, but it should also be drawn out, cleaned and refilled with a service station.

Although these refrigerants are non-toxic, non-flammable and non-explosive in any mixing ratio with air at normal temperatures, there must be conformance with safety precautions.

Avoid any contact with liquid or gas refrigerants. Wear goggles and gloves when working on the refrigerant circuit. Refrigerant on the skin will cause frostbite. Wash off concerned parts of body with cold water thoroughly. If refrigerant gets in the eyes, also rinse out with water and then contact a physician immediately. R12 is heavier than air and could, if it gets into the atmosphere in spite of working with a service station, lead to asphyxiation – especially in working pits – which would not be readily noticed since the gas has no color or odor. Turn on available extraction systems.

Absolute cleanliness and as thorough as possible discharging of the air conditioner (at least 30 minutes extraction of moisture from the refrigerant inlet) are required for perfect air condition re-assembly.

R12 and even more so R 134a take on moisture very quickly. Plug opened pipes, condensers, evaporator, compressor or drier with plugs immediately.

#### Important!

Also in this case the plugs must not be mixed up and should be stored separately.

When replacing parts the plugs should be removed only immediately before connection of pipes.

In case of warranty claims, old parts must be fitted with plugs to be able to determine the cause of damage.

If an air conditioner is completely drained because of leaks or accident, the drier must always be replaced as too much moisture will have entered the unit.

There should never be welding on a filled air conditioner or in the close vicinity. There could be danger of an explosion because of the excessive pressure produced when refrigerant is heated. In addition, refrigerants decompose at high temperature or when exposed to open flame. Decomposed products are injurious to health. Store full refrigerant cylinders that they are not subjected to direct sunshine or other sources of heat (max. 45° C).

#### Important!

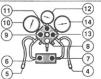
After each refilling check protective caps of charging valves for handtight fit. They serve as additional seals.

The following procedures describe sucking, discharging and charging air conditioners with help of a SECU 134 service station from the company "Behr". Refer to pertinent operating instructions for changes in the service station design.

Prior to starting any operation, the service station must be brought into basic setting. **Basic setting means:** All shut-off valves of the service station and both hose valves must be closed.

#### Important!

When using a different service station, refer to the pertinent operating instructions.

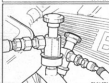


#### SUCKING REFRIGERANT OUT OF AIR CONDITIONER (R 134a)

##### Description of pressure gage assembly

- 4 High pressure hose (red)
- 5 Low pressure hose (blue)
- 6 Refrigerant inlet valve
- 7 Refrigerant outlet valve
- 8 Vacuum pump valve
- 9 Low pressure valve
- 10 Low pressure gage
- 11 Vacuum inlet valve
- 12 Vacuum motor
- 13 High pressure valve
- 14 High pressure gage

30 64 027



30 64 028

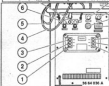
Bring service station into basic setting (refer to page 64-50/12).

Connect service station to vehicle.

Connect blue hose to low pressure side (thick pipe).

Connect red hose to high pressure side (thin pipe).

The quick-action couplings are different in diameter to avoid mixing them up.

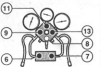


30 64 029

Switch on service station using main switch (1).

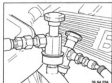
Switch on suction after white control lamp (2) has gone out. Suction is switched off automatically if entire refrigerant has been sucked out of the service station.

Write down or note volume in the charging cylinder.



30 64 026

Open valves (6, 9 and 13). This causes refrigerant to flow into the service station and the white control lamp goes out.



30 64 024

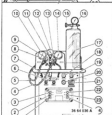
Open valves on the quick-action couplings. Start suction again and suck out entire system until the unit is switched off again.



30 64 025

Bring service station into basic setting (refer to page 64-50/12).

Open valve (12) slowly until refrigerant gas flows into the service station. Switch on suction. Refrigerant is circulated (distilled) into gas which had entered the oil trap in liquid state during suction. Close valve (12) again after about 10 minutes. Read volume in charging cylinder from scale (17) after unit has switched off and write down or note value (required for evaluation of system during troubleshooting).



30 64 026

Drain old refrigerant oil.

Open valve (12) slowly until white control lamp (2) goes out. Open valve (12) slowly about 1/4 turn and drain the sucked out refrigerant oil into the measuring cup.

If there is no more oil in the oil trap, it will close automatically.

Measure amount of drained refrigerant oil. Close valve (12) again.

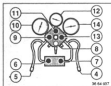
Suck out service station again afterwards.

#### Important!

If the oil running out foams very strongly, there is still liquid refrigerant in the oil. In this case the refrigerant must be cleaned again.

Never reuse drained refrigerant oil and dispose it as special refuse.

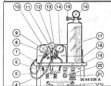
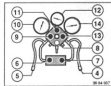
After discharging the system must again be filled with the same amount of new refrigerant oil plus 10 cm<sup>3</sup>.

**DISCHARGING AIR CONDITIONER R 134a)**

Bring service station into basic setting (refer to page 64-50/12).  
Open valves (8, 9, 11 and 13).  
Switch on vacuum pump. This only discharges the pressure gauge assembly and charging hoses up to the quick-action couplings.

Maximum possible vacuum is reached after about 1 to 2 minutes. The needle of vacuum meter (12) must then be above or below the zero. This strongly depends on current weather conditions. In high pressure weather zones the maximum possible vacuum will be lower than in deep pressure weather zones. The pressure gauge assembly or charging hoses leak if the zero point is not approximately reached or vacuum is not built up.

Close valve (8) and switch off vacuum pump after reaching maximum vacuum. Pressure gauge assembly and charging hoses do not leak if the pressure does not rise after about 1 to 2 minutes. Afterwards set needle of vacuum meter (12) to zero (with adjusting screw on top of the vacuum meter) and close valve (11).

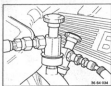


If the pressure has risen, open valve (8).  
Switch on suction again until the unit is again switched off.  
Close valve (8) and open valves (8 and 11).  
Switch on vacuum pump and discharge the air conditioner at least 15 minutes.

Refrigerant in the service station can be cleaned simultaneously to the discharging process. This is only necessary when moisture indicator (20) indicates moisture. This requires opening valve (18) slightly (1 to 1 1/2 turns) and switching on suction.

**Important!**

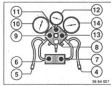
Stop the cleaning process after about 10 to 15 minutes by closing valve (18).  
Discharging still runs.  
If indicator (20) still indicates moisture after the cleaning period, discharging must also be interrupted and the drier in the service station replaced (refer to operating instructions of service station).



Open the valves slowly.

**Important!**

If this causes a rise in pressure in gauges (10 and 14), the system must be sucked out again. Pressure can only rise if the air conditioner is not opened, but only refrigerant was sucked out for troubleshooting. The pressure rise is caused by conversion of small residual amounts of liquid refrigerant into gas in the system.



After discharging, close valve (8) and switch off vacuum pump.

There is no longer moisture in the system if the needle of vacuum meter (12) remains at 0 over a period of at least 2 to 3 minutes. However, if the needle rises in small jumps this is indication of moisture which is evaporating and causing the pressure to rise. In such a case discharging must be continued.

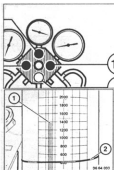
The system leaks if the needle rises continuously. In this case the leak must be eliminated (refer to detecting leaks on page 64-50/16).

## CHARGING SYSTEM (R 134a)

Requirements for correct charging are a sufficient amount of refrigerant and pressure in the charging cylinder of at least 9 to 11 bar. If there is not enough refrigerant in the charging cylinder, this must be compensated by sucking refrigerant out of the pressure cylinder. Insufficient pressure can be increased by switching on the charging cylinder heater. Check whether the refrigerant is dry on the moisture indicator. If not, clean the refrigerant - refer to page 64-50/17.

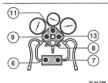
**Important!**

Charging must be carried out exclusively via the red high pressure hose.



Bring the service station into basic setting (refer to page 64-50/12).  
Open valve (7) briefly and close again so that refrigerant can reach the red charging hose.

Read charging cylinder volume (1), subtract the specified volume\* from this value and mark this charging volume level with rubber band (2).



64 50 000

Open valve on red charging hose. Then open valve (7) again and observe charging volume level in the charging cylinder.

If the system has approximately the specified charge volume\*, close and open valve (7) in brief steps until the system has the specified charge volume.

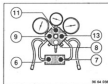
Close valve on red charging hose. Open valves (6, 9 and 13) and switch on suction.

This sucks refrigerant out of the hoses and service station.

If the unit switches off, charging has been completed and charging hoses can be disconnected from the vehicle.

**Installation:**

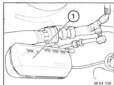
Insert sealing caps in the vehicle's connectors again.



64 50 000

\* Refer to Specifications

\* Refer to Specifications



#### Detecting Leaks (R 134a)

In the vacuum leak test it is possible for leaks not to be detected at loose pipe connections as these might be pressed against the sealing surface, thus preventing them from leaking. Consequently leak detection is absolutely essential after charging the system. If leaks are detected while draining the system, the system must be filled with about 250 to 300 grams of refrigerant.

Afterwards calibrate leak detector (1)\* according to the operating instructions.

Check air conditioner for leaks with leak detector (1).

Tighten loose pipes and mark location of leaks (hairline).

Suck out refrigerant, eliminate leaks and discharge again. If no leaks are detected, the system should be filled with the specified volume of refrigerant\*. Run the engine and adjust the air-conditioning unit as per the A/C performance measurement so that the pressure in the system rises to approx. 12 to 15 bar. Then switch off the engine and repeat the leak examination (starting on the pressure side).

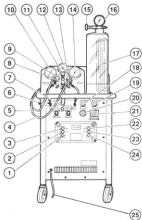
#### Note:

Always check below each assumed point of leakage on pipes and components because refrigerant is heavier than air.

\* Refer to Technical Data

\*\* Refer to Workshop Equipment Planning Documentation





24 04 024

**CLEANING REFRIGERANT (R 134a)**

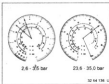
Bring service station into basic setting (refer to page 64-50/12).  
Open valve (15) on charging cylinder slightly (1 to 1 1/2 turns).  
Switch on suction (2) and let cleaning run at least ten minutes.

Close valve (15) and wait until control lamp (3) lights up and the compressor is automatically switched off.

In the cleaning process the refrigerant is pumped through a drier integrated in the service station where it is dried and cleaned to remove particles of dirt. A moisture indicator (20) shows the refrigerant's moisture content. Cleaning time should not exceed 10 to 15 minutes. If the moisture indicator still shows moisture after this time, the drier is saturated and must be replaced (refer to operating instructions of the service station). Afterwards the refrigerant must be cleaned again.

If the compressor is switched off during the cleaning process, the reasons for this could be as follows:

1. Insufficient/excessive pressure in intake of the compressor. This is applicable, if the charging cylinder valve is opened too little or too much.
2. Excessive pressure (> 17 bar) in charging cylinder. This means non-condensable gas in the circuit. In this case close valve (15) and discharge the non-condensable gas via the Schrader valve on the charging cylinder or wait until refrigerant in the charging cylinder has reached ambient temperature. Afterwards switch on suction until there is no longer refrigerant in the service station and the compressor is switched off automatically.



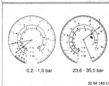
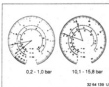
#### TROUBLESHOOTING BY MEASURING PRESSURE (R 134a)

Connect service station to car and open both valves on the charging hoses. Adjust air conditioner on the control unit in such a manner as described for measuring air conditioner efficiency (refer to page 54-50/5). Run engine of car at approx. 2,000 rpm.

High inlet and outlet pressures indicate an overcharged system, contaminated condenser or defective additional fan.

#### Remedy:

Suck out refrigerant, discharge and re-charge system, clean condenser and check additional fan, replacing if necessary.



Low inlet pressure and normal outlet pressure indicate an insufficient charged volume or restricted low pressure side of the system.

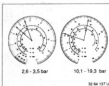
#### Remedy:

1. Check whether evaporator has ice; then check evaporator sensor.
2. Suck out and measure refrigerant. If sucked out volume is approximately the same as specified charge volume\*, check type of expansion valve; then discharge and recharge system.

Low inlet pressure and high outlet pressure indicate a restricted high pressure side.

#### Remedy:

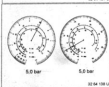
Check condenser, drier and expansion valve.



High inlet pressure and normal outlet pressure indicate a defective compressor.

#### Remedy:

Replace compressor.



Compressor does not run with equal inlet and outlet pressures.

#### Remedy:

If fusing-up protector has switched the compressor off, check evaporator sensor or check power supply to the magnetic coupling (refer to Electric/Electronic Test for Group 64). Otherwise check magnetic coupling mechanism (slips).

\* Refer to Specifications

## CHECKING AIR CONDITIONER EFFICIENCY (R 134a)

The following conditions must be fulfilled for this test.

1. Modic or BMW Service Tester
2. Thermometer
3. Intake air temperature of about 50° C

### Ref. Point 1:

Connect Modic or BMW Service Tester to car and have the evaporator temperature displayed.

### Ref. Point 2:

Install temperature sensor approx. 5 cm below the car's roof liner at height of B-pillar and locate the display unit outside.

### Ref. Point 3:

Set heater to maximum heating. Switch on and set air conditioner to circulated air mode. Set car's blower to speed step 4 or maximum speed. Shut all windows and doors. Start and run engine at approx. 2,000 rpm.

Afterwards heat up the passenger compartment to about 50° C. The compressor must no longer switch off. Now measure the passenger compartment temperature and evaporator temperature and subtract the values from each other. There should be a difference of about 40° C.

If this difference in temperature is not reached, connect the service station. Measure the low pressure and high pressure and compare with troubleshooting by means of a pressure test (refer to page 64-50/18).

## 64 51 000 CLEANING EVAPORATOR

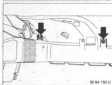
It could happen that bacteria settle on the fins of the evaporator. This is caused by the condensation water which collects on the fins after switching the compressor off. There could temporarily be an unpleasant odor in the car when the compressor is switched on again. Consequently the evaporator should be cleaned at regular intervals.

**Note:**

It is recommended to drive the car to a washbay and do the cleaning there, as the water will run out through the drain holes in the transmission tunnel.

**Cars with BIKA:**

Remove the glovebox - refer to Group 51. Unscrew screws and remove the trim panel. If applicable, disconnect the loudspeaker plugs.



Unscrew screws and fold the air duct down.



Disconnect wires from the control unit and final stage.

**Alert:**

The heater remains installed and was only removed in this picture for better understanding.



Unscrew screws and pull the final stage out.

**Important!**

Cars with Microfilter:  
Unscrew cover, pull the microfilter out and reinstall the cover.



Slide Special Tool 64 1 200 into the final stage opening and secure.



Apply about 1 liter of 5 per cent cleaning solution\* onto the evaporator by moving the spray nozzle pipe back and forth uniformly.

\* Refer to Service Information

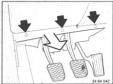
64-51/2



Cars with 104R:  
Remove plugs.  
Unscrew screws.



Remove trim panel.



Unscrew screws.  
Remove trim panel.



Disconnect plug, spread clips apart and lift out resistor.



Clip Special Tool 64 1 213 in opening of the resistor.



Unclip and pull out control unit.



Unscrew screw (1), turn lever (2) about 90° and remove cover.



If applicable, pull out microfilter.



Slide Special Tool 64 1 210 into opening and secure.



Apply about 1 liter of 5 per cent cleaning solution\* on to evaporator by moving the spray nozzle pipe back and forth uniformly.

Leave the cleaning solution on the evaporator for about 10 to 15 minutes.

Afterwards rinse off the evaporator with a large amount of water (at least 6 liters of water).

64 51 510 Removing and installing evaporator

64 51 520 Removing and installing or replacing expansion valve

Drain refrigerant out of air-conditioning unit with the help of a service unit (refer to 64 52 008 or relevant operating manual for Service Station).

Lift up rubber profile.  
Remove plug and overflow hose from expansion tank.

Unfasten nuts on left and right sides of expansion tank and place container to one side.

Note:  
Do not bend coolant hose.

Cut wire straps off.  
Tie up wiring harness and, if necessary, carefully bend down fuel lines.



33 64 018



33 64 045

Unfasten screws and remove cover plate by lifting upwards.

Unfasten nut (1), screws (2) and stud bolt (3).

Installation:  
Replace O-rings.

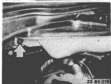
Caution!  
Stud bolt is secured with Loctite 270, if necessary, preheat with hot air blower.

Remove glovebox, refer to 51 15 360.  
Unfasten screws.  
Remove trim by pulling forwards out of rear clip.

Lift out clip and remove cover.



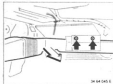
33 64 016



33 64 018



33 64 019



34 64 045 E

Unfasten screws and lift out ventilation duct.



34 64 046 E

Remove all plugs from control unit and lift up wiring harness.

On the automatic air conditioning system, also remove the plug from the output stage.



34 64 047 E

Unfasten screws and remove cover.



34 64 050 E

Unfasten screw and lift out twin tube.

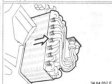
Installation:  
Replace O-rings.



34 64 051 E

Unfasten screws and lift out expansion valve.

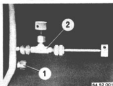
Installation:  
Replace O-rings.



34 64 052 E

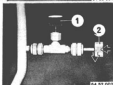
Lift out evaporator.



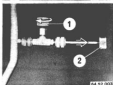


#### 64 52 ... REMOVING AND INSTALLING VALVE CORE

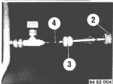
Unscrew cap (1).  
Screw valve core remove (2) on.



Open valve (1).  
Unscrew the valve core with valve turner (2).



Pull valve turner (2) back together with the valve core.  
Shut valve (1).



Unscrew coupling nut (3) and remove valve turner (2) together with valve core (4).



Installation:  
Refrigerant-proof valve cores can be recognized on the transparent seal (1).

730 84 204

## 64 52 000 REPLACING AC COMPRESSOR (M20, M30, M35)

Suck refrigerant out of the air conditioner with help of a service station (refer to 64 52 000 or operating instructions supplied with pertinent service station).

Loosen hose clamp and unscrew nut.  
Remove air cleaner.

**Important!**  
Check that air cleaner is in correct installed position.

Cut through wire strap and disconnect plug.

Unscrew suction hose (1) and pressure hose (2).  
Insert plugs into open connections without delay.

**Installation:**  
Check O-rings, replacing them if necessary. Tightening torque\*.

\* Refer to Specifications



32 54 024



32 54 024

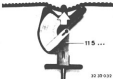
Lift the cap and unscrew splash guard.  
Loosen screw (1).

Loosen screw (1).  
Unscrew adjusting screw (2).  
Remove drive belt, then unscrew screw (1) completely and remove compressor.

**Important!**  
Remove plugs from connections only briefly before connecting the hoses.  
Check for sufficient amount of oil\* in the compressor.  
Discharge, charge and check the air conditioner for leaks after finishing installation.

Check and, if necessary, correct the drive belt tension using Special Tool 11 5 ...

**Note:**  
The pulling hook must be applied on the tip of a tooth.



32 52 0 00

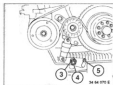
\* Refer to Specifications

### 64 52 000 REPLACING AC COMPRESSOR (MM)

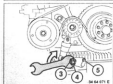
Remove engine splash guard.  
Suck refrigerant out of air conditioner (refer to 64 50 000 or operating instructions supplied with pertinent service station).



Unscrew bolts.  
Disconnect plug.  
Remove compressor downwards.



Loosen nuts (4 and 5) on tensioning roller and take ribbed drive belt off of compressor.



Installation:  
Turn tensioning roller on hexagon (3) as far as stop, tighten nut (5) first and then nut (4).

Tightening torque = 24 Nm.



Unscrew couplings and remove suction and pressure pipes.

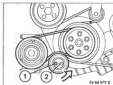
Installation:  
Replace O-rings.

#### 64 52 000 REPLACING AC COMPRESSOR (MS1)

Remove engine splash guard.  
Suck refrigerant out of air conditioner (refer to 64 00 000 or operating instructions supplied with pertinent service station).



Unscrew bolts.  
Disconnect plug.  
Remove compressor downwards.



Loosen bolt (1) and take drive belt off of compressor.



Installation:  
Loosen bolt (1) enough that tensioning roller can turn without friction.  
Insert torque wrench into hexagon socket (2) and apply torque\* against drive belt, hold and tighten bolt (1).

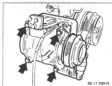


Unscrew couplings and remove suction and pressure pipes.

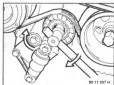
\* Refer to Specifications

#### 64 52 020 REPLACING AC COMPRESSOR (MSD)

Remove engine splash guard.  
Suck refrigerant out of air conditioner (refer to 64 50 026 or operating instructions supplied with pertinent service station).

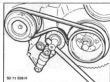


Unscrew bolts.  
Disconnect plug.  
Remove compressor downwards.



#### Slackening Drive Belt:

Insert hexagon socket key into bolt of tensioning roller.  
Turning slowly in clockwise direction will compress the tensioning element and loosen the drive belt.



#### Installation:

Check arrangement of ribbed drive belt.  
When installing the ribbed drive belt, compress the tensioning element again and install belt.  
Check for correct seating in grooves.



Unscrew couplings and remove suction and pressure pipes.



#### 51 31 ... REPLACING TEMPERATURE SWITCH FOR COMPRESSOR

Loosen the hose clamp and unscrew the nut.  
Remove the air cleaner.

**Important!**  
Check that the air cleaner is in correct installed position.



Cut through the wire strap and disconnect the plug.



Remove the temperature switch.

**Note:**  
Shown on removed compressor, as it would not be visible because of the pressure hose in installed state.

### 64 52 061 Replacing compressor coupling (MG, MG0, MG0 with Vee belt)

Remove splash guard.  
Unfasten Vee belt.



30 84 047



30 84 048

Grip drive plate with special tool 64 5 020 and unfasten screw (1).

Screw extractor tool 64 5 010 into the drive plate. Turn screw (1) in opposite direction to compressor shaft and remove drive plate.

#### Caution!

When removing, ensure that shims do not drop down.

Bend up leg on retaining tab, unfasten grooved nut with special tool 64 1 110 and remove pulley wheel.



30 84 049



30 84 040

Unscrew bolts. Disconnect cable tie and plug connection. Remove magnetic coil.

#### Installation:

Check for correct clearance A (0.5...0.8) between drive plate and pulley wheel disc. If necessary, adjust with shims.

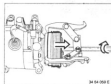
### 64 52 061 Replacing compressor coupling (for 565L compressor)

Remove compressor, refer to 64 52 020.

Grip drive plate with special tool 64 5 020 and unfasten screw (1). Remove drive plate.

**Installation:**  
Check correct clearance A (0.5 ... 0.8 mm) between drive plate and pulley wheel. If necessary, adjust with shims.

Expand retaining ring and remove.



34 54 059 E

Remove pulley wheel with standard three-claw extractor tool.

**Caution!**

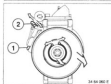
Apply pulling claws only on joint between solenoid coil and pulley as otherwise pulley could be damaged.



34 54 061 E

**Installation:**

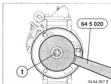
Drive pulley on to bearing set carefully using special tool 33 1 020.



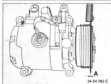
34 54 058 E

Expand retaining ring and remove.

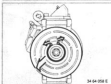
Unscrew bolt (1).  
Disconnect plug connection (2) and remove solenoid coil.



34 54 057 E

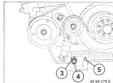


34 54 052 E



34 54 058 E





#### 64 52 001 Replace compressor coupling (on Hitapdenso compressor)

Unscrew and remove splash guard.

Loosen nuts (4 and 5) on the tensioning roller and remove toothed pulley belt from compressor.



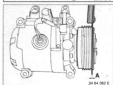
#### Installation:

Turn tensioning roller on hex head (3) until tight, then tighten nut (5) followed by nut (4).

Tightening torque = 24 Nm



Grip drive plate with special tool 64 5 090, unscrew central screw and remove drive plate.

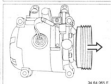


#### Installation:

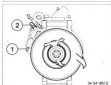
Check correct clearance A (0.5 ... 0.8 mm) between drive plate and pulley wheel. If necessary, adjust with shims.



Expand retaining ring.



Remove pulley wheel.



Expand retaining ring and remove. Unscrew bolt (1). Disconnect plug (2). Remove solenoid coil.

### 64 53 510 Replacing dryer flask for air conditioner

Removing container for windshield washing unit, refer to Gr. 61 61 ...

Drain off refrigerant from air-conditioning unit, refer to 64 50 009 or operating manual for relevant Service Station)

Disconnect or separate plug.

Unfasten nut and disconnect lines.

Installation:  
Tightening torque\*  
Check O-rings and replace if necessary.

Unfasten screws and remove dryer flask.

\* Refer to Technical Data



Remove safety pressure switch and screw onto new dryer flask.

Installation:  
Tightening torque\*  
Install with screw cement HWB No. 61 22 9 407 144.

1 = High pressure switch  
2 = Medium pressure switch  
3 = Low pressure switch

Installation:  
Do not remove sealing plug from connections until shortly before connecting up the lines. Check that oil quantity\* is sufficient. After successful installation, evacuate air-conditioning unit, charge and check for leaks.



From 2/88, only 1 pressure switch with three functions is fitted. (low pressure, high pressure, medium pressure)





32 64 031

#### 64 53 520 Replacing safety high pressure switch (high, medium, low pressure switch)

Remove switch for windshield wash system, refer to Gr. 61 61 ...  
 Drain refrigerant off from air conditioning unit (refer to 64 50 009 or operating manual for relevant Service Station)

Remove or disconnect plug on safety pressure switch which is to be replaced.

- 1 Plug on high pressure switch
- 2 Plug on medium pressure switch
- 3 Plug on low pressure switch



32 64 031

Remove safety pressure switch.  
 Immediately seal all open connections with blind plugs.

- 1 Plug on high pressure switch
- 2 Plug on medium pressure switch
- 3 Plug on low pressure switch



32 64 031

#### Installation:

Tightening torque\*

Fit switch with screw securing device HWB No. 61 22 8 407 144.

After successful installation - evacuate and fill air conditioner and check for leaks.



32 64 031

On version with a multi-function pressure switch (high, medium and low pressure), disconnect plug connection (1) and unscrew switch.

## 64 53 500 Removing and installing or replacing condenser for air-conditioning unit

Remove bumper and BMW kidney grille.  
Drain refrigerant off from air conditioning unit (refer to 64 50 000 or operating manual for relevant Service Station).



Unfasten nuts, disconnect plug connection.



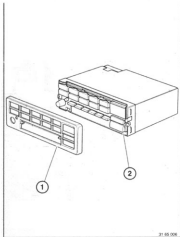
Unscrew bolts.

Lift up condenser and remove by pulling downwards.

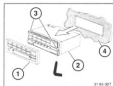
# 65 Radio and special equipment

65 11 030	Radio (Business) – remove and install or replace .....	65-	11/1
030	Radio (Bavaria C II or C Reverse II) .....	65-	11/2
030	Radio "Bavaria Elektronik" – remove and install or replace .....	65-	11/3
030	Radio "Becker Mexiko Elektronik" – remove and install or replace .....	65-	11/4
030	Radio "Bavaria Mono Digital" – remove and install or replace .....	65-	11/5
65 12 000	Front loudspeakers – remove and install or replace (footwell, left) .....	65-	12/1
000	Front loudspeakers – remove and install or replace (footwell, right) .....	65-	12/1
020	Rear loudspeakers – remove and install or replace (left or right) .....	65-	12/2
65 13 050	Loudspeakers – remove and install or replace (in instrument panel) .....	65-	13/1
070	Loudspeakers, left or right – remove and install or replace (in mirror triangle) .....	65-	13/1
	Fault diagnosis for Bavaria radio C Professional .....	65-	99/1
	Connecting wires – check .....	65-	99/1
	Pin assignments .....	65-	99/2
	Overview of defect codes .....	65-	99/3
	Defect code 01 .....	65-	99/4
	Defect code 02 .....	65-	99/5
	Defect code 03 .....	65-	99/6
	Defect code 04 .....	65-	99/7
	Defect code 05 .....	65-	99/8
	Defect code 06 .....	65-	99/8
	Defect code 07 .....	65-	99/9
	Defect code 08 .....	65-	99/9
	Defect code 09 .....	66-	99/10
	Defect code 10 .....	65-	99/11
	Test mode for BMW car radio (Bavaria C III) .....	65-	99/12
	Test mode for BMW car radio (Bavaria C Reverse III) .....	65-	99/13
	Test mode for BMW car radio (Bavaria C Reverse RDS) .....	65-	99/14
	Test mode for BMW car radio (Bavaria C PROFESSIONAL) .....	65-	99/15
	Test mode for BMW car radio (Bavaria C PROFESSIONAL RDS) .....	65-	99/17
	List for use of adapter leads between radio and vehicle wiring harness .....	65-	99/19
	Bavaria radios – troubleshoot .....	65-	99/20
84 11 510	Eject box – remove and install .....		refer to HG-84

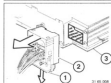
## 65 11 030 REMOVING AND INSTALLING OR REPLACING RADIO (Business)



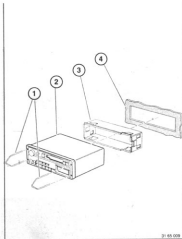
- 1 Mask
- 2 Radio



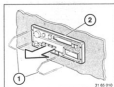
Pull off mask (1).  
Unscrew screws (3) on left and right sides.  
Pull radio (2) out of radio opening.



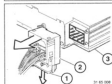
Pull out lock (1) and disconnect plug (2)  
on radio (3).



- 1 Unlocking hooks
- 2 Radio
- 3 Radio console
- 4 Radio opening

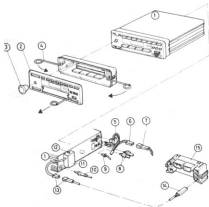


Press unlocking hooks (1) into radio on left and right sides.  
Put out radio carefully with hooks.



Pull out lock (1) and disconnect plug (3) on radio (2).

## 1.3 Radio "Bevera Electronic"



- |   |  |
|---|--|
| 1 Radio   | 8 Plug for speakers                                |
| 2 Mask  | 9 Plug for automatic antenna                       |
| 3 Knob  | 10 Plug for antenna                                |
| 4 Unlocking hook for radio removal                | 11 Adapter for noise dependent loudness regulation |
| 5 Plug for B+ and ground                          | 12 Switch for 11                                   |
| 6 Adapter   | 13 Plug for 11                                     |
| 7 Plug for power supply to electronics and lights | 14 Plug for 11                                     |
|   | 15 Plug receptacle on instrument carrier           |



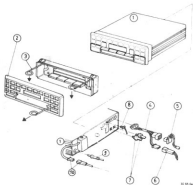
Pull off knob.  
Take off mask carefully with the unlocking hook.  
Note:  
Only attach hook on mask.

Push back clamps on left and right sides with unlocking hooks and pull out radio.



# 65-11/4

## 1.4 Radio "Becker Mexico Electronic"



- 1 Radio
- 2 Control panel
- 3 Unlocking hook for radio removal
- 4 Adapter
- 5 Plug for B+ and ground

- 6 Plug for power supply to electronics and lights
- 7 Plug for speakers
- 8 Plug for automatic antenna
- 9 Plug for antenna
- 10 Connection for speed dependent loudness regulation

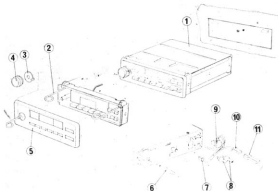


Take off control panel with unlocking hooks (3).

*Note:*

Control panel fits very tight.

Push back clamps on left and right sides with unlocking hooks and pull out radio.



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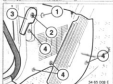
- 1- Radio
- 2- Unlocking hook for removal
- 3- Sound control
- 4- Knob
- 5- Mask
- 6- Antenna plug

- 7- Power connection for automatic antenna
- 8- Speaker plug
- 9- Plug for B+ and ground
- 10- Adapter
- 11- Plug for power supply (term. 30)



**65 12 000 REMOVING AND INSTALLING OR REPLACING FRONT LOUD-SPEAKER (Footwell - Left)**

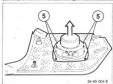
Pull off door seal.



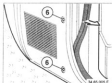
Pry out cap (1), unscrew screw (2) and pull off lever (3).



Turn retainers (4) about 90° and lift out side trim panel.

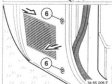


Pull off plug, unscrew nuts (5) and remove loudspeaker.

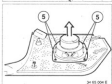


**65 12 000 REMOVING AND INSTALLING OR REPLACING FRONT LOUD-SPEAKER (Footwell - Right)**

Pull off door seal and turn retainers (5) about 90°.



Lift side trim panel in area of retainers and pull out towards rear.

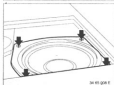


Pull off plug, unscrew nuts (5) and remove loudspeaker.



**65 12 020 REMOVING AND INSTALLING  
OR REPLACING REAR LOUD-  
SPEAKER (Left or Right)**

**Pry out loudspeaker mask.**



**Unscrew screws and lift loudspeaker.**



**Pull off plug and remove loudspeaker  
completely.**



**65-13-050 REMOVING AND INSTALLING  
OR REPLACING LOUD-  
SPEAKER (in Dashboard)**

Pry out cover (1).



Unscrew screws and lift loudspeaker.



Pull off plug and remove loudspeaker  
completely.



**65-13-070 REMOVING AND INSTALLING  
OR REPLACING LOUD-  
SPEAKER (in Mirror Triangle)**

Unscrew screw.  
Unclip loudspeaker at top and fold forward.



Pull off plug and remove loudspeaker.

## TROUBLESHOOTING BAVARIA C PROFESSIONAL RADIO

Bavaria C4 is available in two versions, with or without CD player. Controls and receiver are separated from each other for both versions. Controls are located in the dashboard as always, while the receiver and when applicable CD player are in the trunk. Because of this a connecting wire is required from the controls to the receiver and CD player, which later in the course of troubleshooting will be referred to as V1 (without CD player) or V2 (with CD player). Wires V1 and V2 only differ in length, because connecting wire V1 leads from the controls to the CD player first and from there together with V3 to the receiver.

## Checking Connecting Wires

Connecting wires must be checked for continuity and short circuit.

## Procedures:

Unplug connecting wire on both ends.

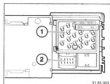
Connect a short circuit bridge (Special Tool ..... ) on 10-pin Eto plug of V1 or V2 wire to the controls.

Measure at the other end with a multimeter and test points, whether there is continuity between the various pins.

Remove short circuit bridge.

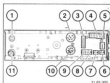
There should no longer be continuity between pins.

Proceed accordingly with the V3 wire. Only a different short circuit bridge (Special Tool ..... ) is required.



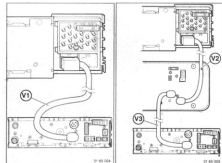
## Connections for Control End:

- 1 Plug, 10-pin (power supply)
- 2 Plug, 10-pin (to receiver with connecting wire V1 or to CD player with connecting wire V2)
- 3 Fuse = 3 amperes



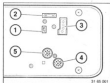
## Connections for Receiver End:

- 1 Ant. div.
- 2 Remote control
- 3 Fuse = 5 amperes
- 4 Plug, 4-pin (power supply)
- 5 Plug, 1-pin (electric antenna)
- 6 Loudspeaker front left
- 7 Loudspeaker front right
- 8 Loudspeaker rear left
- 9 Loudspeaker rear right
- 10 Plug, 8-pin (from controls with connecting wire V1 or from CD player with connecting wire V2)
- 11 Antenna connection



Routing of Wires without CD Player

Routing of Wires with CD Player



## Connections for CD Player End:

- 1 Plug, 1-pin (12 V control outlet)
- 2 Fuse = 3 amperes
- 3 Plug (power supply)
- 4 Plug (to receiver with connecting wire V3)
- 5 Plug (from controls with connecting wire V2)

## PIN CONNECTIONS

## 17 Pin Plug (Controls)

Pin	0	LAC-I bus
Pin	1..3	Not used
Pin	4	Telephone mute
Pin	5 Term. 75	(connected pos.)
Pin	6	Not used
Pin	7	DAC-I bus
Pin	8	Not used
Pin	9 Term. 30	(permanent pos.)
Pin	10 GAL	Speedometer output
Pin	11 - 12	Not used
Pin	13 Term. 58g	Light
Pin	14	Not used
Pin	15 Term. 31	(ground)
Pin	16	Autom. antenna

## 4Pin Plug (Receiver)

Pin	1 Term. 31	(ground)
Pin	2 Term. 75	(connected pos.)
Pin	3	Not used
Pin	4 Term. 30	(permanent pos.)

## 4 Pin Plug (CD Player)

Pin	1 Term. 31	(ground)
Pin	2	Not used
Pin	3	Not used
Pin	4 Term. 30	(permanent pos.)

## FAULT SURVEY

The objective of troubleshooting is the systematic determination of sources of fault. Possible fault conditions are listed in this fault survey. Certain procedures are specified for each fault condition, which lead to the source of fault by answering a question with YES or NO.

The connection of all plugs on different components should be checked for tight fit prior to troubleshooting.

Cannot be switched on, i.e. radio has no reaction	_____	Fault 01
Cannot be switched on, i.e. only click heard from control unit (no sound, display remains dark)	_____	Fault 02
Cannot be switched off	_____	Replace control unit
No sound from one or more loudspeakers with radio, cassette or CD player on (displays are visible)	_____	Fault 03
No sound from one or both channels only with cassette on	_____	Fault 04
Sound quality disturbed with cassette on	_____	Fault 05
Faulty cassette drive such as IN/OUT, fast forward or reverse	_____	Fault 06
Radio reception faulty	_____	Fault 07
CD player rejection button for CD magazine does not work	_____	Fault 08
CD player failure	_____	Fault 09
Faulty reaction to loudness or sound quality adjustments	_____	Fault 10
Faulty displays (undefined symbols displayed)	_____	Replace control unit



## FAULT 01

Radio control (be switched on) - no reaction

Is there battery voltage on 17 pin plug  
in control unit between pins 9 and 15? no → Repair break in positive or ground wire.

yes

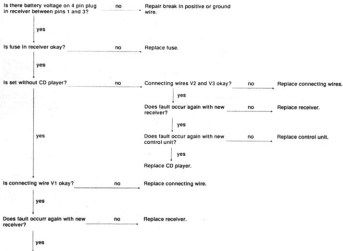
Is fuse in control unit okay? no → Replace fuse.

yes

Replace control unit.

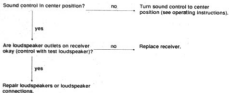
## FAULT 62

Radio does not switch on. Click heard in control unit, but no sound and display is dark.



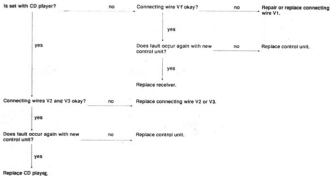
**FAULT 03**

No sound from one or more loudspeakers with radio, cassette player or CD player on (displays shown in display)



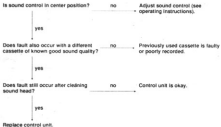
## FAULT 64

Cassette player on - no sound from one or both channels



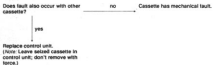
FAULT 05

Sound quality of cassette player is poor.



FAULT 06

Cassette play drive malfunctions, e.g. faulty IN/OUT, fast forward or reverse



## FAULT 07

Radio reception faulty

Does fault also occur with a new receiver?  no  yes → Replace receiver.

yes

Check antenna or antenna system and replace faulty part.

## FAULT 08

CD player ejection button for CD magazine ejection does not react

Is there battery voltage on 4 pin plug in CD player between pins 7 and 4?  no  yes → Check power supply in vehicle.

yes

Is fuse in CD player okay?  no  yes → Replace fuse.

yes

Replace CD player.

**FAULT 09**

**CD player failure**

Installed position of CD player adjusted correctly and transport locking screws removed? (adjusting instructions are provided on left and right sides of housing)

no

Adjust installed position correctly and remove transport locking screws.

yes

Replace CD player.

**FAULT 10**

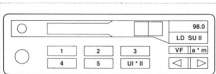
Faulty reaction to loudness and sound control adjustments

Does fault still occur with a new receiver?  no  yes **Replace receiver.**

yes

**Replace control unit.**

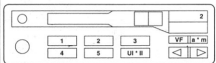




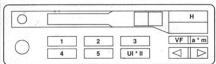
34 99 011 E



34 99 011 E



34 99 011 E



34 99 008 E

**TEST MODE FOR BMW CAR RADIO (BAYAREA C II)**

"BAYAREA C II" radios contain a test mode, with which various types of internal information can be displayed and without operating conditions set.

**Starting Test Mode:**

Press keys "2" and "3" simultaneously while switching the radio on. A capital "B" appears in the display next to the wave range. The selected station is still received.

This service mode is abandoned by switching the radio on and off once.

**Changing Loudness Boost for Traffic Reports:**

Press key "VF" for about 4 seconds until a "0" appears in the display. The station will be a little louder. The loudness boost can be adjusted in 5 steps by using the automatic tuning rocker.

The factory setting is "0".

The regulation range is + 5.25 dB.

This mode is abandoned by pressing the "VF" key again. The test mode remains activated.

**Adjusting Road Speed Dependent Loudness:**

Press station key "3" for about 4 seconds until "2" appears in the display. This value can be changed by using the automatic tuning rocker.

The factory setting is "2".

Regulation range: "0": weak increase  
 "2": medium increase  
 "3": strong increase

This mode is abandoned by pressing the "3" key again. The test mode remains activated.

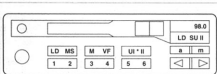
**Switching from "Distance" to "Local" in Italian Mode:**

Press rocker "a/m" for about 4 seconds until "H" or "L" appears in the display. This setting can be changed by using the automatic tuning rocker.

The factory setting is "H".

Regulation range: "H": distance  
 "L": local

This mode is abandoned by pressing the "a/m" key again. The test mode remains activated.



04-95-010 E

#### TEST MODE FOR BMW CAR RADIO (BAVARIA C REVERSE II)

"BAVARIA C REVERSE II" radios contain a test mode, with which various types of internal information can be displayed and various operating conditions set.

##### Starting Test Mode:

Press keys "1" and "3" simultaneously while switching the radio on. A capital "B" appears in the display.

This service mode is abandoned by switching the radio on and off once.



04-95-009 E

##### Changing Loudness Boost for Traffic Reports:

Press key "VF" for about 4 seconds until a "0" appears in the display. The station will be a little louder. The loudness boost can be adjusted in 3 steps by using the automatic tuning rocker.

The factory setting is "0".

The regulation range is ± 6.25 dB.

This mode is abandoned by pressing the "VF" key again. The test mode remains activated.



04-95-021 E

##### Adjusting Road Speed Dependent Loudness:

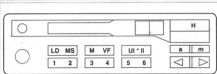
Press station key "3" for about 4 seconds until "3" appears in the display. This value can be changed by using the automatic tuning speaker.

The factory setting is "3".

Regulation range:

- "1": weak increase
- "2": medium increase
- "3": strong increase

This mode is abandoned by pressing the "3" key again. The test mode remains activated.



04-95-003 E

##### Switching from "Distance" to "Local" in Italian Mode:

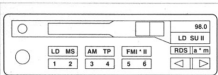
Press rocker "M" for about 4 seconds until "H" or "L" appears in the display. This setting can be changed by using the automatic tuning rocker.

The factory setting is "H".

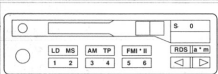
Regulation range:

- "H": distance
- "L": local

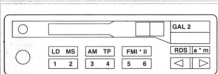
This mode is abandoned by pressing the "m" key again. The test mode remains activated.



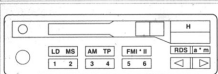
DA 03 023 0



DA 03 024 0



DA 03 025 0



DA 03 026 0

#### TEST MODE FOR BMW CAR RADIO (BAVARIA C REVERSE RDS)

"BAVARIA C REVERSE RDS" radios contain a test mode, with which various types of internal information can be displayed and various operating conditions set.

##### Starting Test Mode:

Press keys "2" and "3" simultaneously while switching the radio on. A capital "B" appears in the display.

This service mode is abandoned by switching the radio on and off once.

##### Changing Loudness Boost for Traffic Reports:

Press key "TP" for about 4 seconds until a "B" appears in the display. The station will be a little louder. The loudness boost can be adjusted in 5 steps by using the automatic tuning rocker.

The factory setting is "0".  
The regulation range is ± 6.25 dB.

This mode is abandoned by pressing the "TP" key again. The test mode remains activated.

##### Adjusting Road Speed Dependent Loudness:

Press station key "3" for about 4 seconds until "2" appears in the display. This value can be changed by using the automatic tuning rocker.

The factory setting is "2".  
Regulation range: "1": weak increase  
"2": medium increase  
"3": strong increase

This mode is abandoned by pressing the "3" key again. The test mode remains activated.

##### Switching from "Distance" to "Local" in Italian Mode:

Press rocker "a/m" for about 4 seconds until "H" or "L" appears in the display. This setting can be changed by using the automatic tuning rocker.

The factory setting is "H".  
Regulation range: "H": distance  
"L": local

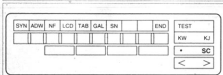
This mode is abandoned by pressing the "a/m" key again. The test mode remains activated.

##### Adjusting Viewing Angle for Display:

The angle of view can be changed by pressing the "RDS" key (6-01).  
Factory setting: dark display with direct view.



34 99 029 E



34 99 029 E

**TEST MODE FOR BMW CAR RADIO (BAYARIA C PROFESSIONAL)**

"BAYARIA C PROFESSIONAL" radios contain a test mode, with which various types of internal information can be displayed and various operating conditions set.

**Starting Test Mode:**

Press key "\*" and then simultaneously operate keys "8" and "0" within the first eight seconds after the radio has been switched on. The basic menu is displayed.

The entire test is menu controlled.

**Basic Menu:**

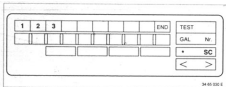
The available test functions can be interrogated via the basic menu. Various codes for the different functions appear in the C-display for this purpose and these functions can be activated by operating the pertinent key located below the multi-function keyboard.

The different codes activate the following functions:

- SYN: Synthesizer set to a fixed frequency
- ADW: Input values of 8 analog/digital converter displayed
- MF: Volume, bass, treble and fader values on sound control module displayed in dB
- LCD: LCD test
- TAB: Stored frequency tables displayed
- GAL: One of three road speed dependent loudness tables activated
- SN: Serial numbers and software status displayed

In addition, the software status of the front software (week and year) appears in the B-display.

The test is stopped by pressing the key below "END".



24-65 030 1

**LCD Test (LCD):**

Four different test patterns are switched on in series for all light emitting diodes (LEDs) during the LCD test:

- All LEDs switched on
- Chessboard pattern
- Chessboard pattern inverted for second test
- All LEDs switched off

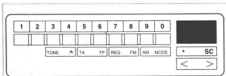
The test can be stopped at any time by pressing key "0", but also returns to the main menu after display of all four test patterns.

**Road Speed Dependent Loudness Control (GAL):**

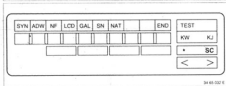
With help of this test one of the three road speed dependent loudness tables is activated, through which one each road speed dependent loudness offset can be determined and reported to the radio.

The instantaneously activated table can be read in the 0-display.  
The table number is stored in 00PRC04.

Return to the main menu is accomplished by pressing the key below "END".



34 65 001 E



34 65 002 E

#### TEST MODE FOR BMW CAR RADIO (BAYARIA C PROFESSIONAL RDS)

"BAYARIA C PROFESSIONAL RDS" radios contain a test mode, with which various types of internal information can be displayed and various operating conditions set.

##### Starting Test Mode:

Press key "\*" and then simultaneously operate keys "8" and "0" within the first eight seconds after the radio has been switched on. The basic menu is displayed.

The entire test is menu controlled.

##### Basic Menu:

The available test functions can be interrogated via the basic menu.

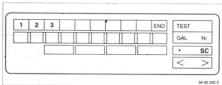
Various codes for the different functions appear in the C-display for this purpose and these functions can be activated by operating the pertinent key located below the multi-function keyboard.

The different codes activate the following functions:

- SYN: Synthesizer set to a fixed frequency
- ADW: Input values of 8 analog-digital converter displayed
- NF: Volume, bass, treble and fader values on sound control module displayed in dB
- LCD: LCD test
- GAL: One of three road speed dependent loudness tables activated
- SN: Serial numbers and software status displayed
- NAT: Application range (USA, EUR) set

In addition, the software status of the front software (week and year) appears in the B-display.

The test is stopped by pressing the key below "END".

**LCD Test (LCD):**

Four different test patterns are switched on in series for all light emitting diodes (LEDs) during the LCD test:

- All LEDs switched on
- Chessboard pattern
- Chessboard pattern inverted for second test
- All LEDs switched off

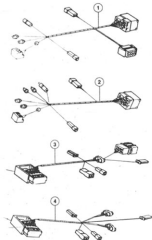
The test can be stopped at any time by pressing key "0", but also returns to the main menu after display of all four test patterns.

**Road Speed Dependent Loudness Control (GAL):**

With help of this test one of the three road speed dependent loudness tables is activated, through which one each road speed dependent loudness offset can be determined and reported to the radio.

The instantaneously activated table can be read in the B-display. The table number is stored in EEPROM.

Return to the main menu is accomplished by pressing the key below "END".



65-99/19

## LIST OF ADAPTER LEADS FOR USE BETWEEN RADIO AND VEHICLE WIRE HARNESS

Part Number	Fig. No.	Plug on Vehicle Wire Harness	Connection on Radio
65 12 0 350 067	1	17-pin plug and HFI sound system with four channel radio	Separate plugs for power supply, GAIL, antenna and four loudspeaker jacks
65 12 0 350 190	1	17-pin plug, HIFI sound system and phase rotation on amplifier with four channel radio	Separate plugs for power supply, GAIL, antenna and four loudspeaker jacks
65 12 0 350 189	1	17-pin plug and stereo system with two channel radio	Separate plugs for power supply, GAIL, antenna and four loudspeaker jacks
65 12 0 350 188	2	17-pin plug and stereo system with two channel radio and fade control	Separate plugs for power supply, GAIL, antenna and four loudspeaker jacks
65 12 0 350 191	3	17-pin plug and HFI sound system with two channel radio and fade control	Separate plugs for power supply, GAIL, antenna and four loudspeaker jacks
65 12 0 350 192	3	Separate plugs for power supply, GAIL, antenna and two loudspeaker plugs and fade control	17-pin connection on radio
62 11 9 410 558	4	Separate plugs for power supply, GAIL, antenna and four loudspeaker plugs and fade control	17-pin connection on radio



## TROUBLESHOOTING BAVARIA RADIOS

Condition	Cause	Correction
Scale light on, but no sound or noise in loudspeakers with loudness set at maximum. Automatic tuning works perfectly.	Loudspeaker plug on radio loose Break in loudspeaker wiring Plugs on fade control loose Loudspeakers defective Radio defective	Tighten plug Replace wiring Tighten plugs Replace loudspeakers Replace radio
Noise with loudness set at maximum, but no reception	Antenna plug not connected to radio Break in antenna wiring Antenna Radio defective	Connect plug Replace wiring Refer to "checking antenna" Replace radio
Loud noise while driving	Antenna wiring and plug Antenna Local reception range was abandoned Station key or station tuned in incorrectly Station too weak Radio set to sound-off for traffic reports	Check, replace or tighten if necessary Refer to "checking antenna" Tune in new station Tune in station Tune in stronger station Unset sound-off and tune in station correctly
Unsatisfactory sound quality	Foreign particles in loudspeaker diaphragm or diaphragm damaged Loudspeaker installed with tension All loudspeakers are not connected identically when using more than one loudspeaker per channel Fade control not in middle position Only when cassette player is used	Remove foreign particles or replace loudspeaker  Loosen and screw on loudspeaker without tension Check for identical poles  Adjust fade control to middle position Clean the cassette drive using the cleaning cassette
Cassette ejected while playing	Cassette without SM mechanism: Cassette tape unwinds too hard Cassette housing distorted C 90 or C 120 cassette used	Run cassette forward and backward completely once Use a different cassette These cassettes have very thin tape and tend very quickly to unwind too hard; consequently only use C 60 cassettes.

## TROUBLESHOOTING BAVARIA RADIOS

Condition	Cause	Correction
Crackling and sizzling noise	Engine or ignition interference	Tune in a weak station. Run engine at approx. 1,000 rpm, switch ignition off. If interference noise stops by switching off the ignition, it concerns ignition interference. <b>CHECKING</b> Distributor cap shielding Ground strap for shielding connected Shielded capacitor 2.2 $\mu\text{F}$ to ignition coil terminal (10) important! Not for thyristor ignition Shielded filter in lead 1 Ignition leads, plug connectors, distributor cap, ignition coil for perfect connection and resistance* Distributor rotor resistance* Hairline cracks in distributor cap, distributor rotor, ignition coil neck, spark plugs, plug connectors Ground strap from engine to body Ground strap from engine hood to body Ground connection of radio Engine hood closed correctly
Crackling and clicking noise	Defective alternator regulator	Run engine enough until interference noise can be clearly heard. Now switch on headlights and rear window defogger. The regulator is defective if the interference noise stops or changes.
Howling or whistling noise, depending on engine speed	Interference from alternator	Remove drive belts and run engine briefly. If this produces interference, replace or service. Install capacitor on terminal (-) of alternator.
Sizzling and clicking noise only while driving, but stops after operating brake pedal	Electrostatic charge	Install wheel hub contacts on front axle
Howling and crackling noise when equipment is switched on	Windshield wiper motor, additional water pump,	Install 3 x 0.47 $\mu\text{F}$ shielded filters
Scale light not on or no display and no reception	Fuse blown Power supply wire loose or not connected Radio defective	Replace fuse Connect wire Replace radio
* Refer to Specifications		

## 66 Transmit and receive equipment

66 10 000	Infrared locking system – check function .....	66-	10/1
010	Receiver (infrared locking system) – remove and install or replace .....	66-	10/1
020	Logic unit (infrared locking system) – remove and install or replace .....	66-	10/2
030	Display unit (infrared locking system) – remove and install or replace .....	66-	10/2
. . .	Infrared transmitter – initialize .....	66-	10/3
. . .	Compact infrared transmitter – initialize .....	66-	10/3
66 20 010	Control unit (park distance control) – remove and install or replace .....	66-	20/1
050	Rear ultrasonic converters, all – remove and install or replace .....	66-	20/2
060	Rear speakers (park distance control) – remove and install or replace .....	66-	20/4

### 66 10 000 Check function of infrared locking system

Refer to Electrical Troubleshooting Manual for function description and troubleshooting instructions:  
I Series

#### Caution!

From September 1992, the compact infrared locking system will be installed.  
Recognition feature: Receiver and control unit are installed in rear view mirror.

Refer to Electrical Troubleshooting Manual for function description and troubleshooting instructions:  
I Series.



### 66 10 010 Removing, installing or replacing the receiver (infrared locking system)

#### Location:

Without sliding/tilting sunroof:  
In front headliner.  
Compress retainers and lift out receiver.  
Disconnect plug.

#### With sliding/tilting sunroof:

In the cover for the sliding/tilting sunroof drive unit.  
Unclip roof section.  
Press together the retaining hooks in the receiver.  
Lift out receiver.  
Disconnect plug.

#### Caution!

From September 1992, the compact infrared locking system will be installed.  
Recognition feature: Receiver and control unit are installed in the inside rear view mirror.

**66 10 020 Removing, installing or replacing logic section (infrared locking system)**

Location: In power distributor at back. Remove rear seat, refer to 52 50 000.

**(2) Control unit (logic section) of the infrared locking system**

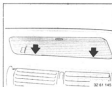
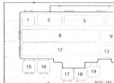
**Caution!**

From September 1992 the compact infrared locking system will be installed.

Recognition feature: Receiver and control unit are installed in the inside rear view mirror.

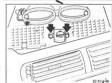
**Installation:**

Whenever the logic section is removed or exchanged (control unit), all the infrared transmitters (max. 4 units fitted) must be re-initialised.



**66 10 030 Removing, installing or replacing the display unit (infrared locking system)**

Unscrew screws on ventilation grill.



Unscrew bolts.  
Disconnect plug.



### 66 10 ... Initializing the infrared transmitter

Initialization of the transmitter is required if the transmitter was without electric power for more than one minute when commissioning a new transmitter.

It is not necessary to initialize a transmitter when changing a transmitter battery in less than one minute. (buffer store with integral condenser)

#### Initialization:

1. Switch on ignition with second key in vehicle.
2. Place transmitter directly on display section (LED must point in direction of operator).
3. Press **UNLOCK** until the LED on the transmitter starts to flash.  
Transmitter is now initialized.

#### Note:

When a transmitter is initialized, this cancels all previously initialized units in a system (up to 4 units may be fitted).

This means that all transmitters fitted in a system have to be initialized again.

This procedure must be carried out within 15 minutes. During this time, the ignition must not be switched off.

### 66 10 ... Initializing compact infrared transmitter

#### Caution!

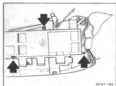
From September 1992, the compact infrared locking system will be installed.

Recognition feature: Transmitter and control unit are installed in the inside rear view mirror.

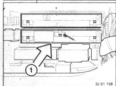
Initializing a transmitter: refer to vehicle-specific Owner's Manual.

**66 20 010 Removing and installing or replacing control unit (Park Distance Control)**

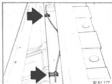
Installation location:  
In power distributor beneath back seat.  
Removing back seat, see Group 52.



Remove screws.  
Remove cover.



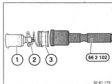
Remove control unit (1).



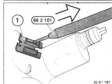
### 66 20 050 Removing and installing or replacing all ultrasonic converters

Removing rear bumper, see Group 51.  
Pull bumper slightly forwards.  
Unclip leads from clips in bumper.

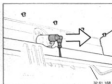
Disconnect plug connections on ultrasonic converter.



Removing ultrasonic converters (2) and (3) in center of car.



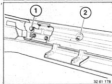
Pull slide (1) down as far as stop with special tool 66 2 101.



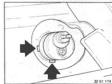
Ultrasonic converter on left side of car.



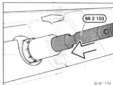
Ultrasonic converter on right side of car.



Installation instruction:  
Locate ultrasonic converter in the grooves in the bumper (jacking device).



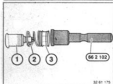




Ultrasonic converters (1) and (4) on the outside of the bumper.  
Press special tool 66 2 102 firmly home; locking ring is unlocked.

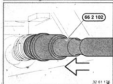


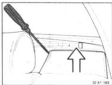
Installation instruction:  
Ultrasonic converter must locate in the grooves on the bumper.



Installed order:  
(Illustrated here in dismantled condition).  
Install ultrasonic converter in bumper, fit spring (2), locking ring (3) and slide home with special tool 66 2 102.

Locking ring (3) must audibly locate and ultrasonic converter must be mounted firmly on the bumper.



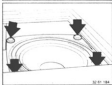


66-20-060 Removing and installing or replacing rear loudspeakers (park distance control)

Unclip rear loudspeaker panel.



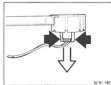
Detail of loudspeaker panel.



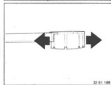
Undo the screws in the loudspeaker panel.



Remove loudspeaker.  
(1) Loudspeaker for Park Distance Control

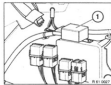


Disconnect plug.



Unclip loudspeaker.

Warning:  
Remove right side wheel arch trim in trunk, see 61-47-151.



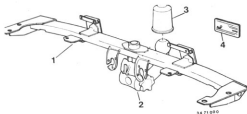
Loudspeaker is mounted beside wiper relay (1).  
Remove screw.  
Disconnect plug.

## 71 Engine / chassis equipment / accessories

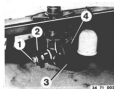
71 60 ...	Overview of trailer hitch with detachable ball hitch .....	71-	60/1
...	Trailer module – remove and install .....	71-	60/2
...	Connector assignments of 13-pin plug connection .....	71-	60/3

# 71-60/1

## TRAILER HITCH WITH REMOVABLE BALL HEAD



- 1 Trailer hitch (carrier)
- 2 Removable ball head
- 3 Cover
- 4 Data plate

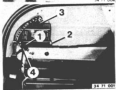


- 1 Key
- 2 Hornwheel for removable ball head (pull out, turn and remove ball head)
- 3 Ball head
- 4 Socket



**71 60 ... REMOVING AND INSTALLING TRAILER MODULE**

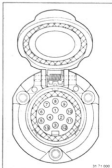
Lift off trim panel partially.



Unscrew screws (1 and 2).  
Pull off plugs (3 and 4).  
Lift out trailer module.



Spare fuses.  
*Note:*  
Also refer to fuses 18 and 22 in the fusebox should the system fail.



30 71 000

71 60 ... CONNECTIONS OF 13 PIN PLUG

- Pin 1 Turn signal indicator, left
- Pin 2 Tail fog lights
- Pin 3\* Ground (for circuit of contacts 1 through 8)
- Pin 4 Turn signal indicator, right
- Pin 5 Right tail light, identity light, marker light and license plate light
- Pin 6 Brake lights
- Pin 7 Left tail light, identity light, marker light and license plate light
- Pin 8 Backup light and/or backup device for overrun brake
- Pin 9 Power supply (permanent positive)
- Pin 10 Positive charge wire for battery in trailer
- Pin 11 Not used
- Pin 12 Not used
- Pin 13\* Ground (for circuit of contacts 9 through 12)

\* Ground wires may not be connected electrically conductive on the trailer end.

## 72 Body equipment and accessories

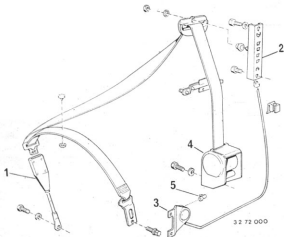
	Layout of seat belt .....	72-	11/1
72 11 030	Front seat belt – remove and install or replace .....	72-	11/2
102	Seat belts (complete), all – remove and install or replace .....	72-	11/4
	Buckle pretensioner .....	72-	11/5
...	Buckle pretensioner – disarm .....	72-	11/6
...	Automatic reel seat belt – check .....	72-	11/7
	Checklist for automatic reel seat belt .....	72-	90/1

**Seat Belt Arrangement:**

- 1 Lower strap
- 2 Belt height control
- 3 Cable roller
- 4 Automatic reel
- 5 Installation on seat

The belt height control is connected directly on the front seat with a cable.

Consequently the position of the upper strap in relation to total height depends on the seat's forward/back position.



Seat forward = lower position  
Seat back = upper position





83 73 604

### 72 11 030 REMOVING AND INSTALLING OR REPLACING FRONT SEAT BELT

#### Important\*

Models with Seat Belt Tensioner:  
Conform with safety precautions!  
Improper handling could cause triggering of the belt tensioner and lead to injury.  
Disconnect battery and cover negative pole or terminal.

Run seat forward and to highest position.  
Unscrew bolts on left and right sides.  
Disconnect cable.

#### Installation:

Tightening torque\*



83 73 092

Pull off rubber door seal partially and lift out trim panel.



83 73 003

Unscrew screws.  
Lift out plug partially.



83 73 004

Unscrew screw.  
Lift out guide (1).

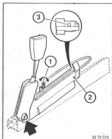
Installation:  
Tightening torque\*.



83 73 005

Unscrew screw.  
Lift out holder.  
Remove seat belt reel.

Installation:  
Tightening torque\*.



83 73 006

With Seat Belt Lock Tensioner:  
Remove seat - refer to Group 52.

#### Important\*

Deactivate seat belt lock tensioner.  
Twist cable (1) out of holder and disconnect on seat.  
Power seat: screw in screw (2), display (3) changes from "green" to "red".

Remove seat belt lock tensioner.

#### Installation:

Tightening torque\*.  
Cable must be secured with a cable strap above the attachment point through the opening in the holder.

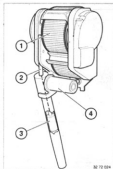
\* Refer to Specifications



Unscrew screw.  
Remove seat belt height adjuster together  
with cable.

Installation:  
Tightening tongue\*.

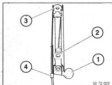
Note:  
If necessary, the complete seat belt height  
adjuster must be replaced, including the  
cable.



Seat Belt Tensioner

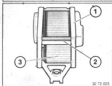
- 1 Reel
- 2 Steel wire cable
- 3 Piston in cylinder
- 4 Gas generator

Refer to Group 22 for description of operation.



Seat Belt Height Adjuster

- 1 Spring
- 2 Upper belt anchorage point
- 3 Reversing roller
- 4 Cable



Seat Belt Reel

- 1 Reel
- 2 Clamp
- 3 Friction roller

\* Refer to Specifications



**72 11 100 REMOVING AND INSTALLING OR REPLACING ALL REAR SEAT BELTS (Complete)**

Remove rear seat cushion and backrest - refer to Group 56.

Unscrew bolt.

Installation:  
Tightening torque\*



Unscrew bolt.  
Remove seat belt reel.

Installation:  
Tightening torque\*



Unscrew bolt.

Installation:  
Check for correct seating of belt anchorage.  
Tightening torque\*

Removing seat belt reel in "touring" models - refer to Removing Cargo Room Trim Panels in Group 51.  
Load-through installation - refer to Gr. 51.



Lift out C-pillar trim panel.



Unscrew bolt.  
Remove seat belt lock.

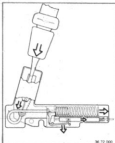
Installation:  
Tightening torque\*



Remove clips.  
Remove console.

\* Refer to Specifications

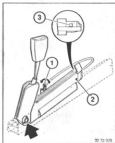
\* Refer to Specifications



### SEAT BELT LOCK TENSIONER

#### Description:

A mechanical impact sensor activates the system in case of a head-on collision. A pre-tensioned spring pulls back the belt lock approx. 95 mm. Shoulder and waist belts are tensioned.



#### Manual Seats:

To avoid unwanted activation while adjusting seat (sudden movement against the final stop) or working on seat the system is activated and deactivated with help of cable (1).

#### Power Seats:

The system is deactivated by screwing in screw (2) for working on the seat.

Check color of display (3).

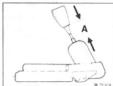
Red = deactivated

Green = activated

#### Caution!

The system is activated when the cable is connected on seat or green display is visible.

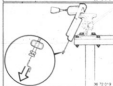
An activated seat belt lock tensioner must always be replaced.



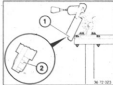
#### TO 11 ... DEACTIVATING SEAT BELT LOCK TENSIONER

**Caution!**  
Conform with country's accident prevention regulations.

The seat belt lock tensioner is "activated" when distance (A) is  $> 10$  mm.

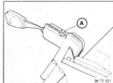


Clamp seat belt lock tensioner in a vise at the point where it is bolted to the seat. Belt whip must be horizontal. Pull locking cable out as far as stop and hold it tight with a pliers.



#### Seat Belt Lock Tensioner for Power Seats:

Turn screw (1) until green mark (2) appears in the window - seat belt lock tensioner is activated.



**Caution!**  
Keep hands away from the belt lock tensioner while deactivating - danger of injury!  
Apply a firm knock from the toe of a hammer weighing 500 grams to the belt lock tensioner in zone (A). This will loosen the belt lock tensioner.



Belt lock must face away from the body of the mechanic.

**Caution!**  
Persons, who have to be on the belt lock side, must stand at least 3 meters away in the interest of safety.



Deactivating will cause the belt lock to be pulled back into the housing suddenly by distance (A) of approx. 55 mm.

## 72 11 . . . INSPECTING AUTOMATIC REEL SEAT BELTS

The automatic reel has two independent activating systems for the locking of seat belts.

The first activating system should lock the automatic reel when driving fast in curves, driving in tight curves, when car rolls over, during sharp braking or by impact. This activation is accomplished with a ball.

To check, seat backrest must be set upright and both hands held in supporting position close to the steering wheel. Afterwards the brakes must be applied fully while driving on a dry surface and at a road speed equal to twice walking speed. The seat belt should lock.

The second activating system is for additional safety and controlled by inertia mass. This system is also okay, if the reel locks when pulling out the belt suddenly.

The automatic reel does not require servicing and must not be opened.

The belt should retract on its own as far as possible when released in parked position. If the last section is not wound, the return spring could be weak or broken and there could be excessive friction in belt guides.

An unusable seat belt or a seat belt, worn in a serious accident should be destroyed immediately after removal to guarantee that it cannot be used again.

To test a seat belt the tongue should insert easily and with a loud click in the lock. When pressing the "PRESS" button the belt tongue should be ejected from the lock by spring force.

If the lock cover is missing or damaged, the seat belt must be replaced.

When replacing a seat belt, the lower strap must also be replaced.

The tongue of the lower strap on the seat rail could be deformed by the impact of an accident in the case of seat belts integrated in a seat.

Attempts should never be made to straighten the seat or seat rail.

Belt straps should only be cleaned with a luke-warm soap solution or a commercial fine laundry detergent.

Belt straps must never be cleaned chemically or dyed.

Automatic reel seat belts must be replaced in case of

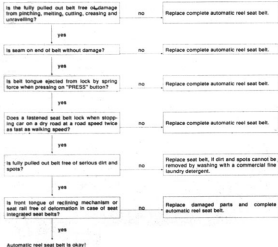
- activated belt tensioner
- crashes,
- unravelling,
- pinches,
- tears and cuts,
- traces of melting,
- traces of abrasion in plastic cover on belt opening for tongue or
- damaged seams on end of belt strap.

Also refer to Check List for Automatic Reel Seat Belts.

## CHECK LIST FOR AUTOMATIC REEL SEAT BELTS



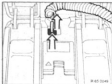
## CHECK LIST FOR AUTOMATIC REEL SEAT BELTS





# 84 Communications system

84 11 510	Eject box – remove and install or replace .....	84-	11/1
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#### 84 11 510 Removing and installing eject box

Lift off telephone receiver.  
Press together clip and disconnect plug connector.



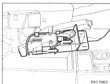
Unclog near finisher, raise and lift out by pulling forward.



Press down clips, slide eject box forward and lift out by pulling upward, place to one side.



Release screws and pull out support bracket.



Disconnect plug connections and completely lift out eject box.

# 97 Body cavity sealing and undercoating

Body cavity sealing ..... 97- 00/1

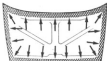
# 97-00/1

## BODY CAVITY SEALING - S SERIES | 0-34

### Preparations for Body Sealing:

Protect wheels with covers\*.

- Undercarriage of car must be clean and dry.
- If necessary, repair damaged undercoating including wheel houses and side panels with PVC and treat with tectyl.  
The thickness of the undercoating should not exceed 0.25 mm (0.010").
- Inspect car for damaged paint finish or damage from flying stones and, if applicable, repair after receiving permission from the customer.
- Body sealing compound and car should have room temperature (about 20° C / 68° F).
- Check spray pattern of guns and nozzles.
- When drilling holes, dip the stepped drill bit in sealing compound to hold the burrs.
- Remove dripping sealing compound.
- Plug all drilled holes with plugs dipped in tectyl after finishing sealing procedures.
- Spray engine and engine compartment with engine wax to cover well.
- When repairing accident damage or replacing body parts, seal body cavities immediately after paint spraying and prior to installation of engine, axles, transmission, trim panels, etc.. If repair welding is only accessible one-sidedly, the side, which produces a cavity, must be sealed with wax. This is also applicable to rear side panels, above the wheel house to the roof joint, as well as doors, especially in the upper corner areas.
- Coat thickness should be at least 0.03 mm (0.001").



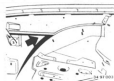
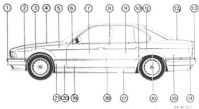
02 97 000

Let the sealing compound penetrate into gaps and spot welding flanges completely.  
Gaps and flanges are to be sealed in this manner.

### Note:

Mentioned holes are in reference to only one side of the car.  
Also seal body cavities on the other side accordingly as required.

Body cavity sealing performed after body repairs must be confirmed in the annual inspection sheets.



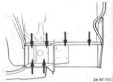
3. Support member/front wheel house  
- hook-type scribe



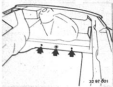
4. Engine hood  
- hook-type scribe  
- nylon scribe



5. Support member/front wheel house  
- nylon scribe



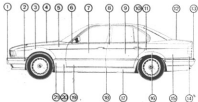
1. Front bumper take-up  
- spray gun



2. Front engine carrier member  
- nylon scribe



6. Front door  
- hook-type scribe



04 97 000

3. Rear door  
- spray gun



02 97 000

10. Rear wheel house, outside  
- hook-type sander  
Turn 350° while spraying.



02 97 000

11. Rear wheel house, inside  
- nylon sander



04 97 014

7. Front door  
- spray gun



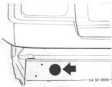
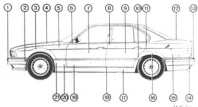
04 97 010

8. Rear door  
- hook-type sander

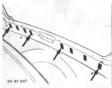


04 97 017

12. Trunk lid  
- hook-type sander  
- nylon sander



13. Rear bumper take-up  
- nylon sonde



14. Tail panel  
- nylon sonde



15. Turnik  
- nylon sonde

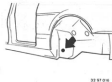
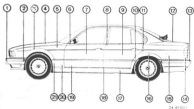


17. Side member  
- nylon sonde



16. B-pillar  
- nylon sonde

97-00/5



21. Front wheel house

- nylon sonde

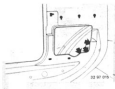
32 61 016



19. Engine carrier, inside

- nylon sonde

32 61 016



20. A-pillar, bottom

- nylon sonde  
- hook-type sonde  
Turn 90° while spraying.

32 61 016



# BMW M5

Introduction

Connecting instructions for complete Engine Test

- 01 Voltage
- 02 Generator
- 03 Starter / battery
- 04 Compression comparison
- 05 Dwell
- 06 Ignition timing
- 07 Timing
- 08 Timing - vacuum
- 09 Firing voltage
- 10 Mixture / exhaust gas
- 11 Cyl. Power balance



## BMW SERVICE TEST

### 01 ENGINE TEST

## Nominal Values – BMW M 5

Distributor / Control Unit No.: 0 261 200 079

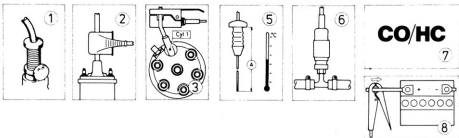
**Warning:** ⚡ Do not work on ignition systems unless engine is stopped and ignition switched off. Risk of fatal electric shock!

Insert workshop manual microfiche into carrier III  
and specifications microfiche into carrier II.

If no fault is indicated by internal test and calibration has been carried out correctly (tester not yet connected on car; leads connected for resistance measurement – U/R/L/C leads –), the test step summary for the engine test and the corresponding connection plan will appear when **0** and **1** are pressed.

**Note:** Keep to test sequence for each test step. The following nominal values are valid only in conjunction with the BMW service test unit or BMW digital tester.

## CONNECTION INSTRUCTIONS FOR COMPLETE ENGINE TEST



- 1 Diagnosis plug
- 2 HT clip on ignition lead 4
- 3 Trigger clip on cyl. 1 ignition lead
- 5 Oil temperature sensor (measurement 'A'  
= length of oil dipstick)
- 6 Pressure sensor between injection pipe  
and fuel feed line
- 7 Connect exhaust probe on exhaust  
manifold.
- 8 Current clip (arrow direction - to B +)

For complete engine test, move on to next test step with . When is pressed (locked in), the corresponding test step will be printed out after it has been completed.

During the various test steps, the relevant connection plan and test step summary can be recovered with (follow with desired test step number)

**Attention: Transmission in NEUTRAL, apply handbrake.**

01 Engine	BMW M 5 Voltage	Control unit No. 0 261 200 079
<b>U B +</b>	Battery voltage	> 11.2 V
<b>U Term.15</b>	Voltage at coil term. 15	> 10.8 V
<b>U Term. 1</b>	Voltage at coil term. 1	> 10.7 V
<b>I Battery</b>	Battery current	< -2.0 A

- Test sequence:**
1. Switch off electrical consumers (e.g. ignition, blower) on car.
  2. Connections: diagnosis plug, current clip
  3. Switch on ignition
  4. Compare with nominal values.
- To repeat test step with print-out:  0  1 .

If nominal values are not reached: check battery connections, check state of battery charge

Further information on workshop manual microfiche: Troubleshooting — digital motor electronics, generator

<b>02 Engine</b>	<b>BMW M 5</b>	<b>Distributor / Control Unit No.:</b>
	<b>Generator</b>	<b>0 261 200 079</b>

<b>Engine speed</b>		<b>850 ± 50/min</b>
<b>U D +</b>	<b>Regulator voltage</b>	<b>13.5 ... 14.6 V</b>
<b>Ripple</b>		<b>&lt; 6 %</b>
<b>U B +</b>	<b>Battery voltage</b>	<b>12.0 ... 14.6 V</b>
<b>I Battery</b>	<b>Charge current</b>	<b>&gt; 15 A</b>

- Test sequence:**
1. Connections: diagnosis plug, current clip, trigger clip
  2. Start the engine (e.g. with remote control). Warning: transmission must be in neutral.
  3. UD + > 13.5 V at 1500/min.
  4. I Battery < 15 A; bring in an electrical load, e.g. by switching on headlights and increase speed.
  5. Compare with nominal values.  
(To repeat test with print-out 0 2 .)

If nominal values are not reached, check leads, voltage regulator and generator

Further information on workshop manual microfiche: generator troubleshooting

**Do not perform this test step  
on models with oxygen sensor**

**Do not perform this test step  
on models with oxygen sensor**

05 Engine

BMW M 5  
Dwell

Control unit No.  
0 261 200 079

---

Engine speed	2000 ± 50 /min
Dwell ratio	
Dwell angle	
U Term. 1      Voltage at coil terminal 1	< 2.0 V
Timing deviation	< 3 ° crankshaft

---

- Test sequence:
1. Connections: diagnosis plug, trigger clip
  2. Start the engine
  3. Compare with nominal values.
- To repeat test step with print-out: 0 5

---

If nominal values are not reached: check control unit

Further information on workshop manual microfiche: troubleshooting — digital motor electronics



---

<b>Engine speed</b>	<b>850 ± 50 /min</b>
<b>Ignition timing at air temp. &gt; 25° C</b>	<b>0 ± 3 ° CS BTDC</b>
<b>Exhaust CO</b>	<b>0,8 ± 0,4 % by vol.</b>
<b>Coolant and oil temperature</b>	<b>&gt; 60° C</b>

---

- Test sequence:**
1. Connections: diagnosis plug, trigger clip, oil temperature sensor, exhaust probe.
  2. Start the engine. Compare with nominal values!
  3. Pull off plug for coolant temperature sensor for approx. 3 sec. — CO/HC values should rise for a short period.

---

If nominal values are not reached:

Further information on workshop manual microfiche: troubleshooting dig. motor electronics.

next test stop 09

**08 Engine**

---

**next test stop 09**

**BMW M 5**  
**Firing voltage**




Control unit No.  
0 261 200 079

09 Engine

Engine speed	850 ± 50 /min
Firing voltage	6 ... 14 kV
Firing voltage diff.	< 3 kV
Oil temperature	> 60 °C
Exhaust CO	0,8 ± 0,4% by vol.

Firing order:

A	B	C	D	E	F
1	5	3	6	2	4

- Test sequence:**
1. Connections: diagnosis plug, trigger clip, HT clip, oil temp. sensor, exhaust probe
  2. Start engine after firing voltage has appeared (app. 40 s). Compare with nominal values
  3. Press  for individual cylinder values  
To repeat test step with print-out, press  again; without print-out:  )

If nominal values are not reached: adjust exhaust emissions, check spark plugs, break in ignition lead.

Further information on workshop manual microfiche: troubleshooting — digital motor electronics

---

<b>Engine speed</b>	<b>850 ± 50 /min</b>
<b>Speed variation</b>	<b>&lt; 40 /min</b>
<b>Oil temperature</b>	<b>&gt; 60 °C</b>
<b>Exhaust CO</b> (vacuum hose attached to pressure regulator)	<b>0,8 ± 0,4% by vol.</b>
<b>Fuel pump pressure</b> (vacuum hose detached from pressure regulator)	<b>2.8 ... 3.2 bar</b>

---

- Test sequence:**
1. Connections: diagnosis plug, trigger clip, HT clip, pressure sensor, oil temp. sensor, exhaust probe
  2. Start the engine
  3. Compare with nominal values
- To repeat test step with print-out: **1 0**
- 

If nominal values are not reached: adjust exhaust emissions

Do not perform this test step on models with an idle speed control valve.

# BMW `5` (E34) series

## Introduction

### Connecting instructions for complete L-Jetronic Test

- 01 Harness / Wheel sensor
- 02 Harness / Relays / Valves
- 03 Dynamic / Wheel sensor
- 04 Dynamic
- 05 Dynamic / Ground / Overvoltage / Bite
- 06 Control unit / Simulation-Front wheels
- 07 Control unit / Simulation-Rear wheels
- 08 Pump
- 09 Hydraulic unit pressure release
- 10 Hydraulic unit pressure buldup



**BMW SERVICE-TEST**

**03 ABS**

## **Nominal values — BMW 5 — E 34 series**

**Compare ABS control unit No. 0 265 100 045 !**

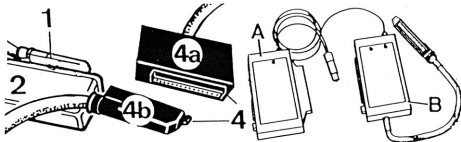
**Location on car: in engine compartment / control unit shelf**

**Insert BMW 5 — E 34 workshop manual microfiche into carrier III  
and BMW 3...7 models Specifications microfiche into carrier II**

**If the internal test does not indicate a fault and calibration has been correctly carried out (tester not yet connected to car or to mechanical or electrical assemblies, leads connected for resistance measurement), the test step summary for the ABS test and the corresponding connection plan will appear when 0 and 3 pressed.**




**Note: keep to test sequence for each test step. The following Nominal Values are valid only in conjunction with the BMW SERVICE TEST unit.**





1. Switch off electrical consumers. Disconnect plugs only with ignition switched off.
2. Connect adapter A between T-plug (4a) and ABS wire harness. Required for all test steps (1 – 10). Connect adapter B between T-plug (4b) and control unit (2) only for test steps 6 and 7. Note other connections and switch positions for each test step.
3. Test steps 01 ... 07 can be performed without brake test dynamometer; test steps 08 ... 10 require the brake test dynamometer.
4. Note sequence for each test step.

For complete ABS test, move on to next step with .

As long as  is pressed (locked), each test step will be printed out on completion. To repeat each test step with print out, put in same test step number again; for repeat without print-out: . During the various test steps, the relevant connection plan and test step summary can be recovered with .

01 ABS	BMW 5–E 34 series cars Harness/wheel sensor		ABS control unit No. 0 265 100 045
<b>Wheel sensor</b>	front	left (R betw. leads 4 and 6)	<b>650Ω ... 1.6 kΩ</b>
		right (R betw. leads 21 and 23)	<b>650Ω ... 1.6 kΩ</b>
	rear	left (R betw. leads 9 and 7)	<b>650Ω ... 1.6 kΩ</b>
		right (R betw. leads 26 and 24)	<b>650Ω ... 1.6 kΩ</b>
<b>WS resistance to gnd.</b> (R betw. leads 26/9/21/4 and lead 10)			<b>999 kΩ</b>
<b>WS resistance to B +</b> (R betw. leads 26/9/21/4 and lead 1)			<b>999 kΩ</b>
<b>SIS (safety) lamp</b> (R betw. leads 29 and 1)			<b>10 ... 80 Ω</b>

- Test sequence:**
1. Connections needed: T-plug (4a) with adapter A on ABS wire harness (1). Connecting lead from adapter A to cigar lighter, control lamp (red) lights up.
  2. Switch position on adapter A to model 3 and test step 01 (left).
  3. Compare with nominal values (if 999 kΩ flashes, this indicates  $> 999 \text{ k}\Omega$ ).

If nominal values are not reached: break in lead or short-circuit; insulation resistance, ABS telltale lamp fault  
 Further information on workshop manual microfiche, Group 34 and job Nos. 61 11 530, 61 12 510/520, 62 99 080,  
 Troubleshooting - ABS

<b>Valve relay coil</b> (Resistance betw. leads 1 and 27)	<b>70 ... 100 <math>\Omega</math></b>
<b>Motor relay coil</b> (Resistance betw. leads 1 and 28)	<b>34 ... 58 <math>\Omega</math></b>
<b>Valve, FL (front left)</b> (Resistance betw. leads 32 and 2)	<b>0.8... 1.9 <math>\Omega</math></b>
<b>Valve, FR (front right)</b> (Resistance betw. leads 32 and 35)	<b>0.8... 1.9 <math>\Omega</math></b>
<b>Valve, RL (rear left)</b> (Resistance betw. leads 32 and 18)	<b>0.8... 1.9 <math>\Omega</math></b>
<b>Valve, RR (rear right)</b> (Resistance betw. leads 32 and 19)	<b>0.8... 1.9 <math>\Omega</math></b>

- Test sequence
1. Connections needed: T-plug (4a) with adapter A on ABS wire harness (1). Connecting lead from adapter A to cigar lighter, control lamp (red) lights up.
  2. Switch position on adapter A to model 3 and test step 01 (right).
  3. Compare with nominal values (if 999 k  $\Omega$  flashes, this indicates  $>$  999 k  $\Omega$ ).

If nominal values are not reached: break in lead, short-circuit, defective relay or valve

**03 ABS****BMW 5–E 34 series cars  
Dynamic/wheel sensor**ABS control unit No.  
0 265 100 045

<b>Sensor</b>	<b>Period</b>	<b>Pulse</b>
<b>FL (front left)</b>	<b>15.7 ... 17.4 ms</b>	<b>100 %</b>
<b>FR (front right)</b>	<b>15.7 ... 17.4 ms</b>	<b>100 %</b>
<b>RL (rear left)</b>	<b>15.7 ... 17.4 ms</b>	<b>100 %</b>
<b>RR (rear right)</b>	<b>15.7 ... 17.4 ms</b>	<b>100 %</b>

- Test sequence:**
1. Connections needed: T-plug (4a) with adapter A on ABS wire harness (1). T-plug (4b) direct on ABS control unit (2). Connecting lead on adapter A – control lamp (red) lights up.
  2. Switch position on adapter A to model 3 and test step 03 (right).
  3. Lift car. Turn wheels at steady speed within nominal periods (approx. 5 km/h) until 100 % display appears.

If nominal values are not reached: check sensor gap, test step 01, pulse wheel damaged (number of teeth, out-of-roundness)

Further information on workshop manual microfiche, Group 34 and job Nos. 61 12 510/520

<b>Voltage betw. leads 1 and 10</b>	<b>&gt; 11.5 V</b>
<b>Voltage reg. betw. leads 12 and 10</b>	<b>4.8 ... 5.2 V</b>
<b>Valve relay off contact</b> (voltage drop, betw. lines 32 and 10)	<b>&gt; 10.8 V</b>
<b>Valve relay on contact</b> (volt. drop betw. leads 32 and 1)	<b>– 0.3... + 0.3 V</b>
<b>Motor relay on contact</b> (voltage drop betw. leads 14 and 1)	<b>– 1.0... + 1.0 V</b>
<b>SIS (safety) lamp/diode</b> (voltage drop betw. leads 29 and 32)	<b>0.3...1.6 V</b>

- Test sequence**
1. Connections needed: T-plug (4a) with adapter A on ABS wire harness (1), (4b) direct on ABS control unit (2), connecting lead on adapter A – control lamp (red) lights up. Switch position on adapter A to model 3 and test step 04 (left).
  2. Turn on ignition – ABS control lamp in instrument cluster and lamp D + on adapter A light up.
  3. Second (green) lamp on adapter (right) must light up while operating brake ped.
  4. Compare nominal values.

If nominal values are not reached: check battery, break in lead, short-circuit, relay, ABS telltale lamp

Further instructions on workshop manual microfiche, Group 34, job Nos. 62 99 080, 34 52 510, 61 31 570, 34 51 520;

Troubleshooting – ABS

**BMW 5–E 34 series cars**  
**Ground/overvoltage**ABS control unit No.  
0 265 100 045**05 ABS**

<b>Voltage betw. leads 1 and 10</b>	<b>&gt; 11.5 V</b>
<b>Ground pin 10 (voltage drop)</b>	<b>– 0.7... + 0.7 V</b>
<b>Ground pin 20 (voltage drop)</b>	<b>– 0.7... + 0.7 V</b>
<b>Ground pin 34 (voltage drop)</b>	<b>– 0.7... + 0.7 V</b>
<b>RFP (return pump) pin 14/gnd. (voltage drop)</b>	<b>– 0.7... + 0.7 V</b>
<b>Overvoltage protect. (voltage betw. leads 1 and 10)</b>	<b>16 ... 28 V</b>
<b>Test cycle</b>	<b>passed</b>
<b>Failure sim.</b>	<b>passed</b>

**Test sequence:**

1. Connections needed: T-plug (4a) with Adapter A on ABS wire harness (1), (4b) direct on ABS contr. unit (2), connecting lead on adapter A – control lamp (red) lights up. Switch position on adapter A to model 3 and test step 05 (left).
2. Turn on ignition – ABS control lamp in instrument cluster and lamp D + on adapter A light up.
3. Compare with nominal values.

If nominal values are not reached: check battery, ground connections, line 15 to instrument carrier terminal 61  
Further information on workshop manual microfiche, Group 34, job Nos. 61 11 530, 34 52 510, 62 99 080;  
Troubleshooting – ABS

**06 ABS****BMW 5—E 34 series cars**



ABS control unit No.

Control unit/simulation - front wheels 0 265 100 045

**Voltage betw. leads 1 and 10****> 11.5 V**

<b>Valve</b>	<b>front left</b>	<b>front right</b>	<b>rear left</b>	<b>rear right</b>
<b>Pressure-buildup:</b>	$\leq 0.1$	$\leq 0.1$	$\leq 0.1$	$\leq 0.1$ A
<b>left</b>				
- drop:	4.5 ... 5.7	$\leq 0.1$	$\leq 0.1$	$\leq 0.1$ A
- retention:	1.9 ... 2.3	$\leq 0.1$	$\leq 0.1$	$\leq 0.1$ A
<b>right</b>				
- drop:	$\leq 0.1$	4.5 ... 5.7	$\leq 0.1$	$\leq 0.1$ A
- retention:	$\leq 0.1$	1.9 ... 2.3	$\leq 0.1$	$\leq 0.1$ A

**Test sequence:**

1. Connections needed: T-plug (4a) with adapter A on ABS wire harness (1), (4b) with adapter B on ABS contr. unit (2), connecting lead from adapter A and B to cigar lighter - control lamps (red) light up. Switch position on adapter A to model 3 and test step 06 (left)/on adapter B to model 3 and 2 A - nominal values for pressure drop.
2. Turn on ignition; check voltage between leads 1 and 10!
3. Press  after appearance of pressure build-up values.
4. Press  after appearance of pressure drop values. Compare with nominal values.
5. Repeat test step with switch position 5 A (adapter B). Compare pressure retention nominal values.



If nominal values are not reached: check battery, test steps 02/04/05 hydr. unit, ABS control unit

Further information on workshop manual microfiche, Group 34, job Nos. 34 52 510, 34 51 520

Voltage betw. leads 1 and 10 > 11.5 V

Valve		front left	front right	rear left	rear right
Pressure - buildup		$\leq 0.1$	$\leq 0.1$	$\leq 0.1$	$\leq 0.1$ A
left	- drop:	$\leq 0.1$	$\leq 0.1$	4.5...5.7	4.5...5.7 A
	- retention:	$\leq 0.1$	$\leq 0.1$	1.9...2.3	1.9...2.3 A
right	- drop:	$\leq 0.1$	$\leq 0.1$	4.5...5.7	4.5...5.7 A
	- retention:	$\leq 0.1$	$\leq 0.1$	1.9...2.3	1.9...2.3 A

Test sequence:

1. Conn. req.: T-plug (4a) with adapter A on ABS wire harn. (1), (4b) with adapter B on ABS contr. unit (2), conn. lead from adapters A + B to cig. lighter - contr. lamps (red) light up. Switch pos. on adapter A to mod. 3 and test step 07 (left)/ on adapter B to mod. 3 and 5 A - pressure drop nominal values.
2. Turn on ignition, check voltage between leads 1 and 10!
3. Press  after appearance of pressure buildup values.
4. Press  after appearance of pressure drop values. Compare nominal values.
5. Repeat test step with switch position 2 A (adapter B). Compare pressure retention nominal values.

If nominal values are not reached: check battery, test steps 02/04/05, hydr. unit, ABS control unit



# BMW 5-E 34 series cars

## Pump

ABS control unit No.  
0 265 100 045

08 ABS

Volt. betw. leads 1 + 10 > 11.5V

Front left COMPLETED

right COMPLETED


left/right —





Rear left COMPLETED

right COMPLETED

left/right —

Display on brake dynamometer (BPS):  
See test sequence:

4. 2000 N (one or both wheels);
5. Display for controlled wheel:  
Front wheels gradually up to app.  
150 N ... 450 N  
Rear wheels gradually up to app.  
150 N ... 450 N  
After app. 3 s, press  ; both wheels  
app. 2000 N  
Note: when the pump starts, slight pres-  
sure against the foot is noted at the bra-  
ke pedal.

- Test sequence:
1. Conn. req.: T-plug (4a) with adapter A on ABS wire harn. (1), (4b) direct on ABS contr. unit (2), conn. lead on adapter A — control lamp (red) lights up.
  2. Front axle on brake dynamometer (BPS) and flashing \* on tester for FRONT LEFT
  3. Switch on ignition; note voltage between leads 1 and 10 (if necessary, run engine at idle speed). Switch on brake dynamometer for one or both wheels
  4. Apply brakes until BPS reading is 2000 N (charge axle if nec.), and maintain this pedal force steadily
  5. Press  . After app. 5 s valve cuts in briefly; after app. 4 s pump (RFP) cuts in briefly. After this, COMPLETED display appears and the reading at the brake dynamometer drops again. After app. 3 s, terminate measurement by pressing  .
  6. Repeat test with  ; pass on to next wheel with  . Test positions: FRONT L, FRONT R, REAR L, REAR R in any desired order.

If nominal values are not reached: check battery, perform test steps 05-06/07, check hydr. unit

Further information on workshop manual microfiche, Group 34, job No. 34 51 520; troubleshooting — ABS

**BMW 5-E 34 series cars**  
**Hydr. unit press. release**

ABS control unit No.  
 0 265 100 045

**09 ABS**

<b>Volt.betw.leads 1 + 10</b>	<b>&gt; 11.5V</b>
<b>Front left</b>	—
<b>right</b>	—
<b>left/right</b>	<b>3...4 s</b>
<b>Rear left</b>	—
<b>right</b>	—
<b>left/right</b>	<b>3...4 s</b>

Display on brake dynamometer (BPS):  
 see test sequence

4. 2000 N front axle, 1500 N rear axle  
 (both wheels); diff. between wheels  
 < 400 N

5. Displayed reading drops: Front  
 wheels 500 ... 950 N  
 Rear wheels 400 ... 850 N  
 With pedal force unchanged, the bra-  
 ke dynamometer (BPS) display must  
 not change by more than N  
 within 3 s.

- Test sequence:**
1. Conn. req. : T-plug (4a) with adapter A on ABS wire harn. (1), (4b) direct on ABS contr. unit (2), conn. lead on adapter A → control lamp (red) lights up.
  2. Rear axle on brake dynamometer (BPS) and flashing \* on tester for REAR L/R with [↓].
  3. Switch on ignition; note voltage between leads 1 and 10. (If necessary, run engine at idle speed). Switch on brake dynamometer for both wheels.
  4. Apply brakes until BPS reading is 2000 N (charge axle if nec.), and maintain this pedal force steadily.
  5. Press [⊗]. After 2 s, the pump (RFP) is started, the valve opened briefly and brought to the main phase, and the 's' display starts to run. When 3 s are displayed: press [⊗]; end of measurement.
  6. To repeat, press [⊗]; to move on to next wheel, press [↓]. Test positions: REAR L/R, FRONT L/R in any desired order.

If nominal values are not reached: check battery, perform test steps 05-06/07, check hydr. unit  
 Further information on workshop manual microfiche, Group 34, job No. 34 51 520; troubleshooting — ABS

## BMW 5—E 34 Series Cars

ABS Control Unit No.

10 ABS

Hydr. unit pressure buildup

0 265 100 045

Volt. betw. leads 1 + 10 &gt; 11.5 V

Front left

—

right

—

left/right

3 ... 4 sec.

Rear left

—

right

—

left/right

3 ... 4 sec.

Display on brake test dynamometer (BPS), see test sequence:

4. 2000 N front axle, 1500 N rear axle (both wheels); dif. betw. wheels &lt; 400 N.

5. Displayed reading drops:


Front and rear axles: &lt; 500 N.

Reading displayed afterwards:

front: 650 ... 1400 N

rear: 450 ... 950 N.

Important: Keep pedal force uniform.





Brake dyn. (BPS) display must not vary by more than 200 N within 3 sec. after initial force is displayed by pressing .

Test sequence: 1. Connections needed: T-plug (4a) with adapter A on ABS wire harness (1), (4b) direct on ABS control unit (2), connecting lead on adapter A — control lamp (red) lights up.

2. Front axle on BPS and flashing \* on tester for FRONT LEFT/RIGHT: .

3. Turn on ignition, note voltage betw. leads 1 and 10 (if necessary at idle speed), BPS switched on for both wheels.

4. Apply brakes until BPS reading is 2000 N, load axle if necessary, maintain this pedal force steadily.

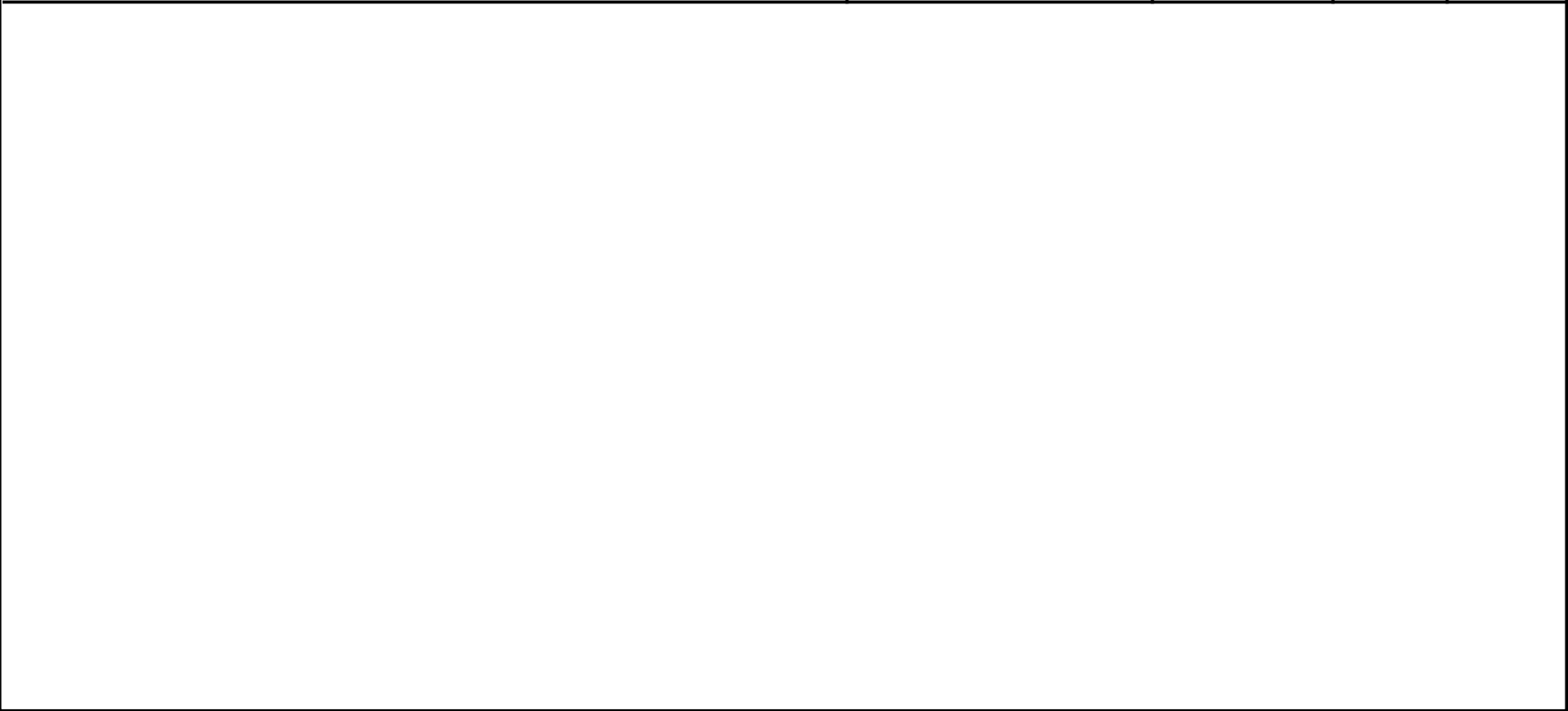
5. Press . After 2 sec. pump is activated, valve opened for approx. 4 sec. and brought to the retention phase after a brief pressure buildup and the "s" display is started. Displayed 3 seconds: press .6. Repeat: , next wheel: , test positions: FRONT LEFT/RIGHT, REAR LEFT/RIGHT in any desired order.

If nominal values are not reached: battery, test steps 05-06/07, hydraulic control unit.  
Further information on repair manual microfiche, Gr. 34, Job 34 51 520, Troublesh. ABS.

# **Tightening Torques**

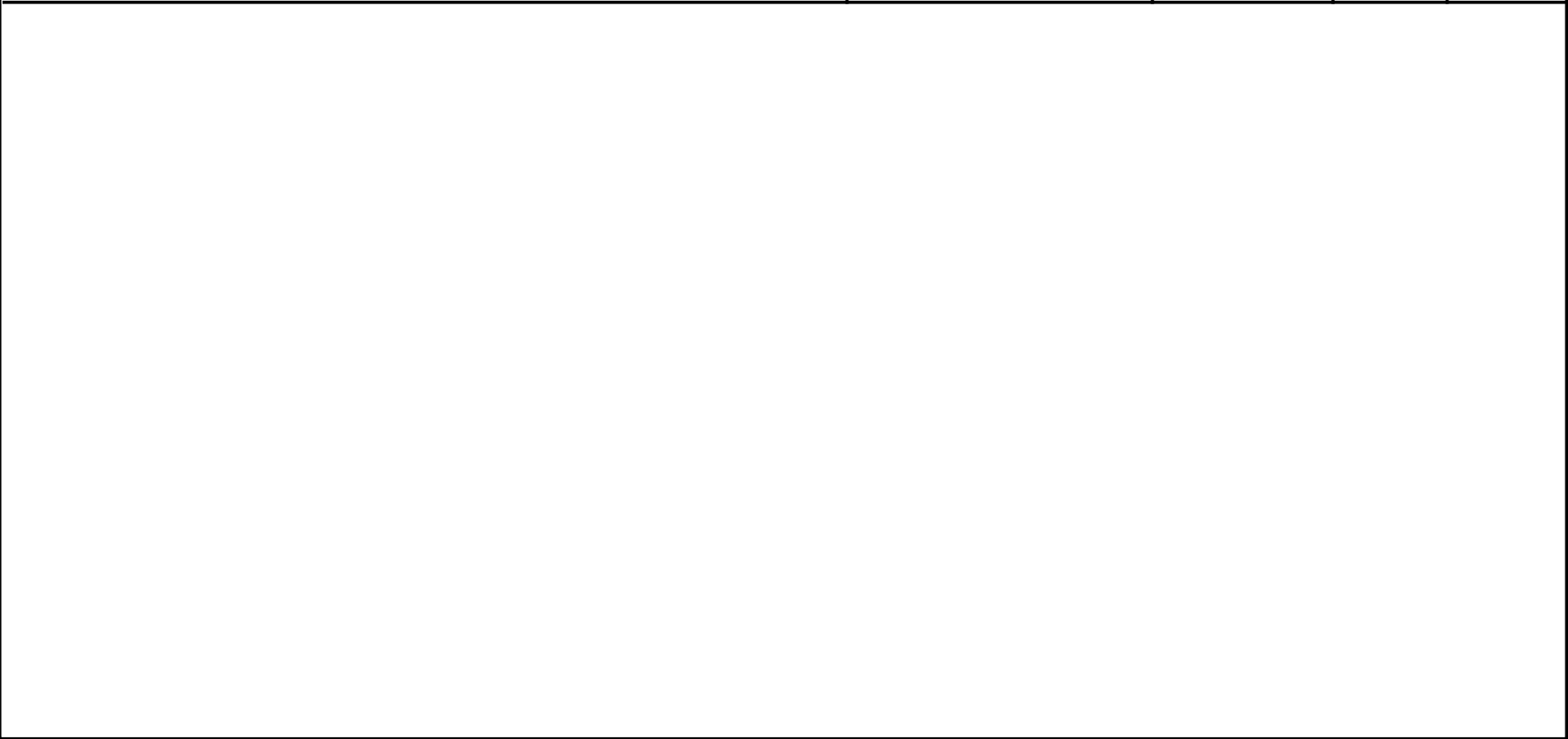
00 - 1 General Instructions	Type	Screw	Dimension	Unit
00 00 Extract from company standard BMW N 600 02.0				
<p>The maximum tightening torques are:</p> <p>Only applicable to shaft screws with metric standard and fine threads acc. to DIN 13, sheet 13 and nuts with height of 0,8 x d acc. to DIN 934 and only for a <math>\mu</math> total = 0.125 (screws phosphatized, screws untreated or galvanized. Lubrication condition: unlubricated and also oiled).</p> <p>For cadmium-plated screws or nuts (<math>\mu</math> total = 0.08 to 0.09) the tightening torque with screw material at the same level of utilization ca. must be 30% less than shown in the table.</p> <p>The values specified in this table apply to all screw connections conforming to the aforementioned conditions.</p> <p>Not applicable when using a different surface or lubricant condition on the thread, or if the height of the nut differs.</p> <p>Not applicable to necked-down bolts, self-tapping screw connections or to connections between parts made of different materials.</p> <p><b>Important!</b> Maintaining specified tightening torques is vital for performing repair work to a professional standard. This presupposes that the torque wrenches required for this are subjected to a regular inspection. Approved torque testing equipment is listed in the catalogue of workshop equipment planning documents.</p>				

00 - 2 General Instructions	Type	Screw	Dimension	Unit
<b>00 00 M4 and M5 - maximum tightening torques in accordance with BMW N 600 02.0</b>				
Applicable range for tightening torques, refer to extract from company standard <u>BMW N 600 02.0</u>				
M4 thread		M4 8.8	2.9	Nm (ft. lbs.)
		M4 10.9	4.1	Nm (ft. lbs.)
		M4 12.9	4.9	Nm (ft. lbs.)
M5 thread		M5 8.8	5.9	Nm (ft. lbs.)
		M5 10.9	8.3	Nm (ft. lbs.)
		M5 12.9	10.0	Nm (ft. lbs.)



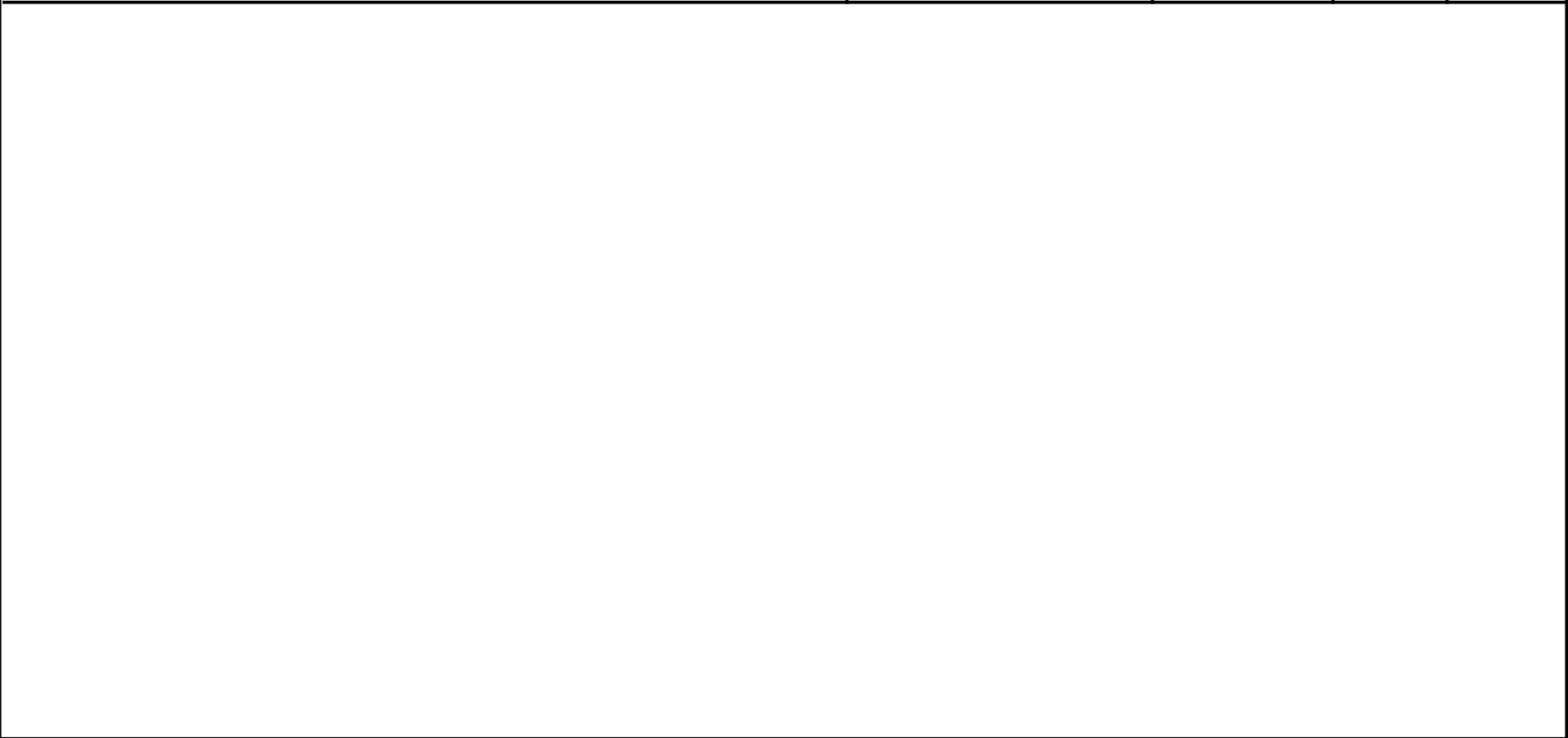
00 - 3 General Instructions	Type	Screw	Measure	Unit
00 00 M6 and M7 - maximum tightening torques accord. to BMW N 600 02.0				
Applicable range for tightening torques, <u>refer to extract from company standard BMW N 600 02.0</u>				
M6 thread		M6 8.8	9.9	Nm
		M6 10.9	14.0	Nm
		M6 12.9	16.5	Nm
M7 thread		M7 8.8	14.8	Nm
		M7 10.9	21.3	Nm
		M7 12.9	25.5	Nm

<b>00 - 4 General Instructions</b>	<b>Type</b>	<b>Screw</b>	<b>Dimension</b>	<b>Unit</b>
<b>00 00 M8 and M8x1 - maximum tightening torques in acc. with BMW N 600 02.0</b>				
Applicable range for tightening torques, <u>refer to extract from company standard BMW N 600 02.0</u>				
M8 thread		M8 8.8	24	Nm (ft. lbs.)
		M8 10.9	34	Nm (ft. lbs.)
		M8 12.9	40	Nm (ft. lbs.)
M8x1 thread		M8x1 8.8	26	Nm (ft. lbs.)
		M8x1 10.9	36	Nm (ft. lbs.)
		M8x1 12.9	44	Nm (ft. lbs.)

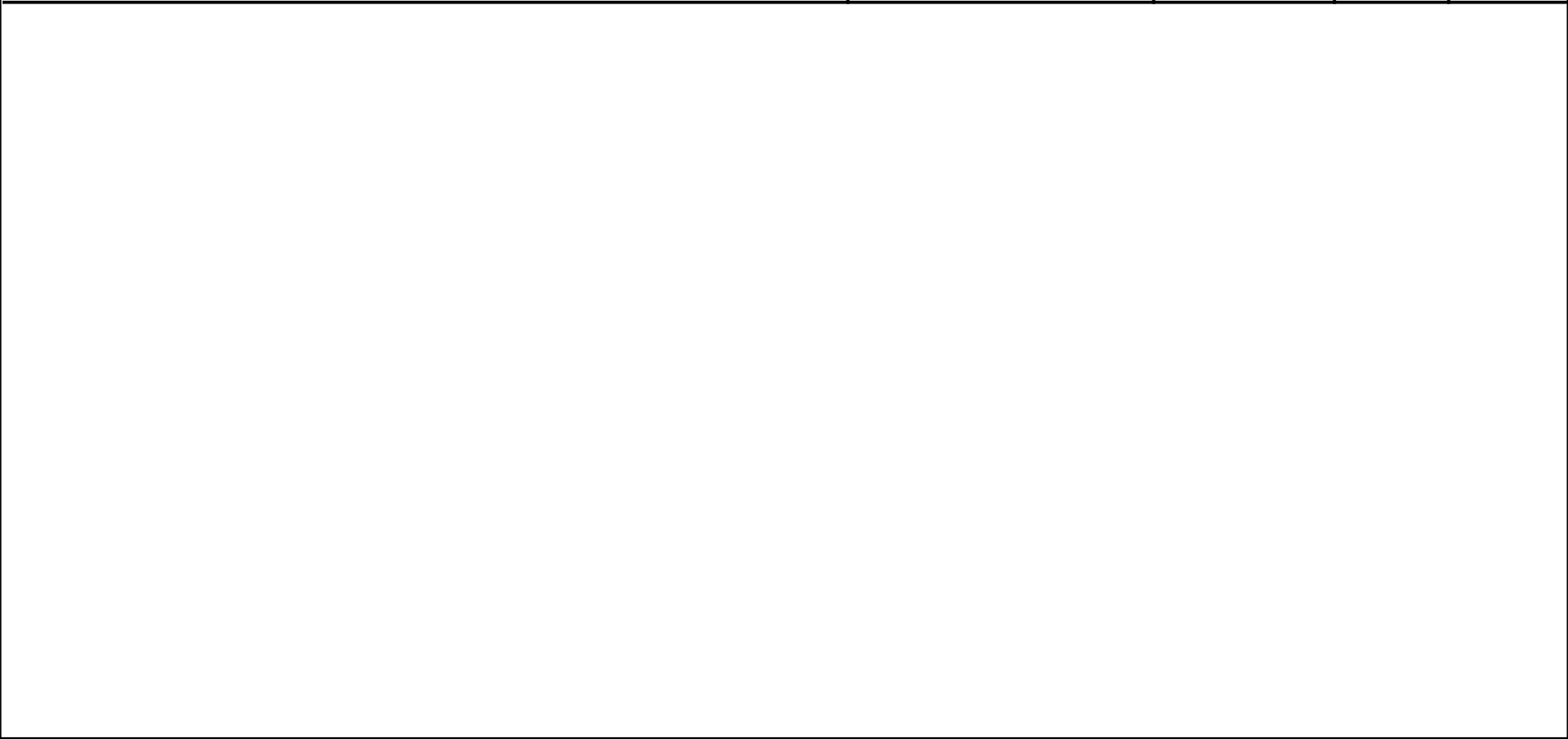




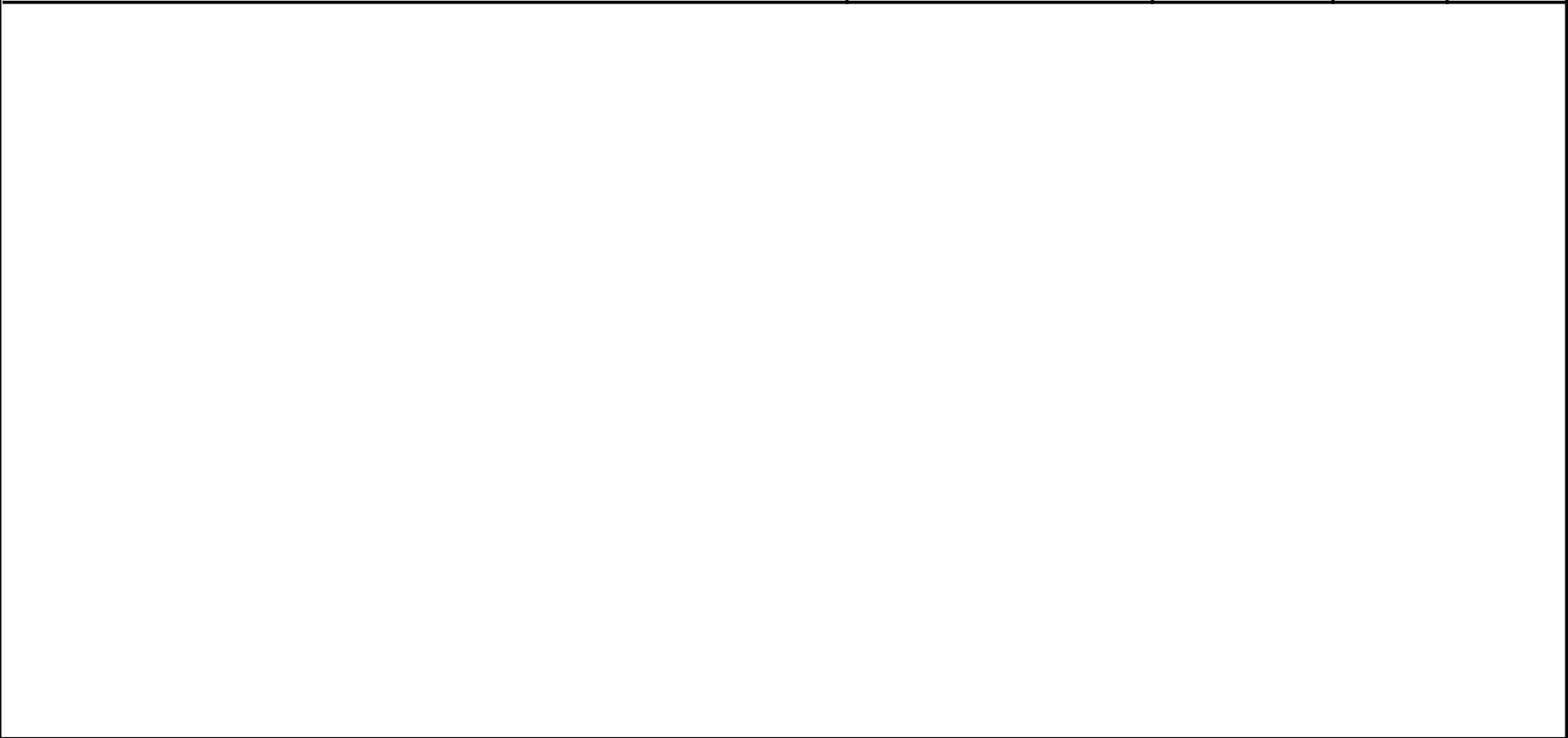
00 - 5 General Instructions	Type	Screw	Dimension	Unit
00 00 M10 and M10x1 - maximum tightening torques acc. to BMW N 600 02.0				
Applicable range for tightening torques, <u>refer to extract from company standard BMW N 600 02.0</u>				
M10 thread		M10 8.8	47	Nm (ft. lbs.)
		M10 10.9	66	Nm (ft. lbs.)
		M10 12.9	79	Nm (ft. lbs.)
M10x1 thread		M10x1 8.8	54	Nm (ft. lbs.)
		M10x1 10.9	75	Nm (ft. lbs.)
		M10x1 12.9	91	Nm (ft. lbs.)



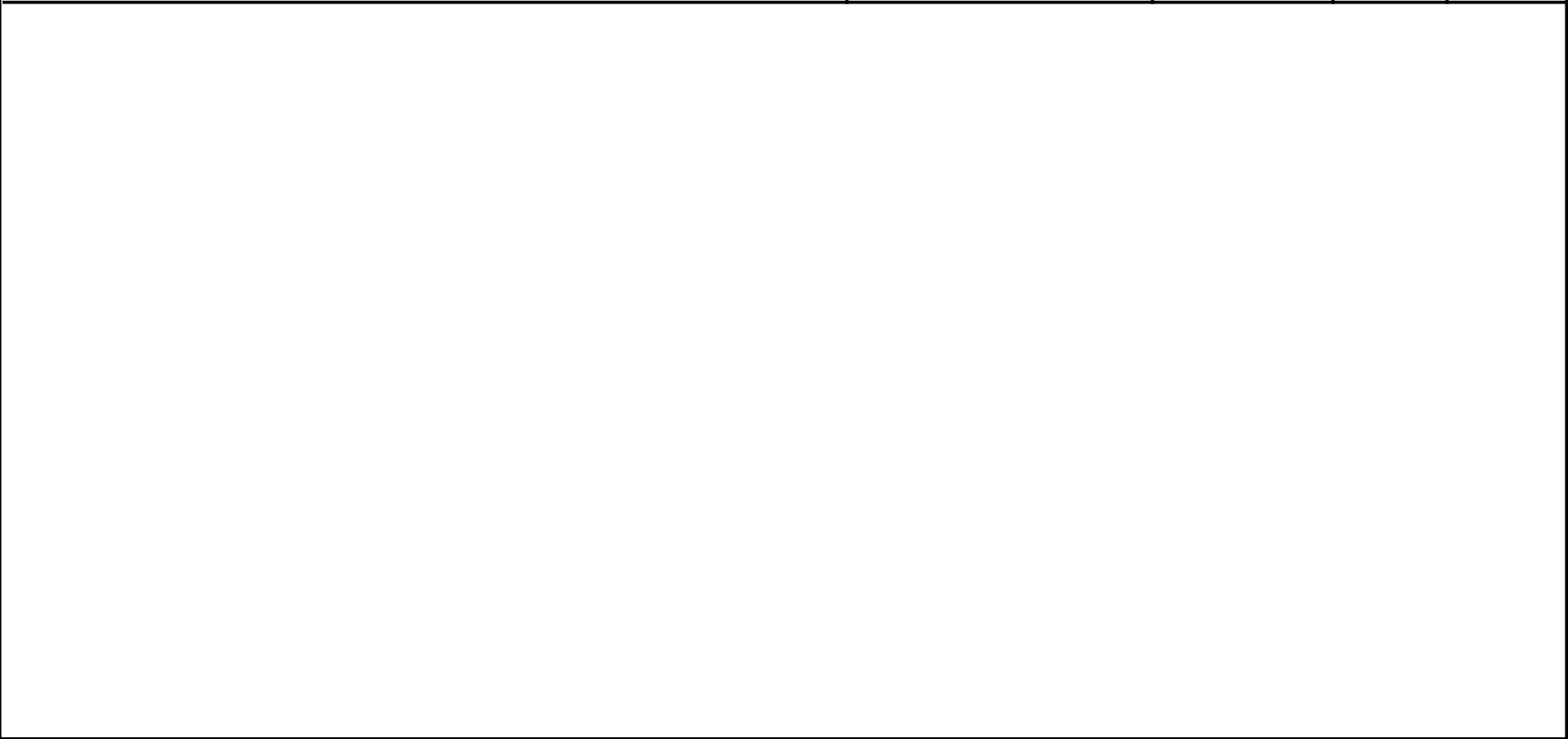
00 - 6 General Instructions	Type	Screw	Dimension	Unit
00 00 M12 and M12x1.5 - maximum tightening torques acc. to BMW N 600 02.0				
Applicable range for tightening torques, refer to extract from company standard BMW N 600 02.0				
M12 thread		M12 8.8	82	Nm (ft. lbs.)
		M12 10.9	115	Nm (ft. lbs.)
		M12 12.9	140	Nm (ft. lbs.)
M12x1.5 thread		M12x1.5 8.8	87	Nm (ft. lbs.)
		M12x1.5 10.9	123	Nm (ft. lbs.)
		M12x1.5 12.9	147	Nm (ft. lbs.)



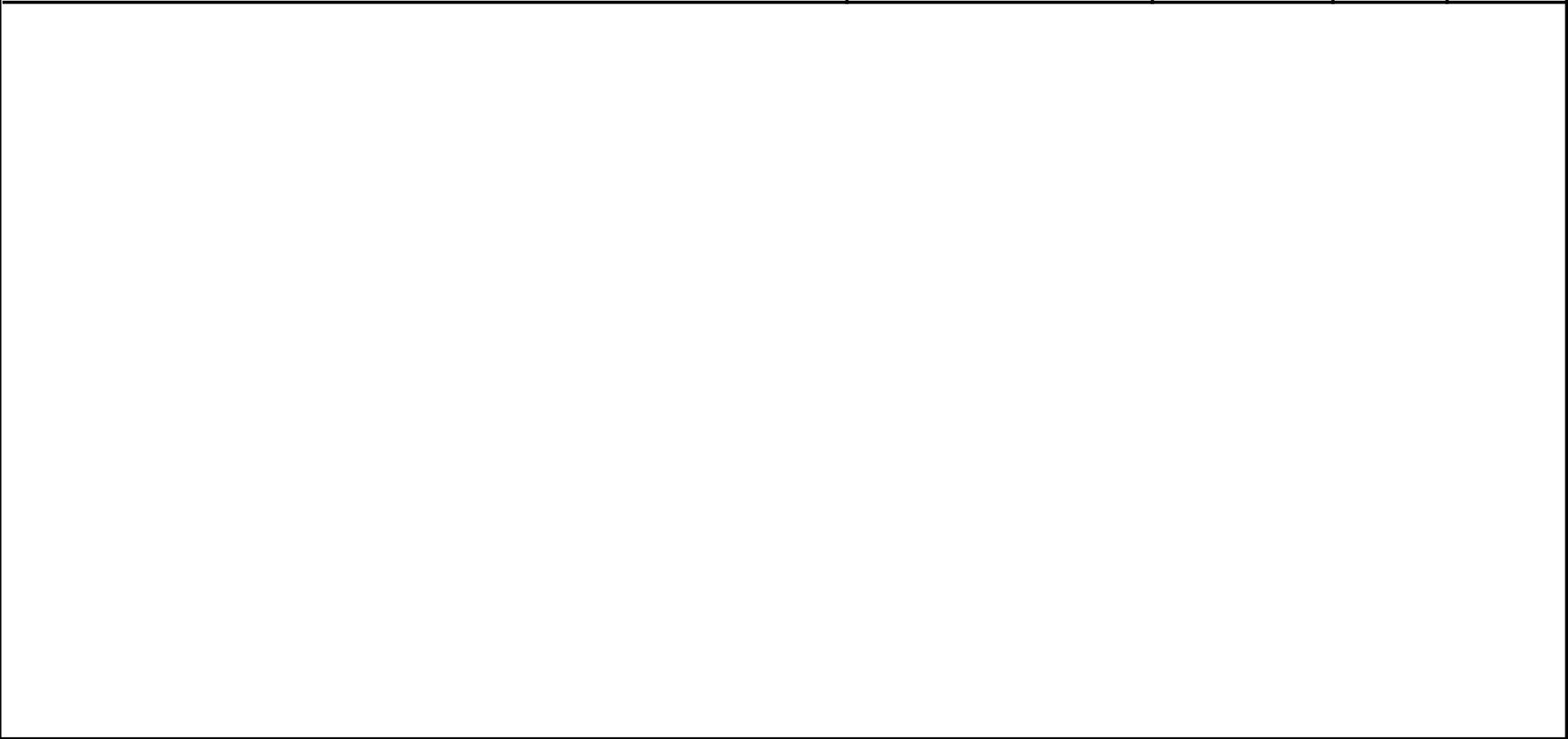
00 - 7 General Instructions	Type	Screw	Dimension	Unit
00 00 M14 and M14x1.5 - maximum tightening torques acc. to BMW N 600 02.0				
Applicable range for tightening torques, refer to extract from company standard BMW N 600 02.0				
M14 thread		M14 8.8	130	Nm (ft. lbs.)
		M14 10.9	180	Nm (ft. lbs.)
		M14 12.9	220	Nm (ft. lbs.)
M14x1.5 thread		M14x1.5 8.8	143	Nm (ft. lbs.)
		M14x1.5 10.9	200	Nm (ft. lbs.)
		M14x1.5 12.9	240	Nm (ft. lbs.)



00 - 8 General Instructions	Type	Screw	Dimension	Unit
00 00 M16 and M16x1.5 - maximum tightening torques acc. to BMW N 600 02.0				
Applicable range for tightening torques, <u>refer to extract from company standard BMW N 600 02.0</u>				
M16 thread		M16 8.8	200	Nm (ft. lbs.)
		M16 10.9	280	Nm (ft. lbs.)
		M16 12.9	340	Nm (ft. lbs.)
M16x1.5 thread		M16x1.5 8.8	216	Nm (ft. lbs.)
		M16x1.5 10.9	303	Nm (ft. lbs.)
		M16x1.5 12.9	364	Nm (ft. lbs.)



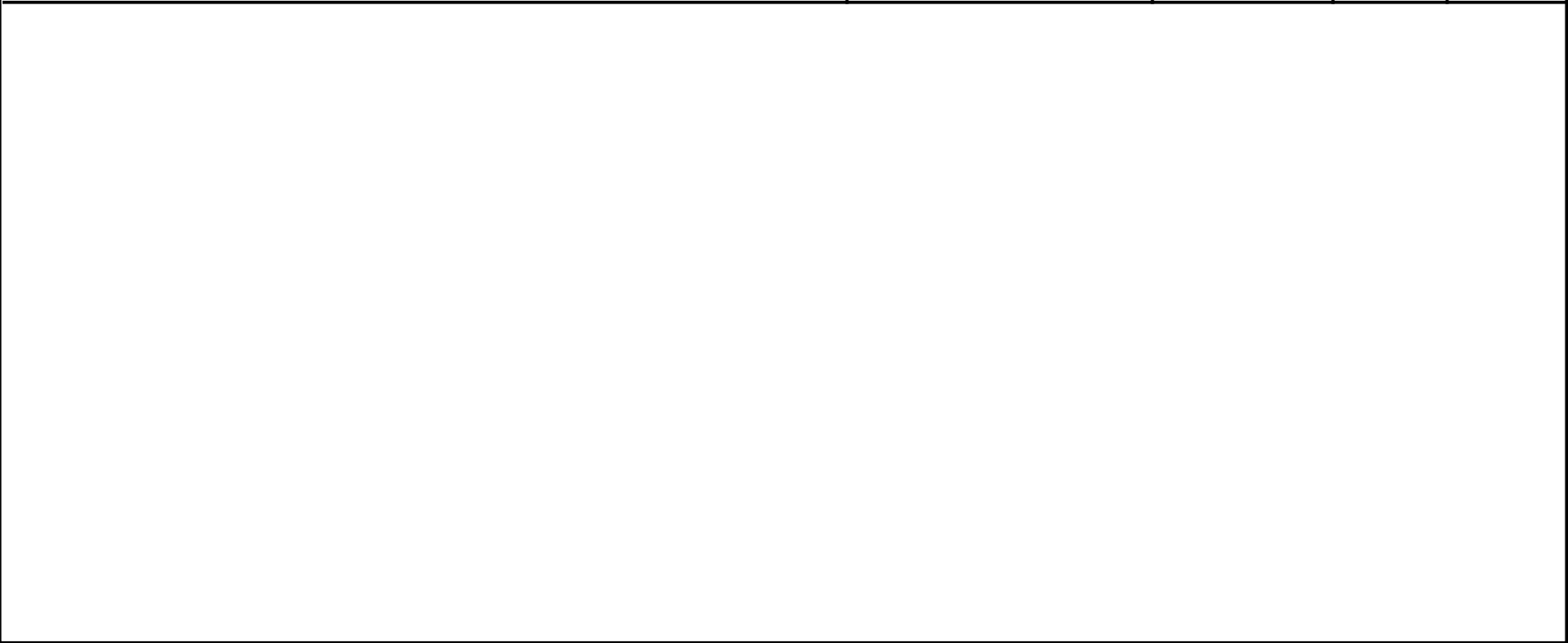
00 - 9 General Instructions	Type	Screw	Dimension	Unit
00 00 M18 and M18x1.5 - maximum tightening torques acc. to BMW N 600 02.0				
Applicable range for tightening torques, <u>refer to extract from company standard BMW N 600 02.0</u>				
M18 thread		M18 8.8	280	Nm (ft. lbs.)
		M18 10.9	390	Nm (ft. lbs.)
		M18 12.9	470	Nm (ft. lbs.)
M18x1.5 thread		M18x1.5 8.8	313	Nm (ft. lbs.)
		M18x1.5 10.9	440	Nm (ft. lbs.)
		M18x1.5 12.9	527	Nm (ft. lbs.)



11 - 1 Engine		Type	Screw	Measure	Unit
11 11 Crankcase					
1AZ	Main bearing screws Replace, wash and oil main bearing screws	M10/M20/M30	M10	60	Nm
		M21	M10	65	Nm
		S38/S14/M40/M42/M43/M44/M50/ M41/M51/S50/S50 US	M10		
	Torque			20	Nm
	Torque angle			50	°
2AZ	Main bearing screws Replace main bearing screws Do not wash off coating on main bearing screw	M70/S70/M73/M52 With cast aluminium engine block			
	Torque			20	Nm
	Torque angle		M10	70	°
		M60/1/M60/2/M62			
	Torque			20	Nm
	Torque angle on engines with M10 main bearing screws		M10	70	°
	Torque angle on engines with M11 main bearing screws		M11	100	°
	Main bearing screws Replace, wash and oil main bearing screws	S52/M52 With cast iron engine block			
	Torque			20	Nm
	Torque angle		M10	50	°

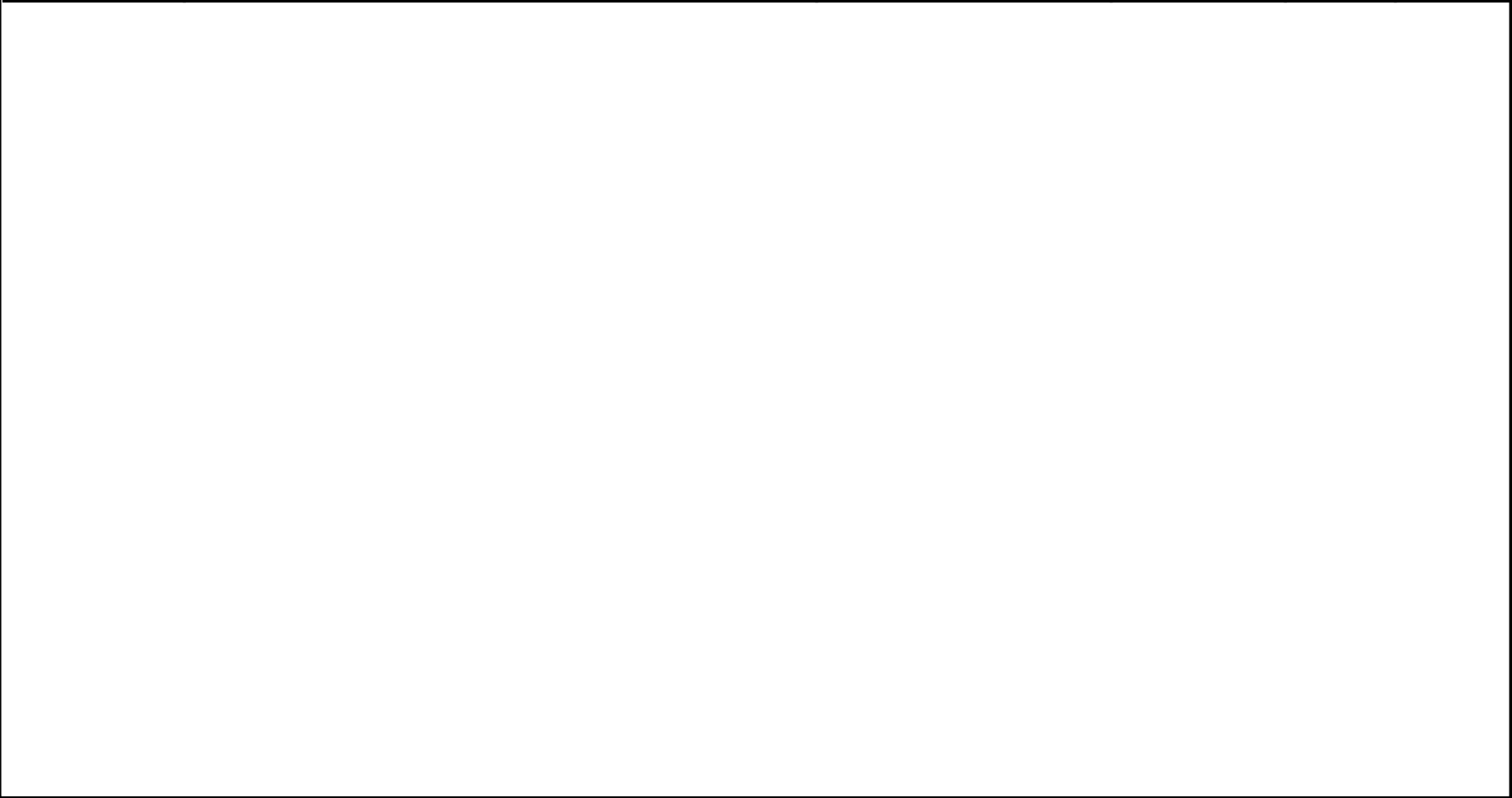
11 - 1 Engine		Type	Screw	Measure	Unit
11 11 Crankcase					
1AZ	Main bearing screws Replace, wash and oil main bearing screws	M10/M20/M30	M10	60	Nm
		M21	M10	65	Nm
		S38/S14/M40/M42/M43/M44/M50/ M41/M51/S50/S50 US	M10		
	Torque			20	Nm
	Torque angle			50	°
2AZ	Main bearing screws Replace main bearing screws Do not wash off coating on main bearing screw	M70/S70/M73/M52 With cast aluminium engine block			
	Torque			20	Nm
	Torque angle		M10	70	°
		M60/1/M60/2/M62			
	Torque			20	Nm
	Torque angle on engines with M10 main bearing screws		M10	70	°
	Torque angle on engines with M11 main bearing screws		M11	100	°
	Main bearing screws Replace, wash and oil main bearing screws	S52/M52 With cast iron engine block			
	Torque			20	Nm
	Torque angle		M10	50	°

11 - 2 Engine		Type	Screw	Measure	Unit
11 11 Crankcase					
3AZ Main bearing cap inclined bolts					
Screws (replace hex and collar screws) and spacer pin		M60/1/M60/2/M62/M70/S70/M73	M8		
	Torque			20	Nm
	Torque angle			45	°
Threaded support sleeves		M70/M60/1/M60/2/M62/S70/M73		10	Nm
4AZ Struts/bracing shell		All	M10	43	Nm
		All	M8	22	Nm
5AZ Drain plug for coolant on engine block		All	M14 x 1.5	25	Nm
6AZ Main oil duct screw plugs		All	M16 x 1.5	34	Nm
7AZ Oil spray nozzle on engine block		All	M8x1	12	Nm





11 - 4 Engine		Type	Screw	Measure	Unit
11 12 Cylinder Head and Cover					
2AZ Cylinder head bolts Replace, wash and oil cylinder head bolts.					
For repair work, only use screws with Torx head		M20	M10		
	torque			30	Nm
	torque angle			90	°
	torque angle No settling time. No warm-running time.			90	°



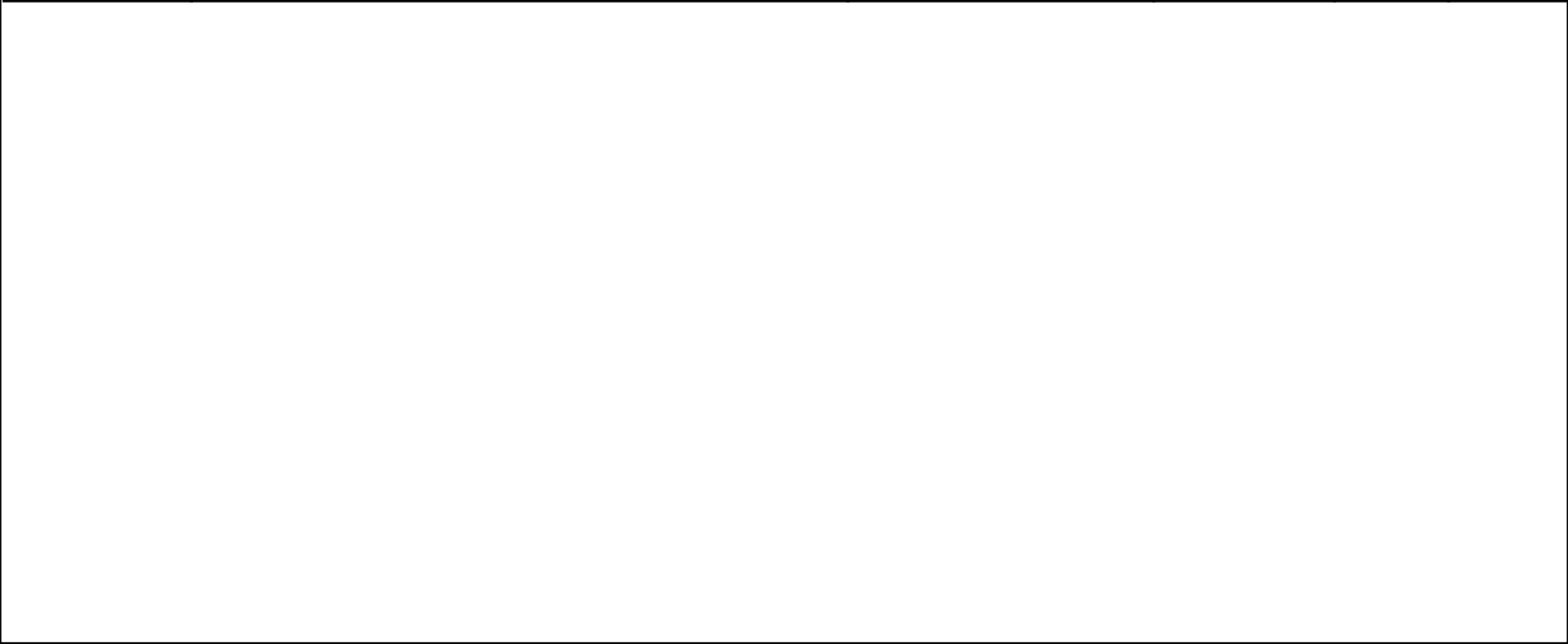
11 - 5 Engine		Type	Screw	Measure	Unit
11 12 Cylinder Head and Cover					
3AZ Cylinder head bolts Replace, wash and oil cylinder head bolts.		M21			
	torque			50	Nm
	Torsion angle (screws no. 1 - 10)			90	°
	Torsion angle (screws no. 11 - 14)			73	°
	warm-running time			15	min
	torque angle			90	°
4AZ Cylinder head bolts Replace, wash and oil cylinder head bolts.		M30			
	torque			60	Nm
	settling time			20	min
	torque			80	Nm
	warm-running time			25	min
	torque angle			35	°

11 - 6 Engine		Type	Screw	Measure	Unit
11 12 Cylinder head with cover					
5AZ Cylinder head bolts Replace, wash and oil cylinder head bolts		M51/M41	M11		
	Torque			80	Nm
	Loosen all bolts 1/2 turn				
	Torque			50	Nm
	Torque angle			90	°
	Torque angle			90	°
	warm-running time			25	min
	Torque angle			90	°
6AZ Cylinder head bolts Replace, wash and oil cylinder head bolts		M40/M42/M43/M44/M50/S50 US/ S52/M52 With cast iron engine block	M10		
	Torque			30	Nm
	Torque angle			90	°
	Torque angle			90	°
Cylinder head bolts Fit new cylinder head bolts Do not wash away coating on cylinder head screws		M52 With cast aluminium engine block	M10		
	Torque			40	Nm
	Torque angle			90	°
	Torque angle			90	°

11 - 7 Engine		Type	Screw	Measure	Unit
11 12 Cylinder head with cover					
6AZ Cylinder head bolts Replace, wash and oil cylinder head bolts		S50	M11		
	Torque			30	Nm
	Torque angle			90	°
	Torque angle			90	°

11 - 8 Engine		Type	Screw	Measure	Unit
11 12 Cylinder head with cover					
7AZ Cylinder head bolts Fit new cylinder head bolts Do not wash away coating on cylinder head screws For repair work, only use screws with Torx head		M70/S70/M73	M10		
	Torque			30	Nm
	Torque angle			60	°
	Torque angle			60	°
8AZ Cylinder head bolts Fit new cylinder head bolts Do not wash away coating on cylinder head screws		M60/1/M60/2/M62	M10		
	Torque			30	Nm
	Torque angle			80	°
	Torque angle			80	°

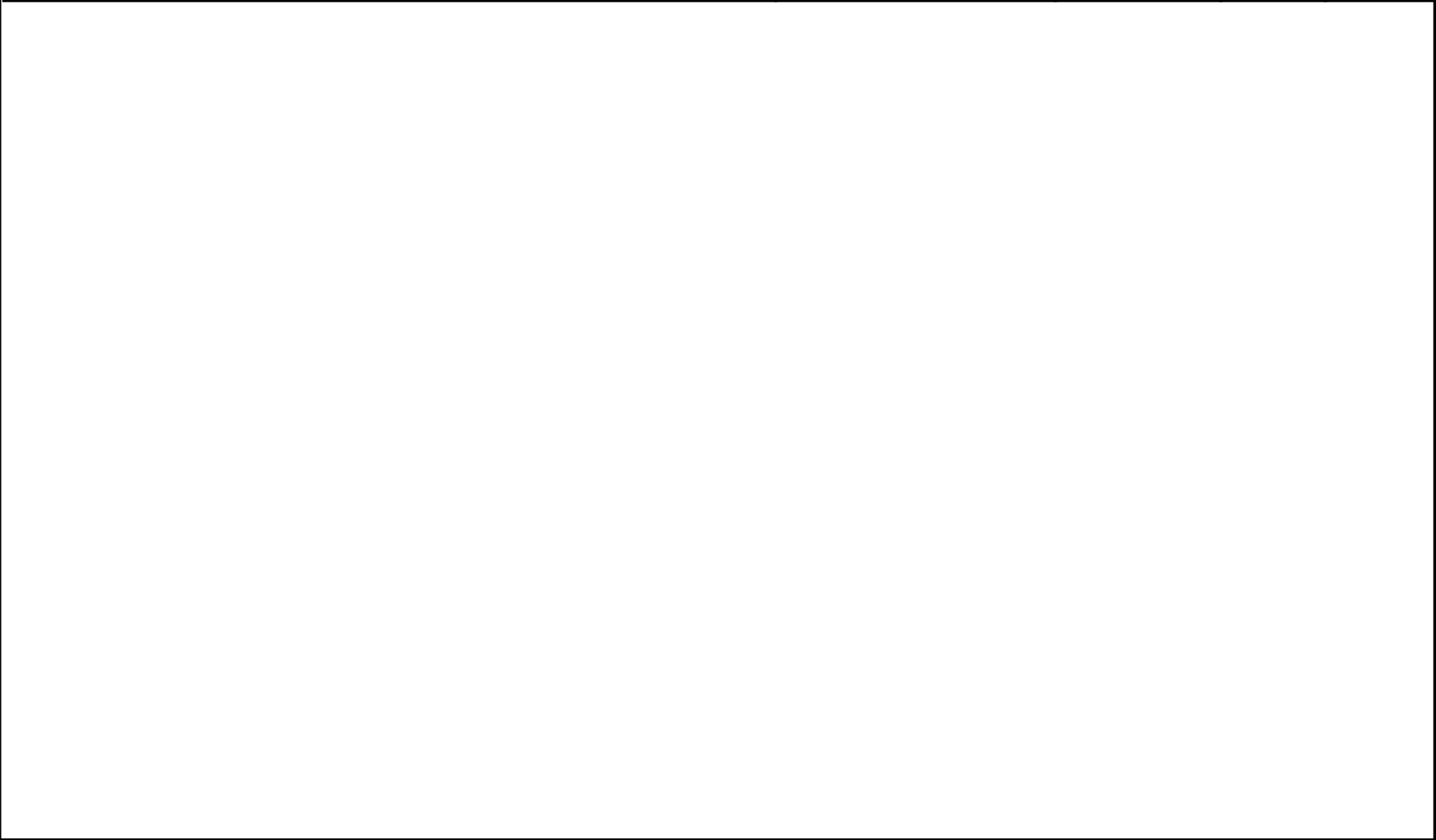
11 - 9 Engine		Type	Screw	Measure	Unit
11 12 Cylinder Head and Cover					
9AZ Cylinder head bolts Replace, wash and oil cylinder head bolts.		S14/S38 B35	M12		
	torque			50	Nm
	torque			80	Nm
	settling time			15	min
	torque			100	Nm
10AZ Cylinder head bolts Replace, wash and oil cylinder head bolts.		S38 B36/S38 B38	M12		
	torque			20	Nm
	torque angle			60	°
	torque angle			70	°



<b>11 - 10 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>11 12 Cylinder Head and Cover</b>				
11AZ Cylinder head cover	All	M6	10	Nm
	All	M7	15	Nm
	M21	M8	15	Nm
12AZ Oil trap to cylinder head cover	M21	M8	17	Nm
13AZ Timing case to cylinder head	All	M7	15	Nm
	All	M8	20	Nm

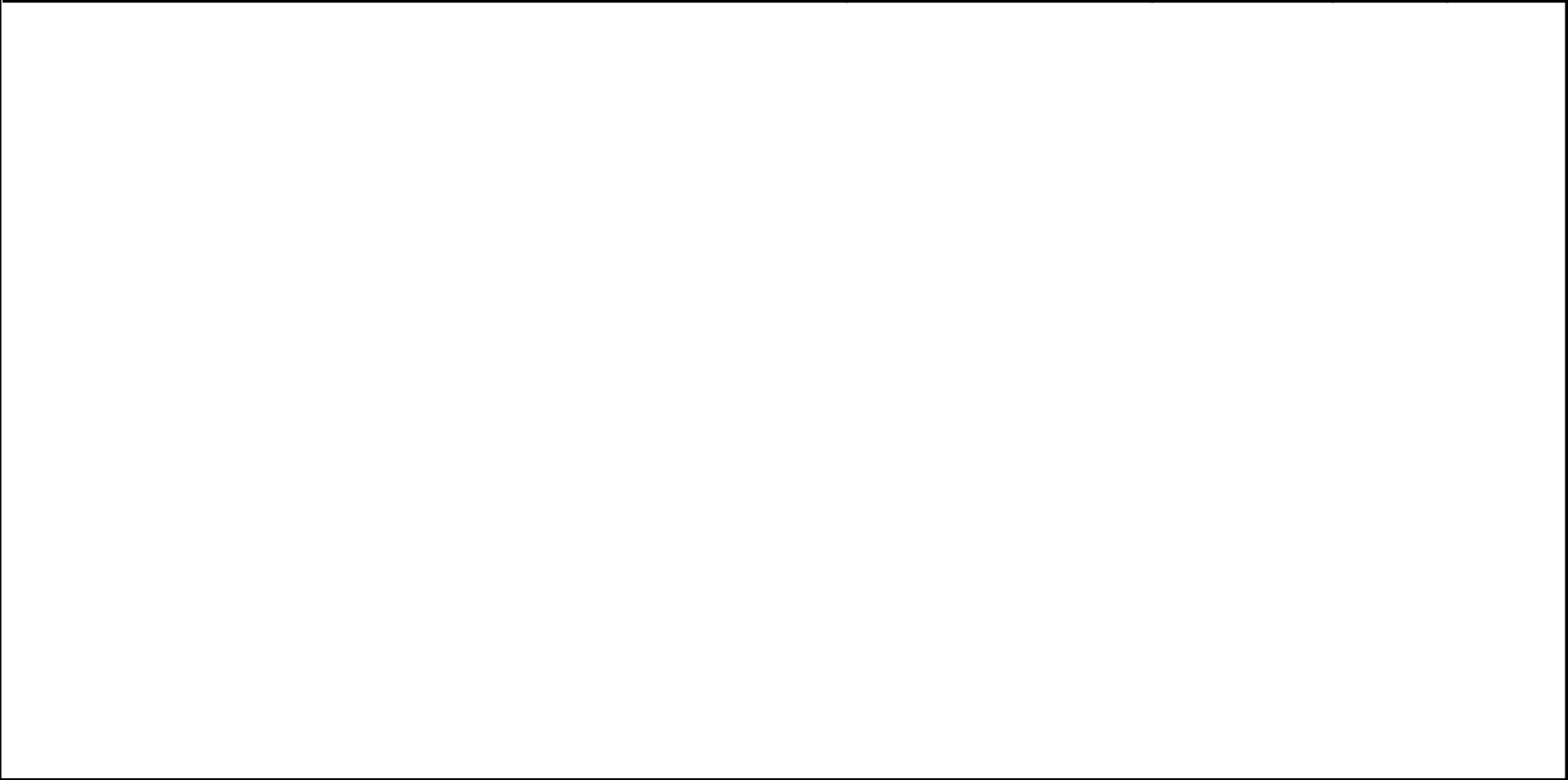


<b>11 - 11 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>11 13 Oil Pan</b>				
1AZ Oil drain plug	All	M12 x 1.5	25	Nm
	All	M22 x 1.5	60	Nm
2AZ Oil pan on engine block	All	M6 8.8	10	Nm
	All	M6 10.9	12	Nm



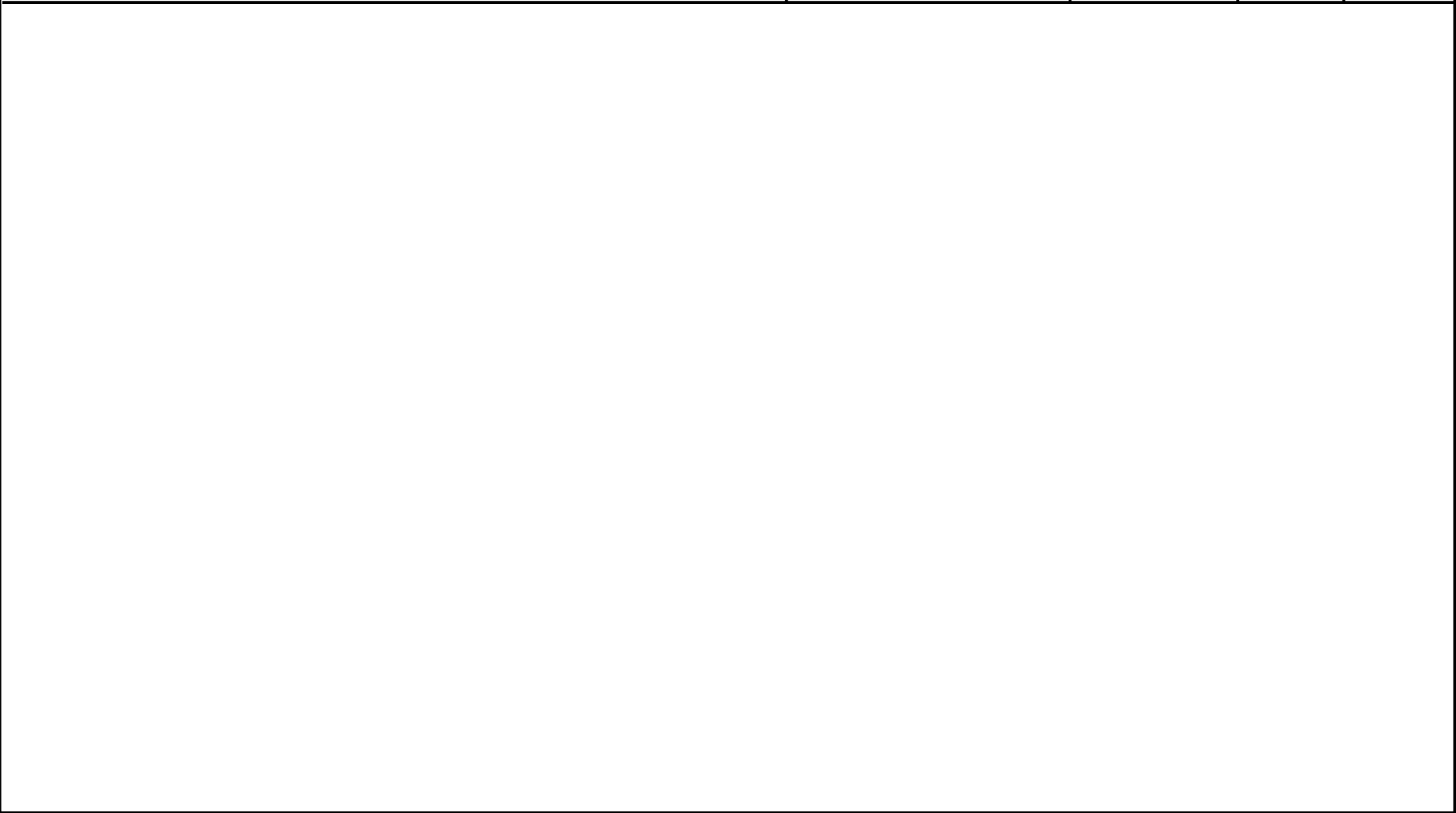


11 - 12 Engine	Type	Screw	Measure	Unit
<b>11 14 Case covers</b>				
1AZ Timing case and top and bottom timing case cover	All	M6	10	Nm
	All	M8	22	Nm
	All	M10	47	Nm
2AZ Front/rear end cover to crankcase	All	M6	10	Nm
	All	M8	22	Nm
3AZ Bolts on timing case cover	M51/M41	M42x1.5	65	Nm
4AZ Sealing plug or connector on timing case cover	M51/M41	M20x1.5	30	Nm



<b>11 - 13 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Dimension</b>	<b>Unit</b>
<b>11 21 Crankshaft and Bearings</b>				
<b>1AZ Increment wheel on crankshaft</b>	<b>All</b>	<b>M5 10.9</b>	<b>13</b>	<b>Nm (ft. lbs.)</b>

<b>11 - 14 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>11 22 Flywheel</b>				
<b>1AZ Flywheel to crankshaft</b>				
<b>Do not install with screw retaining compound. Bolts are a component part of the flywheel. Screw threads oiled.</b>	<b>M60/1/M60/2/M62 Manual Transmission</b>		<b>105</b>	<b>Nm</b>
<b>New micro-encapsulated screws</b>	<b>M40/M42/M43/M44/ M51 Automatic/M52 Automatic</b>		<b>120</b>	<b>Nm</b>
<b>New micro-encapsulated screws</b>	<b>All others</b>		<b>105</b>	<b>Nm</b>



11 - 15 Engine		Type	Screw	Measure	Unit
11 23 Vibration Damper					
1AZ	Vee belt pulley on crankshaft	M10		190	Nm
2AZ	Vibration damper hub on crankshaft Replace screws	M20/M21/M50/M52/S50 US/S52	M18 x 1.5	410	Nm
		M30/S14/S38 B 35	M24 x 1.5	440	Nm
		M41/M51/M60/1/M60/2/M62	M18 x 1.5		
	Torque			100	Nm
	Torque angle			60	°
	Torque angle			60	°
	Torque angle			30	°
		M70/S70/M73	M18 x 1.5		
	Torque			100	Nm
	Torque angle			60	°
	Torque angle			60	°
		S38 B36	M20 x 1.5		
	Torque			150	Nm
	Unfasten screw one half turn				
	Torque			60	Nm
	Torque angle			60	°
	Torque angle			60	°
	Torque angle			30	°

11 - 16 Engine		Type	Screw	Dimension	Unit
11 23 Vibration Damper					
2AZ	Vibration damper hub on crankshaft Replace screws	S38 B38	M12x1.5		
		S50	M12x1.5		
	torque			60	Nm
	torque angle			50	°
	torque angle			50	°



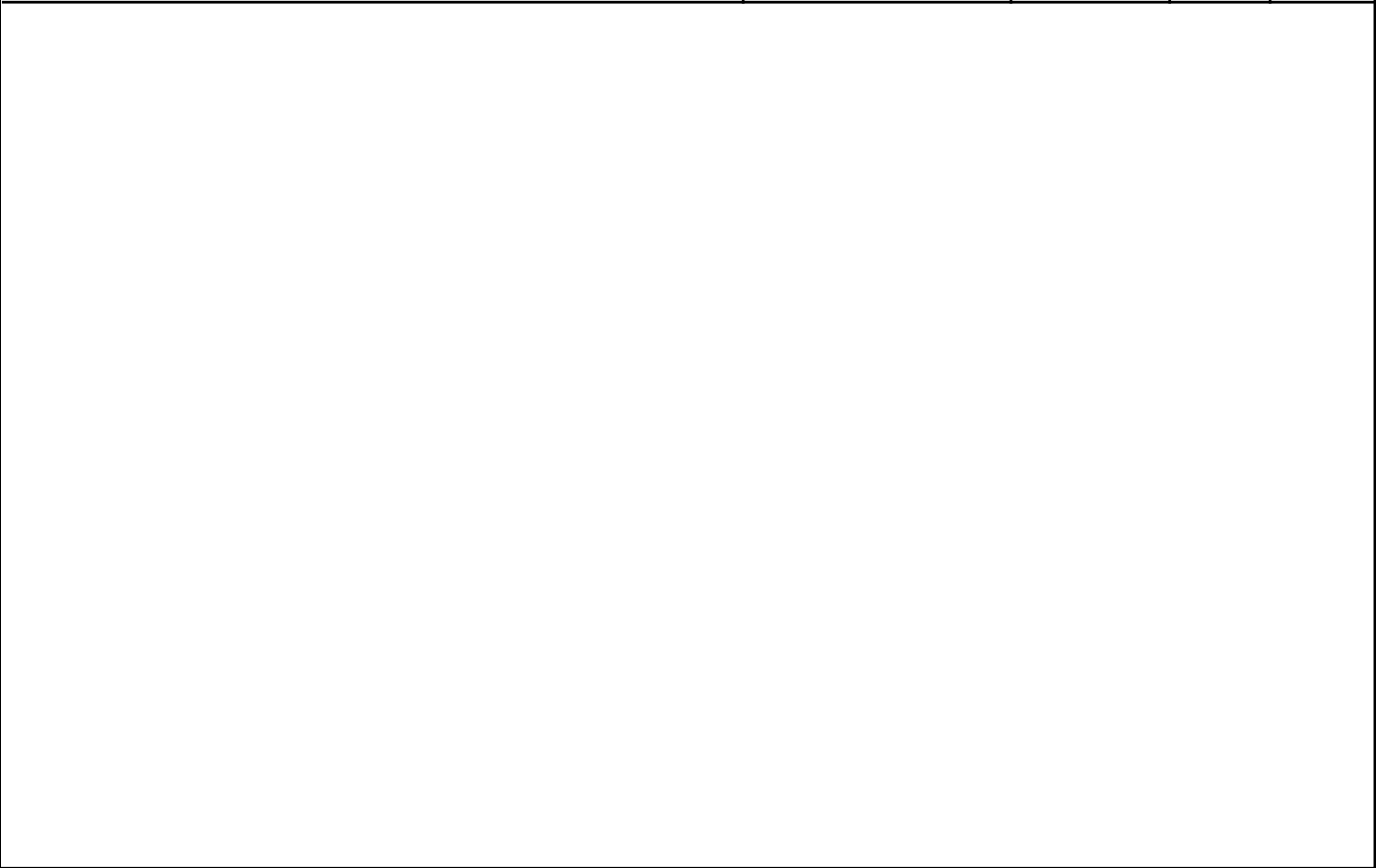
11 - 17 Engine	Type	Screw	Measure	Unit
<b>11 23 Vibration Damper</b>				
3AZ Vee belt pulley / vibration damper on hub	S38 B36	M8 10.9	34	Nm
	S38 B 38	M8 10.9	34	Nm
	All others	M8	22	Nm
4AZ Pulley to vibration damper	S38 B 35	M8 8.8	22	Nm
	S50	M8 8.8	22	Nm
5AZ Sprocket with hub or hub to crankshaft Replace screw	M40	M16 x 1.5	310	Nm
	M42/M43/M44	M16 x 1.5	330	Nm

11 - 18 Engine		Type	Screw	Measure	Unit
11 24 Connecting Rods and Bearings					
1AZ	Connecting rod bolts Replace, wash and oil conrod bolts	M10/M30		55	Nm
		M20/M21/M40/M41/M42/M43/ M44/M50/M51/M52/S52/S50 US/ M70/S70/M73			
	Application torque			5	Nm
	Torque			20	Nm
	Torque angle			70	°
		M60/1/M60/2/M62			
	Application torque			5	Nm
	Torque			20	Nm
	Torque angle			80	°

11 - 19 Engine		Type	Screw	Measure	Unit
11 24 Connecting Rods and Bearings					
1AZ	Connecting rod bolts Replace, wash and oil conrod bolts	S14		55	Nm
		S38			
	Application torque			5	Nm
	Torque			30	Nm
	Torque angle			60	°
		S50			
	Application torque			5	Nm
	Torque			20	Nm
	Torque angle			65	°



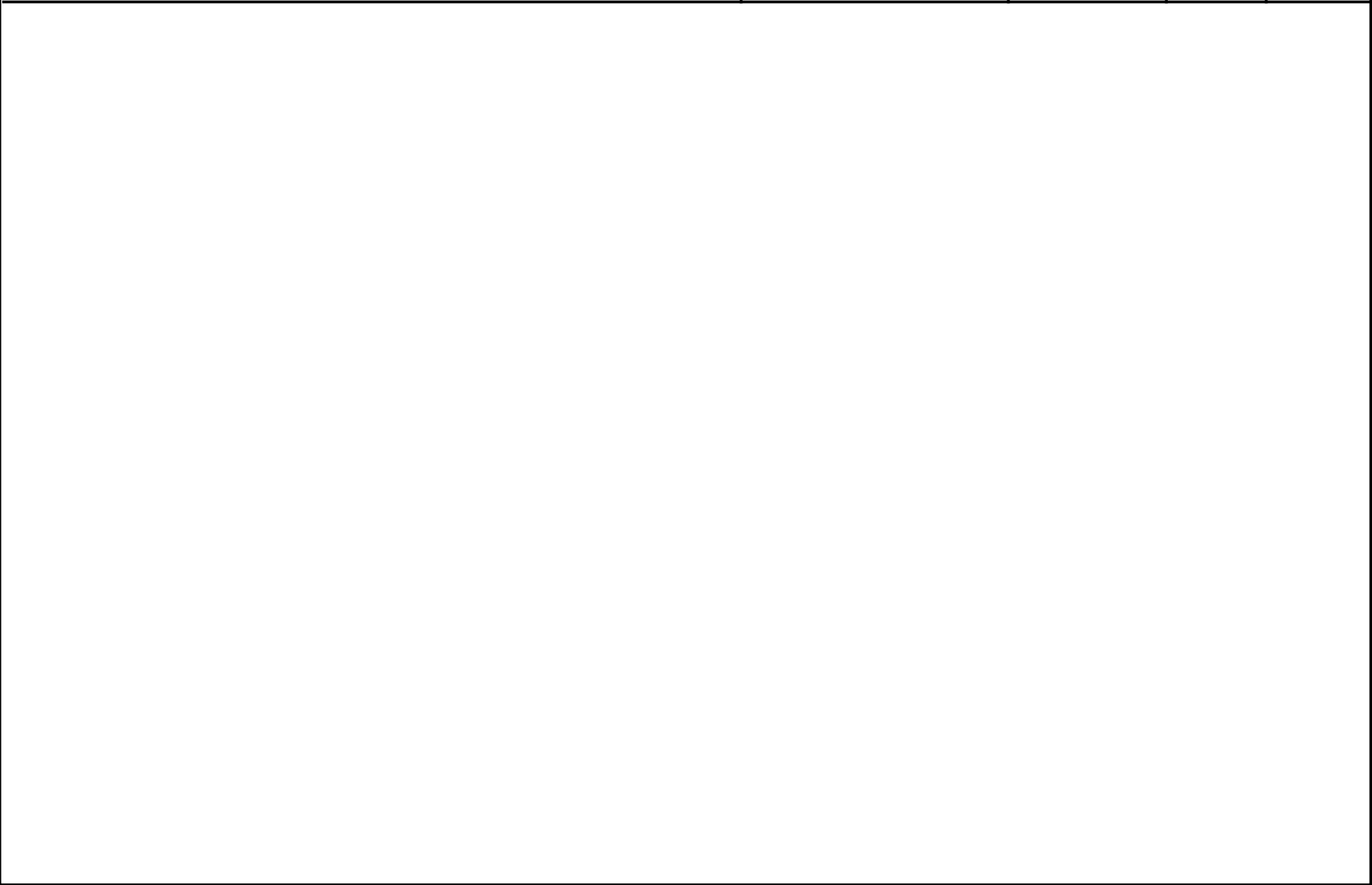
<b>11 - 20 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>11 28 V-ribbed belt with tension and deflection element</b>				
<b>1AZ Idler lever to alternator bracket Replace screw</b>	<b>M43</b>	<b>M10 10.9</b>	<b>90</b>	<b>Nm</b>
<b>2AZ Screw plug for bearing pin</b>	<b>M51/M41</b>		<b>20</b>	<b>Nm</b>



11 - 21 Engine		Type	Screw	Measure	Unit
11 31 Camshaft					
1AZ	Camshaft bearing cap	All	M6	10	Nm
		All	M7	15	Nm
		All	M8	20	Nm
2AZ	Sprocket to camshaft	M20/M21/M40	M10	65	Nm
3AZ	Sprocket to camshaft flange	M60/1/M60/2/M62	M6	15	Nm
		All others	M6	10	Nm
		M50/M52/S52/S50 US/M50 VANOS	M7		
	Application torque			5	Nm
	Torque			22	Nm
		All others	M7	15	Nm
4AZ	Sprocket to camshaft	M51/M41			
	Torque			20	Nm
	Torque angle			35	°
5AZ	Splined shaft to intake camshaft	M52/S52/S50 US/M50 VANOS	M14 x 1.5		
	Torque			40	Nm
	Torque angle			60	°

11 - 22 Engine	Type	Screw	Measure	Unit
<b>11 31 Camshaft</b>				
6AZ Flange to camshaft	M30		145	Nm
7AZ Plug for chain tensioner	M50/S50 US	M22 x 1.5	50	Nm
	All others	M22 x 1.5	40	Nm
8AZ Cylinder for chain tensioner plunger	M50/M52/S52/S50 US	M26 x 1.5	70	Nm
	All others	M26 x 1.5	50	Nm
9AZ Bearing flange on engine block	M60/1/M60/2	M6	13	Nm
10AZ Reversing rail on engine block	M62	M6	13	Nm
11AZ Screw-in pin on camshaft	All	M7	15	Nm
Nut on screw-in pin	All	M6	10	Nm

<b>11 - 23 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>11 33 Rocker Arms/Drag Arms and Bearings</b>				
1AZ Clamping bolt in rocker arm	M10/M20/M30	M6	10	Nm
Clamping bolt in drag arm	M21	M6	8	Nm



11 - 24 Engine	Type	Screw	Measure	Unit
11 35 Intermediate Shaft				
1AZ Toothed belt pulley to intermediate	M20/M21	M10	60	Nm

11 - 25 Engine	Type	Screw	Measure	Unit
<b>11 36 Variable Camshaft Control</b>				
1AZ 4/2 way directional valve/solenoid valve on VANOS housing	M52/S52/S50 US/M50 VANOS		30	Nm
2AZ Banjo bolt to VANOS controller	M52/S52/S50 US/M50 VANOS	M14 x 1.5	32	Nm
3AZ Plug to VANOS adjusting unit	M52/S52/S50 US/M50 VANOS	M22 x 1.5	50	Nm
4AZ Plug to hydraulic plunger	M52/S52/S50 US/M50 VANOS	M36x1	60	Nm
5AZ Hydr. line for VANOS on oil filter aggregate carrier	M52/S52/S50 US/M50 VANOS		32	Nm
6AZ Collar nut on toothed shaft (nut secured with Loctite)	S50	M6	9	Nm
7AZ Cover on VANOS control unit (hydraulic pistons, intake side)	S50	M5	5	Nm
8AZ Filter screw on VANOS adjusting unit	S50	M10x1	12	Nm
9AZ Pressure line on pressure accumulator and VANOS adjustment unit	S50	M12x1	20	Nm
10AZ Cover for solenoid valve on VANOS control unit	S50 B 30	M5 8.8	6	Nm
	S50 B 32	M5 10.9	8	Nm
11AZ Cover on VANOS control unit (hydraulic pistons, exhaust side)	S50 B 32	M6 10.9	13	Nm

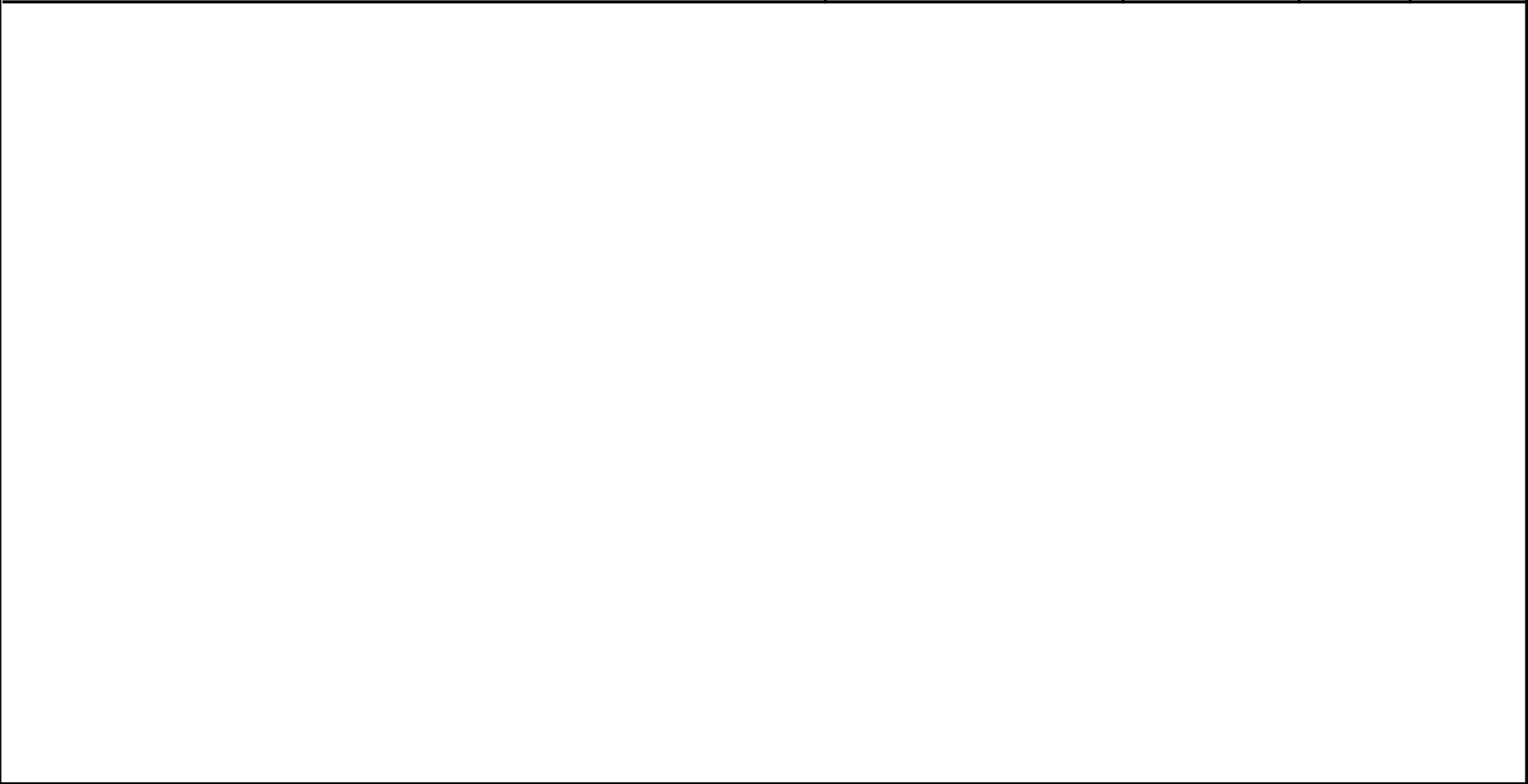
<b>11 - 26 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Dimension</b>	<b>Unit</b>
<b>11 41 Oil Pump with Strainer and Drive</b>				
1AZ Plug for pressure relief valve	M10/M30		40	Nm
	M20		30	Nm
2AZ Oil pump to crankcase	All	M8	22	Nm
3AZ Oil pump cover	All	M6	10	Nm
4AZ Sprocket to oil pump	All	M6	10	Nm
	All	M10	47	Nm
	All	M10x1	25	Nm

11 - 27 Engine	Type	Screw	Measure	Unit
<b>11 42 Oil Filter and Pipes</b>				
1AZ Oil filter (one-way cartridge) (Tightening torque by hand in acc. with specification on spin-on oil filter)	All			Nm
2AZ Full flow oil filter (cover)	All	M8	22	Nm
	All	M10	33	Nm
	All	M12	33	Nm
Screwed-on cover	All		25	Nm
3AZ Oil filter housing and lines on crankcase	All	M8	22	Nm
	All	M20 x 1.5	40	Nm

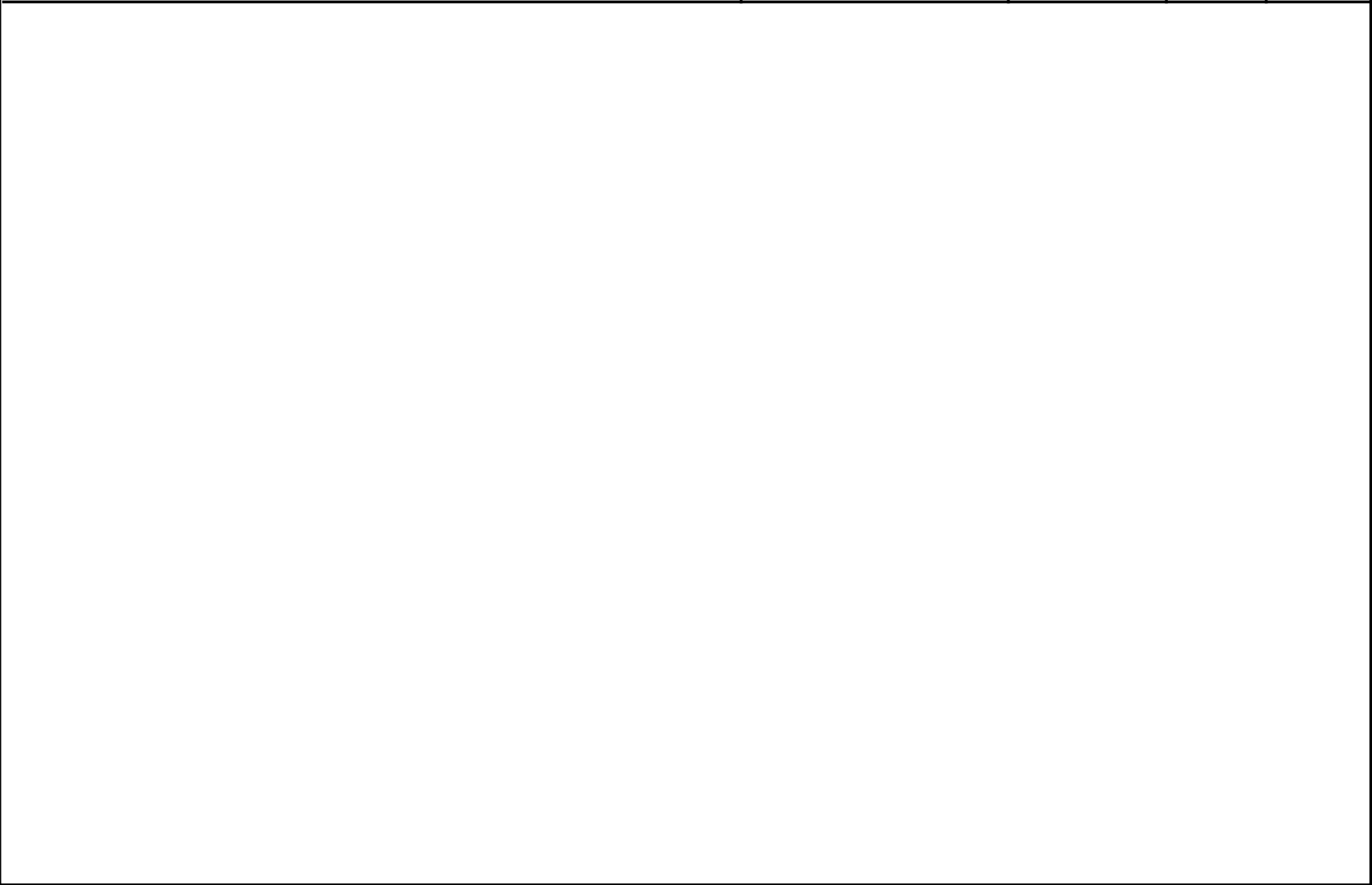


11 - 28 Engine	Type	Screw	Measure	Unit
<b>11 42 Oil Filter and Pipes</b>				
4AZ Oil filter drain plug				
Hollow bolt	M21/S38		20	Nm
Solid aluminium screw	M21		10	Nm
Full length screw in threaded insert	M21		23	Nm
5AZ Oil drain line on oil filter and upper section of oil pan (banjo bolt)	M60/1/M60/2/M62/M70/S70/M73		30	Nm
6AZ Oil line to bearing points and camshaft lubrication	All	M6	10	Nm
7AZ Oil line for camshaft lubrication on cylinder head				
Hollow bolt	All	M8x1	10	Nm
	All	M5	5	Nm

<b>11 - 29 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>11 42 Oil Filter and Pipes</b>				
8AZ Oil cooler oil pipes to oil filter housing	All	M8	22	Nm
9AZ Oil pipes to turbocharger	All	M8	22	Nm
10AZ Oil lines from turbocharger to engine block Hollow bolt	All	M16 x 1.5	40	Nm
11AZ Oil supply pipe to turbocharger				
Hollow bolt	All		25	Nm
Coupling nut	All		30	Nm

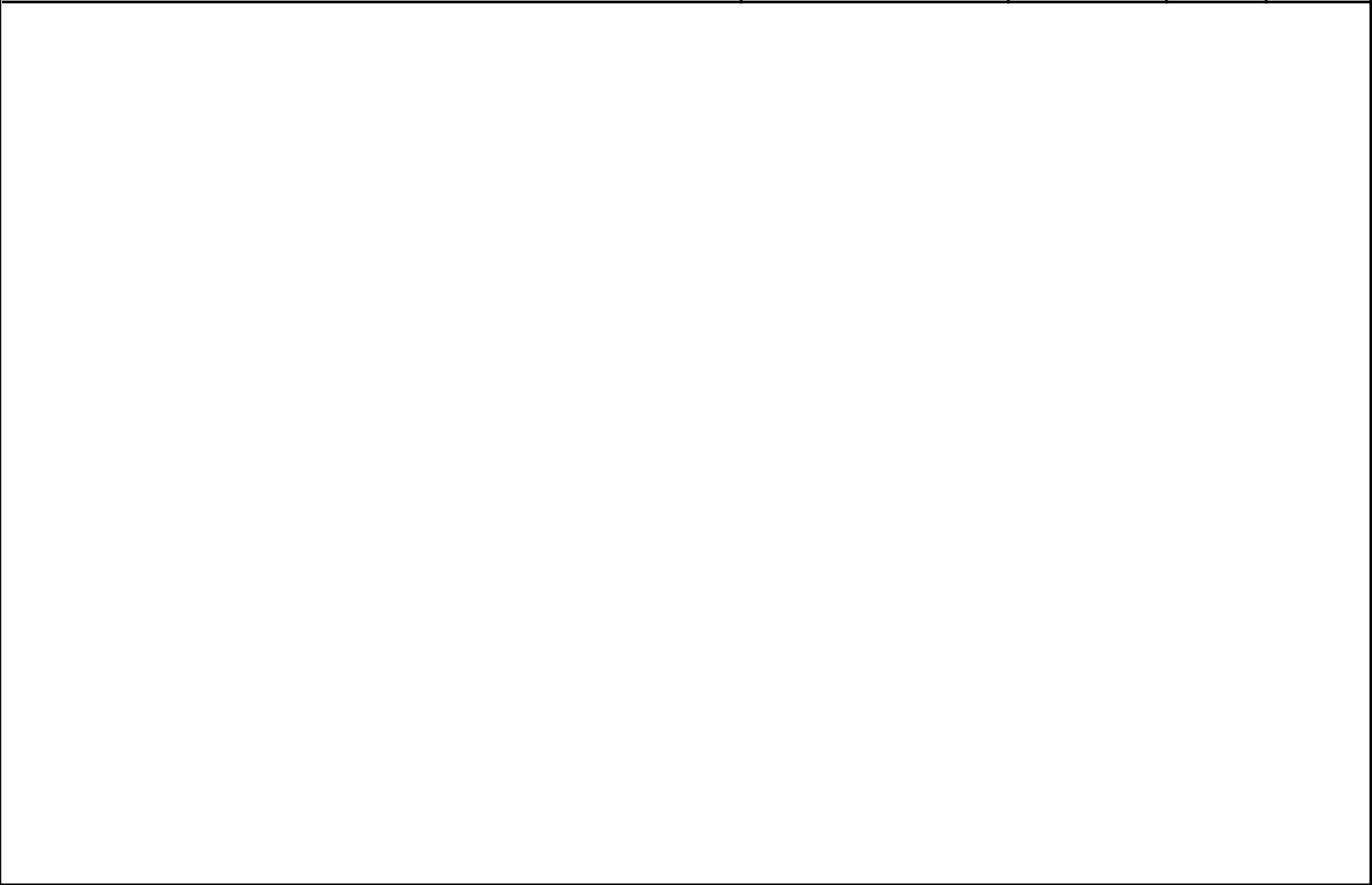


<b>11 - 30 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>11 51 Water Pump and Drive</b>				
1AZ Water pump to crankcase	All	M8	22	Nm
	All	M6	10	Nm



11 - 31 Engine	Type	Screw	Measure	Unit
11 52 Fan				
1AZ Fan clutch on water pump Coupling nut (left-hand threads)	All		40	Nm

<b>11 - 32 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>11 53 Thermostat and Connections</b>				
1AZ Thermostat housing	All	M6	10	Nm
2AZ Bleeder screw	All	M8	8	Nm



<b>11 - 33 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>11 61 Intake manifold</b>				
1AZ Intake manifold on cylinder head	All	M8	22	Nm
	All	M7	15	Nm
	All	M6	10	Nm
2AZ Soundproofing hood to holder	M60/1/M60/2/M62	M6	8	Nm

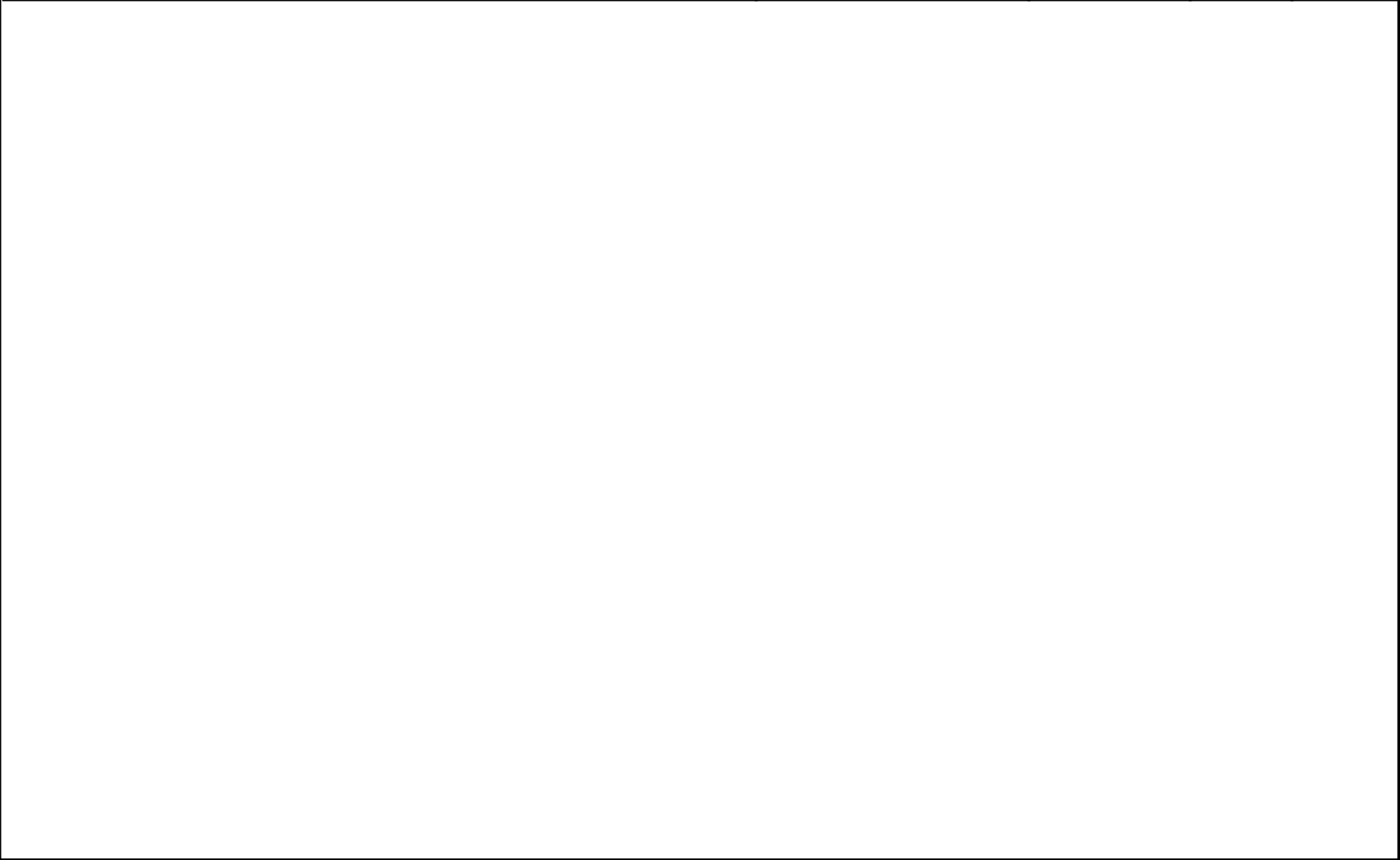
11 - 34 Engine	Type	Screw	Measure	Unit
<b>11 62 Exhaust manifold</b>				
1AZ Exhaust manifold to cylinder head Screw connections on exhaust with Molykote HSC compound coat	All	M6	10	Nm
	M50/M52/S52/S50 US	M7	20	Nm
	All others	M7	15	Nm
Upper row of staybolts installed with bolt cement	All	M8	22	Nm
Retorque after 2000 km Loosen bolt first	M21	M8	12	Nm

11 - 35 Engine		Type	Screw	Measure	Unit
11 62 Exhaust manifold					
2AZ	Exhaust manifold to cylinder head (Apply Molykote HSC paste to exhaust nuts and bolts)	M30 Turbo	M10		
	When mounting on new cylinder head or with new studs			28	Nm
	Subsequent mounting			15	Nm
	Retorque after 2000 km Loosen bolt first Install studs with Molykote HSC			15	Nm
	Protrusion from head: Short studs			88 + 1.0	mm
	Protrusion from head: Long studs			98 + 0.5	mm

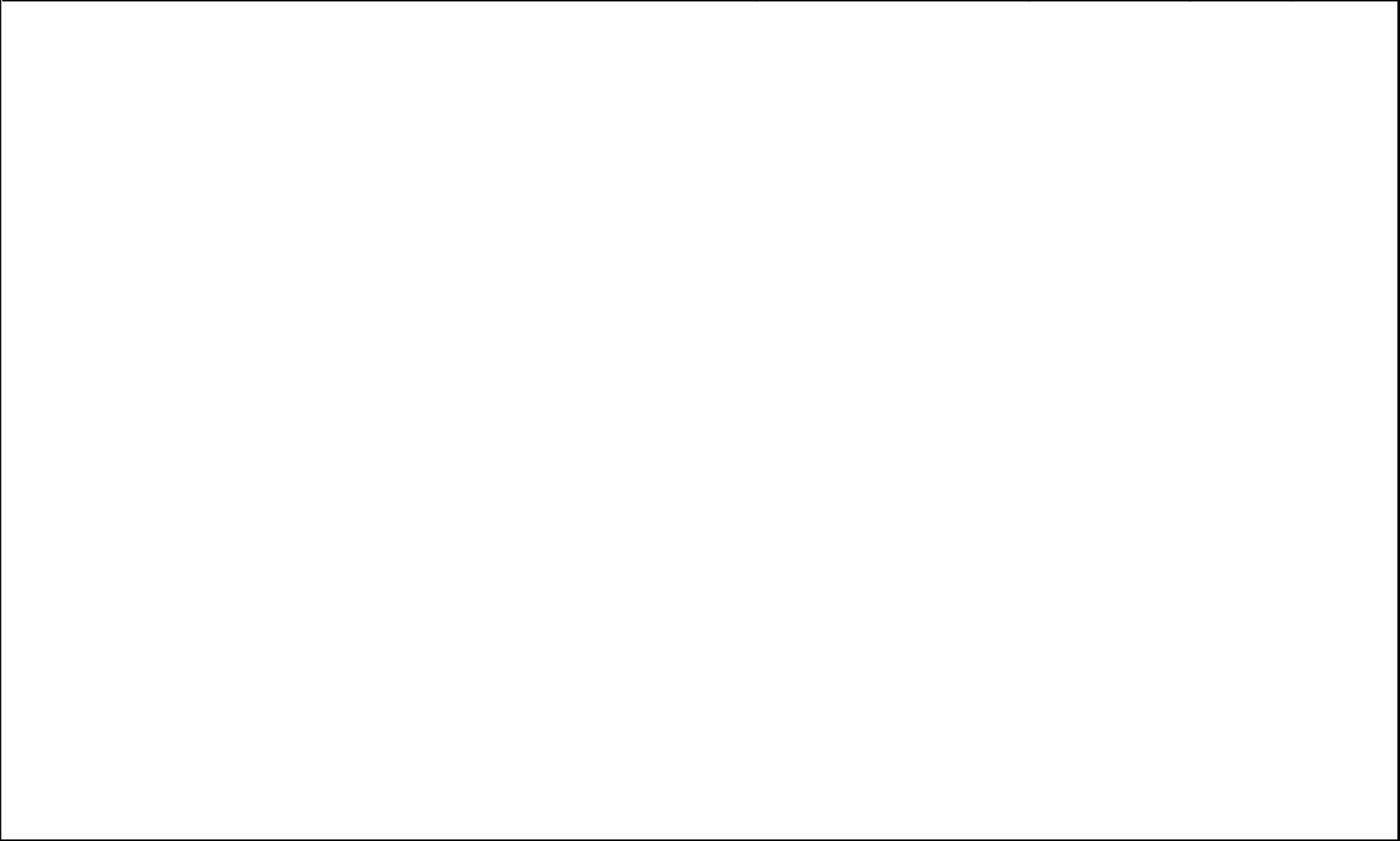


11 - 36 Engine	Type	Screw	Measure	Unit
<b>11 65 Turbocharger and Control</b>				
1AZ Turbocharger to exhaust manifold	M21	M10	25	Nm
	M30/M51/M41		45	Nm
2AZ Bypass valve to flow section	M30	M8	25	Nm
3AZ Ring nut to exhaust manifold	M30		220	Nm
4AZ Screws to bypass valve	M30	M6	10	Nm
5AZ Charge tract to exhaust manifold	M30	M8	22	Nm
6AZ Oil return flange to turbocharger	M30	M8	22	Nm
7AZ Oil supply for turbocharger and engine block Hollow bolt	M51/M41		25	Nm
8AZ Threaded plug to oil return	M30	M16	45	Nm
9AZ Control pipe to bypass valve/turbocharger	M30		30	Nm

<b>11 - 37 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>11 66 Vacuum pump</b>				
1AZ Vacuum pump on cylinder head	All	M6	10	Nm
	M51/M41	M8	22	Nm
microencapsulated	M51/M41	M9	22	Nm



<b>11 - 38 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Dimension</b>	<b>Unit</b>
<b>11 72 Air pump, lines and control valves</b>				
<b>1AZ Cap nut on air intake tube</b>	<b>M60/1/M60/2</b>		<b>30</b>	<b>Nm</b>
<b>2AZ Compression screw</b>	<b>M60/1/M60/2</b>	<b>M6</b>	<b>5</b>	<b>Nm</b>
<b>Lock nut</b>	<b>M60/1/M60/2</b>	<b>M6</b>	<b>5</b>	<b>Nm</b>

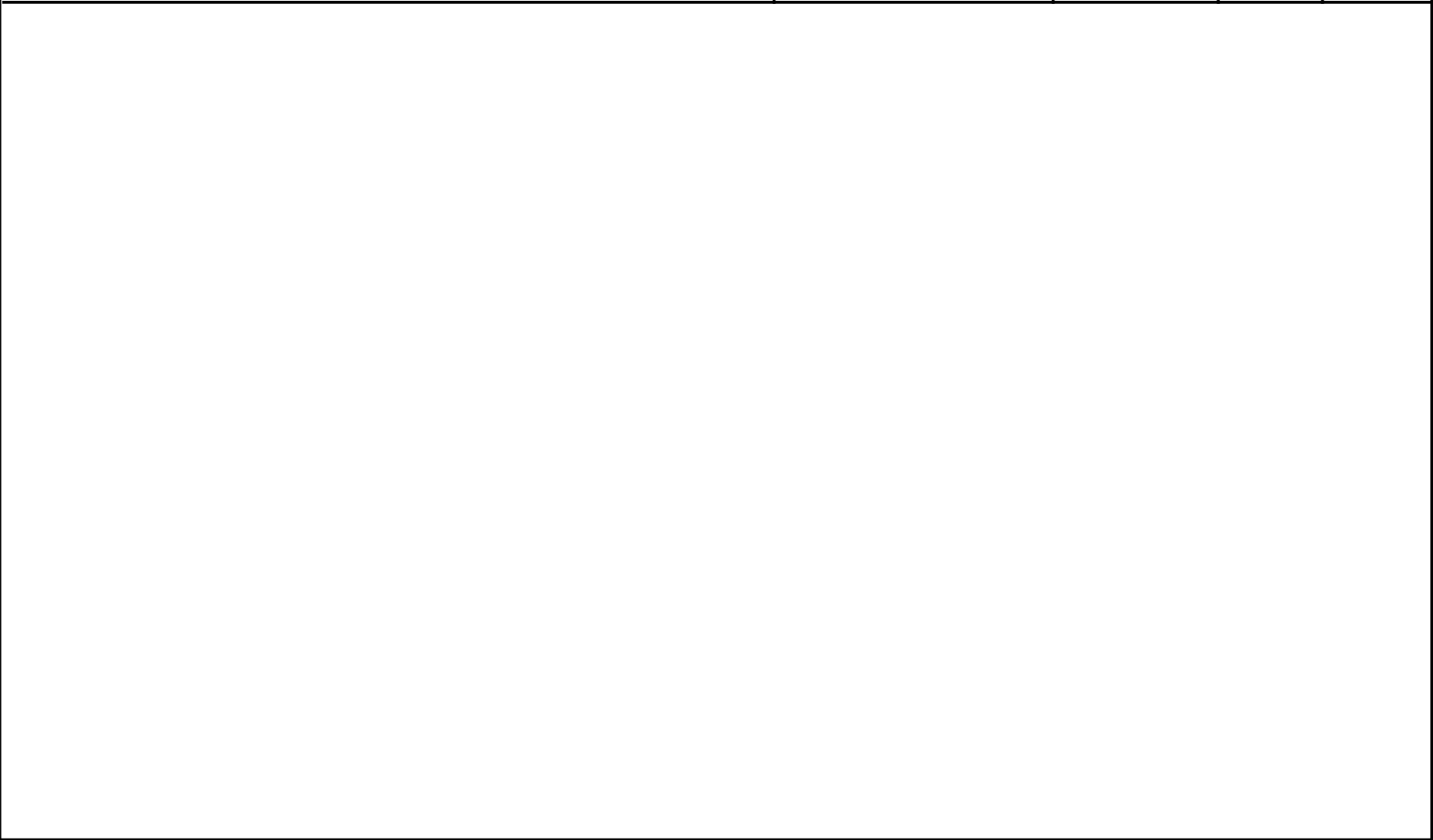


<b>11 - 39 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>11 78 Emissions-control, Lambda oxygen sensor</b>				
<b>1AZ Oxygen sensor and oxygen monitor sensor</b>	<b>All</b>		<b>55</b>	<b>Nm</b>

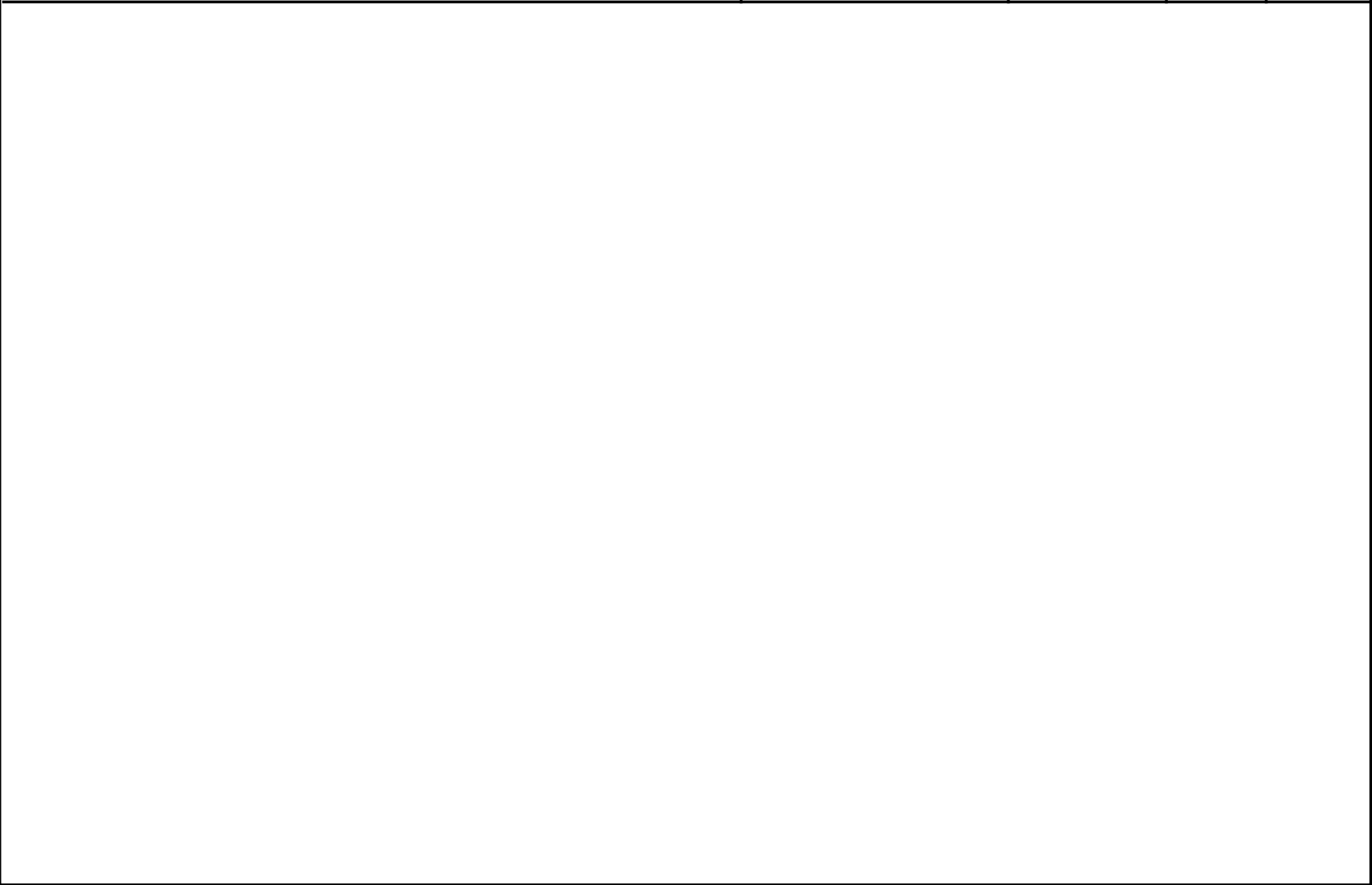
<b>11 - 40 Engine</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>11 81 Engine Suspension</b>				
1AZ Rubber mount to front axle carrier	All	M8	22	Nm
	All	M10	47	Nm
2AZ Rubber mount to engine console	All	M8	22	Nm
	All	M10	47	Nm
3AZ Engine console to engine	All	M8	22	Nm
	All	M10	47	Nm



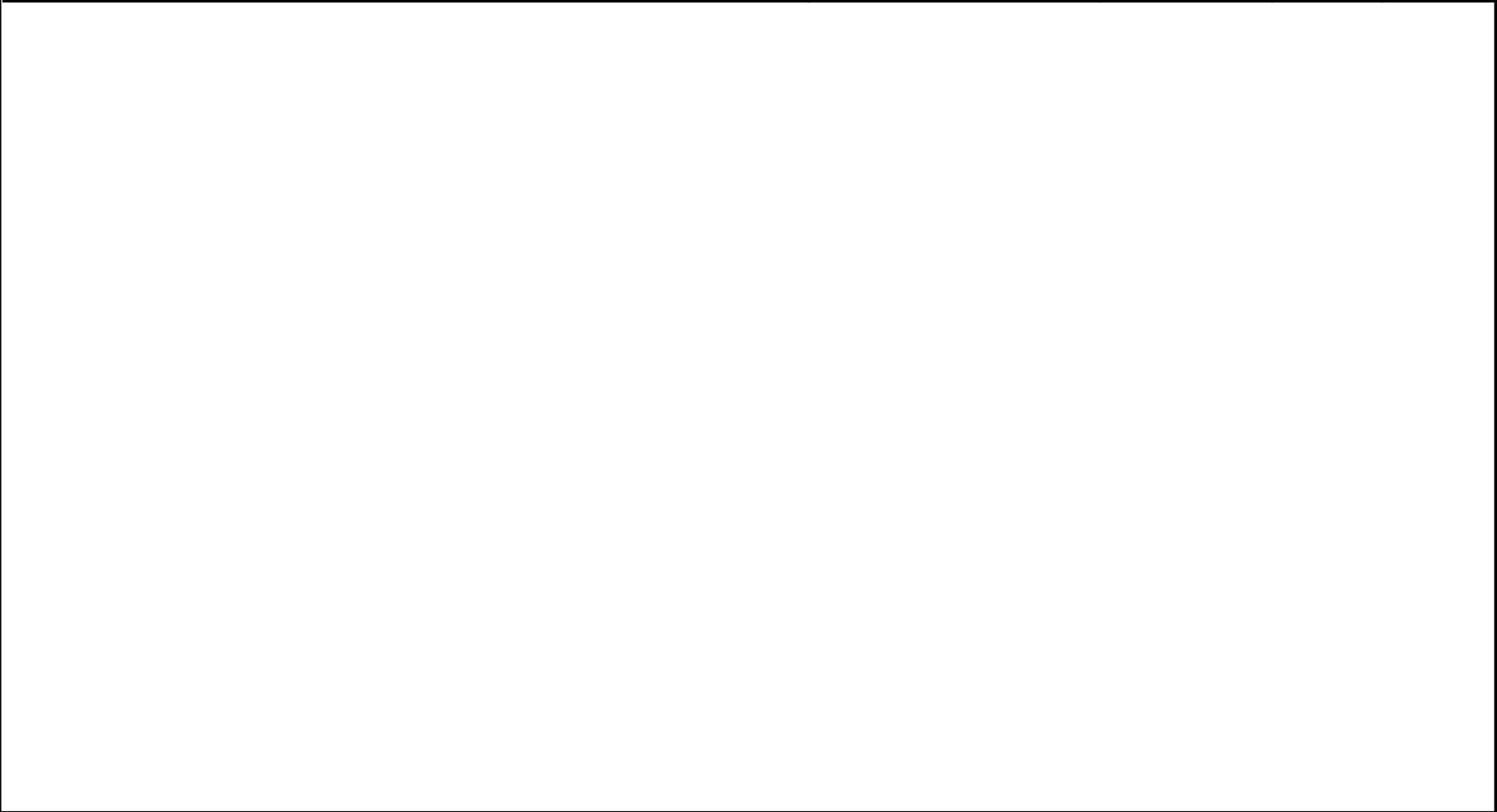
<b>12 - 1 Engine Electrical Equipment</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>12 11 Distributor</b>				
1AZ Distributor	M20		22	Nm
	M10/M30		10	Nm
2AZ Distributor rotor to adapter with DME	All		2.8	Nm
3AZ High-tension distributor cap	All		4	Nm



<b>12 - 2 Engine Electrical System</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>12 12 Spark plugs</b>				
1AZ Spark plugs (ungreased)	All	M12x1.25	23 ± 3	Nm
	All	M14x1.25	30 ± 3	Nm



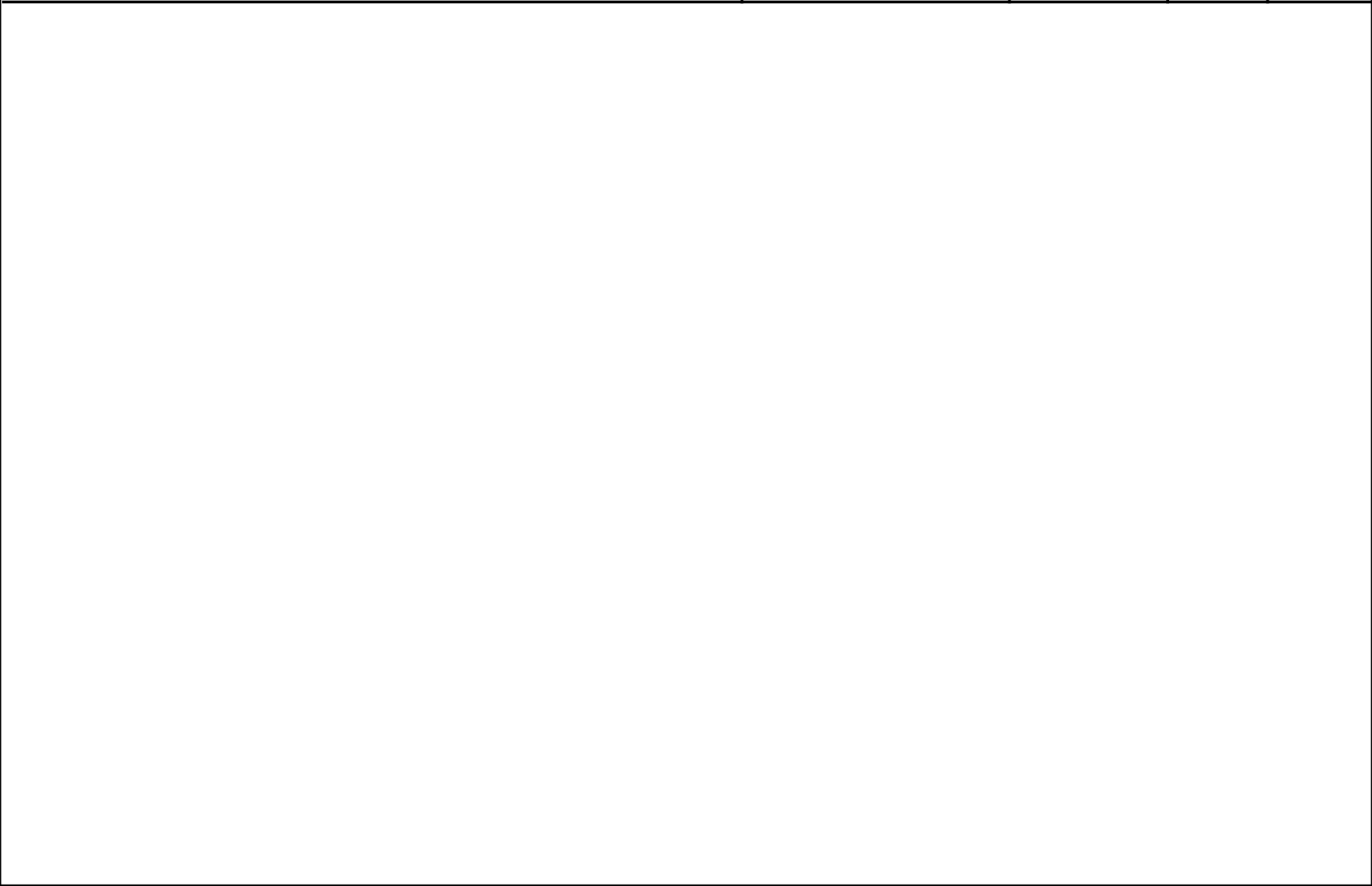
<b>12 - 3 Engine Electrical System</b>	<b>Type</b>	<b>Screw</b>	<b>Dimension</b>	<b>Unit</b>
<b>12 13 Ignition Coil</b>				
<b>1AZ Primary connections</b>				
Terminal 1	All		3.0	Nm (ft. lbs.)
Terminal 15	All		4.5	Nm (ft. lbs.)
<b>2AZ Ignition coil on wheel arch / end wall</b>	M42/M43/M44		5	Nm (ft. lbs.)
<b>3AZ Ignition coil on wheel arch</b>	M40		16	Nm (ft. lbs.)



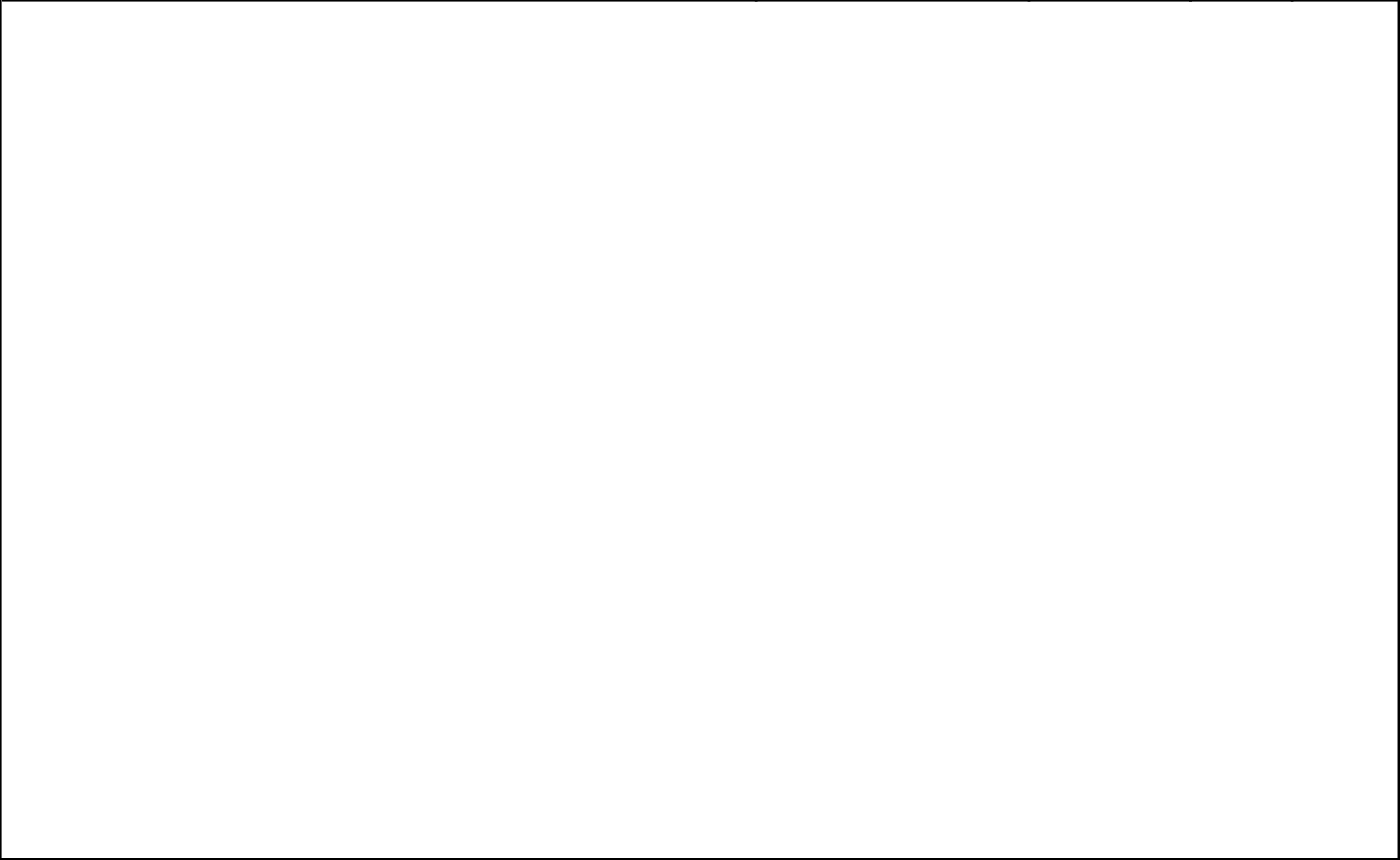


12 - 4 Engine Electrical System	Type	Screw	Dimension	Unit
<b>12 14 Electronic Shift Units or Control Units</b>				
1AZ TCI control unit	All		2.5	Nm (ft. lbs.)
2AZ Knock sensor	E23		13	Nm (ft. lbs.)
	All		20	Nm (ft. lbs.)
3AZ Speed and reference mark senders	All with DME		7	Nm (ft. lbs.)
4AZ Cover on control unit box	E38		4.4	Nm (ft. lbs.)
5AZ Angle impulse sensor on cylinder head	M52		5.0	Nm (ft. lbs.)
6AZ Crankshaft sensor on timing case cover Crankshaft sensor on cylinder crankcase	M52		5.0	Nm (ft. lbs.)

<b>12 - 5 Engine Electrical Equipment</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>12 21 Preheating Relay</b>				
1AZ Terminal 30 wire to glow plug relay	M41/M51		4	Nm
2AZ 80 A fuse on glow plug relay	M41/M51		2	Nm



<b>12 - 6 Engine Electrical Equipment</b>	<b>Type</b>	<b>Screw</b>	<b>Value</b>	<b>Unit</b>
<b>12 23 Glow Plugs</b>				
1AZ Glow plug	M21		25	Nm
2AZ Glow plug 4"	M21/M41/M51		20	Nm
3AZ Wire to glow plug	M21/M41/M51		4	Nm

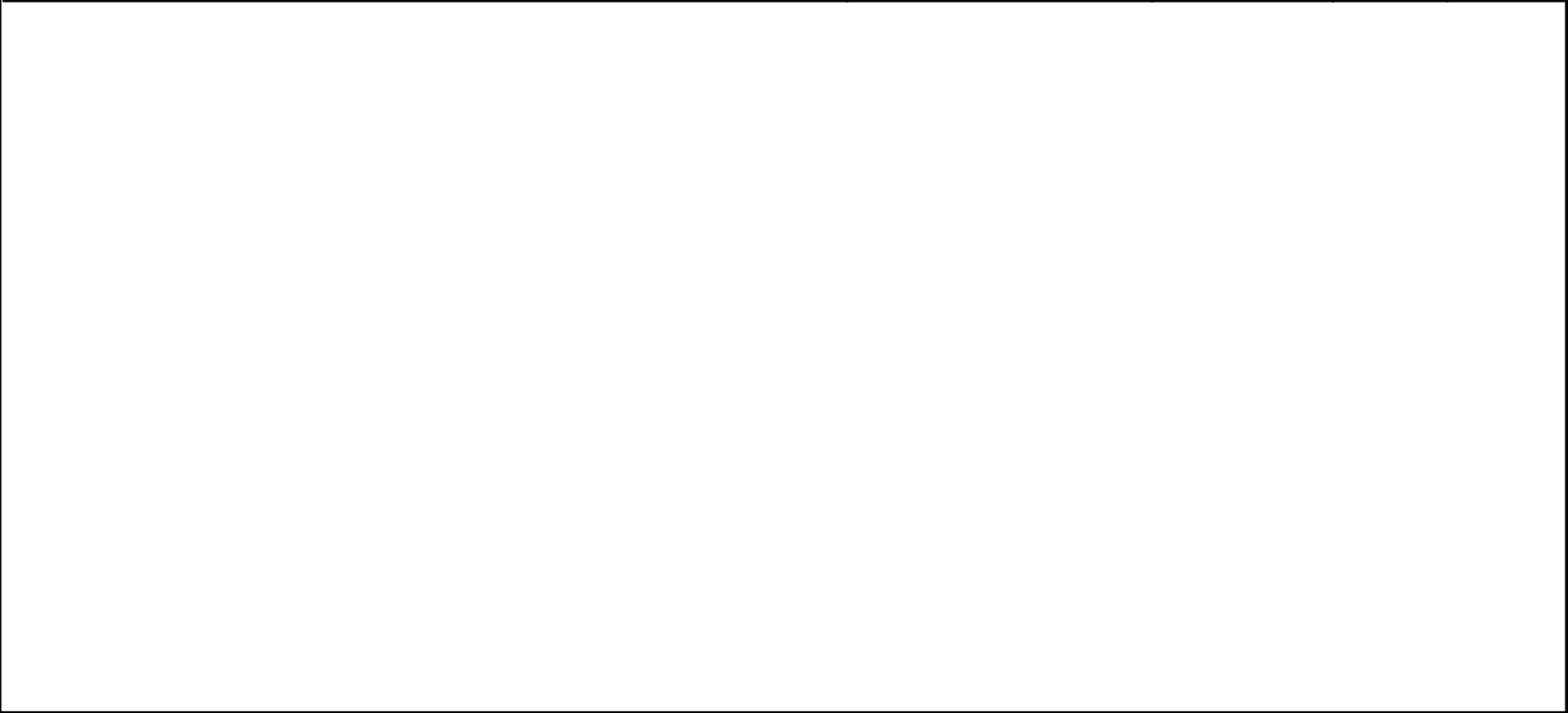


12 - 7 Engine Electrical System	Type	Screw	Dimension	Unit
12 31 Alternator with Drive and Mounting Parts				
1AZ Wires to alternator				
KI. D+	M10/M20		5	Nm (ft. lbs.)
	All others	M6	7	Nm (ft. lbs.)
KI. B+	S38 B 38		8	Nm (ft. lbs.)
	All others	M8	13	Nm (ft. lbs.)
2AZ Pulley	All		45	Nm (ft. lbs.)
3AZ Pulley (ribbed drive belt)	All		60	Nm (ft. lbs.)
4AZ Rear holder	All		3.5	Nm (ft. lbs.)
5AZ Fillister head screw for wire holder	All		3.5	Nm (ft. lbs.)
6AZ Alternator on bearing block	M40/M42/M43/M44		43	Nm (ft. lbs.)

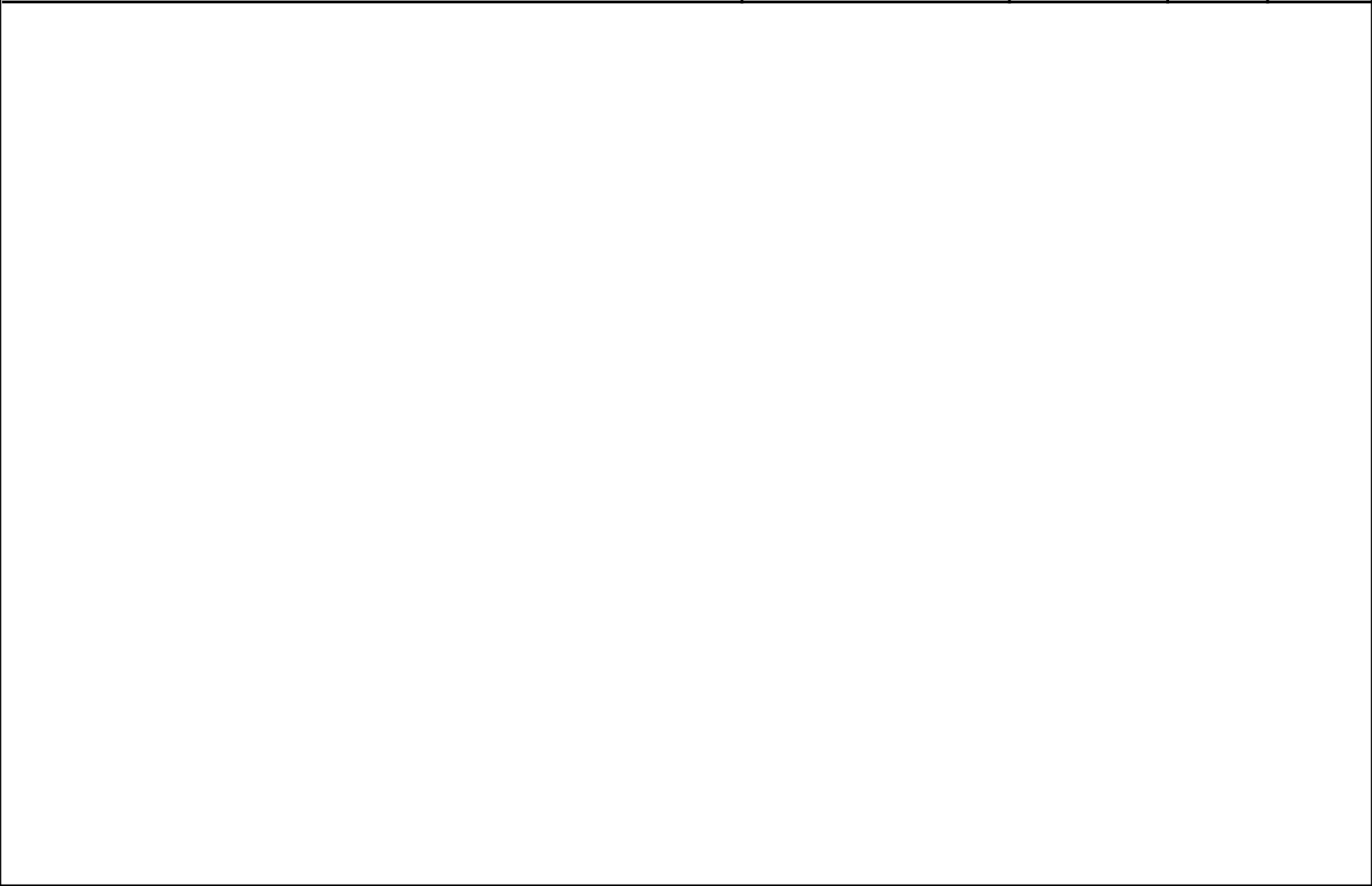
<b>12 - 8 Engine Electrical Equipment</b>	<b>Type</b>	<b>Screw</b>	<b>Value</b>	<b>Unit</b>
<b>12 32 Governor</b>				
1AZ Regulator switch	All	M4	2	Nm
	All	M5	4	Nm

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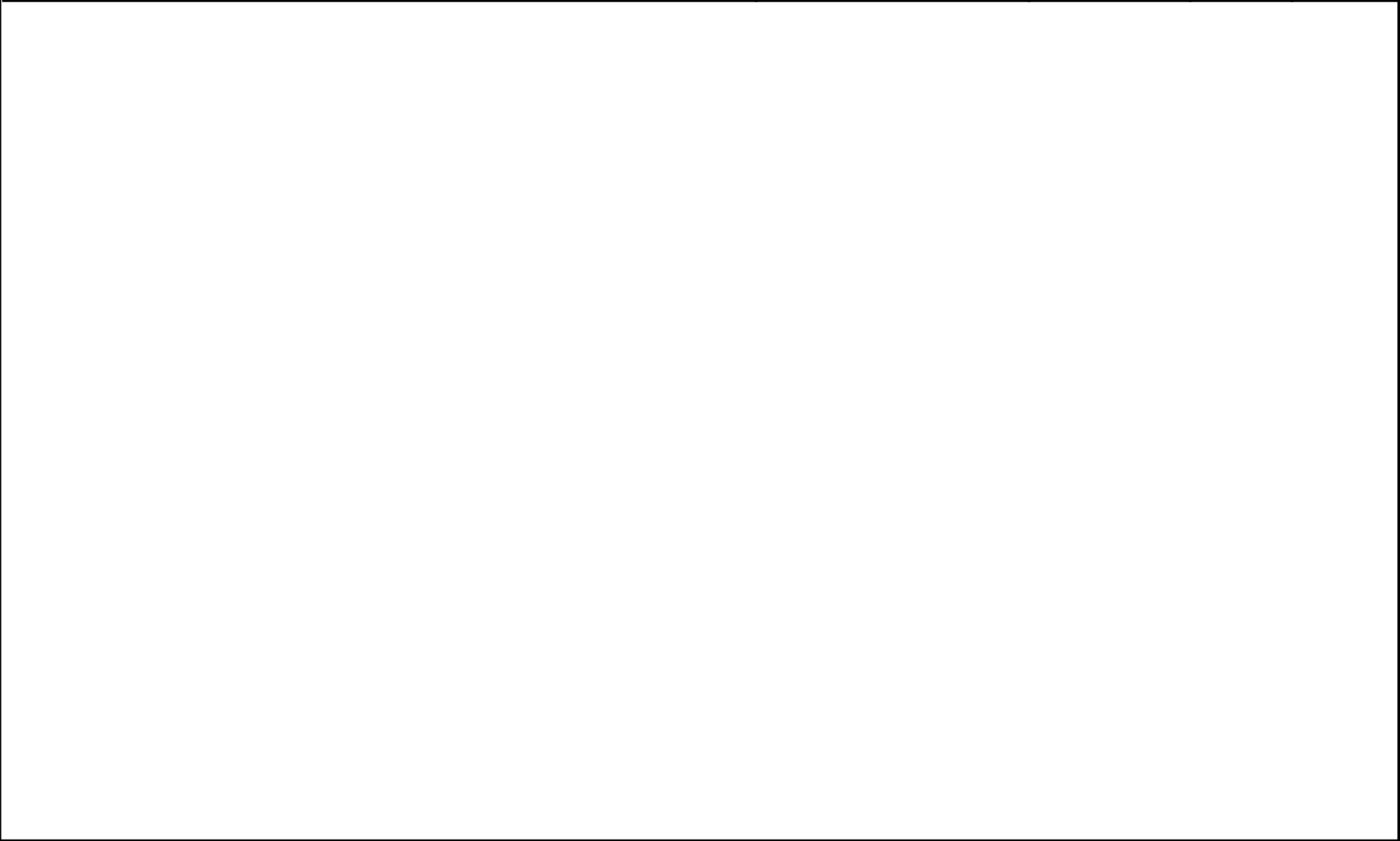
12 - 9 Engine electrics	Type	Screw	Dimension	Unit
<b>12 41 Starter and Mounting Parts</b>				
1AZ Starter mount	All		50	Nm
2AZ Support to starter	All	M5	5	Nm
3AZ Support to crankcase	All		47	Nm
4AZ Electrical leads to starter				
Terminal 30h	All	M5	5	Nm
Terminal 50	All	M6	6	Nm
Terminal 30	All	M8	12	Nm
5AZ Bolt connection, pole tube	All	M6	6	Nm



<b>12 - 10 Engine Electrical Equipment</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>12 42 Wires to starter</b>				
1AZ Battery positive connection point in power distributor	E32/E34/E31/E36	M8	20	Nm
2AZ Wiring harness on distributor	E36 M41	M8	10	Nm

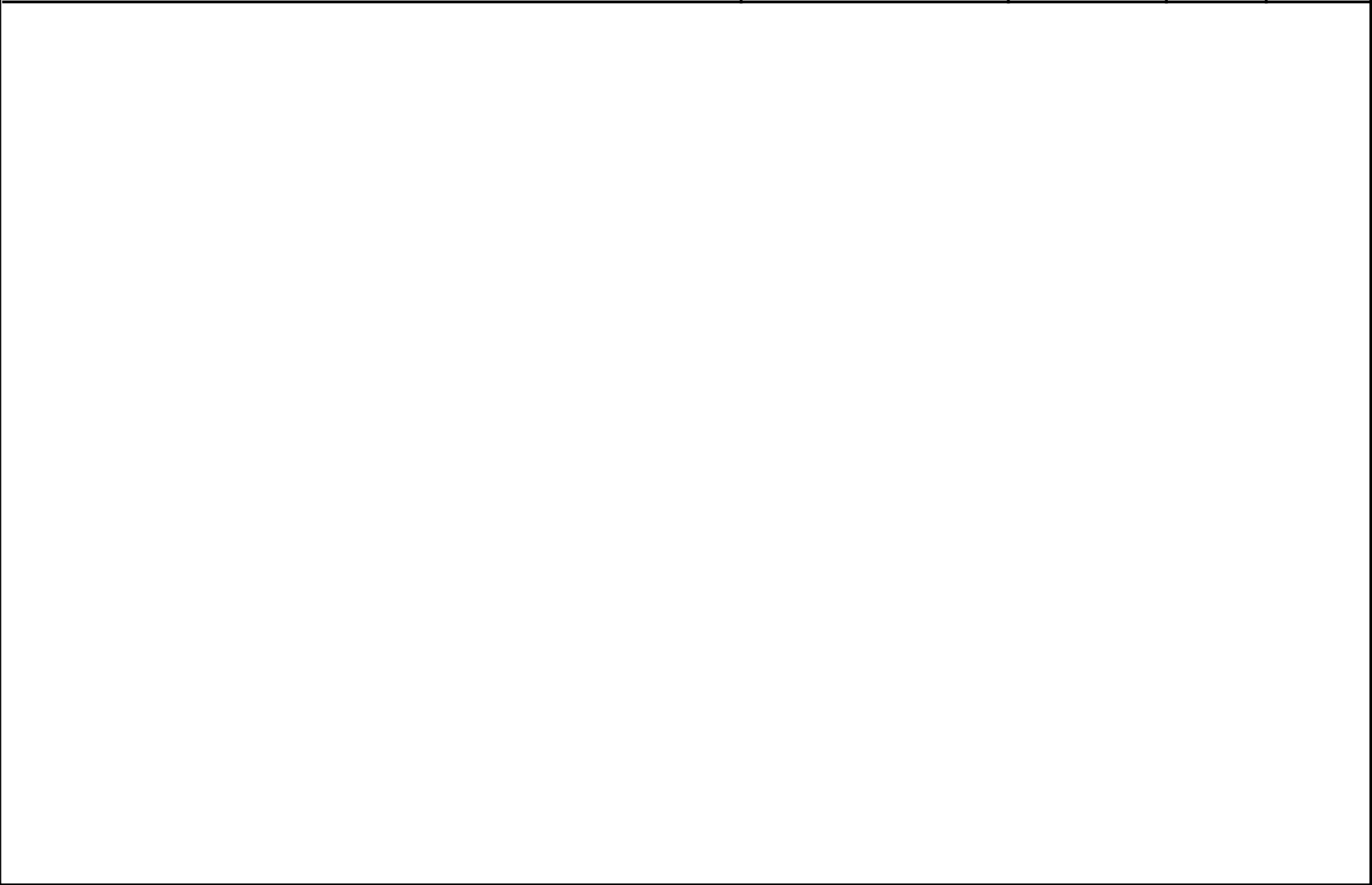


<b>12 - 11 Engine Electrical Equipment</b>	<b>Type</b>	<b>Screw</b>	<b>Value</b>	<b>Unit</b>
<b>12 52 Plug Connectors, Terminals</b>				
1AZ Holder for modules	E36	M6	9	Nm
2AZ Ground connections Flange nut	E36		16	Nm
3AZ Cover on heating splash wall	E36		1.1	Nm

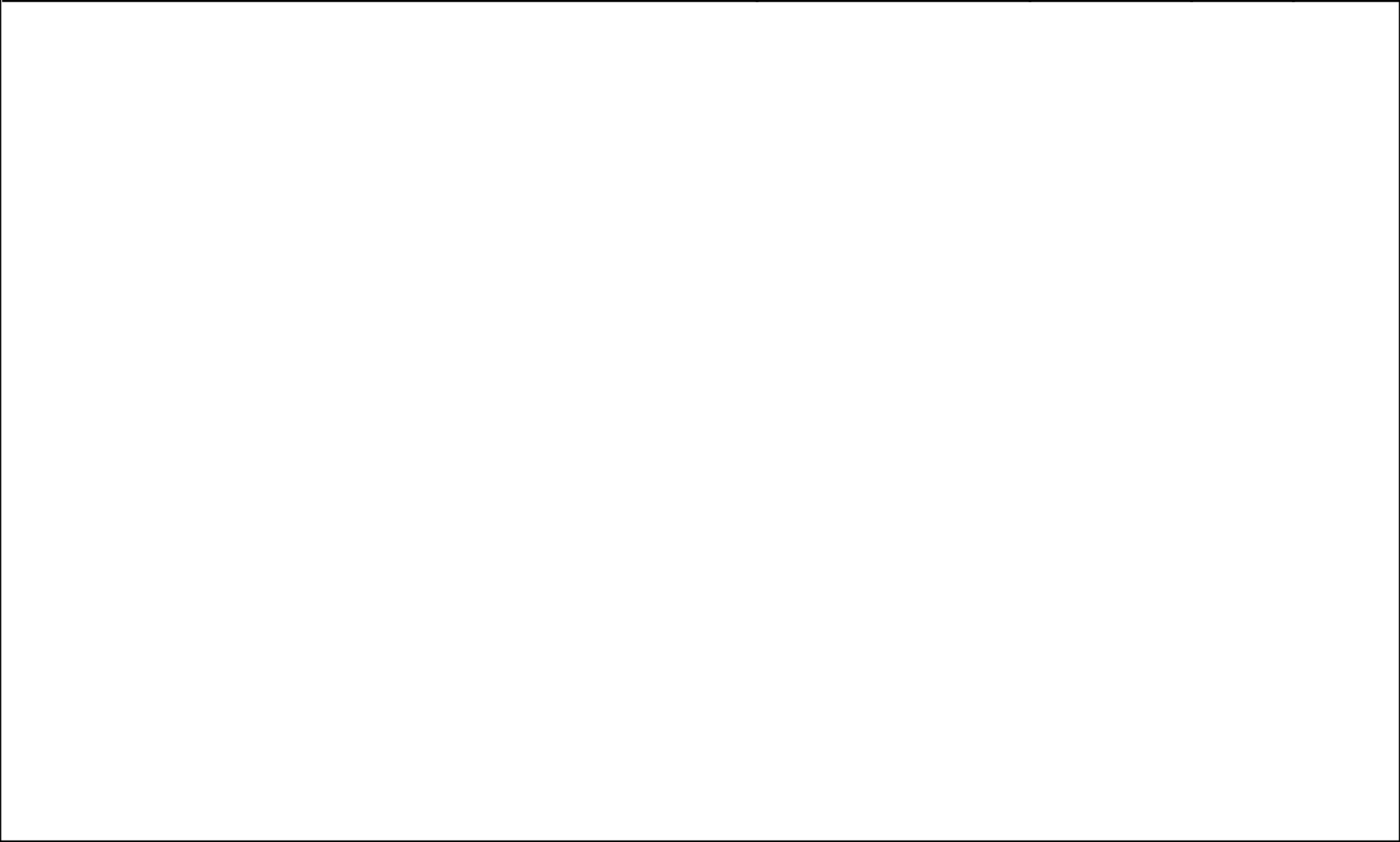




<b>12 - 12 Engine Electrical Equipment</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>12 51 Engine wiring harness</b>				
1AZ Wiring harness on electrical cutout device	M51/M41	M5	2.5	Nm
2AZ Wiring harness connection on distributor	E36 M41	M8	10	Nm



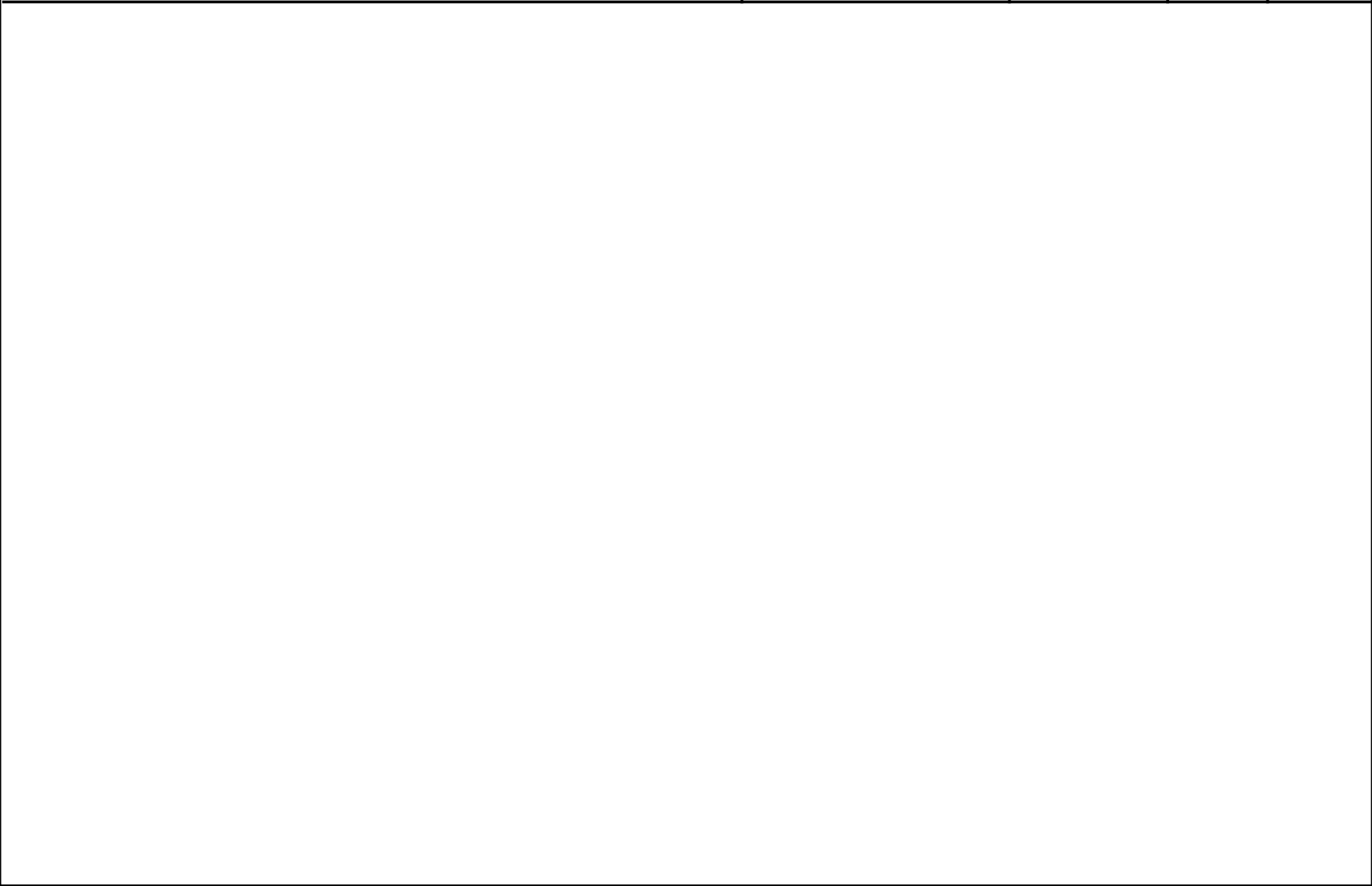
<b>12 - 13 Engine Electrical System</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>12 61 Oil pressure, oil temperature, oil level display</b>				
<b>1AZ Oil-pressure switch/oil-temperature switch</b> <b>Note: Oil and screw in</b>	<b>S14/S50/S38</b>		<b>20</b>	<b>Nm</b>
	<b>M60/M62/M73</b>		<b>27</b>	<b>Nm</b>
	<b>All others</b>		<b>35</b>	<b>Nm</b>



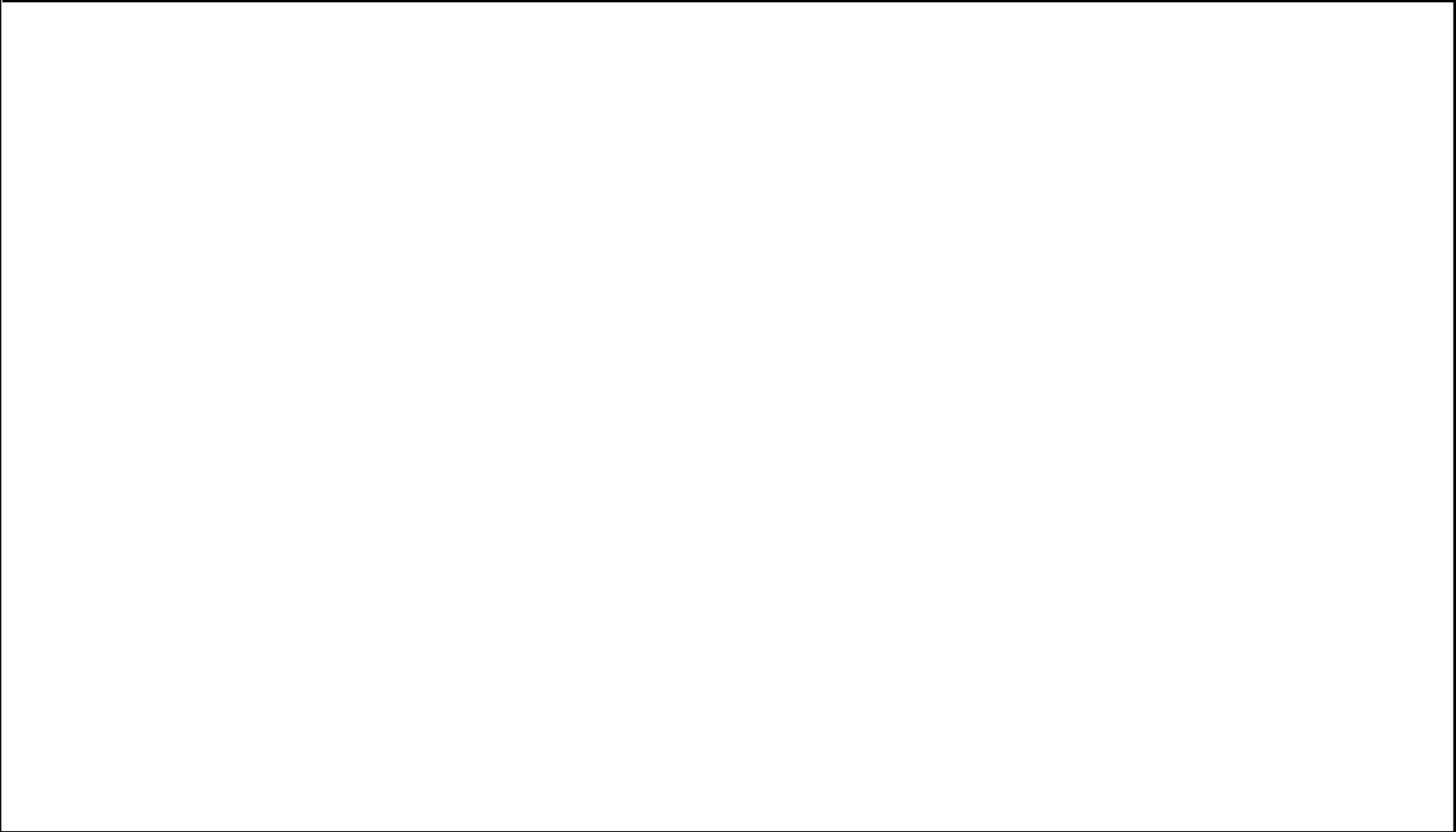
12 - 14 Engine electrics	Type	Screw	Dimension	Unit
12 62 Coolant Temperature				
1AZ Temperature sensor to water flange (glow time/coolant temperature gage)	M21		18	Nm
	M51		13	Nm
2AZ Temperature switch (5.5 °C / 17 °C) to fuel filter/cylinder head	M21		18	Nm
3AZ Coolant temperature sensor (2-pin plug-in connection)	S38/S50		13	Nm
	All others		20	Nm
4AZ Remote thermometer sensor (2-pin plug-in connection)	All others		20	Nm
5AZ Remote thermometer sensor on coolant flange	S50		18	Nm
6AZ Temperature sensor - air	S38/S50		13	Nm
7AZ Temperature sensor - oil	S38/S50		13	Nm

<b>12 - 15 Engine Electrical Equipment</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>12 63 Switches and Relays</b>				
1AZ Temperature switch for electronic box	E32/E34/E31		15	Nm

<b>12 - 16 Engine Electrical System</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>12 72 Senders for Control Unit</b>				
1AZ Lever to pedal value sender	E32/E34/E31/E36		9	Nm
2AZ Pedal value sender to pedal console	E32/E34/E31		5	Nm

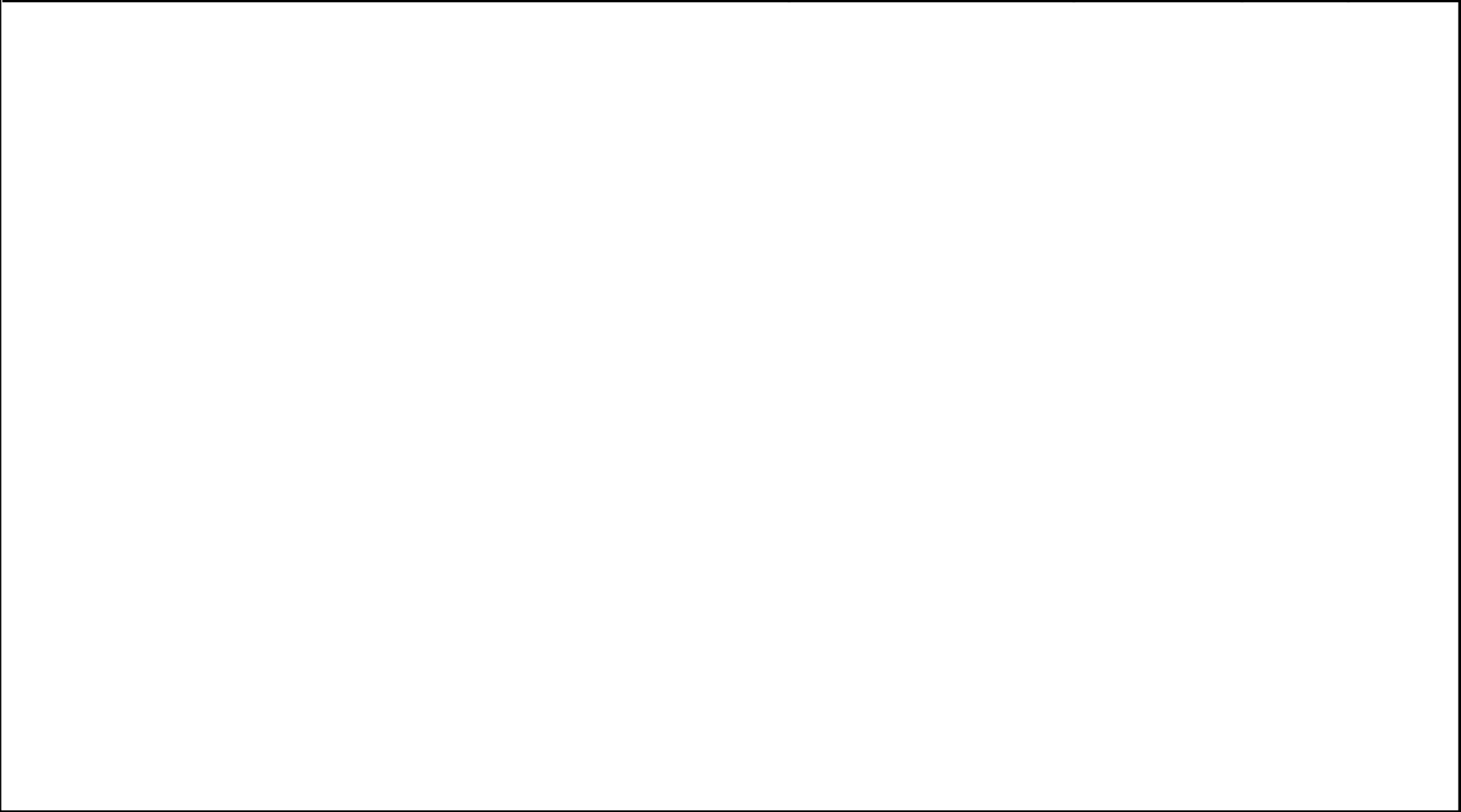


<b>12 - 17 Engine Electrical System</b>	<b>Type</b>	<b>Screw</b>	<b>Dimension</b>	<b>Unit</b>
<b>12 90 Control unit housing</b>				
1AZ Assembly of upper and lower sections	E32/E34/E36		5	Nm (ft. lbs.)
2AZ Center section to body	E32/E34		3	Nm (ft. lbs.)
3AZ Control unit holder in E box	E36		5	Nm (ft. lbs.)
4AZ Control unit box cover	E38/E39		4.4	Nm (ft. lbs.)



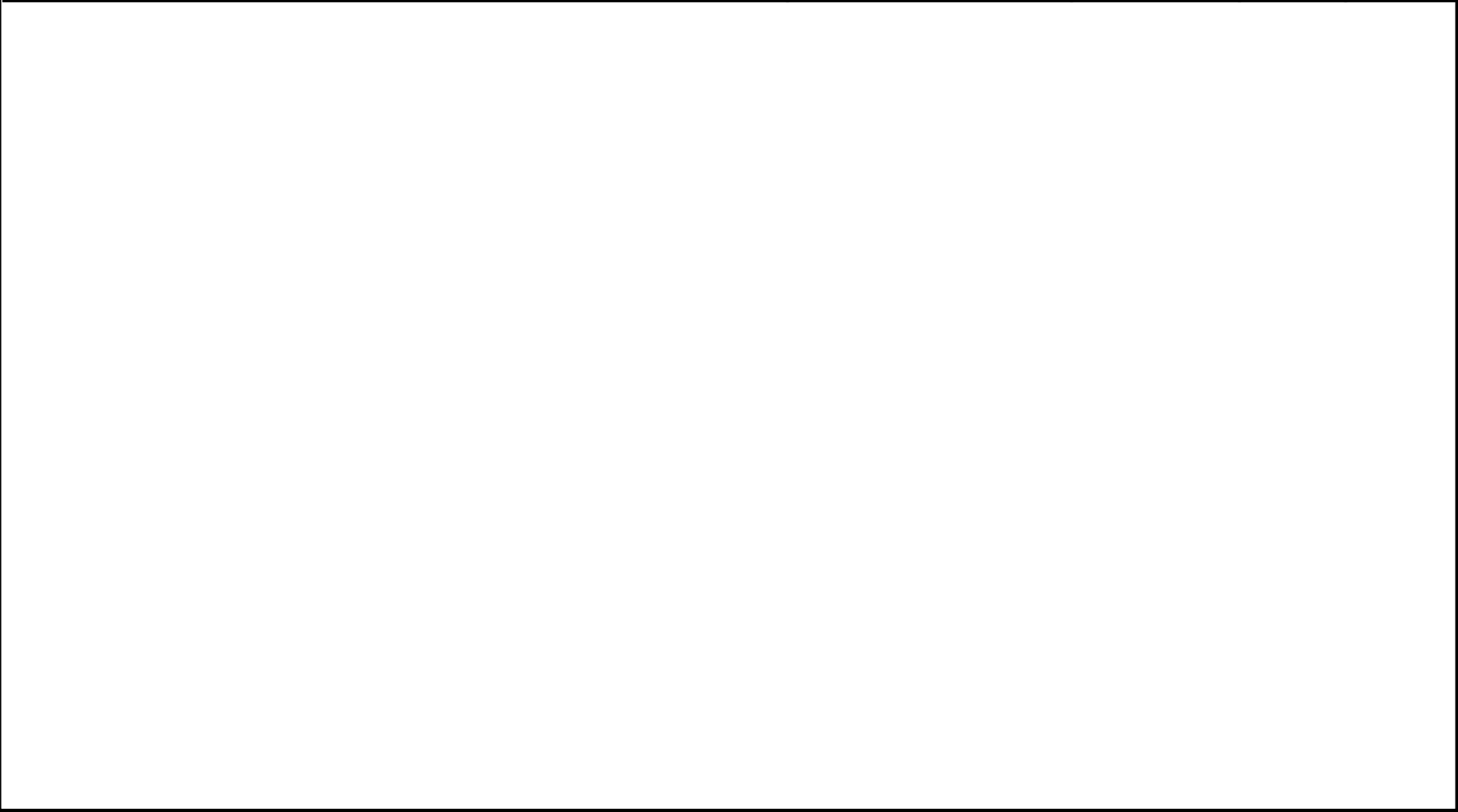
13 - 1 Fuel delivery and metering system	Type	Screw	Measure	Unit
<b>13 11 Carburetor</b>				
1AZ Carburetor to intake manifold	M10/M20/M30		10	Nm
2AZ Carburetor to insulating flange	M10/M20/M30		10	Nm
3AZ Insulating flange to intake manifold	M10/M20/M30		10	Nm
4AZ Idling shutoof valve; max.	M10/M20/M30		5	Nm
5AZ Flow valve; max.	M10/M20/M30		28	Nm
6AZ Throttle valve assembly to float housing; max.	M10/M20/M30		9	Nm
7AZ Throttle valve neck to intake manifold	M10/M20/M30		10	Nm
8AZ Throttle valve control to carburetor; max.	2BE		3	Nm
9AZ Warm-up regulator to engine	M10/M20/M30		23	Nm

<b>13 - 2 Fuel delivery and metering system</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>13 31 Fuel Pump with Drive and Pipes</b>				
1AZ Fuel pump to engine	All		12	Nm
2AZ Fuel pipe coupling bolt	All with K-Jetr.	M8	9	Nm
3AZ Fuel pipe coupling bolt	All with K-Jetr.	M12	20	Nm
4AZ Fuel pipe to pressure regulator	All with L-Jetr.		30	Nm
5AZ Return pipe connector to pressure regulator	All with L-Jetr.		27	Nm



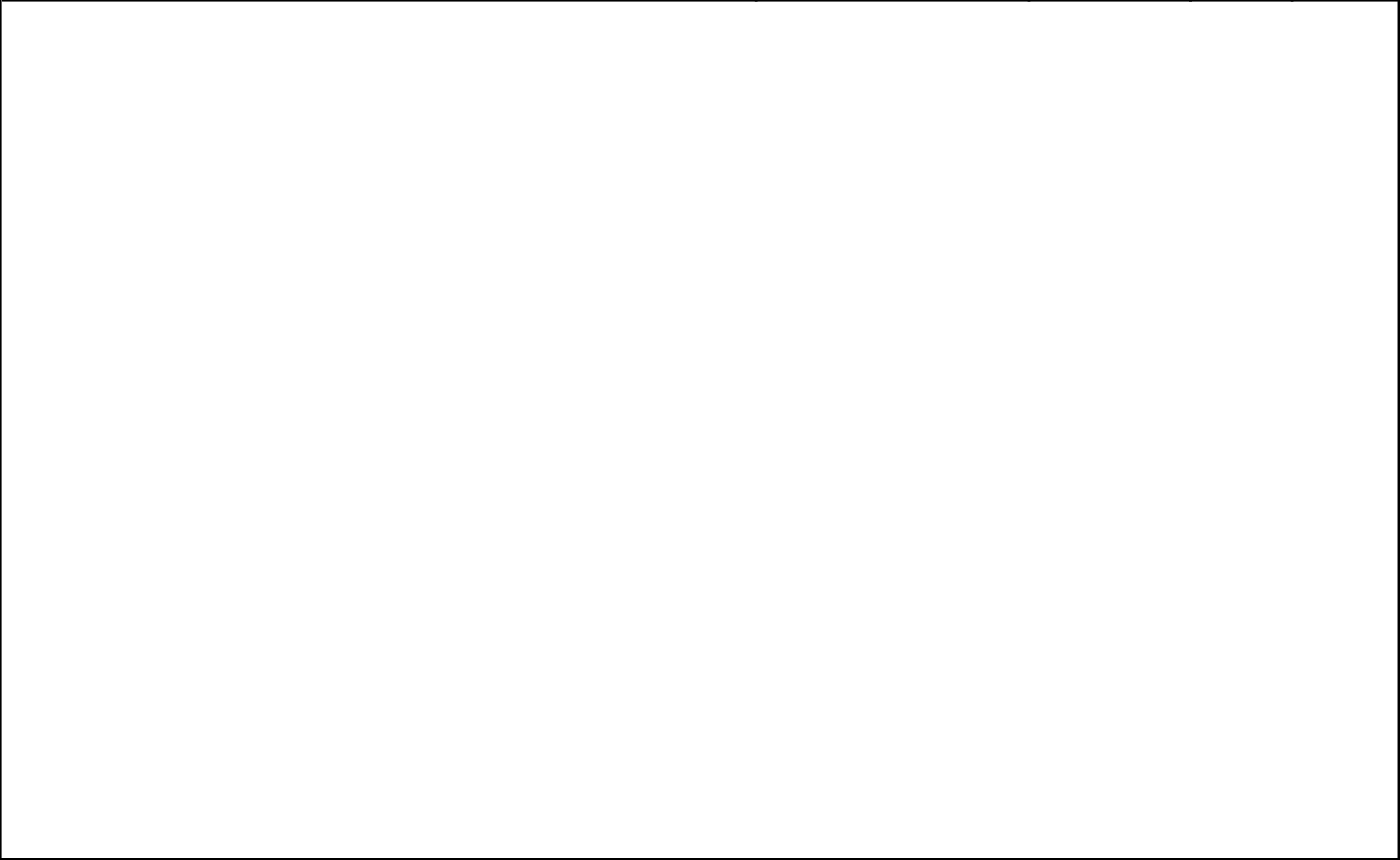


<b>13 - 3 Fuel delivery and metering system</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>13 32 Fuel filter</b>				
1AZ Fuel line to filter housing and injection pump				
Coupling nut	M21/M51/M41	M14 x 1.5	14	Nm
Adapter	M21/M51/M41	M12 x 1.5	9	Nm
Hollow bolt	M21/M51/M41	M14 x 1.5	14	Nm
2AZ Fuel filter to holder	M51/M41	M8	22	Nm

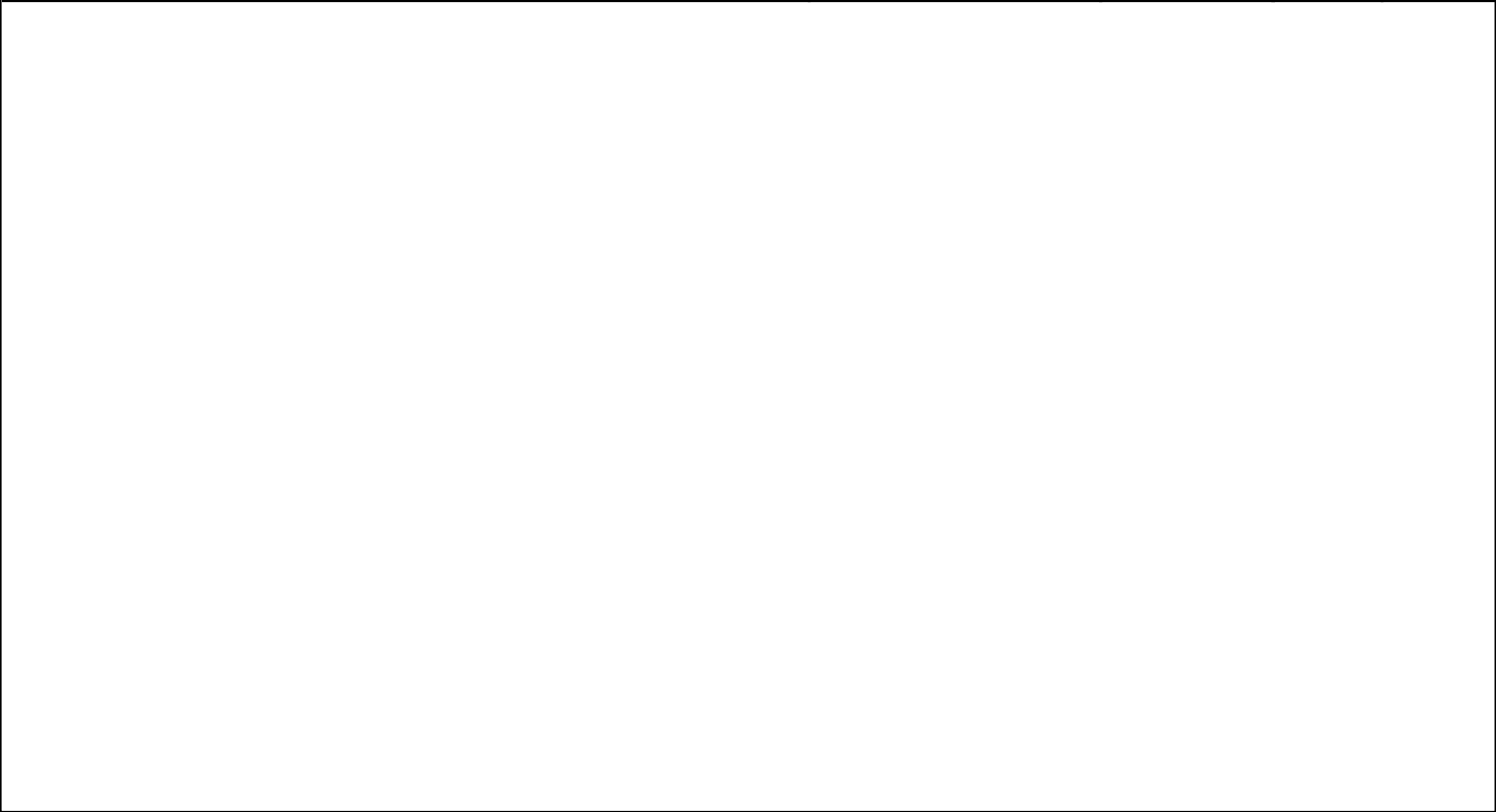


13 - 4 Fuel delivery and metering system	Type	Screw	Measure	Unit
13 51 Injection Pump Control receptacle				
1AZ Plug for high pressure section of injection pump	M21/M51/M41		25	Nm
2AZ Distributor injection pump to holder	M21/M51/M41		25	Nm
3AZ Electric shutoff to injection pump	M21/M51/M41		20 ± 5	Nm
4AZ Electric cold start valve to injection pump	M21		20	Nm
5AZ Coupling bolt (OUT) to injection pump (fuel return)	M21/M51/M41		25	Nm
6AZ Pressure valve holder to injection pump	M21/M51		45	Nm
7AZ Expansion element housing (temperature dependent idling speed boost) to injection pump	M21		18	Nm
8AZ Distributor injection pump to flange and console	M21/M51/M41		22	Nm
9AZ Electr. line on fuel cutout device	M51/M41		2.5	Nm

<b>13 - 5 Fuel delivery and metering system</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>13 52 Injection Pump Drive</b>				
1AZ Chain sprocket to injection pump	M21		47	Nm
2AZ Toothed belt pulley to injection pump	M51/M41		50	Nm
3AZ Chain tensioner	M51/M41		15	Nm

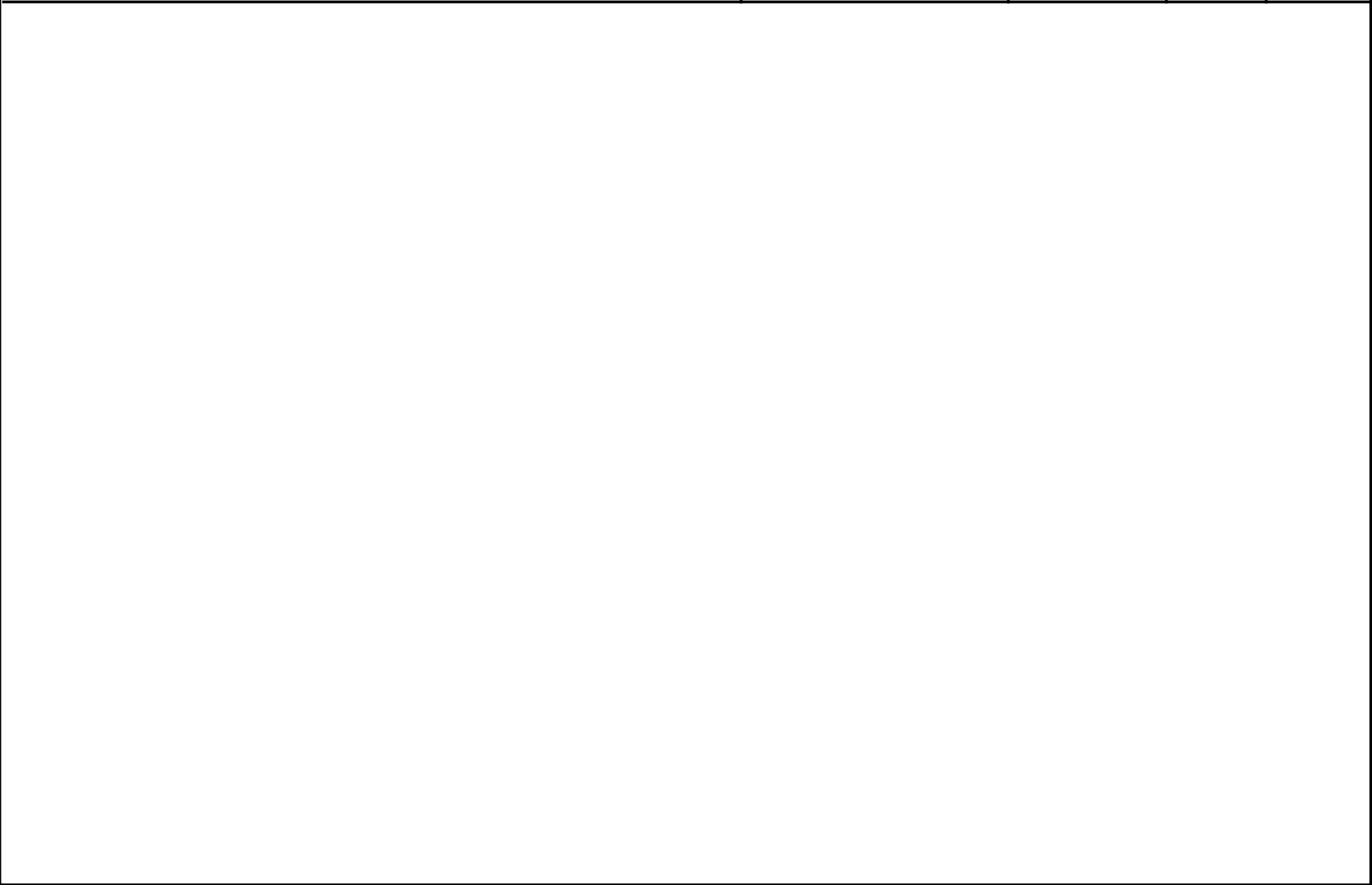


<b>13 - 6 Fuel metering and regulation system</b>	<b>Type</b>	<b>Screw</b>	<b>Dimension</b>	<b>Unit</b>
<b>13 53 Fuel Injection Nozzles and Pipes</b>				
1AZ Injection nozzle combination (assembly)	M21/M51		80	Nm
2AZ Injection nozzle combination to cylinder head	M21		40	Nm
	M51/M41		65	Nm
3AZ Injection pipe (coupling nut) to injection pump and nozzle combination	M21/M51/M41		20	Nm
4AZ Feed line on injection panel	M43/M44		20	Nm



13 - 7 Fuel System	Type	Screw	Measure	Unit
<b>13 62 Senders for Control Unit</b>				
1AZ Temperature time switch	M21/M51		18	Nm
2AZ Coolant temperature sensor	M60/1/M60/2/M21/M51		18	Nm
	All others		13	Nm
3AZ Temperature switch	All		28	Nm
4AZ Temperature sensor - air	All		13	Nm
5AZ Charge pressure sensor on holder	M51/M41		4	Nm
6AZ Twin temperature sensor (4-pin plug-in connection)	M41/M43/M44/S50/S52/M52/M62/M73		13	Nm
7AZ Air-mass sensor on lower section of air filter housing	M51		3.5	Nm

<b>13 - 8 Fuel delivery and metering system</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>13 64 Fuel Injectors</b>				
1AZ Fuel injector to intake manifold	All	M6	10	Nm
2AZ Coupling nut on fuel injector	All with K-Jetr.		25	Nm



<b>13 - 9 Fuel System</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>13 71 Air intake silencer</b>				
1AZ Air intake silencer on cylinder head cover	M41/M51	M6	6	Nm

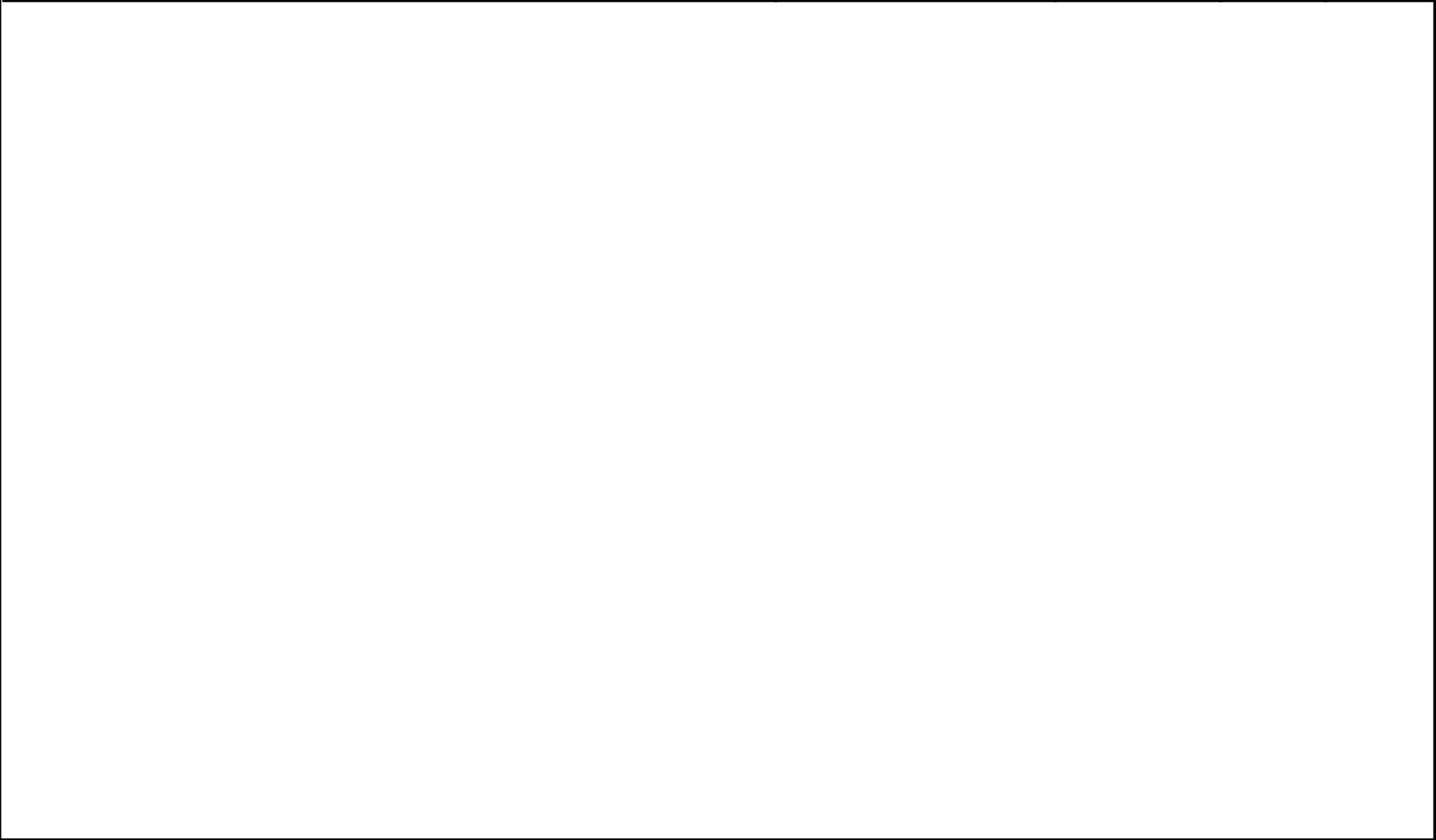
<b>13 - 10 Fuel System</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>13 80 Gas-powered units</b>				
1AZ Screw plug on low-pressure regulator	316g/518g		3	Nm



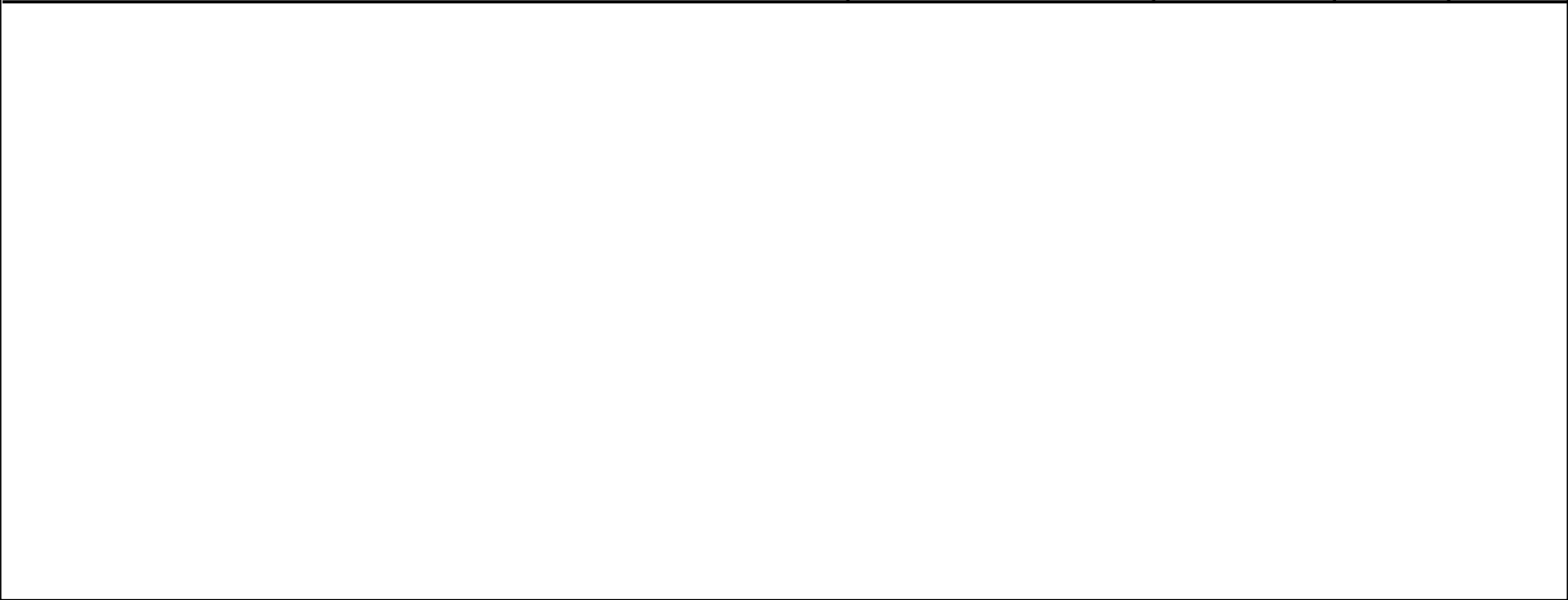
<b>13 - 11 Fuel System</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>13 81 Air intake valves, low-pressure and vacuum hoses</b>				
1AZ Air intake line on low-pressure unit	316g/518g		22	Nm

<b>13 - 12 Fuel System</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>13 82 Mixture and metering system, low-pressure reducer</b>				
1AZ MAP sensor on holder	316g/518g		3.5	Nm

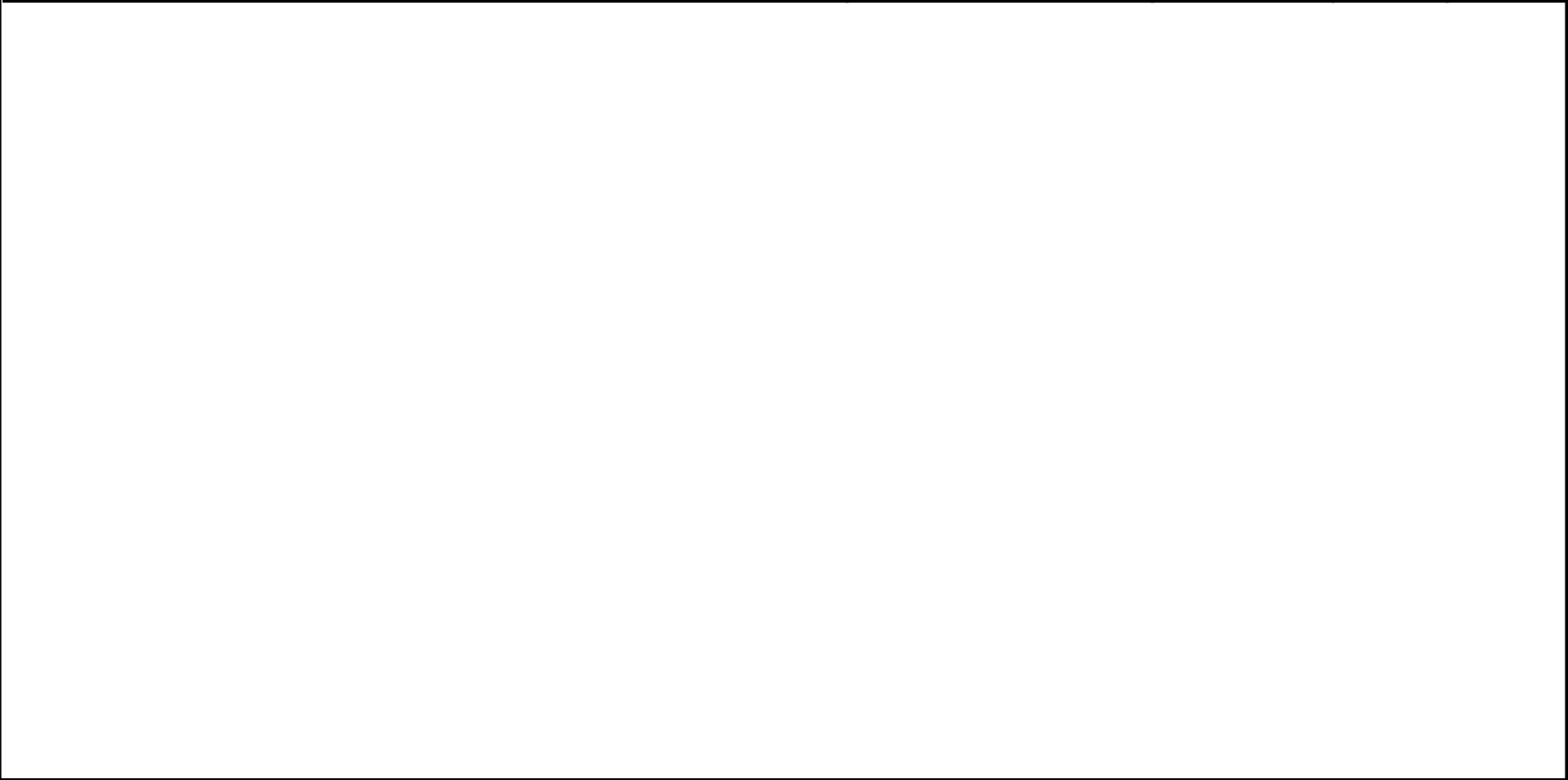
<b>13 - 13 Fuel System</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>13 83 Gas tank with attachment</b>				
1AZ Support frame on body	316g/518g		45	Nm
2AZ Gas density sensor on non-return cock of gas tank	316g/518g		35	Nm
3AZ Holder of filler connection on body	316g		5	Nm
4AZ Holder for filler connections on body	518g		3	Nm



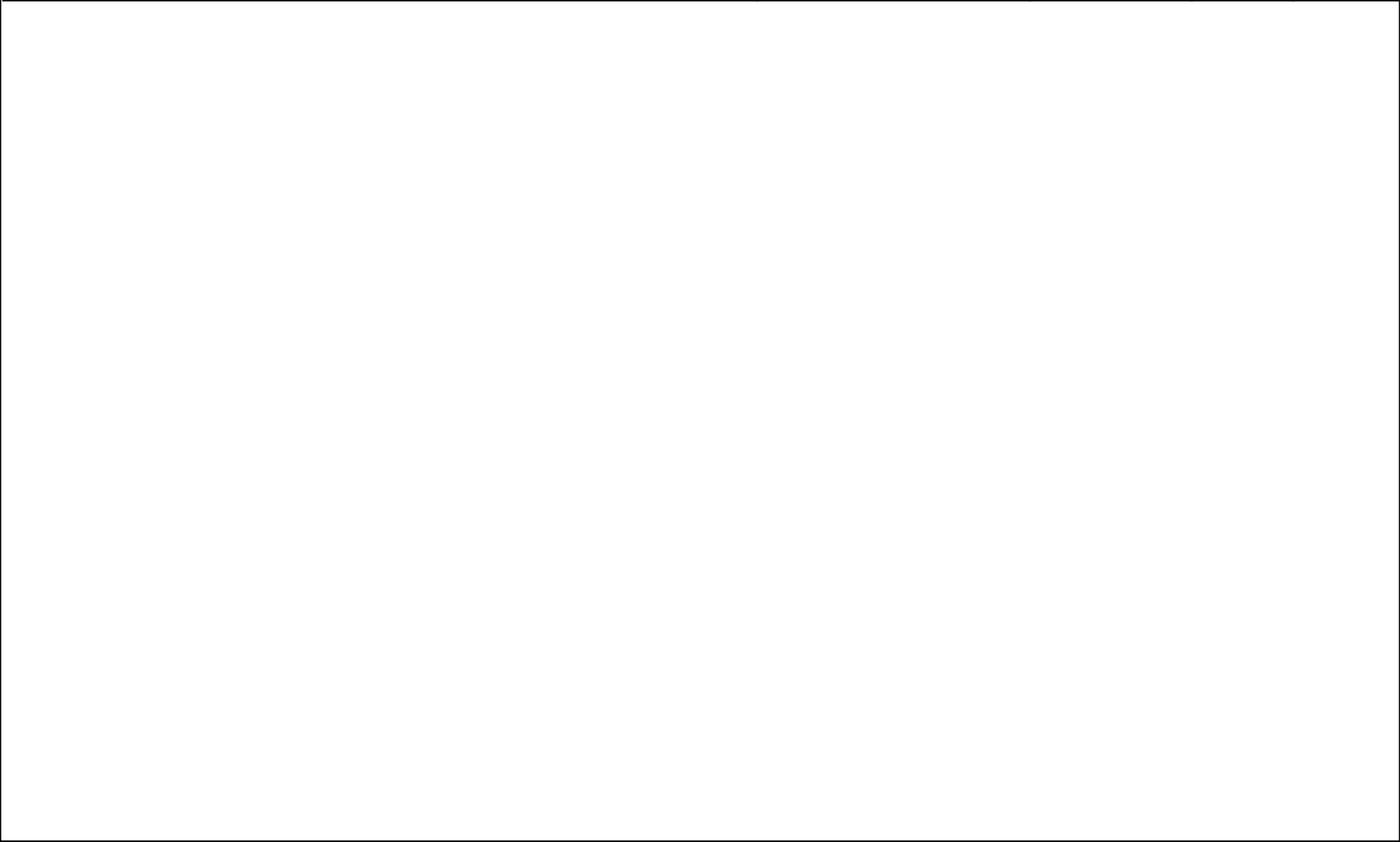
16 - 1 Fuel tank and fuel lines	Type	Screw	Dimension	Unit
<b>16 11 Fuel Tank and Mounting Parts</b>				
1AZ Fuel tank to body Screw	All	M8	23	Nm (ft. lbs.)
nut	E30	M8	25	Nm (ft. lbs.)
nut	E24	M8	45	Nm (ft. lbs.)
Retaining strap			8	Nm (ft. lbs.)
Retaining strap	E39	M8	23	Nm (ft. lbs.)
2AZ Connecting pipe to fuel tank	E30		25	Nm (ft. lbs.)
3AZ Heat shield to fuel tank	E30		8.5	Nm (ft. lbs.)
	E24		1.0	Nm (ft. lbs.)
	E31		3	Nm (ft. lbs.)
4AZ Drain plug on fuel tank	All		25	Nm (ft. lbs.)



16 - 2 Fuel tank and fuel lines	Type	Screw	Measure	Unit
<b>16 12 Fuel Supply</b>				
1AZ Pump assembly to metal-bonded mount	All with fuel injection		6.5	Nm
2AZ Holder to fuel pump or fuel reservoir	All with fuel injection		6.5	Nm
3AZ Electric connections on fuel pump	All with fuel injection		2	Nm
4AZ Electric connections on fuel pump	All with fuel injection	M4	1.2	Nm
5AZ Electric connections on fuel pump	All with fuel injection	M5	1.6	Nm
6AZ Plastic nut on cover for fuel pipes	E30		2	Nm
7AZ Hose clamps 10 - 16 mm dia.	All		2	Nm

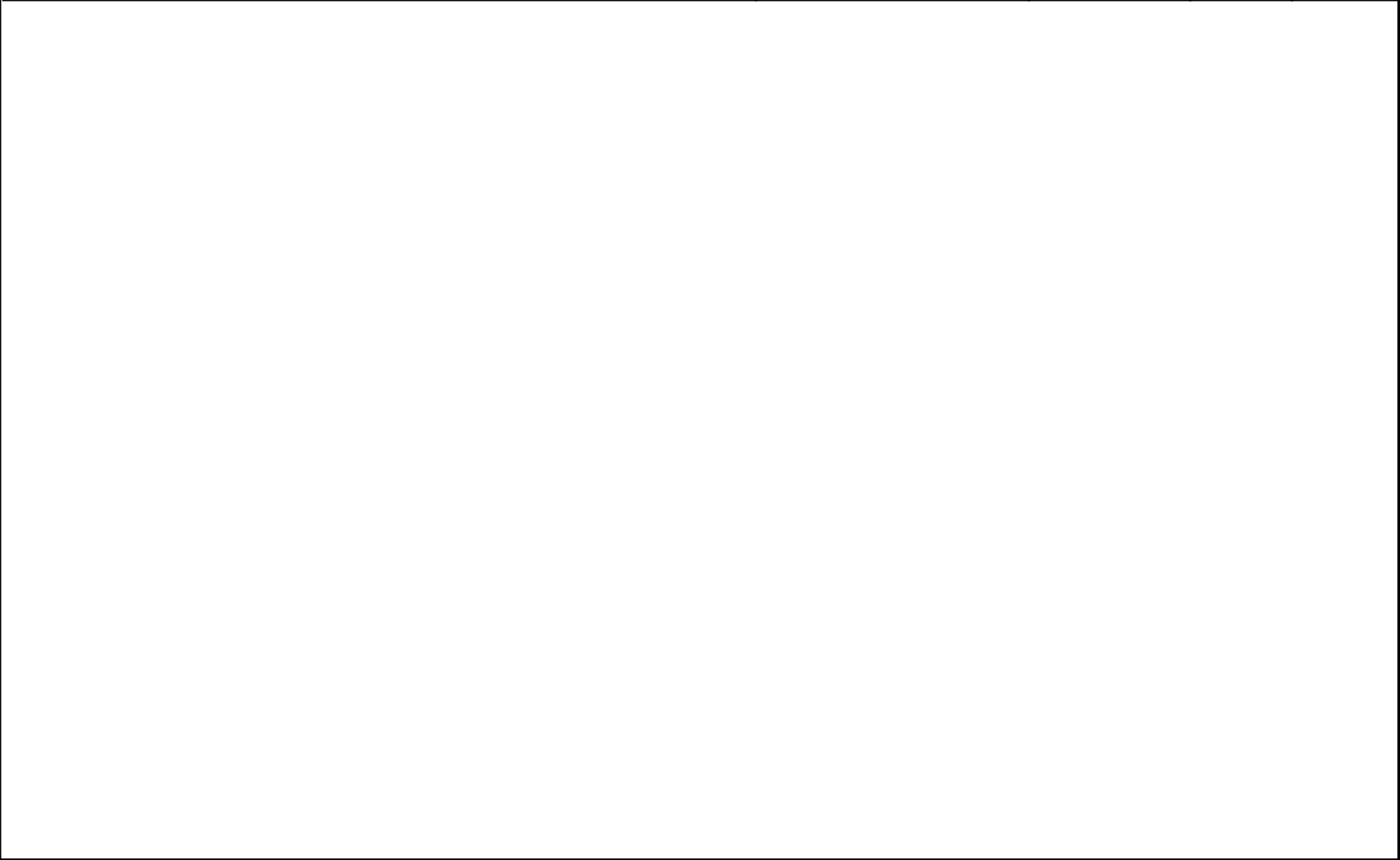


<b>16 - 3 Fuel tank and fuel lines</b>	<b>Type</b>	<b>Screw</b>	<b>Dimension</b>	<b>Unit</b>
<b>16 13 Fuel Vapor Venting</b>				
1AZ Fuel vapor venting tank to body	E24		3	Nm (ft. lbs.)
	E30		4.5	Nm (ft. lbs.)
	E39		4.0	Nm (ft. lbs.)



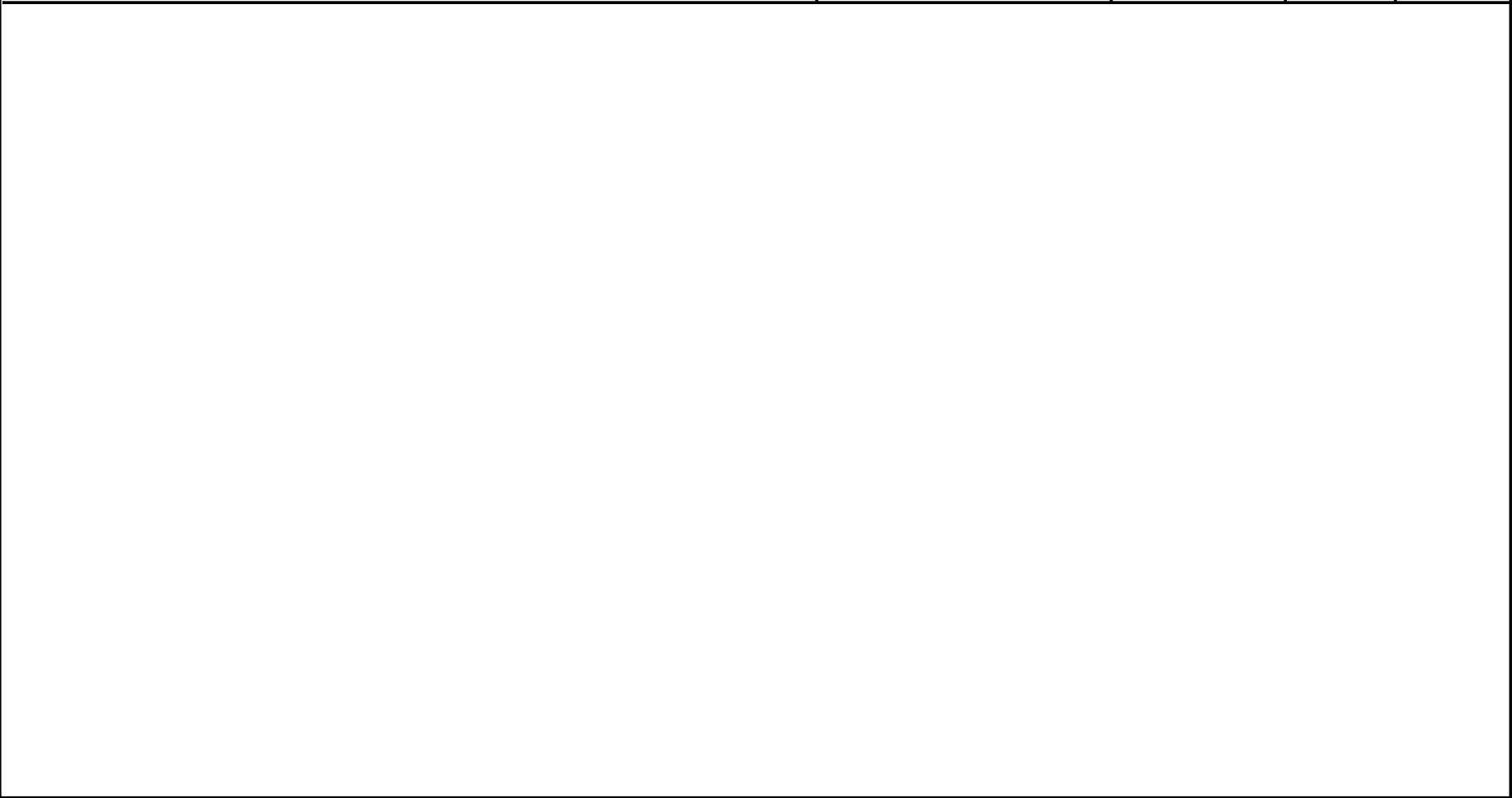
<b>16 - 4 Fuel Tank and Fuel Lines</b>		<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>16 14 Fuel Pump</b>					
<b>1AZ</b>	<b>Fuel level sender to fuel intake</b>	<b>All with transfer pump in tank</b>		<b>2</b>	<b>Nm</b>
		<b>E32</b>		<b>8</b>	<b>Nm</b>
<b>2AZ</b>	<b>End ring for fuel tank (fuel level sender/pump)</b>				
	<b>Plastic sealing ring, 26.5 mm high</b>	<b>E34/E31</b>		<b>40</b>	<b>Nm</b>
	<b>Plastic sealing ring, 31.5 mm high (new)</b>	<b>E36/E34/E31</b>			
	<b>Torque angle</b>			<b>720</b>	<b>°</b>
	<b>Torque</b>			<b>55</b>	<b>Nm</b>
	<b>Metal sealing ring</b>	<b>E39</b>		<b>35</b>	<b>Nm</b>
<b>3AZ</b>	<b>Intank pump with fill level sensor on tank (tighten nuts crosswise)</b>	<b>E38</b>	<b>M6</b>	<b>6.5</b>	<b>Nm</b>

<b>17 - 1 Radiator</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>17 00 Coolant</b>				
1AZ Cooland hoses 32 ... 48 mm dia.	All		2.5	Nm
2AZ Bleeder screw (8 mm wrench size) on thermostat housing	All		8	Nm
3AZ Level switch (30 mm wrench size) to coolant expansion tank	All		3	Nm

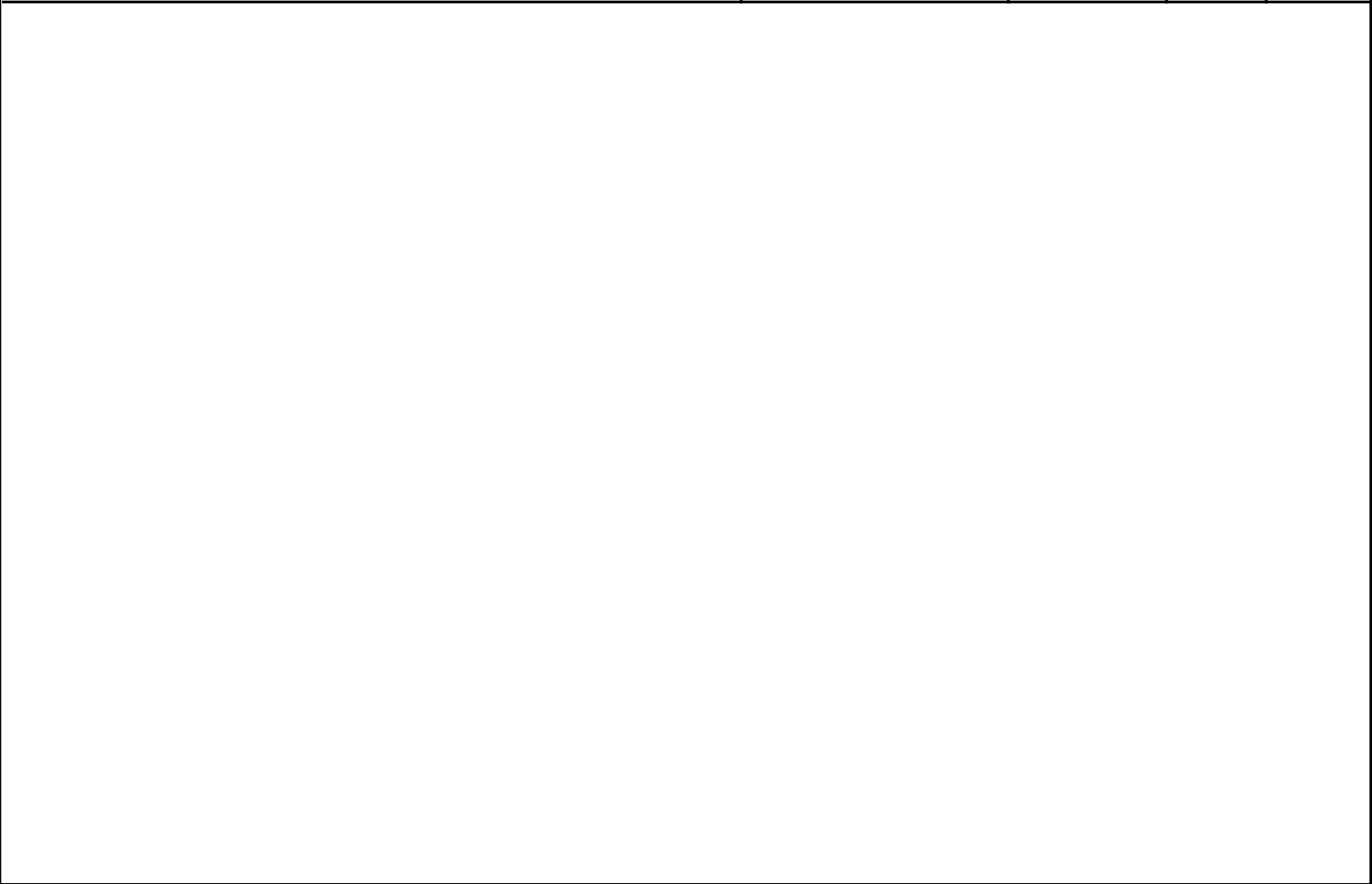




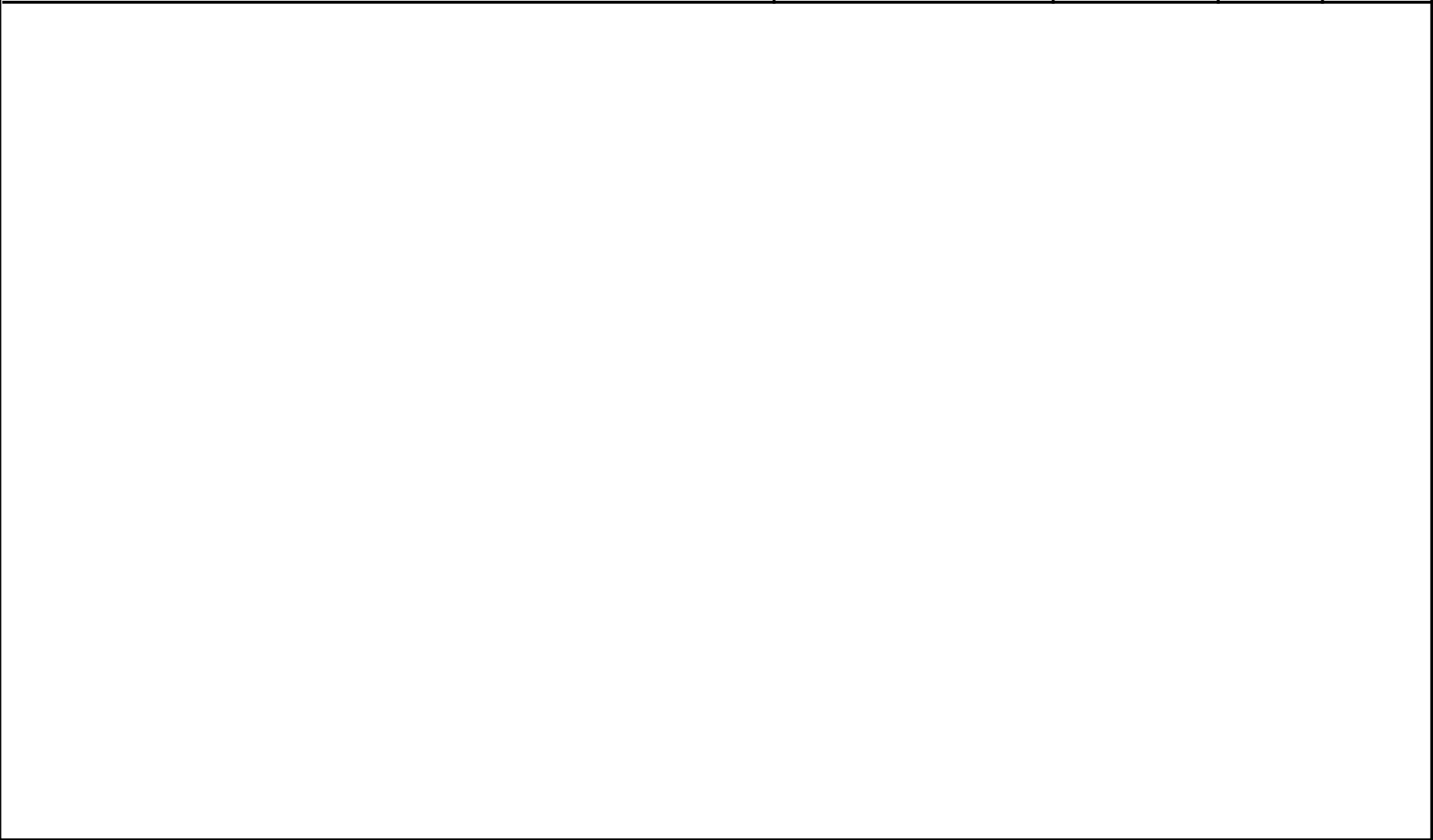
<b>17 - 2 Radiator</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>17 11 Radiator and Mounting Parts</b>				
<b>1AZ Radiator to body</b>				
<b>self-tapping screw</b>	All	B6.3	9	Nm
	All	M6	10	Nm
<b>2AZ Drain plug on radiator</b>	All		2.5	Nm
<b>3AZ Temperature switch to radiator (91°C / 99°C) max.</b>	All		15	Nm
<b>4AZ Expansion tank to body</b>	All		9	Nm



<b>17 - 3 Radiator</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>17 21 Engine Oil Cooler</b>				
1AZ Engine oil cooler to body	All		14	Nm
Oil cooler vapor extraction guide to trim panel	E36 M3	B4.8	4	Nm



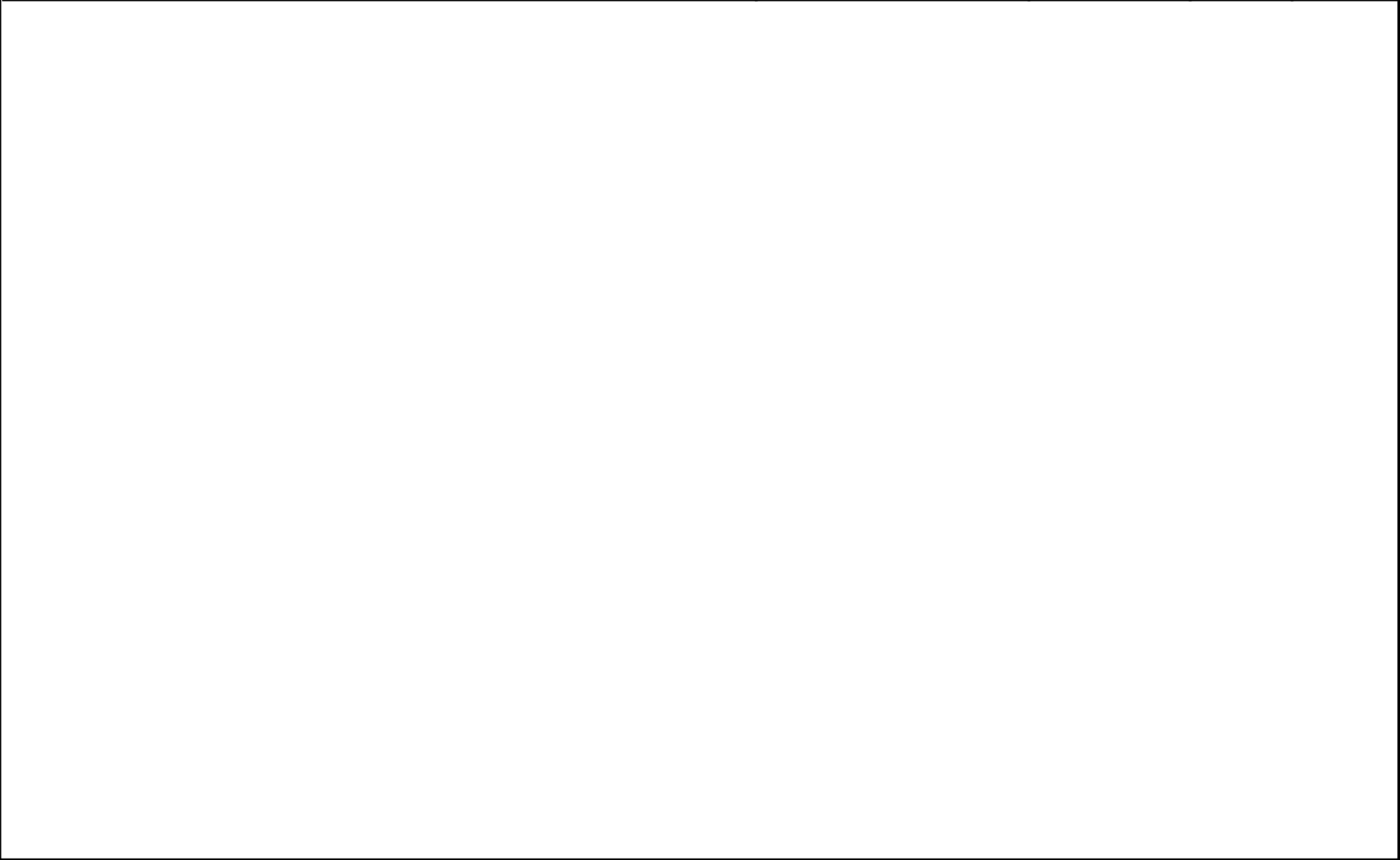
<b>17 - 4 Radiator</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>17 22 Oil Cooler Pipes</b>				
1AZ Pipes to engine oil cooler	All		28	Nm
2AZ Pipes to oil filter head	E36 M3		25	Nm
3AZ Holder on oil cooler pipes	All		6	Nm
4AZ Holder for oil cooler pipes to alternator	E36 M3	M6	10	Nm



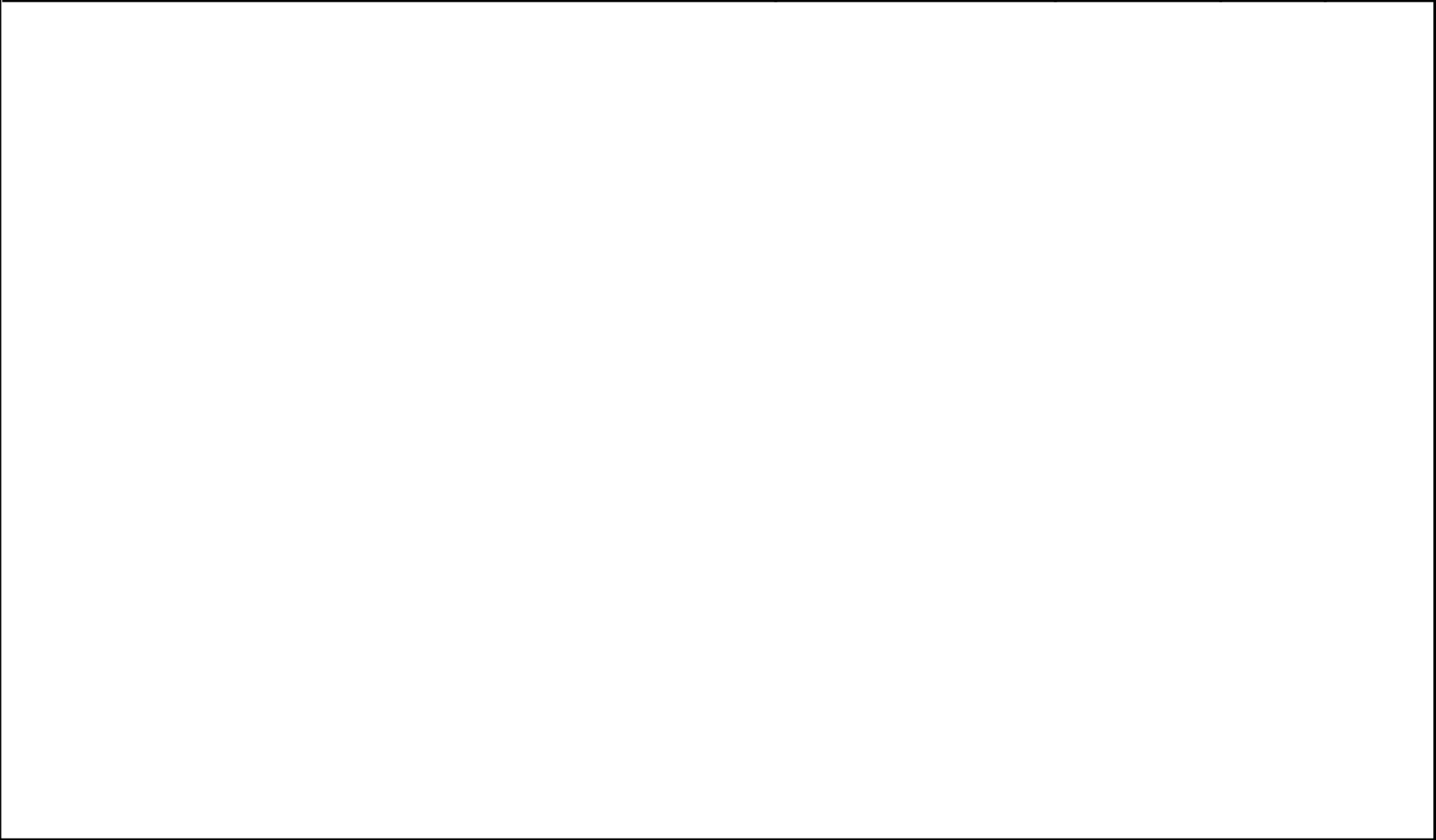
<b>17 - 5 Radiator</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>17 22 Oil Cooler Pipes</b>				
<b>5AZ Cap nut on transmission oil cooler (on radiator) and on transmission</b>	All	M18x1.5	20	Nm
	5HP30	M22x1.5	28	Nm
<b>6AZ Oil lines on transmission</b>				
Hollow bolt	All	M16 x 1.5	37	Nm
<b>7AZ Oil lines on transmission oil cooler</b>	A5S 300J		28	Nm
Hollow bolt	All	M14 x 1.5	27	Nm
<b>8AZ Screw-in fitting on transmission</b>	All	M14x1.5 und M16x1.5	37	Nm
<b>9AZ Oil hose on oil pipe</b>	E23		28	Nm
<b>10AZ Oil pipe bracket on radiator</b>	E23		2	Nm
<b>11AZ Oil pipe bracket on body</b>	E23		6.5	Nm
<b>12AZ Oil cooler on transmission</b>	5HP30		10	Nm

18 - 1 Exhaust system	Type	Screw	Dimension	Unit
<b>18 00 Exhaust Assembly</b>				
1AZ Exhaust pipe to exhaust manifold or turbocharger				
Version with compression spring: Evenly tighten the compression springs with nuts on the block, then loosen by 1.5 revolutions	M30/M70		10	Nm
Preload compression springs with nuts to $27 \pm 1$ mm	M51			
Version without compression springs	S50	M10	30	Nm
2AZ Exhaust pipe to flow section	E23		25	Nm
3AZ Clamp for final muffler	All	M8	15	Nm
4AZ Catalytic converter on silencer				
Version with compression spring: Evenly preload compression springs with nuts to 30 mm	E36 M42			

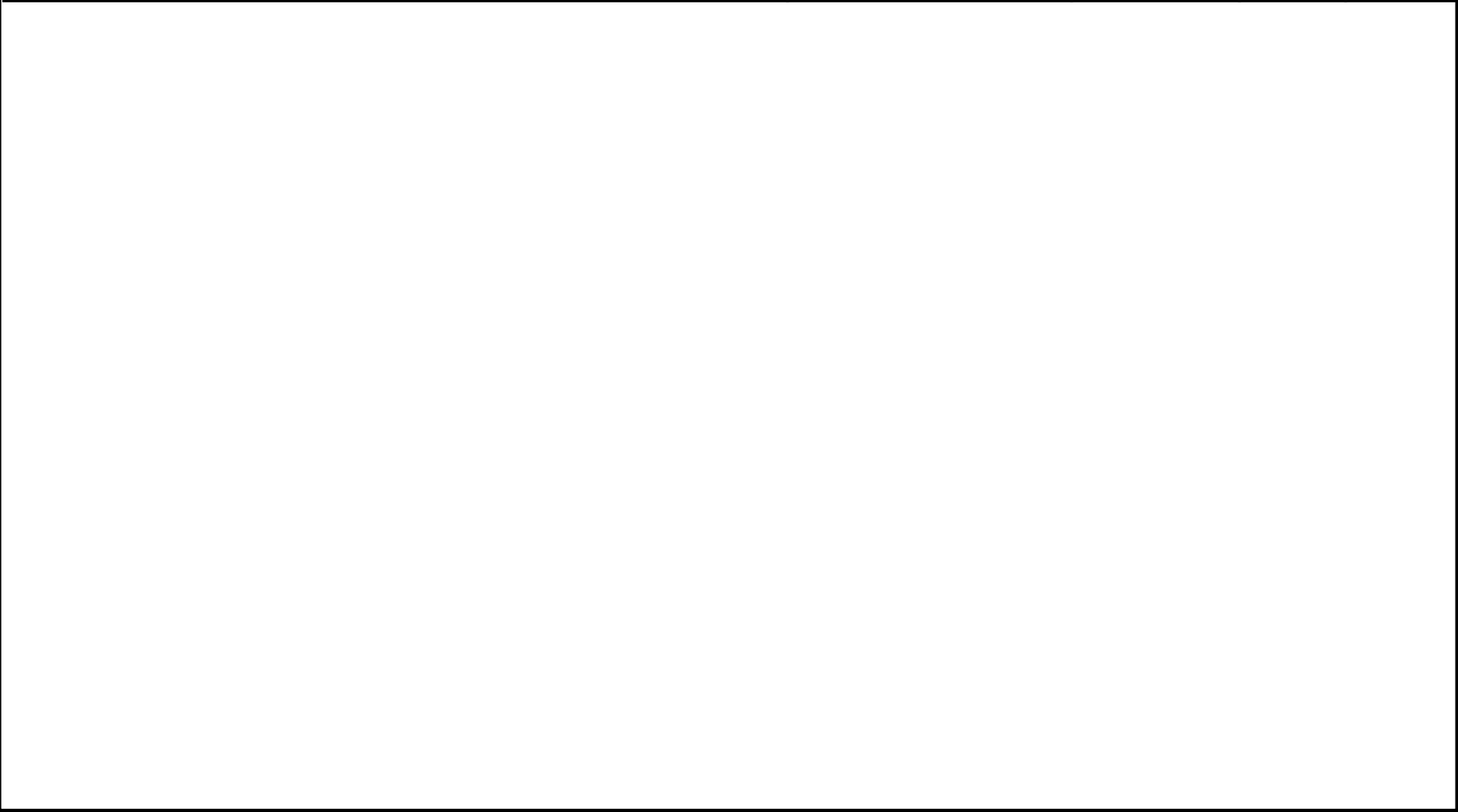
<b>21 - 1 Clutch</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>21 11 Bell housing</b>				
1AZ Clutch housing to crankcase	All	M8	27	Nm
	All	M10	51	Nm
	All	M12	86	Nm



<b>21 - 2 Clutch</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>21 21 Clutch disc and drive plate</b>				
<b>1AZ Clutch to flywheel</b>				
	All	M8 8.8	24	Nm
	All	M8 10.9	34	Nm
Replace bolt and taper sleeve.	S14/S38 B36	M8 10.9	34	Nm

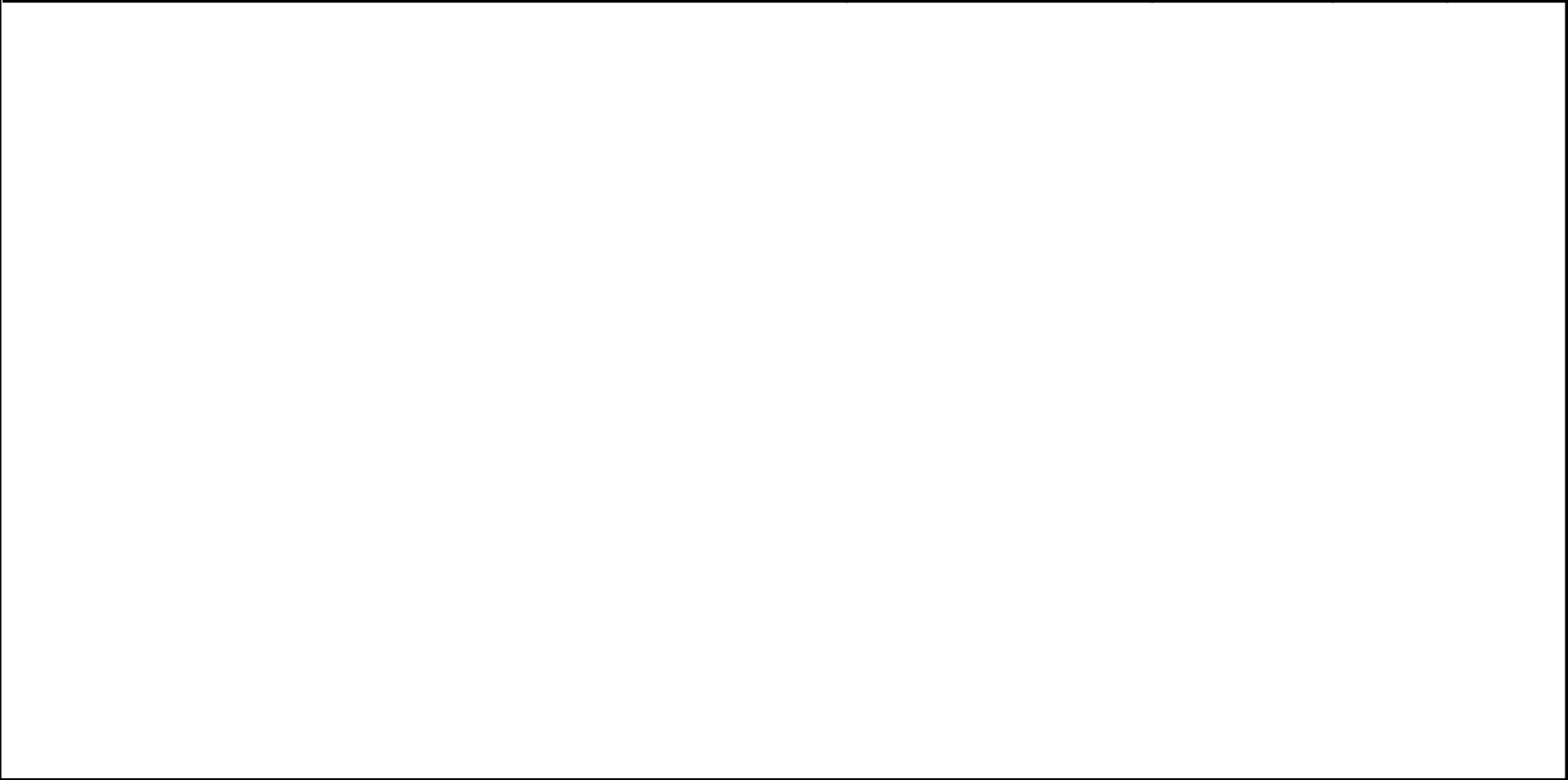


<b>21 - 3 Clutch</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>21 52 Clutch operation (hydraulic)</b>				
1AZ Coupling bolts for hydraulic pipes	All		17	Nm
2AZ Master cylinder to console	All		22	Nm
3AZ Master cylinder setscrew	All		22	Nm
4AZ Master cylinder to pedal assembly	All		10	Nm
5AZ Slave cylinder to clutch housing or transmission case	All		22	Nm

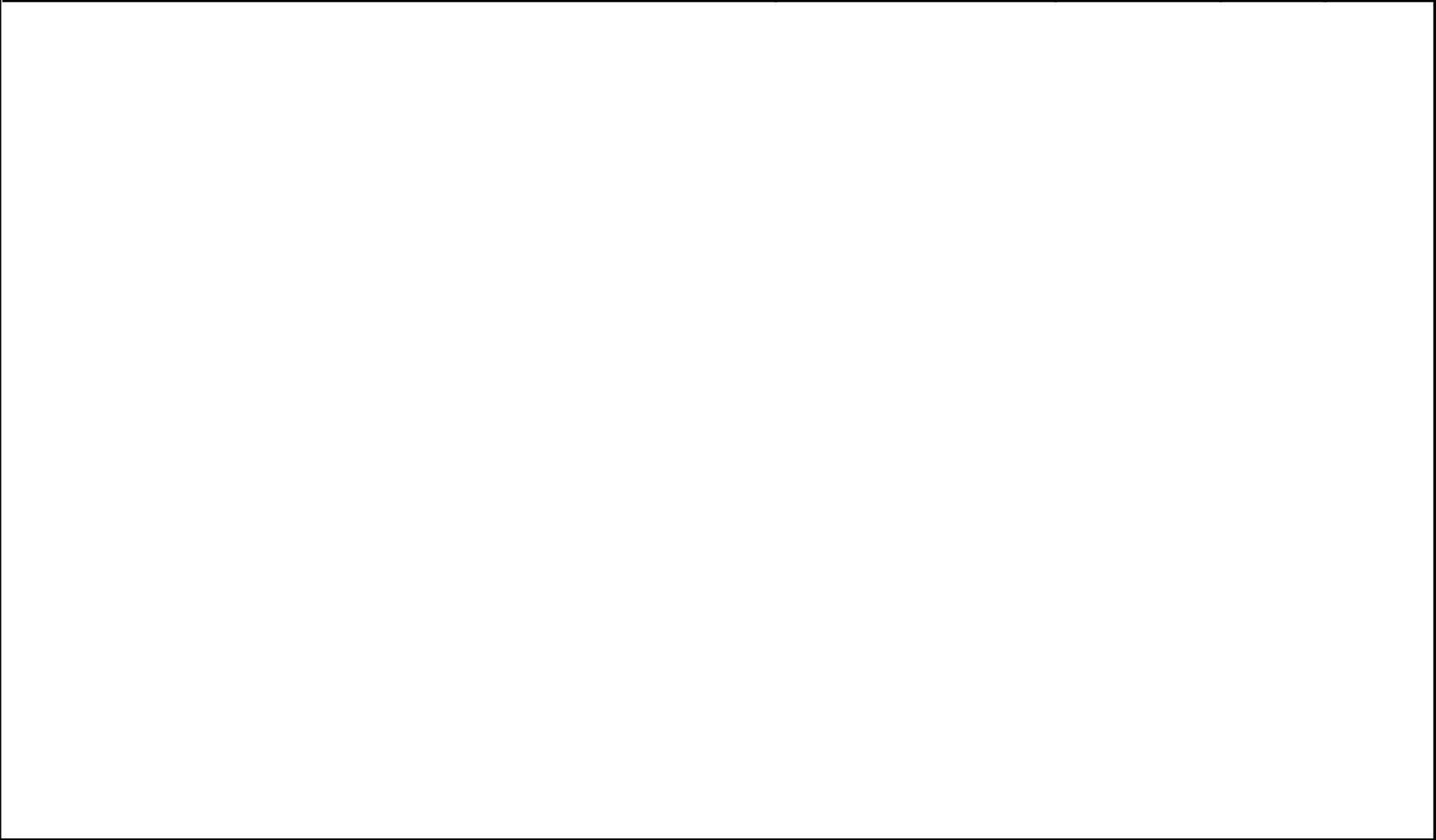




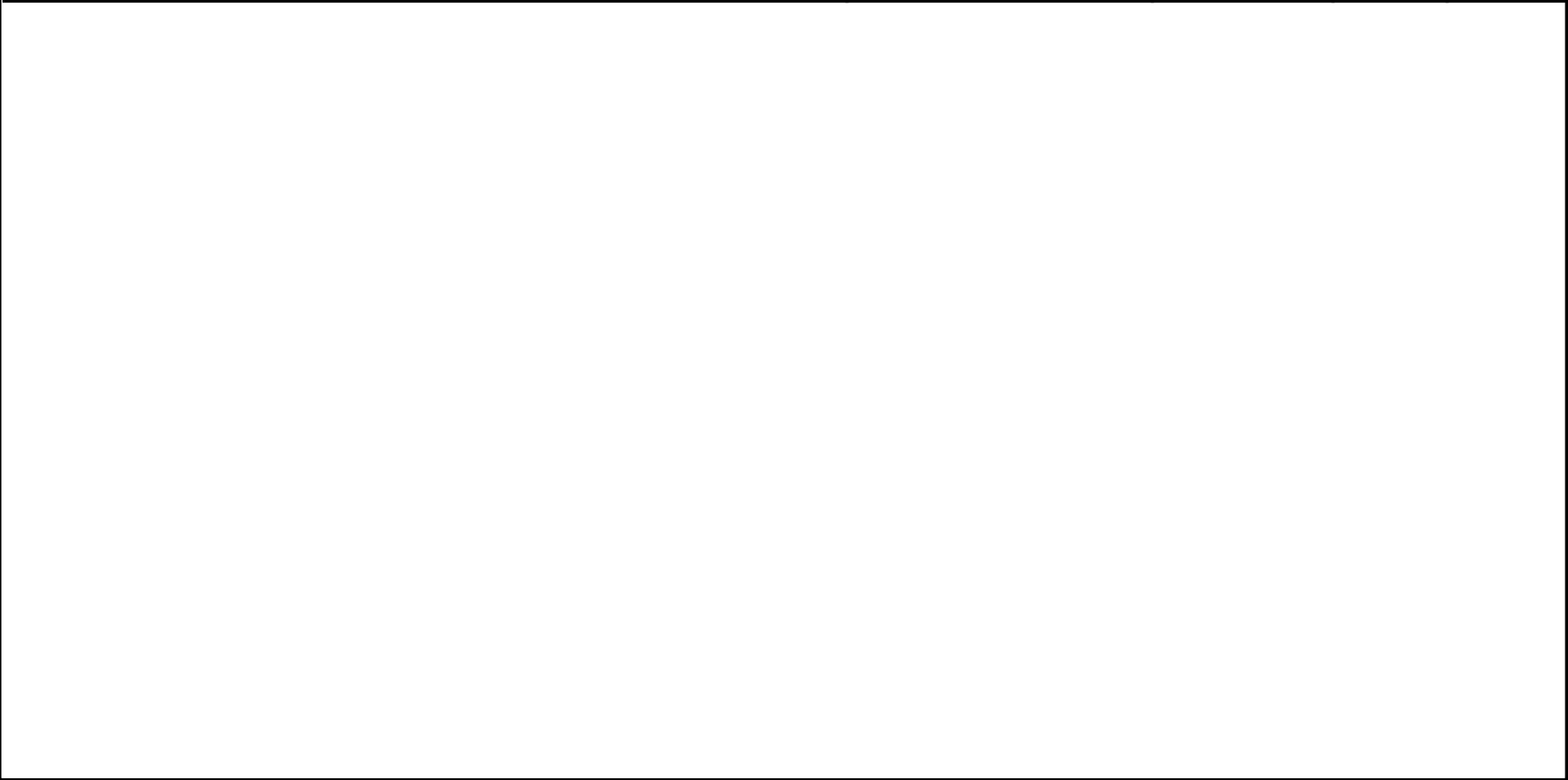
<b>23 - 1 Manual Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>23 00 Transmission in general</b>				
<b>1AZ Transmission to engine</b>				
<b>Hex screws</b>	All	M8	25	Nm
	All	M10	49	Nm
	All	M12	74	Nm
<b>Torx bolts</b>	All	M8	22	Nm
	All	M10	43	Nm
	All	M12	72	Nm



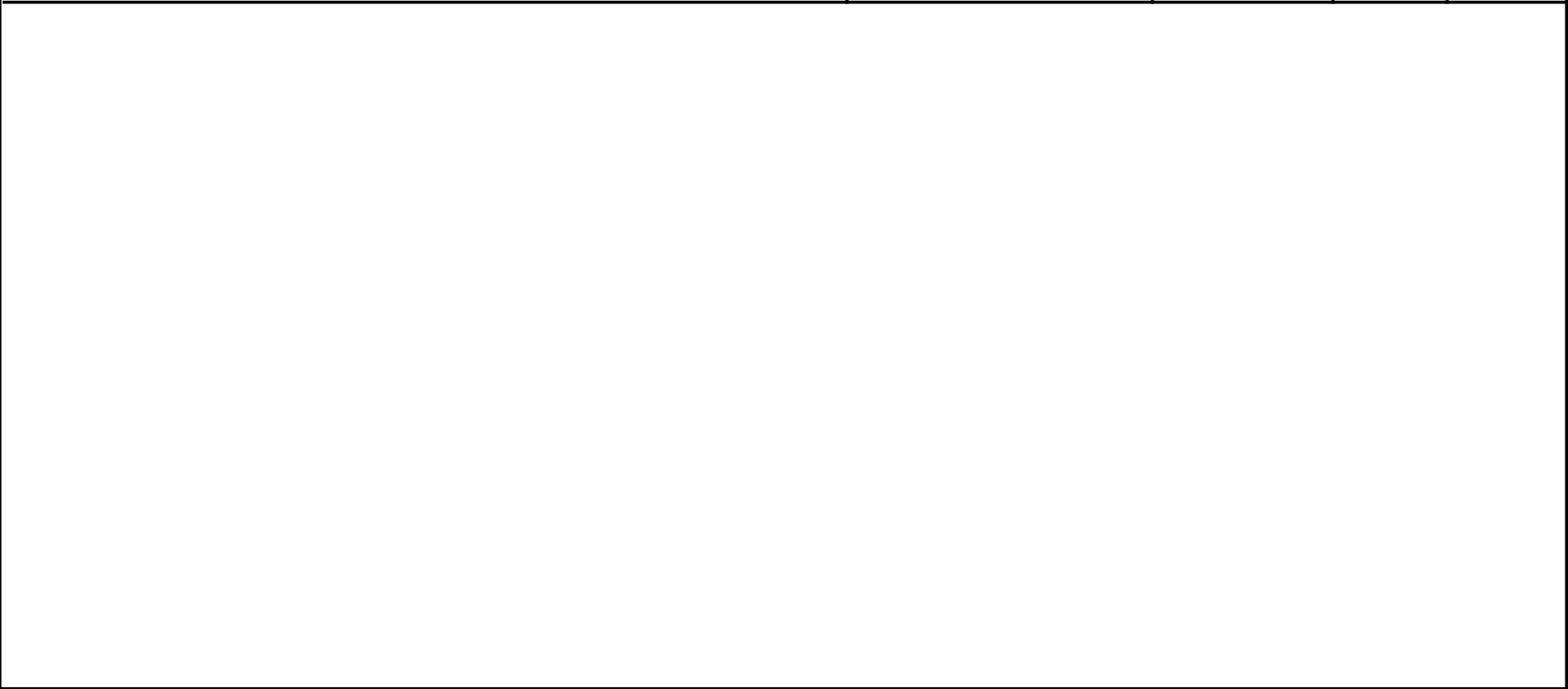
<b>23 - 2 Manual transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>23 00 Transmission Assembly</b>				
2AZ Transmission to clutch housing	All	M12	76	Nm
3AZ Reinforcement plate to transmission	All	M8	23	Nm
4AZ Oil drain plug/filler plug	All		50	Nm
	S 6 S 560 G		52	Nm



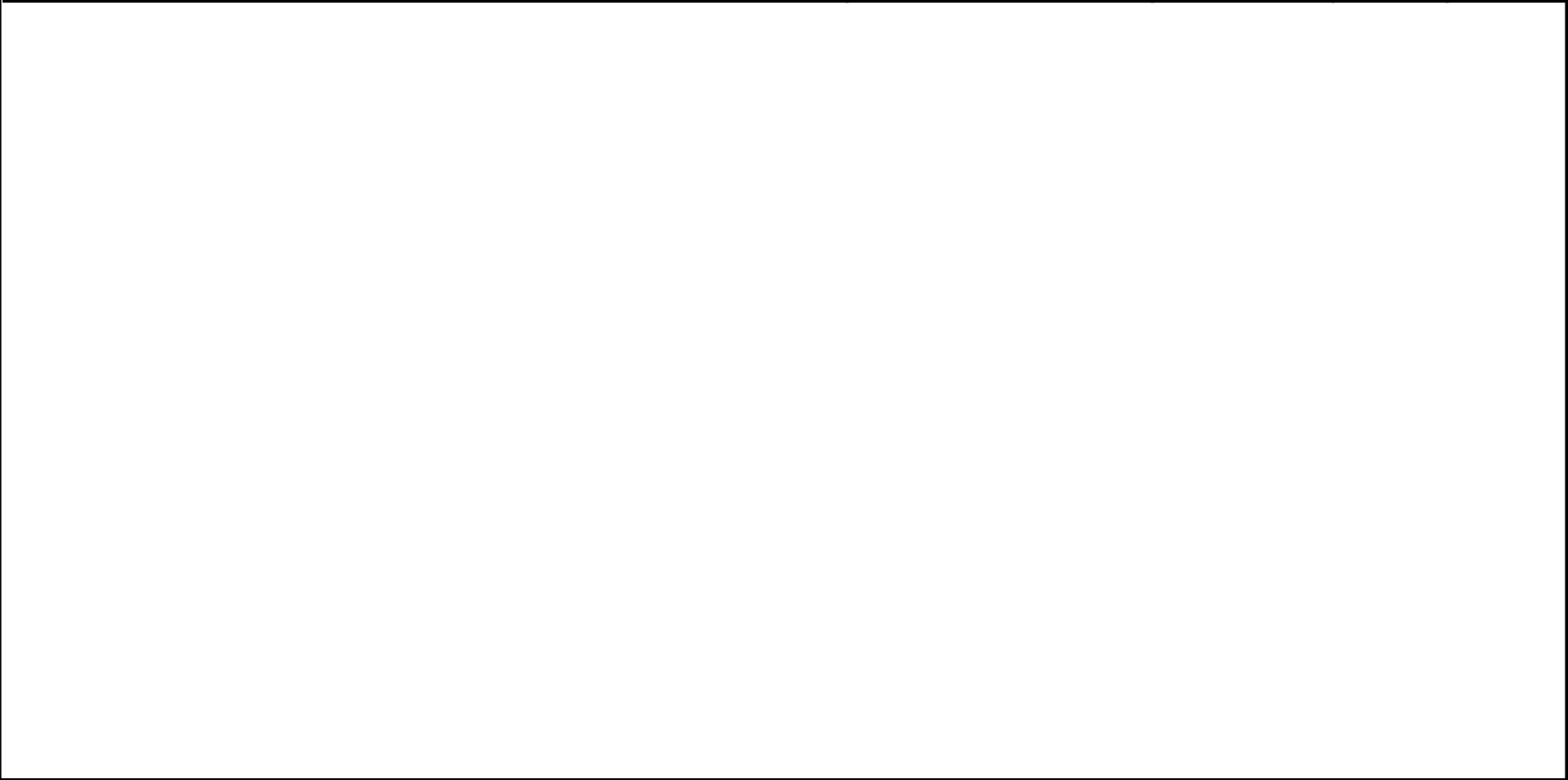
<b>23 - 3 Manual transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>23 11 Case and Covers</b>				
1AZ Transmission case rear/front sections	All		22	Nm
2AZ Cover with guide tube/transmission case	All	M8x22	18	Nm
	All	M8x30	25	Nm
	All	M6	10	Nm
3AZ Bearing cap/sealing flange	All		10.5	Nm
4AZ Reverse gear shaft on intermediate housing	All		49	Nm
5AZ Retaining plate for reverse gear shaft on intermediate housing	All		25	Nm



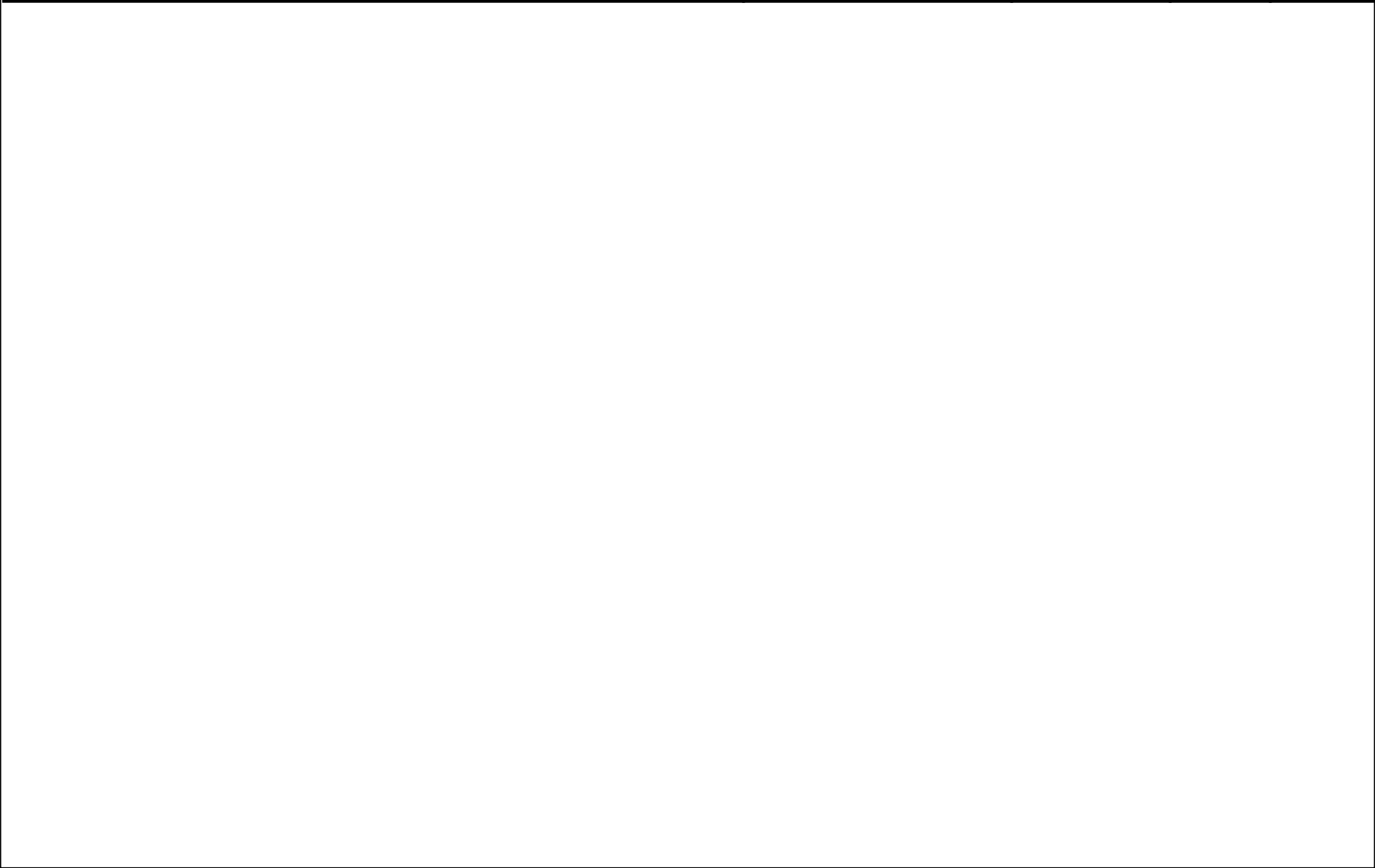
<b>23 - 4 Manual Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>23 11 Case and Cover</b>				
6AZ Reverse gear shaft to case	All	M8	25	Nm
	S 5 D 310 Z	M8	20	Nm
	All	M10	45	Nm
7AZ Support for reverse gear shaft	240/260	M8	25	Nm
8AZ Bearing bracket on rear section of case	240/260/265/280	M6	10	Nm
9AZ Mounting tabs for sealing cover	280	M6	10	Nm
10AZ Bearing on countershaft	S 5 D 200 G/S 5 D 250 G	M10	90	Nm
	S 5 D 310 Z	M10	30	Nm
	280	M10	60	Nm



<b>23 - 5 Manual transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>23 11 Case and Covers</b>				
11AZ Plug in rear casing section	All	M20	60	Nm
	240	M16	40	Nm
	260/280	M22	60	Nm
12AZ Sealing caps on rear case section	240/260/280	M6	10	Nm
13AZ Reversing bolt to reversing lever	ZF S-5-16/S 5 D 310 Z		43	Nm
14AZ Clamping claws to rear case section	ZF S-5-16/S 5 D 310 Z		33	Nm
15AZ Screws on detent plate	ZF S-5-16/S 5 D 310 Z		9	Nm



<b>23 - 6 Manual Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Dimension</b>	<b>Unit</b>
<b>23 11 Case and Cover</b>				
16AZ Holder to transfer case	265 Sport	M6	9	Nm (ft. lbs.)
17AZ Retaining plates for bearings on housing	S 5 D 310 Z/S 5 D 200 G/250 G	M6	10	Nm (ft. lbs.)

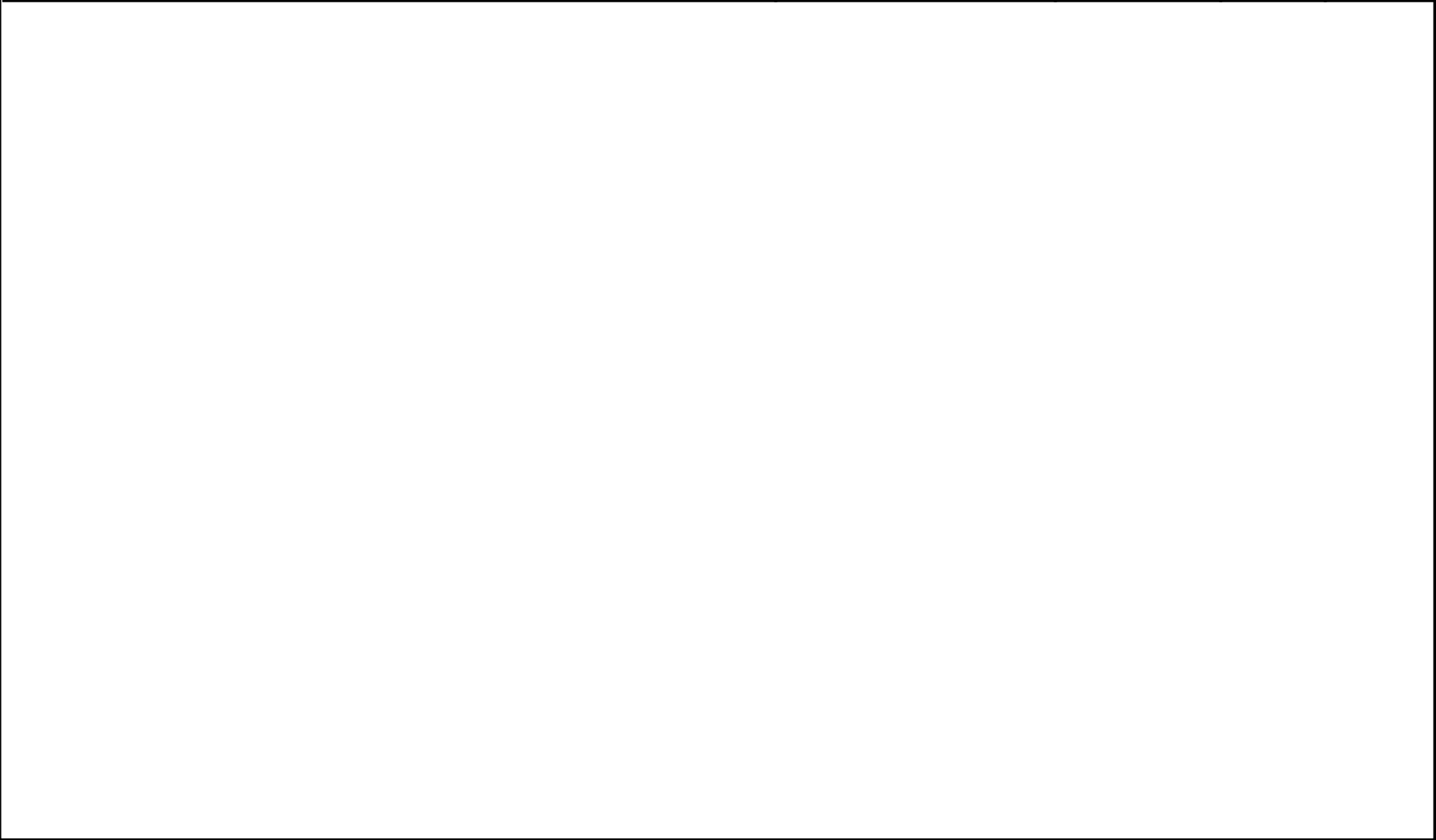


<b>23 - 7 Manual transmission</b>		<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>23 21 Transmission Shafts</b>					
<b>1AZ</b>	<b>Output flange Collar nut installed with bolt cement</b>	<b>All</b>			
	initial torque			<b>190</b>	<b>Nm</b>
	loosen				
	final torque			<b>120</b>	<b>Nm</b>
<b>2AZ</b>	<b>Gear wheel to layshaft</b>	<b>265 Sport</b>	<b>M10</b>	<b>60</b>	<b>Nm</b>

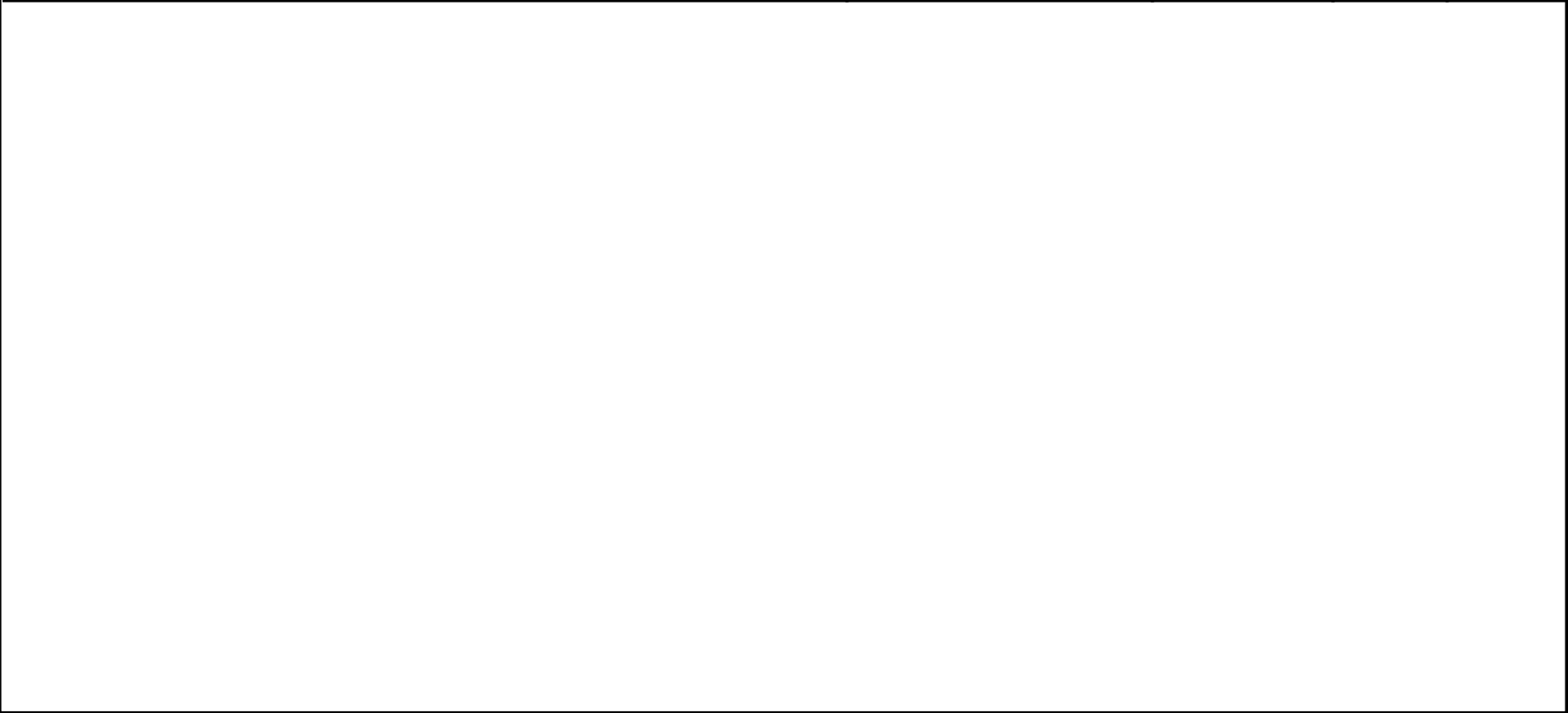
<b>23 - 8 Manual transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>23 31 Interior Shift Components</b>				
1AZ Shift arms to transmission case	S 5 D 310 Z		45	Nm



<b>23 - 9 Manual transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>23 71 Transmission mounts</b>				
1AZ Transmission mounts (rubber) to body	All	M10	42	Nm
2AZ Transmission cross member to body	All	M10	42	Nm
	All	M8	21	Nm
3AZ Mount bracket to transmission	All	M8	21	Nm



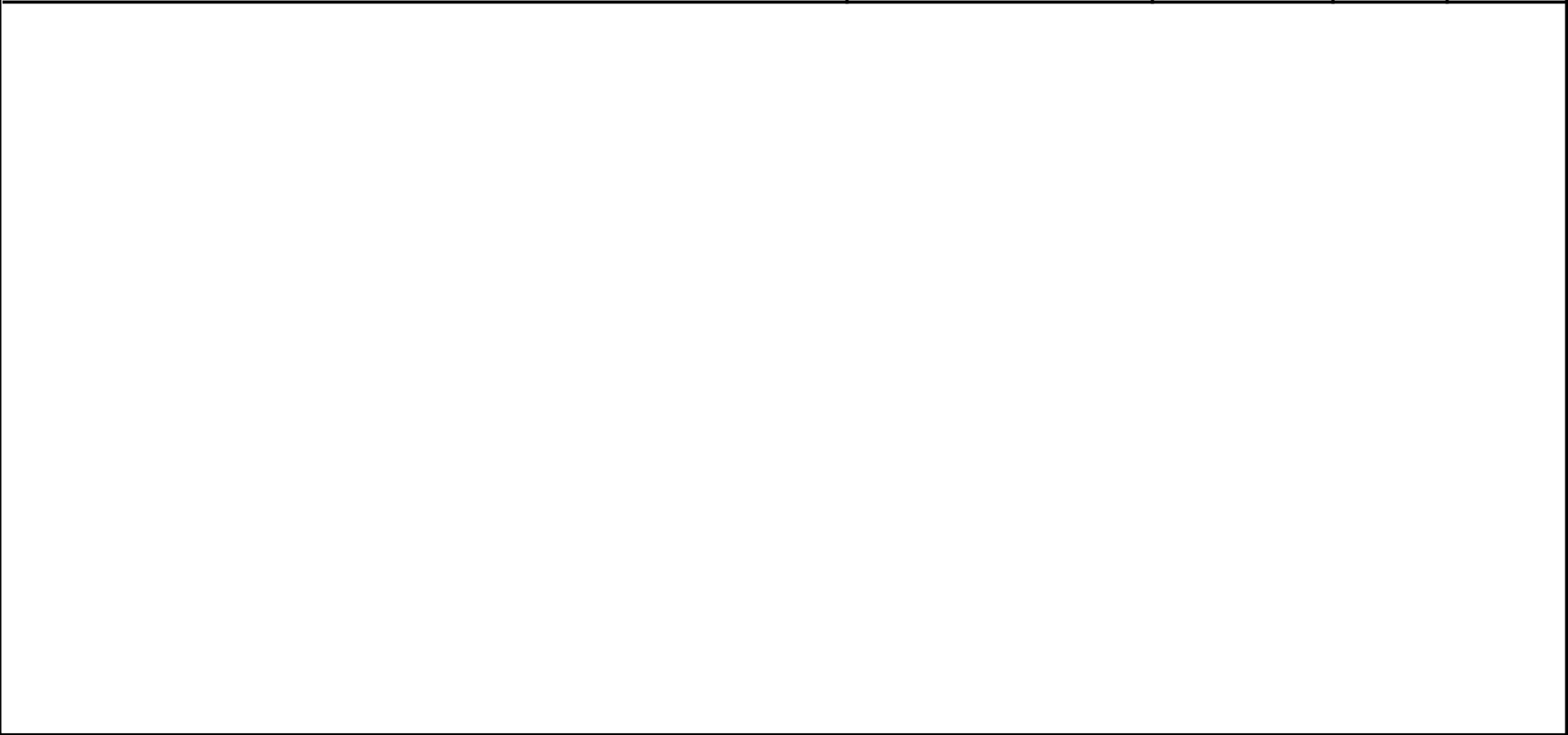
<b>24 - 1 Automatic Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Dimension</b>	<b>Unit</b>
<b>24 00 Transmission in General</b>				
<b>1AZ Transmission to engine</b>				
Hex screws	All	M8	24	Nm (ft. lbs.)
Hex screws	All	M10	45	Nm (ft. lbs.)
Hex screws	All	M12	82	Nm (ft. lbs.)
Torx bolts	All	M8	21	Nm (ft. lbs.)
Torx bolts	All	M10	42	Nm (ft. lbs.)
Torx bolts	All	M12	72	Nm (ft. lbs.)
2AZ Reinforcement plate to transmission	All	M8	23	Nm (ft. lbs.)



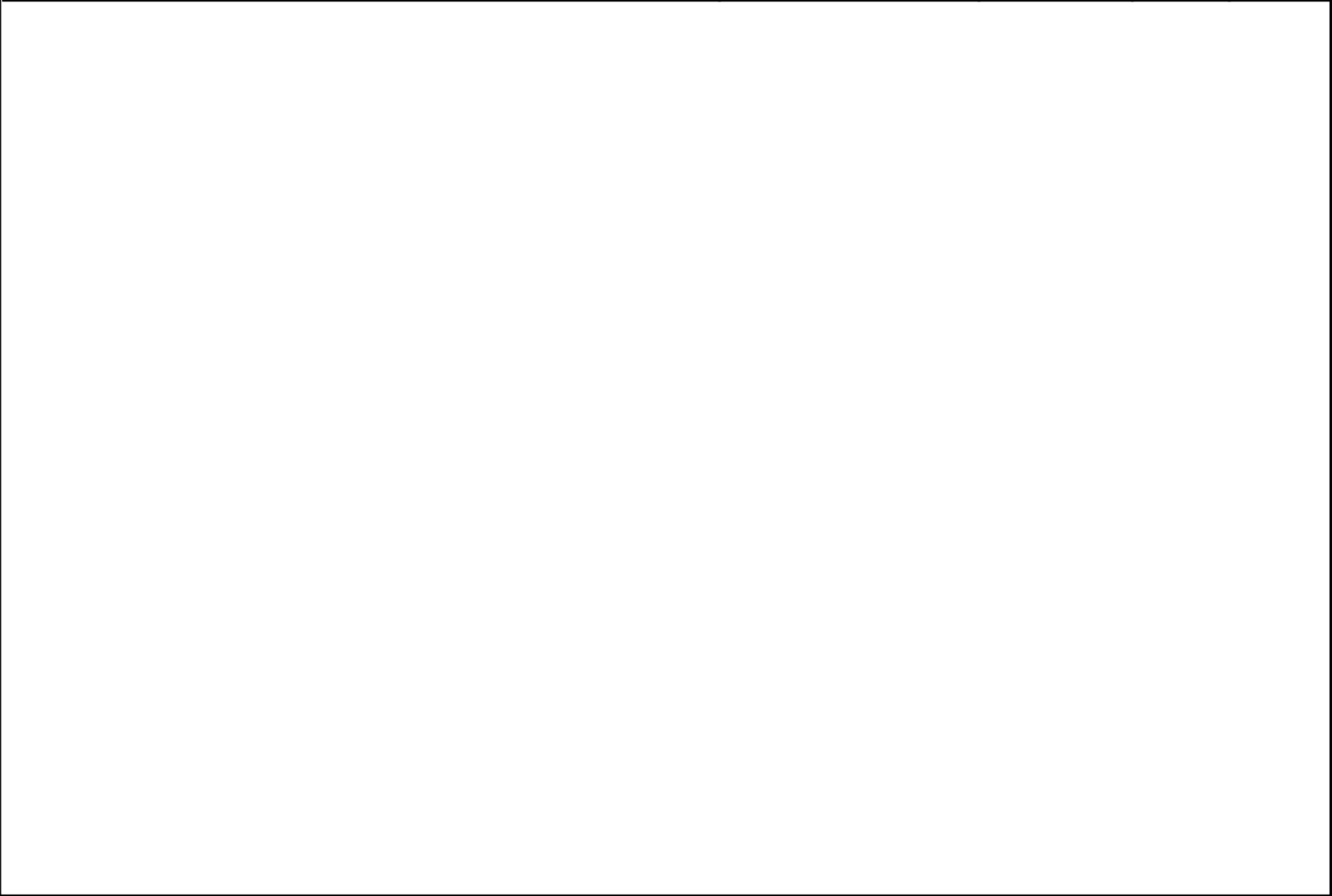
24 - 2 Automatic Transmission	Type	Screw	Measure	Unit
<b>24 11 Transmission Case, Oil Sump</b>				
1AZ Transmission extension	All	M8	25	Nm
	A4S 270R/A4S 310R	5/16"	32	Nm
2AZ Guard	All	M6	9	Nm
3AZ Converter bell housing	All	M8	25	Nm
	4HP-22/4HP-24	M10	46	Nm
	A4S 270R/A4S 310R	1/2"	42	Nm
4AZ Plug on transfer plate	All	M10	16	Nm
	4HP-22/4HP-24	M14	40	Nm
	4HP-22/4HP-24	M20	50	Nm

24 - 3 Automatic Transmission	Type	Screw	Measure	Unit
<b>24 11 Transmission Case, Oil Sump</b>				
5AZ Oil Pan	4HP-22/4HP-24/A5S 310Z	M6	6	Nm
	A5S 300J		9	Nm
	A4S 270R/A4S 310R	M6	12	Nm
	A5S 560Z/A5S 440Z	M6	10	Nm
6AZ Oil drain plug	All	M10	16	Nm
	A4S 270R/A4S 310R		25	Nm
	A5S 300J		35	Nm
	A5S 560Z		50	Nm
	A5S 440Z	M16x1.5	30	Nm
7AZ Oil filler plug	A4S 270R/A4S 310R		33	Nm
	A5S 300J		40	Nm
	A5S 310Z/A5S 560Z		100	Nm
	A5S 440Z	M18x1.5	35	Nm

24 - 4 Automatic Transmission	Type	Screw	Measure	Unit
<b>24 11 Transmission Case, Oil Sump</b>				
8AZ Oil filler pipe	3HP-22		105	Nm
	4HP-22/4HP-24/A5S 310Z		98	Nm
9AZ Plug	All	M18	43	Nm
10AZ Oil bore plugs	A5S 300J		8	Nm
	A5S 310Z/A5S 560Z		15	Nm
11AZ Damper cover on transmission case	A5S 300J	M6	10	Nm
12AZ Radial shaft seal on converter bell housing	A4S 270R/A4S 310R	M4	3	Nm
13AZ Intermediate plate on intermediate housing	A4S 270R/A4S 310R	5/16"	25	Nm



<b>24 - 5 Automatic Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>24 13 Transmission Extension, Bearings, Seals</b>				
<b>1AZ Slotted nut/output flange</b>	<b>A5S 310Z/A 5 S 440 Z/A5S 560Z</b>		<b>120</b>	<b>Nm</b>



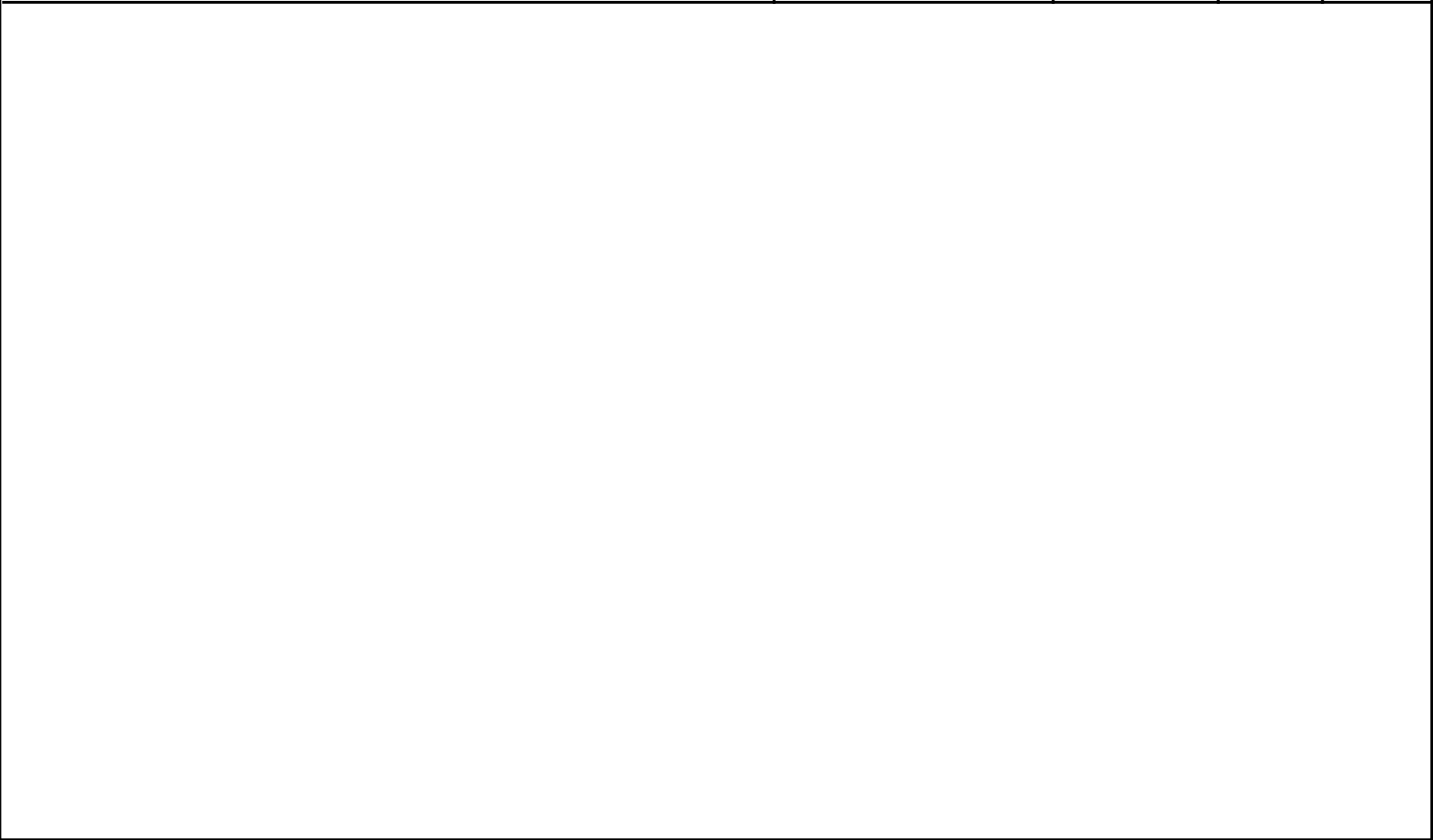
<b>24 - 6 Automatic Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>24 21 Input, Intermediate and Output Shafts</b>				
1AZ Output flange collar nut	A5S 300J		225	Nm
	All others		100	Nm

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<b>24 - 7 Automatic Transmission</b>		<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>24 22 Planetary gear drive</b>					
<b>1AZ</b>	<b>Brake coupling D/G on gear box housing</b>	<b>A5S 310Z/A5S 560Z</b>	<b>M10</b>		
	Insert all screws until contact is made with screw head in each case				
	center bolt			<b>30</b>	<b>Nm</b>
	both outer screws			<b>15</b>	<b>Nm</b>
	center bolt			<b>63</b>	<b>Nm</b>
	both outer screws			<b>30</b>	<b>Nm</b>
	both outer screws			<b>63</b>	<b>Nm</b>



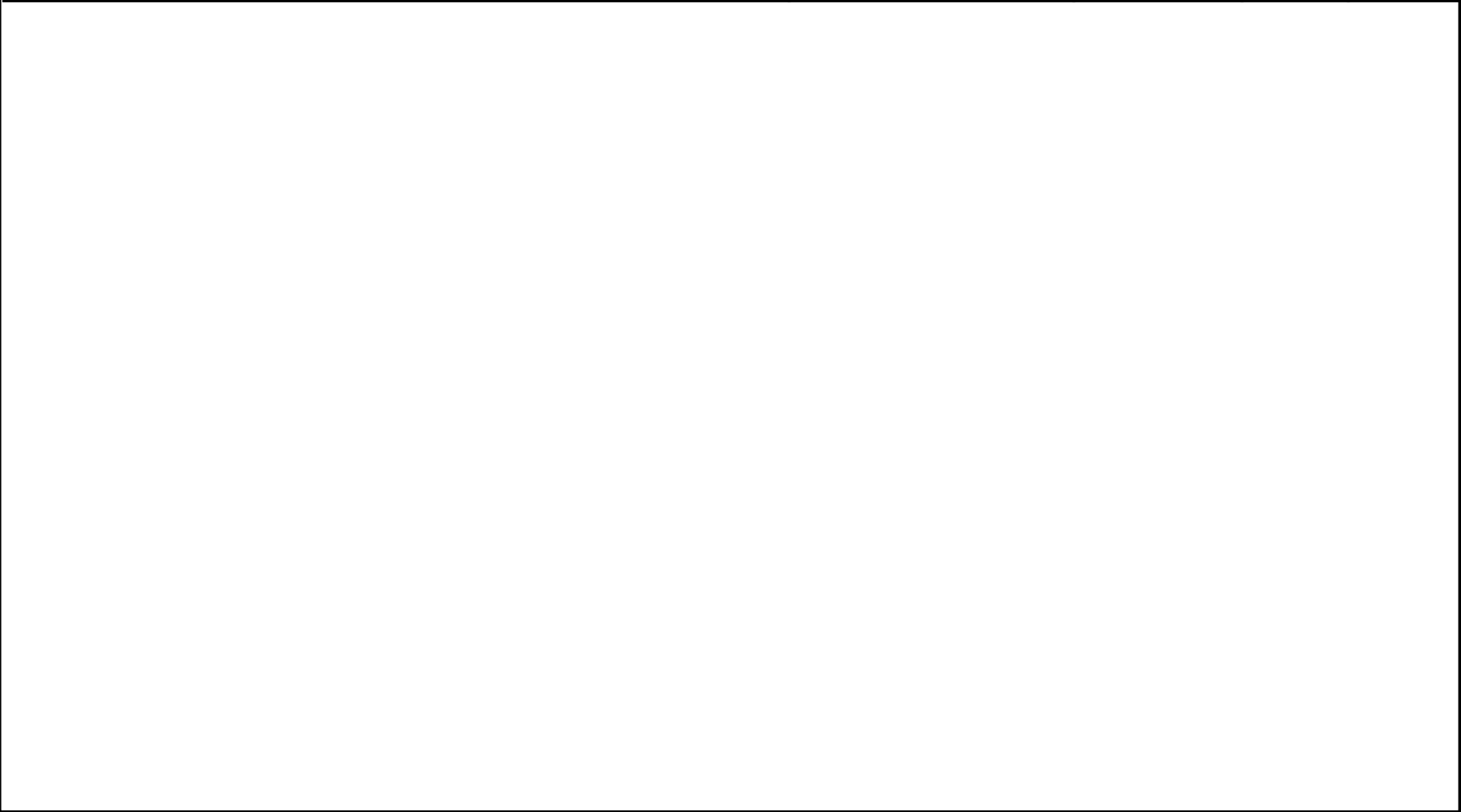
<b>24 - 8 Automatic Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>24 23 Shift Clutches</b>				
1AZ Torx screws for F clutch on transmission case	4HP-22/4HP-24	M6	10	Nm
	A5S 560Z	M8	23	Nm
2AZ Brake band adjusting screw	A 4 S 270 R/A 4 S 310 R	5/16"	5	Nm
3AZ Lock nut of brake band adjusting screw	A 4 S 270 R/A 4 S 310 R	5/16"	21	Nm



24 - 9 Automatic Transmission	Type	Screw	Measure	Unit
<b>24 30 Hydr./elec.control elements</b>				
1AZ Valve body to transmission	3HP-22	M6	11	Nm
	4HP-22/4HP-24/A5S 310Z/ A5S 440Z/A5S 300J	M6	8	Nm
	A4S 270R/A4S 310R	5/16"	20	Nm
	A5S 560Z	M6 x 12	6	Nm
	A5S 560Z	M6x55	8	Nm
2AZ Valve housing to valve body	All	M6	5	Nm
3AZ Adapter plate on shift unit	A4S 270R/A4S 310R		13	Nm

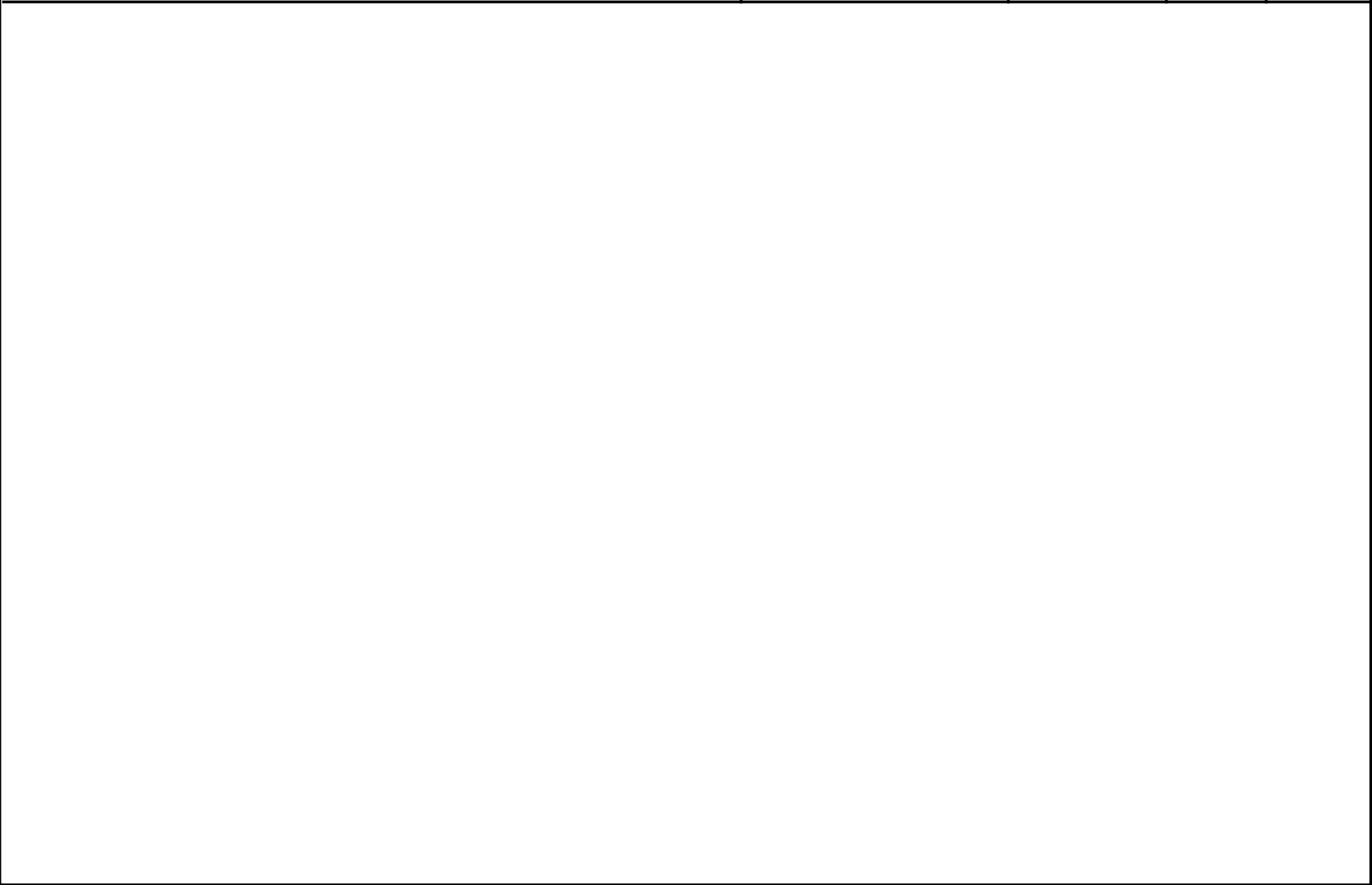
<b>24 - 10 Automatic Transmission</b>		<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>24 31 Primary Pump</b>					
<b>1AZ Oil pump to case</b>					
		<b>A4S 270R/A4S 310R</b>	<b>5/16"</b>		
	<b>1st pass</b>			<b>10</b>	<b>Nm</b>
	<b>2nd pass</b>			<b>20</b>	<b>Nm</b>
		<b>A5S 560Z</b>	<b>M6</b>	<b>10</b>	<b>Nm</b>
		<b>A5S 560Z</b>	<b>M5</b>	<b>5</b>	<b>Nm</b>
		<b>All others</b>	<b>M6</b>	<b>11</b>	<b>Nm</b>
<b>2AZ Oil strainer</b>		<b>A5S 440Z/A5S 560Z</b>		<b>5</b>	<b>Nm</b>
		<b>A5S 310Z</b>		<b>6</b>	<b>Nm</b>
		<b>A4S 270R/A4S 310R</b>	<b>5/16"</b>	<b>20</b>	<b>Nm</b>
		<b>All others</b>		<b>8</b>	<b>Nm</b>
<b>3AZ Oil pump body</b>		<b>A4S 270R/A4S 310R</b>	<b>5/16"</b>	<b>20</b>	<b>Nm</b>
		<b>A5S 310Z/A5S 560Z</b>	<b>M6</b>	<b>10</b>	<b>Nm</b>
<b>4AZ Oil cooler pipe adapter to transmission</b>		<b>A5S 300J/A4S 270R/A 4 S 310 R</b>		<b>28</b>	<b>Nm</b>
<b>Hollow bolt</b>		<b>A5S 440Z</b>	<b>M18x1.5</b>	<b>25</b>	<b>Nm</b>
<b>Cap screw</b>		<b>A5S 440Z</b>	<b>M18x1.5</b>	<b>20</b>	<b>Nm</b>

<b>24 - 11 Automatic Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>24 32 Governor</b>				
1AZ Governor flange to transmission	All	M8	16	Nm
2AZ Stud in centrifugal governor	All	M6	3	Nm
3AZ Hexagon nut on stud	All		10	Nm
4AZ Hexagon head screw on centrifugal governor	All	M6	11	Nm
5AZ Governor housing to hub	4 HP-22 H	M6	11	Nm

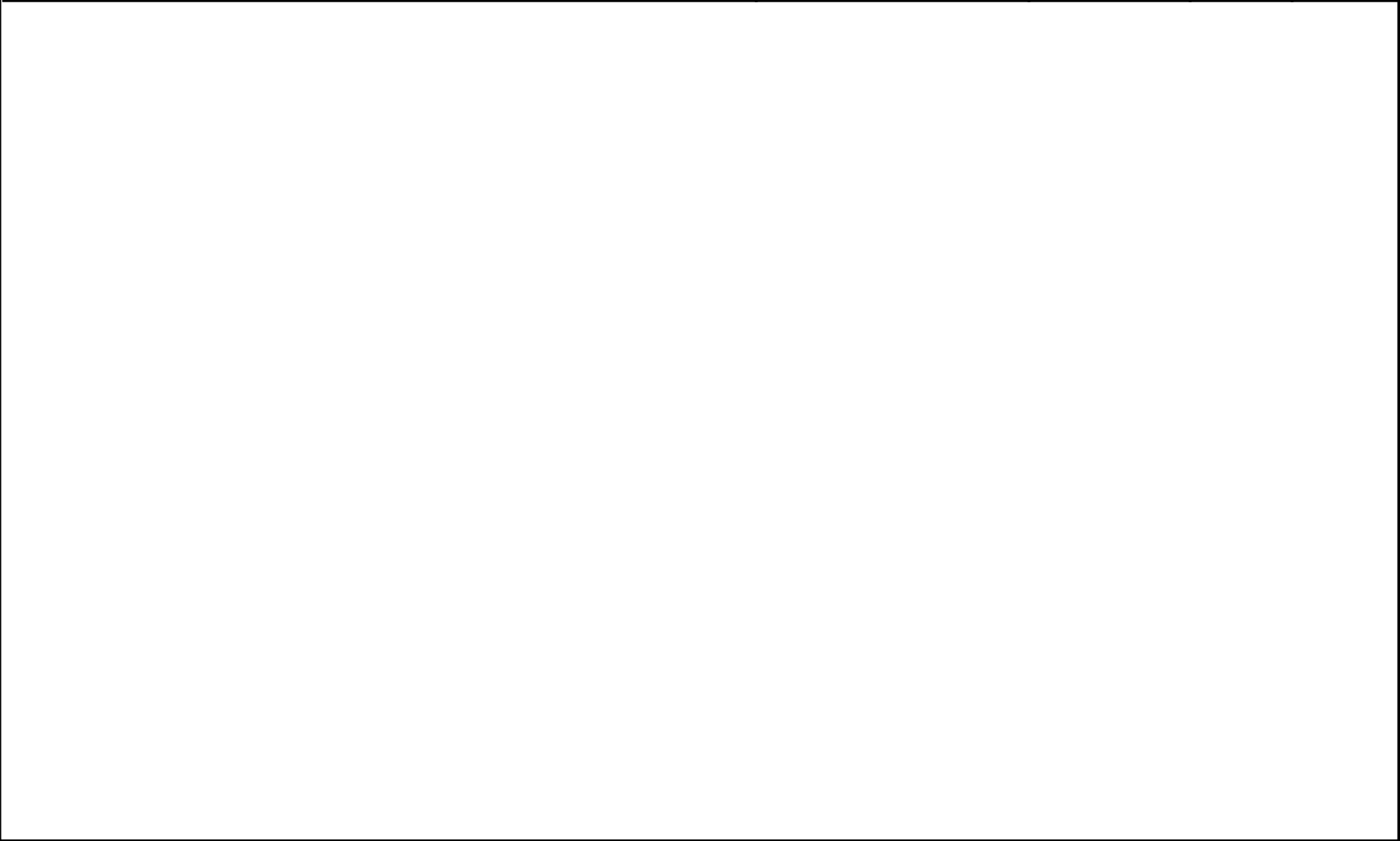


24 - 12 Automatic Transmission	Type	Screw	Measure	Unit
<b>24 34 Shift Valves, Parking Lock</b>				
1AZ Pressure regulator to valve housing	4HP-22 EH/4 HP-24EH/ A5S 310Z	M6	5	Nm
	A4S 270R/A4S 310R		10	Nm
2AZ Solenoid valve to valve housing	4HP-22 EH/4HP-24EH/A5S 310Z	M6	5	Nm
	A4S 270R/A4S 310R		10	Nm
	A5S 560Z		6	Nm
	A5S 300J	M5	3	Nm
	A5S 300J	M6	8	Nm
3AZ Guide plate/parking lock mechanism	A5S 310Z		10	Nm
	A5S 560Z		23	Nm
4AZ Pulse sender	A5S 310Z/A5S 440Z	M5	5	Nm
	A5S 300J	M5	6	Nm
	A5S 560Z	M5	6	Nm
		M8	23	Nm
5AZ Cover for servo piston on shift unit	A4S 270R/A4S 310R	5/16"	25	Nm
6AZ Retaining plate for solenoid valves and pressure regulator on shift unit	A5S 440Z	M5	5	Nm

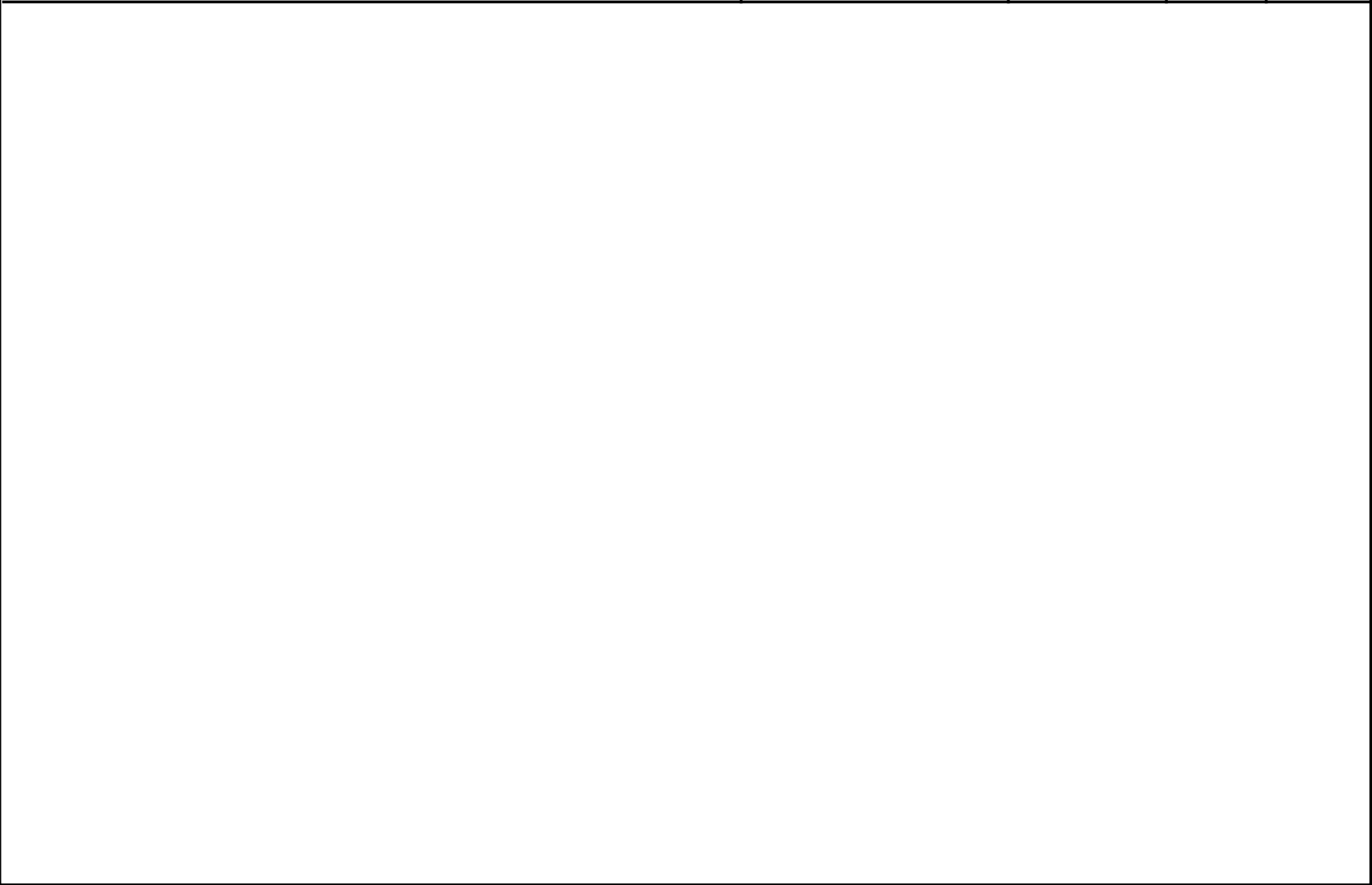
<b>24 - 13 Automatic Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>24 35 Wire Harness, Shift Elements and Sensor</b>				
1AZ Transmission socket to case	4HP-22 EH/4HP-24EH/A5S 310Z	M26	12	Nm
	A4S 270R/A4S 310R	M26	14	Nm



<b>24 - 14 Automatic Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>24 40 Torque converter</b>				
1AZ Torque converter to flywheel	All	M8	26	Nm
	A4S 270R/A4S 310R/A5S 310Z/ A5S 300J/A5S 440Z/A5S 560Z	M10	45	Nm
	All others	M10	49	Nm

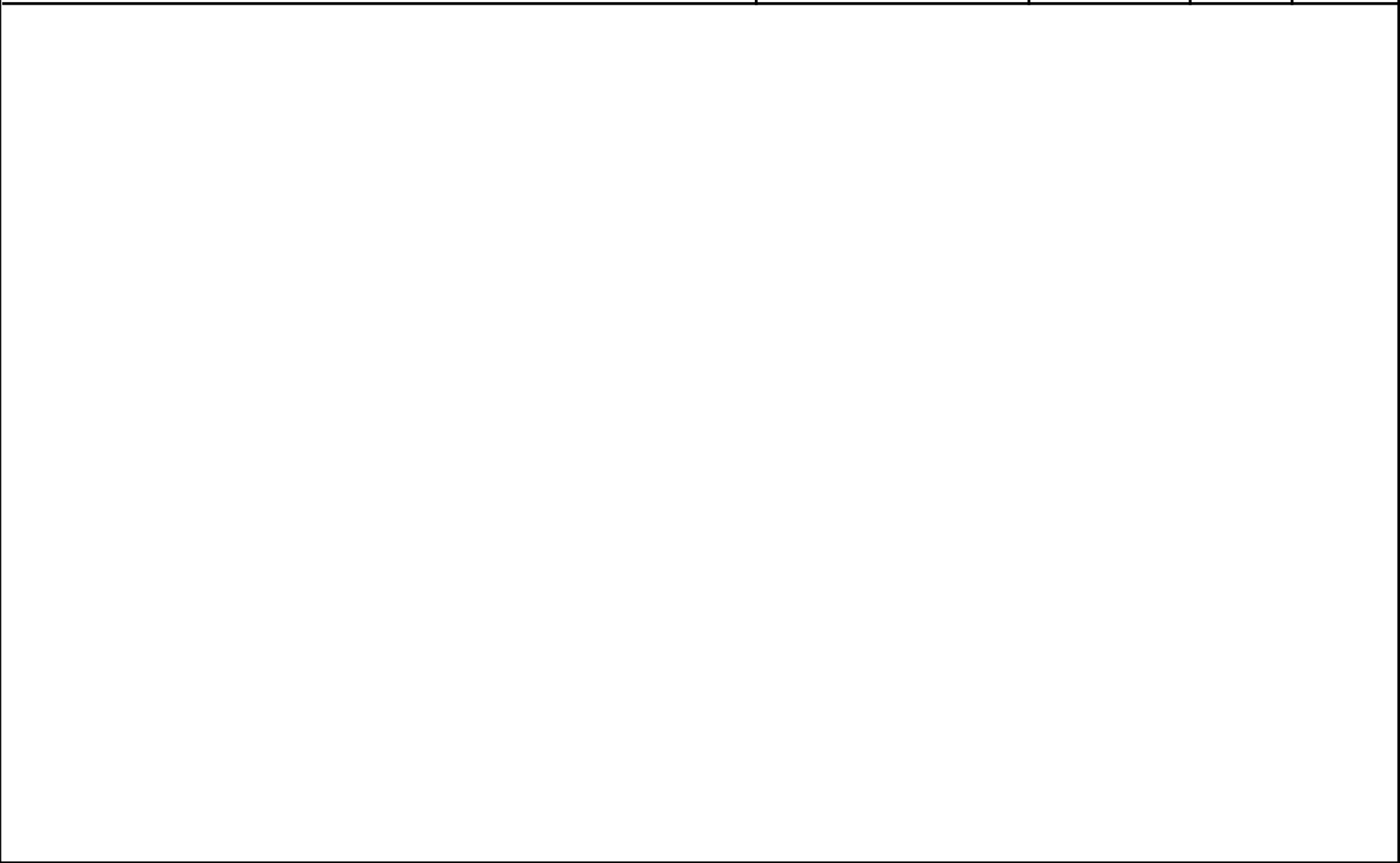


<b>24 - 15 Automatic Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>24 51 External shift linkage</b>				
1AZ Selector lever on transmission	All	M8x1	10	Nm
	A5S 300J	M8	15	Nm

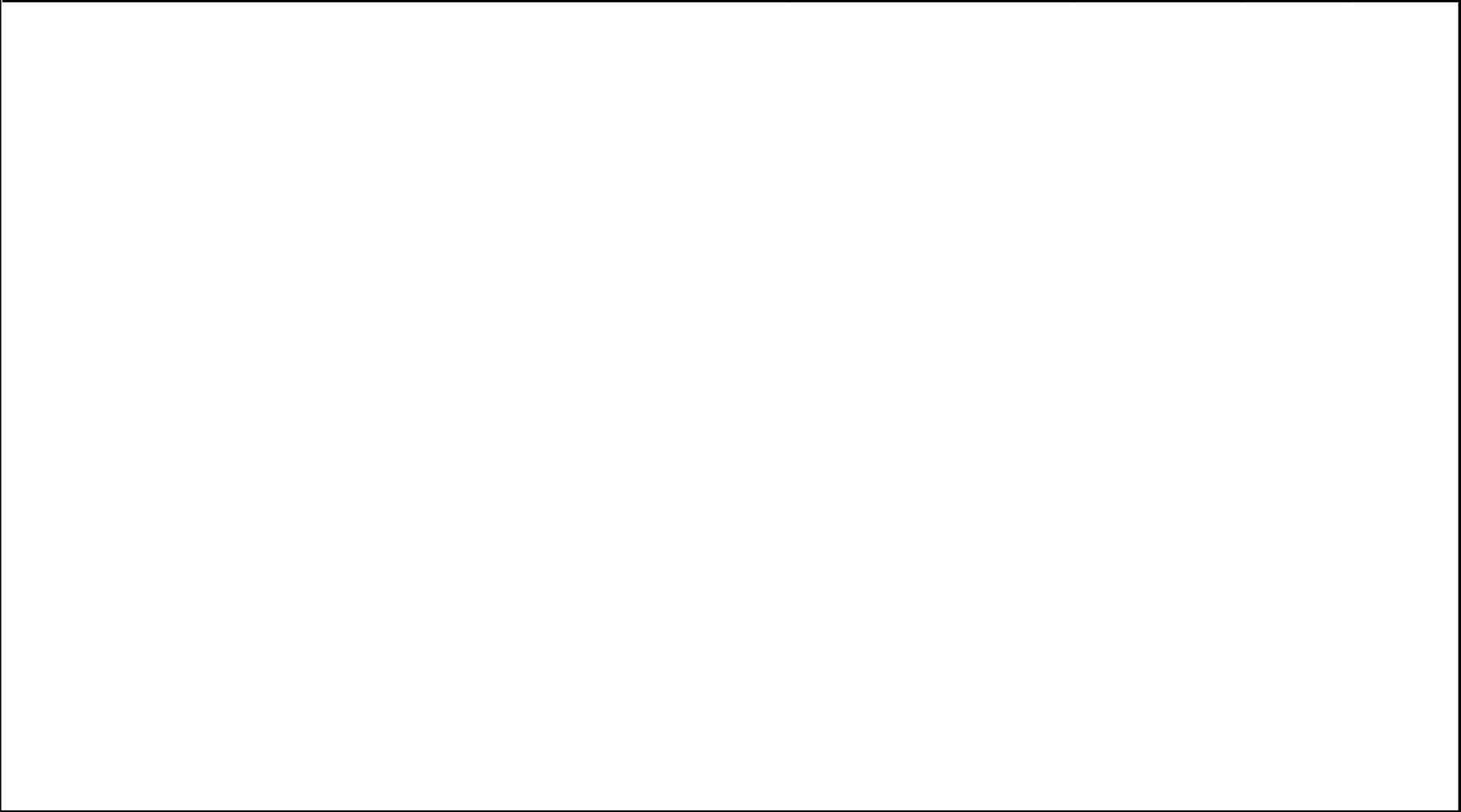




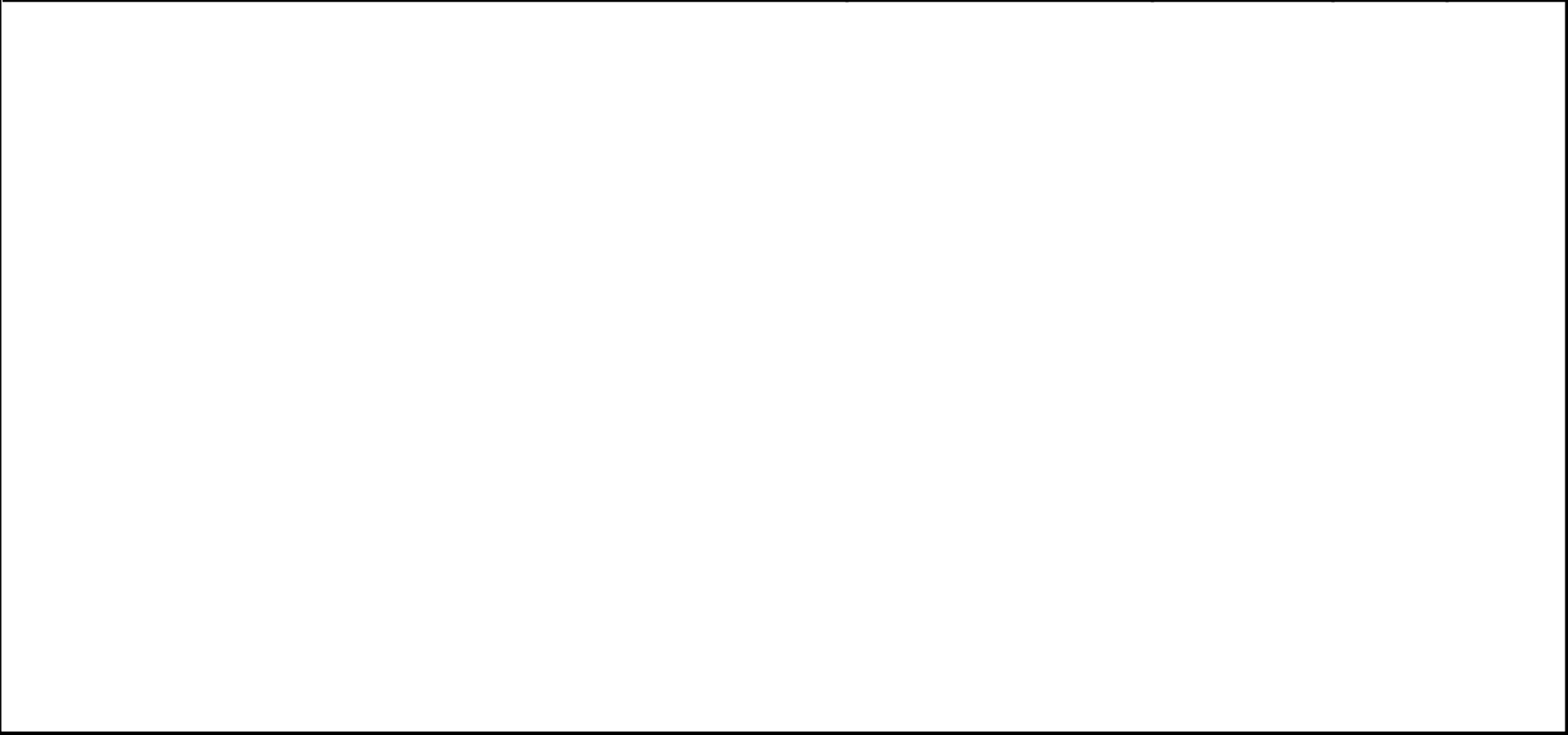
<b>24 - 16 Automatic Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>24 52 Interior Shift Elements</b>				
1AZ Shift segment to shaft	A4S 310R/A4S 310R		22	Nm
	A5S 300J	M14x1.5	35	Nm
2AZ Detent spring on shift unit	A4S 270R/A4S 310R	5/16"	25	Nm



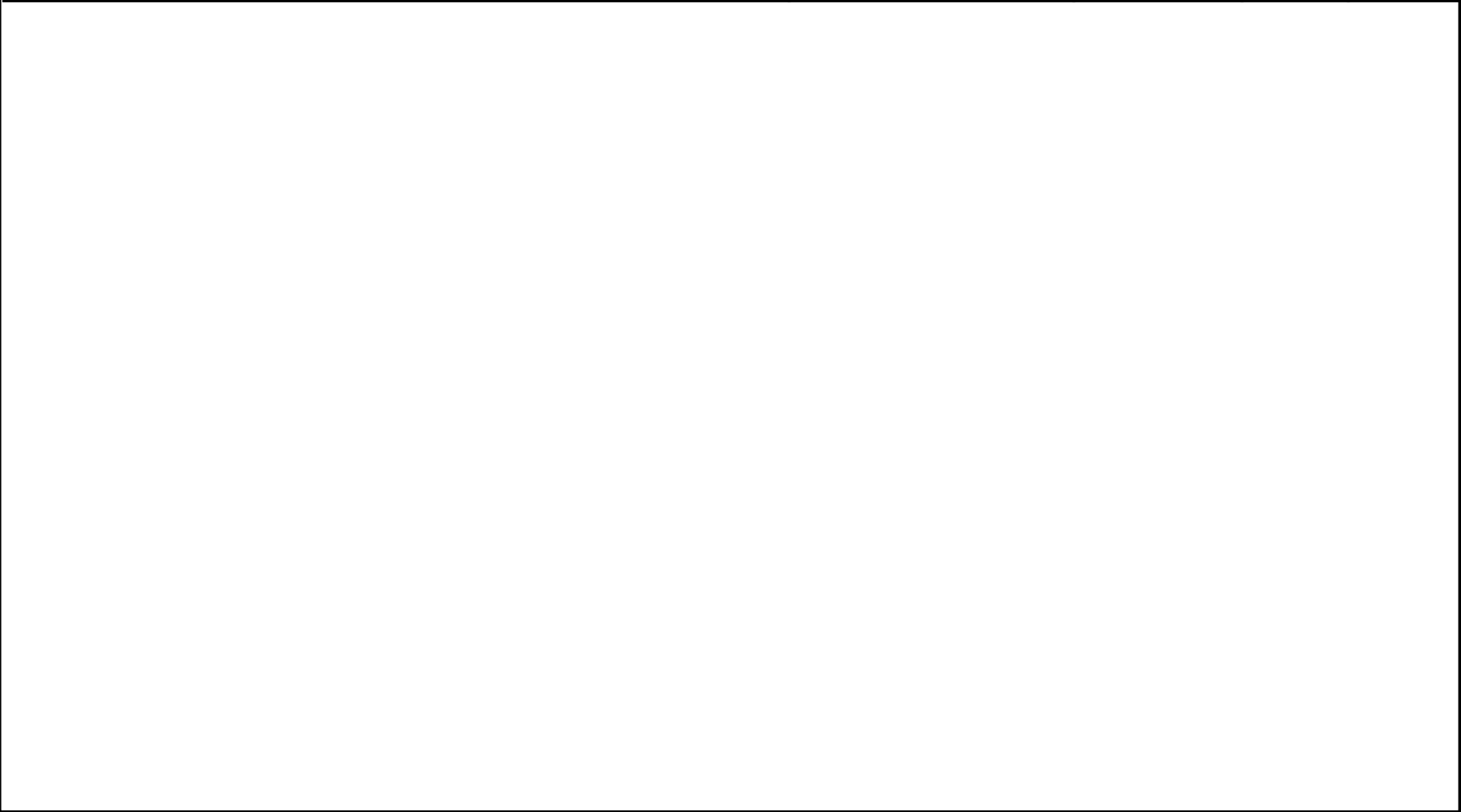
<b>24 - 17 Automatic Transmission</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>24 71 Transmission mounts</b>				
1AZ Cross member to body	All		21	Nm
2AZ Rubber mounts to cross member or transmission	All		21	Nm
3AZ Support tube to engine subframe	E36		42	Nm
4AZ Rubber mounts to carrier pipe	E36		21	Nm
5AZ Carrier plate	E36		21	Nm



25 - 1 Shift Mechanism	Type	Screw	Measure	Unit
<b>25 11 Shift Console - Manual Transmission</b>				
1AZ Front console to shift console	All with sheet metal console		25	Nm
2AZ Shift console to transmission	All with sheet metal console		23	Nm
3AZ Rear shift console to body	All		11	Nm
4AZ Aluminum shift arm console to transmission	E30 M3		21.5	Nm
5AZ Aluminum shift arm to console	E30 M3		11	Nm
6AZ Shift arm console to body	All except E31		21	Nm
	E31		9	Nm
7AZ Adjustable shift rod (clamp)	E31		23	Nm



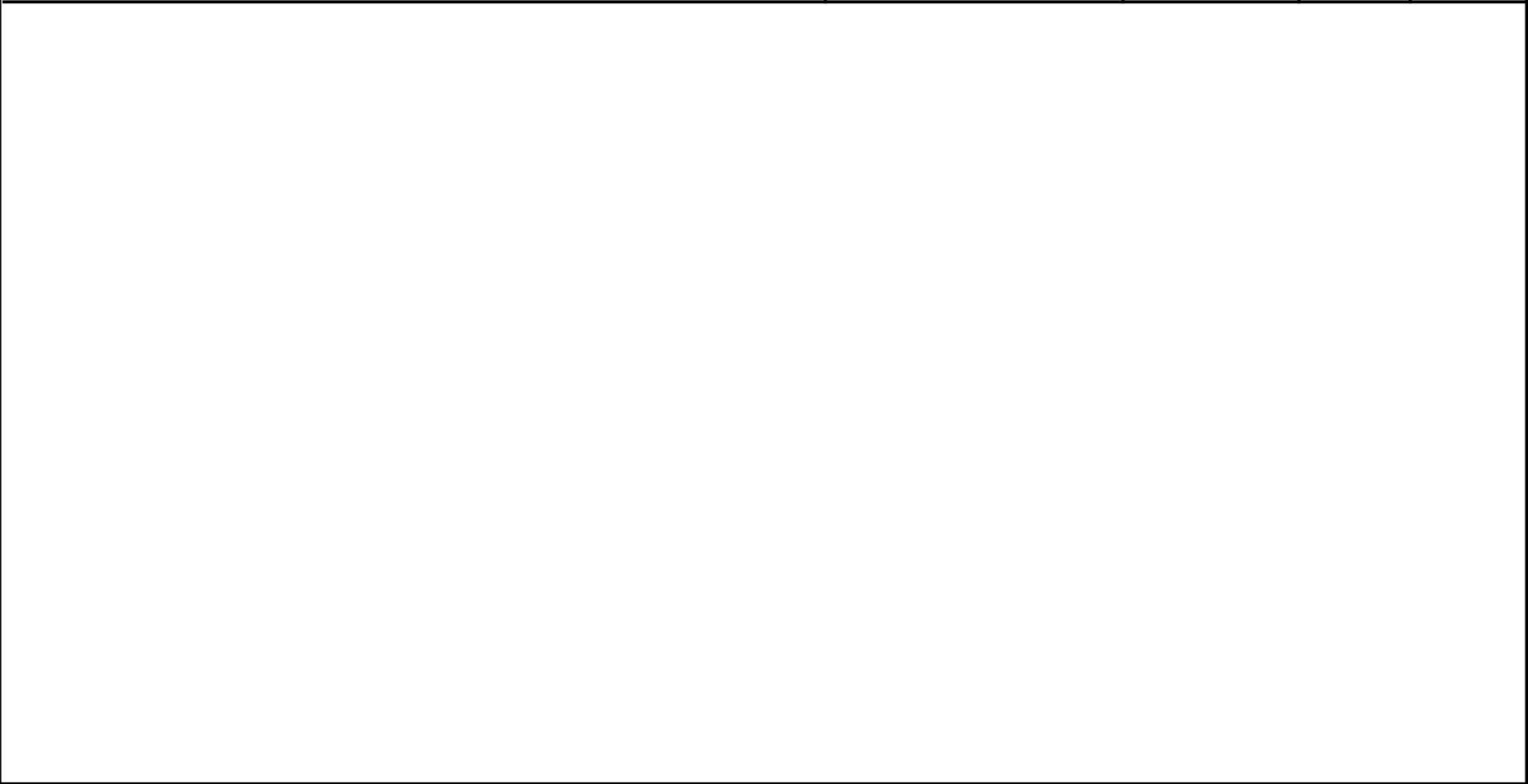
<b>25 - 2 Shift Mechanism</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>25 16 Shift Console - Automatic Transmission</b>				
1AZ Bowden cable on shift tower/transmission	All		15	Nm
2AZ Clamping screw on shift lever	All		10	Nm
3AZ Shift console to tunnel	All		7	Nm
4AZ Switch to shift console	All		4.5	Nm
5AZ Interlock cable on shift tower	All		7	Nm



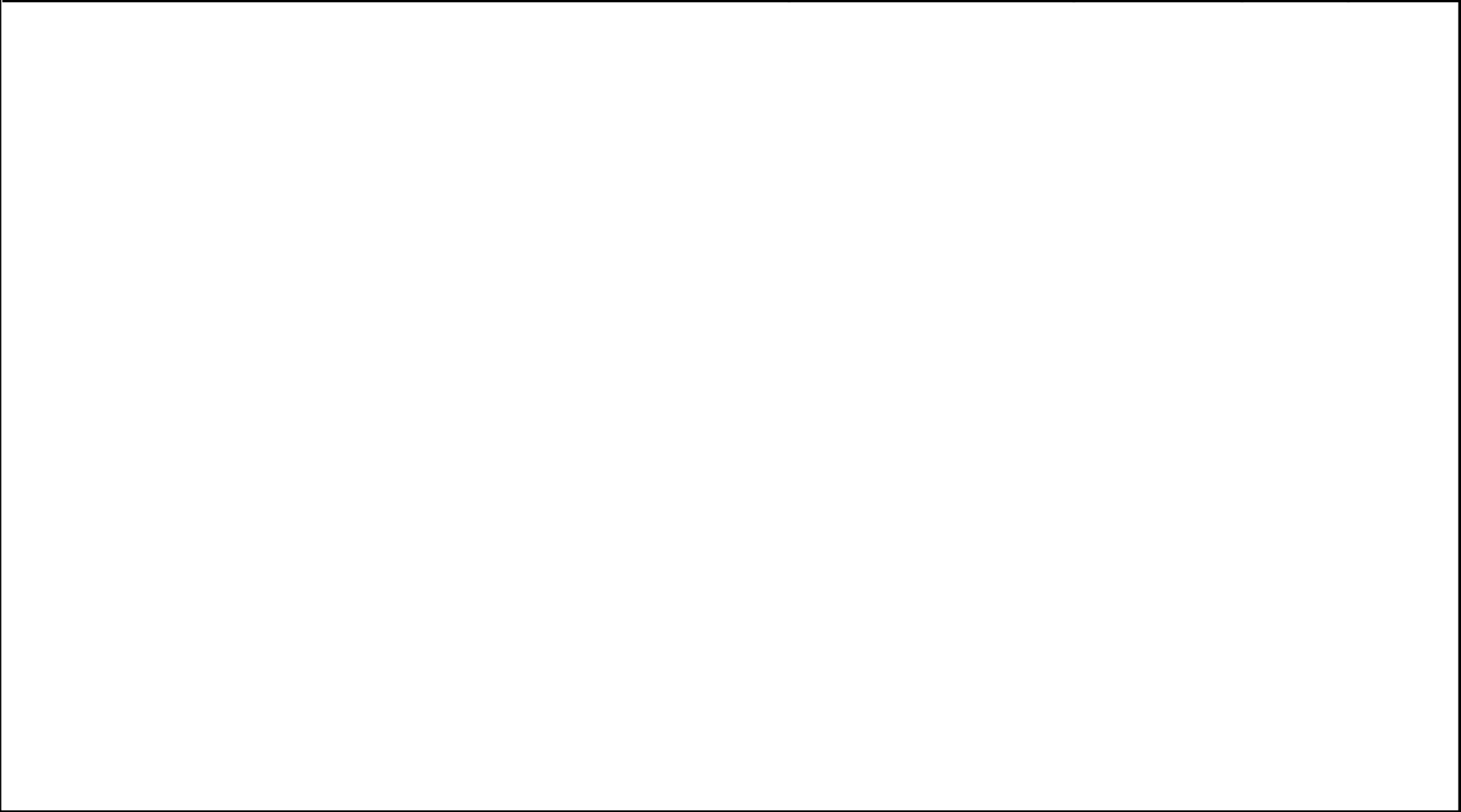
26 - 1 Propeller Shaft	Type	Screw	Measure	Unit
<b>26 11 Propeller Shaft Complete</b>				
1AZ Universal joint to propeller shaft and transmission	All	M10 8.8	48	Nm
	All	M10 10.9	60	Nm
	E31/E38/E39	M14	140	Nm
	E32/E34/E36/E39	M12 8.8	81	Nm
	E32/E34/E36/E38/E39	M12 10.9	100	Nm
	M3/M5	M12 10.9	115	Nm
Aluminum propeller shaft: flexible disk on propeller shaft	E39	M12 10.9	100	Nm
Aluminum propeller shaft: flexible disk on transmission	E39	M12 10.9	90	Nm
2AZ Coupling propeller shaft to transmission	All	M10	60	Nm
	E32/E31	M12	95	Nm
3AZ Clamping ring for slide after installation in car	All		10	Nm
	E30 Four Wheel Drive		22	Nm

26 - 2 Propeller Shaft	Type	Screw	Measure	Unit
26 11 Propeller Shaft Complete				
4AZ Driveshaft to drive flange (rear axle)				
Version, universal joint: Compression nut After loosening connection only use ribbed nuts with higher tightening torque	All	M10	64	Nm
Finned nut	All	M10	80	Nm
Version, constant velocity joint: Compression nut	All	M8	32	Nm
Compression nut	All	M10	64	Nm
Finned nut	All	M8	43	Nm
Finned nut	All	M10	70	Nm
5AZ Pivot to center propeller shaft journal with Loctite (Version without slide)	All		97	Nm
6AZ Center mount to body	All		21	Nm

<b>27 - 1 Transfer Box - Four Wheel Drive -</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>27 00 Transfer Box in General</b>				
1AZ Transfer box to manual transmission	All	M10	42	Nm
2AZ Transfer box on automatic transmission	All	M8	23	Nm
3AZ Coupling to manual transmission and transfer box	All	M12	90	Nm
4AZ Case bolts	All	M8	25	Nm
5AZ Electromagnetic clutch to case	All	M8	25	Nm
6AZ Output flange Collar nut installed with Loctite 270 or Hylogrip bolt cement	All		110	Nm



<b>27 - 2 Transfer Box - Four Wheel Drive -</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>27 00 Transfer Box in General</b>				
7AZ Plug	All	M24x1.5	33	Nm
	All	M14 x 1.5	33	Nm
	All	M18x1.5	23	Nm
8AZ Transmission cross member to rubber mounts	All	M12	80	Nm
Transmission cross member to body	All	M8	24	Nm





<b>61 - 1 General Electrical system</b>	<b>Type</b>	<b>Screw</b>	<b>Dimension</b>	<b>Unit</b>
<b>61 13 Plug Connections</b>				
1AZ Door plug connection to body	All		5	Nm
2AZ Fuse box Screws for safety fuse	All	M6	5	Nm
3AZ Ground or positive connections	All		5	Nm

61 - 2 General Electrical system	Type	Screw	Dimension	Unit
61 31 Switch				
1AZ Temperature switch				
91°C	All		14	Nm
99°C	All		14	Nm
2AZ Oil pressure switch Note: oil and screw in				
	M10/M40/M42/M21/M51/M20/ M30/M50/M60/1/M60/2/M70/S70		40	Nm
	S14/S50/S38/M43		20	Nm
3AZ Reversing light switch	All		20	Nm
4AZ Light switch on instrument panel	E36/E38		2	Nm
5AZ Transmission switch on shift block	All		4.5	Nm

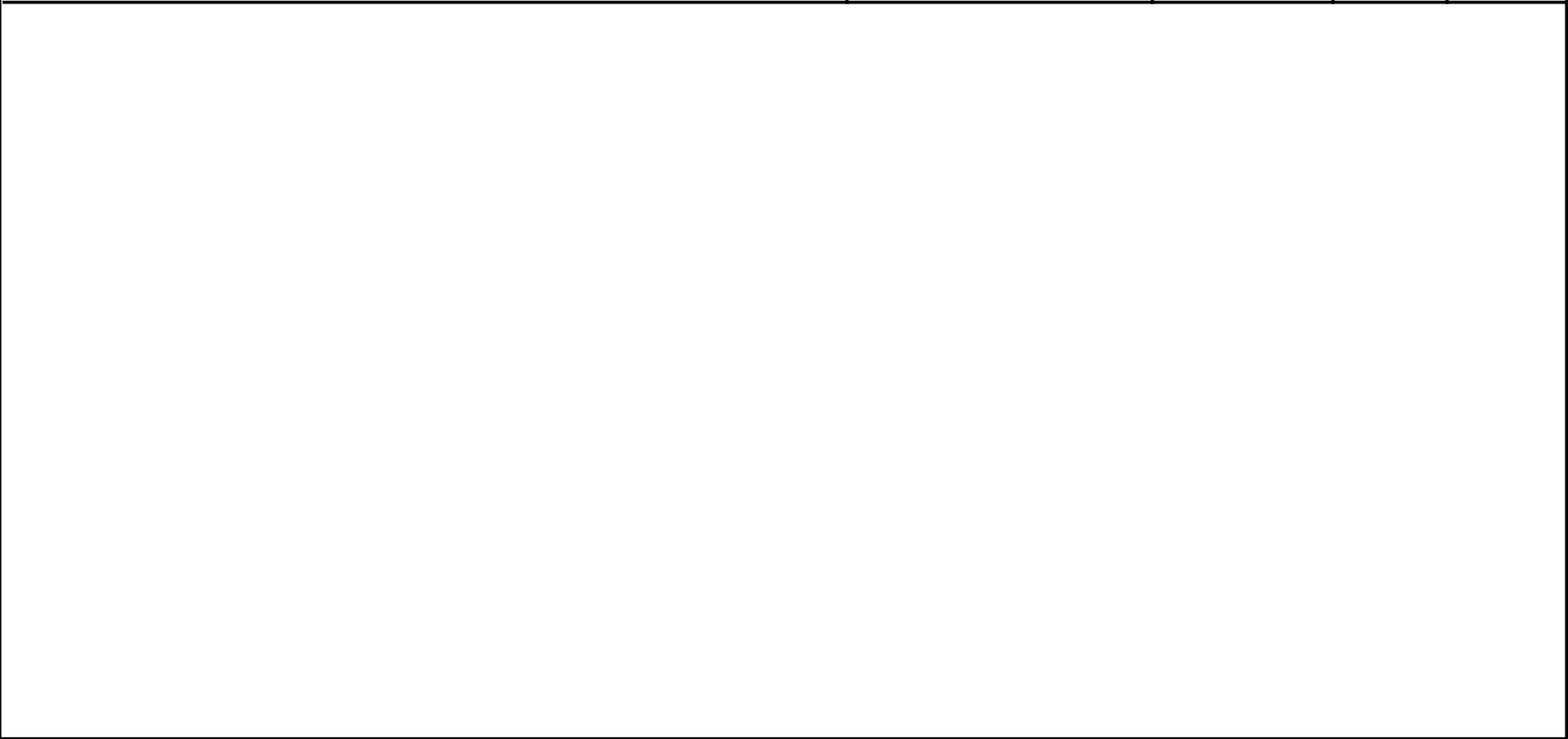
<b>61 - 3 General Electrical system</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>61 35 Control Units, Modules</b>				
1AZ Power window module to drive	E36		1 + 0.5	Nm
2AZ Screws on E-box	E38		4	Nm

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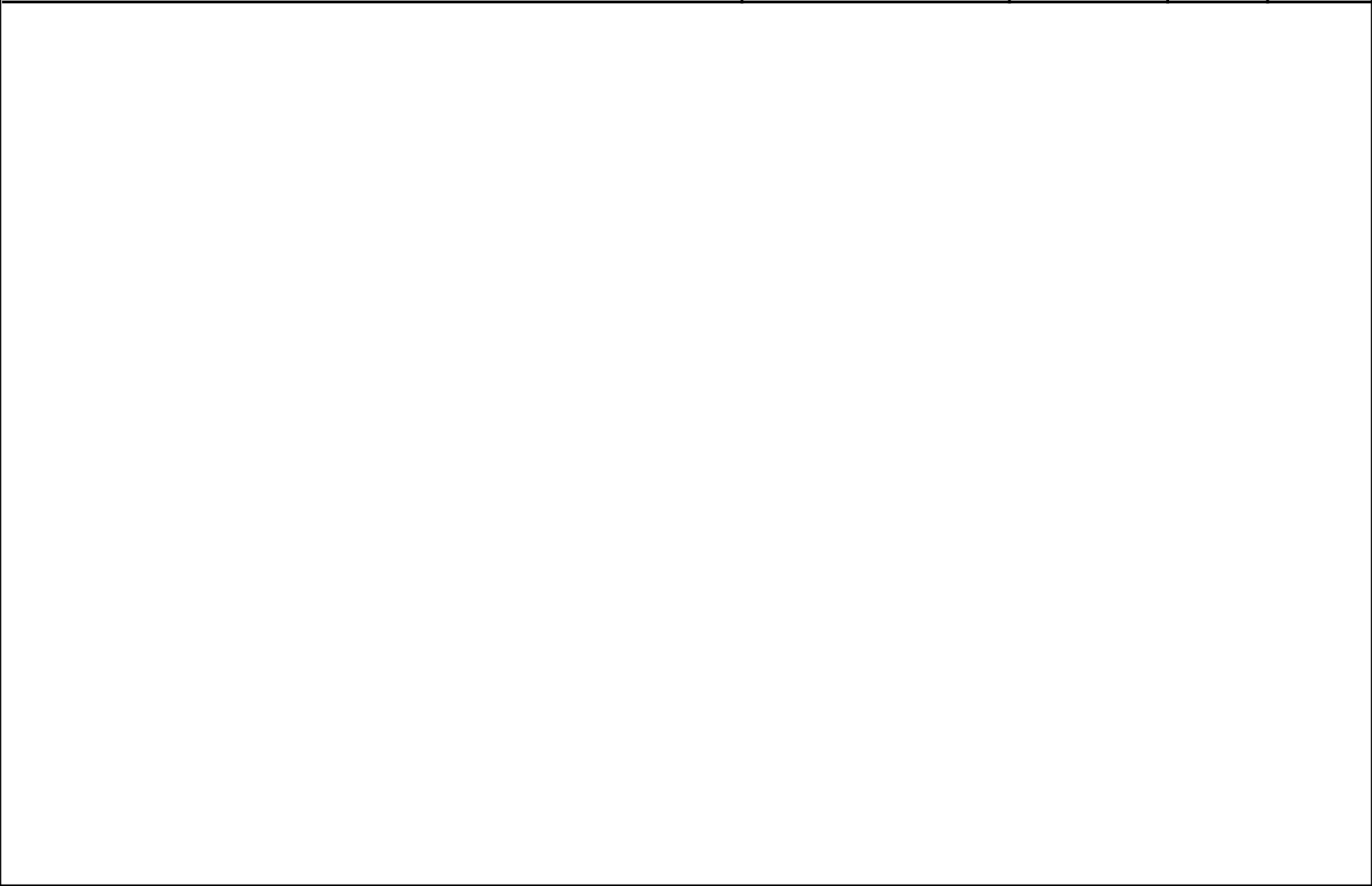
61 - 4 General Electrical system	Type	Screw	Dimension	Unit
<b>61 61 Windshield Wipers</b>				
1AZ Wiper motor secured to wiper bracket	E31LL/E38	M6	7.5	Nm (ft. lbs.)
	E36/E31RL		10	Nm (ft. lbs.)
2AZ Parked position stop to wiper console	E31		15	Nm (ft. lbs.)
3AZ Wiper contact pressure motor to wiper console	E31/E32/E34/E38		6.5	Nm (ft. lbs.)
4AZ Motor crank to wiper motor				
	SWF	M8	27	Nm (ft. lbs.)
	Bosch, Magnet Marelli	M8		Nm (ft. lbs.)
5AZ Wiper shaft nut to body	E31/E36/E32/E34		12	Nm (ft. lbs.)
6AZ Holder to firewall	E31	M6	10	Nm (ft. lbs.)
screws in firewall	E38/E39/E36 Coupé		10	Nm (ft. lbs.)

61 - 5 General Electrical system	Type	Screw	Dimension	Unit
<b>61 61 Windshield Wipers</b>				
7AZ Upper cowl panel support	E31	M4	5	Nm (ft. lbs.)
8AZ Wiper support bracket to firewall	E36		10	Nm (ft. lbs.)
9AZ Wiper support bracket to wiper console	E36		10	Nm (ft. lbs.)
10AZ Wiper arms * after waiting for 15 minutes, retighten to torque				
	E36		25*	Nm (ft. lbs.)
driver's side	E31		40*	Nm (ft. lbs.)
passenger's side	E31/E32/E34/E38/E39		25*	Nm (ft. lbs.)
driver's side with WCPC	E32/E34		21*	Nm (ft. lbs.)
	E38/E39		40	Nm (ft. lbs.)
driver's side without WCPC	E32/E34		25*	Nm (ft. lbs.)
	E38		25*	Nm (ft. lbs.)

<b>61 - 6 General Electrical system</b>	<b>Type</b>	<b>Screw</b>	<b>Dimension</b>	<b>Unit</b>
<b>61 62 Tailgate Window Wiper</b>				
1AZ Wiper shaft to tailgate window	E34 touring		5	Nm
2AZ Wiper console to tailgate (rubber mount)	E34 touring		5	Nm
	E36 comp/touring	M6	10	Nm
3AZ Wiper motor to console	E34 touring		13	Nm
4AZ Motor crank to wiper motor	E34 touring		13	Nm
5AZ Wiper arm to wiper shaft	E34/E36 Touring / E36 comp, touring		13	Nm
6AZ Spray nozzle to tailgate	E34 touring		10	Nm



<b>61 - 7 General Electrical system</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>61 67 Headlight Cleaners</b>				
1AZ Telescope to bracket	E36		3	Nm
2AZ Bracket to body	E36		15	Nm



<b>62 - 1 Instruments</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>62 16 Car Electrical System Senders</b>				
1AZ Screws for speedometer sender	All		6,6 ... 8,4	Nm



<b>71 - 1 Equipment and Accessories for Engine and Chassis</b>	<b>Type</b>	<b>Screw</b>	<b>Measure</b>	<b>Unit</b>
<b>71 60 Trailer Hitch</b>				
<b>1AZ Hitch to body: Tighten according to following sequence:</b> 1. Hitch bolts 2. Axial strut bolts 3. Reinforcement bracket collar nut	<b>E36</b>	<b>M10 8.8</b>	<b>42</b>	<b>Nm</b>
		<b>M10 10.9</b>	<b>59</b>	<b>Nm</b>
<b>2AZ Slotted nut for take-up pipe to hitch (use Loctite No. 638)</b>	<b>E32</b>	<b>M40</b>	<b>220</b>	<b>Nm</b>

72 - 1 Equipment and Accessories for Engine and Chassis	Type	Screw	Measure	Unit
<b>72 11 Seat belts</b>				
1AZ Safety belt on body, except for B-pillar	All		48	Nm
Safety belt on B-pillar	All		31	Nm
Safety belt on seat, on touring also on rear seat backrest	All		48	Nm
2AZ Screws for seatbelt height adjustment on body	All		24	Nm
3AZ Seat belt to seat Install bolt with bolt cement	E31		47	Nm
4AZ Seat belt to backrest	E31		24	Nm
5AZ Headrest to backrest	E31		24	Nm
6AZ Safety belt with belt height adjustment	All		31	Nm
7AZ Tension relief between roller blind mount and backrest lock mount	E39/2		24	Nm

72 - 2 Equipment and Accessories for Engine and Chassis	Type	Screw	Measure	Unit
72 12 Airbag generator				
1AZ Airbag module on doors	E36, E38, E39		11	Nm
2AZ Gas generator of ITS head airbag on body	E38		4	Nm
3AZ Bracket of ITS head airbag on body	E38	self-tapping screw	2.5	Nm
4AZ ITS head airbag on body	E38		11	Nm
5AZ Additional steel bracket for ITS head airbag on body	E38 L7	Self-tapping M5 threaded bolt	3	Nm

