Repair Manual

R 1100 S

BMW AG Motorcycle Division
After Sales

Published by: © BMW AG Motorcycle Division
After Sales
UX-VS-2

All rights reserved. Not to be reprinted, translated or duplicated either wholly or in part without prior written permission.
Errors and omissions excepted; subject to technical amendment.

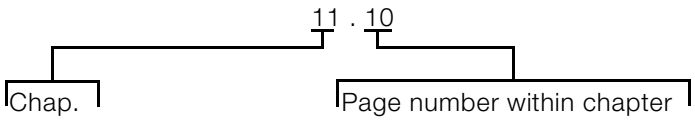
Produced in Germany 06/99

Introduction

This repair manual will help you to perform all the main maintenance and repair work correctly and efficiently. It should be consulted regularly by workshop personnel as an addition to the practical and theoretical knowledge obtained in Training School courses. It is a contribution towards achieving even higher Service quality.

All information in both text and illustrations refers to motorcycles in standard condition or with genuine BMW accessories installed, and not to motorcycles which have been modified in any way to depart from the manufacturer's specification.

- The repair manual is structured in the logical sequence of the work to be performed: Removal, Disassembly, Repair, Assembly, Installation.
- The entire contents are divided into individual chapters, corresponding to the Construction Groups.



- Work to be performed during an Inspection is described in Group "00". The various inspection routines are numbered I, II, III and IV. This numbering is repeated in the work descriptions which follow, so that work can take place without interruption.
- Use of the BMW special tools needed for certain tasks is described in the work instructions.

If the need arises, repair instructions are also issued in the form of Service Information. This information is of course incorporated into the next issue of the repair manual. We also recommend you to consult the detailed illustrations on the Parts microfiches as an additional source of information.

BMW AG Motorcycle Division
After Sales

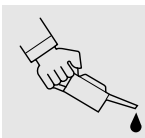
Published by: BMW AG, Sparte Motorrad
Hufelandstr. 6
D - 80937 München

All rights reserved. Not to be reprinted, translated or duplicated either wholly or in part without prior written permission.
Errors and omissions excepted; subject to technical amendment.
Produced in Germany

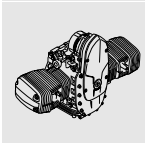
Contents

Group / Chapter

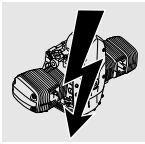
00 Maintenance and general instructions



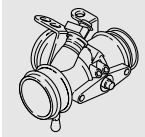
11 Engine



12 Engine electrics



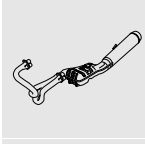
13 Fuel preparation and control



16 Fuel tank and lines



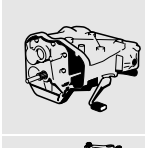
18 Exhaust system



21 Clutch



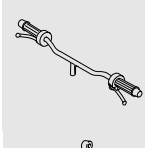
23 Gearbox



31 Front fork



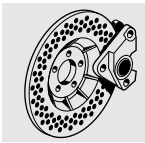
32 Steering



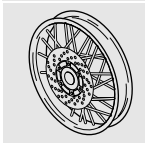
33 Rear wheel drive

Group / Chapter

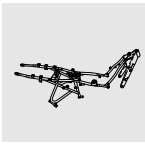
34 Brakes



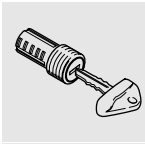
36 Wheels and tyres



46 Frame



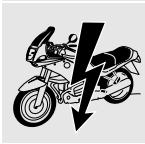
51 Equipment



52 Seat



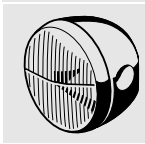
61 General electrical equipment



62 Instruments



63 Lights



BMW AG Motorcycle Division
Maintenance schedule
R 1100 S

Customer	Licence plate No.	BMW Inspection at 1,000 km (600 miles)	BMW Service every 10,000 km (6,000 miles)	BMW Inspection every 20,000 km (12,000 miles)	BMW Annual Service
Order No.	Mechanic's signature				
Read out the fault memory with the BMW MoDiTeC unit		☐	☐	☐	☐
Change the oil while at regular operating temperature and renew the oil filter element **if motorcycle is used only for short journeys or at outside temperatures under 0°C, every 3 months, but at least every 3,000 km (1,800 miles) *)**		☐	☐	☐	☐
Change the oil in the gearbox while at regular operating temperature **at least every 2 years**				☐	☐ every 2 years
Change the oil in the rear wheel drive while at regular operating temperature Clean the inductive sensor at the rear wheel **every 40,000 km (24,000 miles) or at least every 2 years *)**		☐		☐ 40,000 (24,000)	☐ every 2 years
Renew fuel filter *) **normally every 40,000 km (24,000 miles), if fuel quality is poor every 20,000 km (12,000 miles)**				☐ 40,000 (24,000)	
Check battery acid level, if necessary add distilled water Clean/grease battery poles if necessary				☐	☐
Renewing intake air cleaner element **in very dusty or dirty operating conditions, renew the intake air cleaner element every 10,000 km (6,000 miles) or even more often if necessary *)**				☐	
Renew Poly-V belt *) **Renew Poly-V belt every 60,000 km (36,000 miles); do not adjust**				☐ 60,000 (36,000)	
Check brake fluid level at front/rear and top up if necessary *)		☐	☐	☐	
Check operation of brake system and freedom from leaks; repair/renew items if necessary *)				☐	
Examine brake pads and discs for wear, renew if necessary *)			☐	☐	
Renew the brake fluid annually					☐
Check clutch operating fluid level		☐	☐	☐	
Change clutch fluid **every 40,000 km (24,000 miles) or at least every 2 years *)**				☐ 40,000 (24,000)	☐ every 2 years
Check tightness of rear wheel studs		☐			
Check rear wheel bearing play by tilting wheel				☐	
Check swinging arm bearings (zero play); adjust if necessary *)		☐		☐	
Grease the side (prop) stand pivot		☐	☐	☐	
Check function of side (prop) stand contact switch		☐	☐	☐	☐
Check condition of spark plugs			☐		
Renew spark plugs *)				☐	
Take up slack at cylinder head nuts		☐			
Check/adjust valve operating clearances		☐	☐	☐	
Check throttle cable for free movement, abrasion and kinking; renew if necessary *) Check free travel in throttle cable Check synchronisation and eliminate any leaks *)		☐	☐	☐	
Final inspection with road safety and functional check: – condition of tyres and wheels, tyre pressures – lights and signalling equipment – telltale and warning lights – clutch, gear shift – handbrake and foot brake, steering – instruments – trial run if necessary		☐	☐	☐	☐

***) Charged as an additional item**

BMW AG Motorcycle Division
Pre-delivery check
R 1100 S

Customer	Licence plate No.	**BMW Pre-delivery check**
Order No.	Mechanic's signature	
Checking the shipping crate for damage		☐
Motorcycle: – unpack – attach items supplied loose – inspect for damage – check that delivery is complete: tools, documentation, keys, correct optional extras		☐
Fill and charge the battery (mark with charging date)		☐
Check engine oil level when cold; add oil if necessary		☐
Check clutch operating fluid level and brake fluid levels at front and rear		☐
Check headlight beam angle and adjust if necessary		☐
Checking tightness of rear wheel studs (comply with correct tightening torque)		☐
Check tyre pressures		☐
Add fuel		☐
Final inspection and functional check: – clutch, gear shift – handbrake, foot brake – lighting and signalling equipment, telltale lights, instruments – check operation of optional extras, ABS – trial run if necessary		☐
Confirm pre-delivery check in Service and Technical Booklet		☐
Final cleaning		☐
Motorcycle handed over on:		

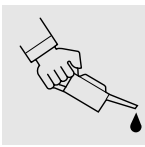
Order No. 01 71 7 654 263 UX-VS-2, 3.99 Printed in Germany

00 Maintenance and general instructions

Tightening torques and Table of consumables
Pre-delivery check
Maintenance

Contents

Page



Tightening torques 5

Table of consumables 11

Contents - Pre-delivery check

Page



Pre-delivery check 13

General view of crated motorcycle 13

Checking the crate for damage 14

In case of damage in Germany 14

In case of damage in importer markets 14

Unpacking the motorcycle 14

Installing remaining items on motorcycle 14

Inspecting motorcycle for damage 14

Checking that delivery is complete 14

Filling and charging the battery 15

Disengaging and raising the fuel tank 15

Filling and charging the battery 15

Checking engine oil level when cold, adding oil if necessary 16

Checking clutch fluid level 17

Checking brake fluid level 17

Rear brake 17

Front brake 17

Checking headlight beam angle, adjusting if necessary 18

Checking tightness of rear wheel studs 18

Checking tyre pressures 18

Final inspection and function check 19

Final cleaning 19

Handing over the motorcycle 19

Contents - Maintenance

Page

Maintenance 20

Key to maintenance intervals 20

Reading out MoDiTeC fault memory 20
(Inspections I, II, III and IV)

Changing engine oil, replacing oil filter element 20
(Inspections I, II, III and IV)

Changing oil in gearbox 21
(Inspections III and IV)
or every 2 years at the latest

Changing oil in rear wheel drive; cleaning inductive signal transmitter at rear wheel 22
(Inspections I, III and IV)
Every 40 000 km (24 000 miles) or every 2 years at the latest

Replacing fuel filter 23
(Inspection III)
In normal operating conditions every 40 000 km (24 000 miles); if fuel quality is poor every 20 000 km (12 000 miles)

Checking battery fluid level and topping up if necessary; cleaning and greasing the battery posts 25
(Inspections III and IV)

Replacing intake air filter element 25
(Inspection III)
In very dirty and dusty operating conditions, replace every 10 000 km (6 000 miles) or even more frequently if necessary

Replacing Poly-V belt 26
(every 60 000 km/36 000 miles)
(Inspection III)
Poly-V belt adjusting procedure:

Checking brake fluid level 27

Front brake 27

Rear brake 27

Checking brake pads and discs for wear/replacing 28
(Inspections II and III)

Checking front brake pad wear 28

Checking rear brake pad wear 28

Checking brake disc wear 28

Replacing brake pads, front brake 29

Replacing brake pads, rear brake 29

Contents - Maintenance

Page



Changing brake fluid and bleeding brake system 30
Change the brake fluid annually
(Inspection IV)
[ABS Inspections II and III]

Bleeding front brake circuit/changing brake fluid 30
Additional information for [ABS]

Bleeding rear brake circuit/changing brake fluid 32

Checking clutch fluid level 33
(Inspections I, II and III)

Changing the clutch fluid 33
(Inspections III and IV)
Every 40 000 km (24 000 miles) or every 2 years at the latest

Checking tightness of rear wheel studs 34
(Inspection I)

Checking rear wheel bearing play by tilting wheel 34
(Inspection III)

Checking swinging arm bearings, adjusting if necessary 34
(Inspections I and III)

Greasing the side stand pivot 35
(Inspections I, II and III)

Checking function of side stand switch 35
(Inspections I, II, III and IV)

Checking/replacing spark plugs 35
(Inspection II) check/(Inspection III) replace

Tightening cylinder heads 36
(Inspection I)

Checking/adjusting valve clearances 36
(Inspections I, II and III)

Checking throttle cable for ease of movement, abrasion and kinks; replacing if necessary
Checking throttle-cable play
Checking/adjusting idle speed and throttle-valve synchronisation 37
(Inspections I, II, III and IV)

Final inspection with road safety and functional check 38
(Inspections I, II, III and IV)
Road safety check
Roadworthiness check

Tightening torques

Model	R 1100 S
Connection	**Nm**
11 Engine	
Cylinder head	
Tightening sequence: 1. Tighten cylinder head nuts (oiled) in diagonally opposite sequence 1.1 Tighten all nuts to closing torque 1.2 Tighten all nuts to wrench angle 90° 1.3 Tighten all nuts to wrench angle 90° 2. M 10 screw 3. M 6 screw	 20 40 9
After 1000 km (600 miles), tighten cylinder head nuts in diagonally opposite sequence: 1. Slacken one nut 2. Tighten one nut to initial torque 3. Tighten nut to wrench angle 180° 4. Slacken and retighten M 10 screw	 20 40
Timing gear carrier to cylinder head	9
Bearing cap on rocker shaft	15
Locknut, valve adjusting screw	8
Cylinder head cover to cylinder head	9
Camshaft end cover to cylinder head	9
Air intake connection to cylinder head	9
Camshaft	
Chain sprocket to camshaft	65
Camshaft bearing cap	15
Alternator mount cover	
M 6 screw	9
M 8 screw	20
Auxiliary shaft	
Chain sprocket to crankshaft	10
Chainwheel to auxiliary shaft	70
Chain tensioner housing to engine block	9
Oil filter	
Oil filter	11
Oil drain plug	32



Model			R 1100 S
Connection			**Nm**
11 Engine			
Oil pump			
Mesh filter basket to engine block			9
Oil pump cover			9
Pressure relief valve			42
Oil pressure switch			30
Oil cooler			
Oil cooler pipe to engine block			10
Cooling oil line – banjo screw with oil vent valve			25
Oil cooler to fairing bracket			9
Oil cooler return line to engine block			35
Oil cooler connection to crankcase			9
Cylinders			
Tightening sequence:			
1. M 8 screw			20
2. M 6 screw			9
3. Chain guide rail pivot screw			18
Timing chain			
Chain tensioner			32
Connecting rod			
Big end cap	Closing torque		20
	Wrench angle	80°	
Crankcase			
Tightening sequence:			
1. M 10 screw (oiled)	Initial torque		25
	Wrench angle	90°	
2. M 8 screw (oiled)			22
3. M 6 screw			9

Model			R 1100 S
Connection			**Nm**
12 Engine electrics			
Starter motor to engine			20
Starter cover to gearbox housing			7
Alternator to cover mount			20
Tensioning and retaining link to alternator			20
Spacer to alternator			20
Belt pulley to alternator Series generator 560 W Option 700 W			 Do not release 50
Belt pulley to crankshaft			50
Poly-V belt preload			8
Spark plug			20
13 Fuel preparation and control			
Temperature sensor, oil, in crankcase			25
Temperature sensor, air, in air-filter housing			10
16 Fuel tank and lines			
Fuel tank to main frame			10
18 Exhaust system			
Manifold to cylinder head			21
Clamp for manifold			45 (apply Never Seeze to clamp seat)
Manifold to front silencer			12
Silencer to front-silencer outlet			55 (apply Never Seeze to clamp seat)
Oxygen sensor to silencer			45 (apply Never Seeze to thread)
21 Clutch			
Clutch housing	Closing torque		40 (oil screw threads lightly)
	Wrench angle	32°	
Housing cover			12
Slave cylinder to gearbox			9
Clutch line to handlebar fitting			18



Model		R 1100 S
Connection		**Nm**
23 Transmission		
Oil drain plug		55
Oil filler plug		23
Gearbox to engine block		22
Foot shift lever to footrest plate		21
Selector lever to selector shaft		9
Gearbox cover to gearbox housing		9
31 Front fork		
Quick-release axle clamp screws		22
Clamp, fork fixed tube to fork bridge		22
Slider tube bridge to slider tube		25 (clean thread + Loctite 243)
Ball joint to fork bridge		230 (apply light coat of Never Seeze to thread)
Ball joint to tube slider bridge		230 (apply light coat of Never Seeze to thread)
Leading link tube to ball joint		130 (clean thread + Loctite 2701)
Frame to ball joint		130 (clean thread + Loctite 2701)
Leading link tube to engine	right	73
Screw cap to leading link	left	42 (apply light coat of Never Seeze to thread)
Suspension strut to front frame		43
Suspension strut to leading link		50
32 Steering		
Handlebar to fixed tube		21
Handlebar to fork bridge		9 (clean thread + Loctite 243)
33 Rear wheel drive		
Oil filler plug		23
Oil drain plug		23
Threaded ring		118 (Hylomar SQ 32 M)
Hexagon nut, input bevel gear		200 (clean thread + Loctite 2701)
Cover to rear-wheel drive housing		35
Swinging-arm fixed bearing stud bolt to rear frame		9
Swinging-arm floating bearing stud bolt to rear frame		7 (clean thread + Loctite 2701)
Swinging-arm floating bearing stud bolt to rear axle housing		160 (clean thread + Loctite 2701)
Swinging-arm floating bearing stud bolt to rear-axle housing		7 (clean thread + Loctite 2701)
Locknut of swinging-arm floating bearing stud bolt		160

Model	R 1100 S
Connection	**Nm**
33 Rear wheel drive	
Reaction link to rear wheel drive/main frame	43 Load approx. 85 kg (187 lbs) onto motorcycle and tighten loose reaction link
Spring strut to main frame	50
Spring strut to rear swinging arm	50
34 Brakes	
Brake caliper to fork slider tube	40
Brake caliper to rear wheel drive	40
Brake disc to front wheel	21 (clean thread + Loctite 2701)
Brake disc to rear wheel drive	21 (clean thread + Loctite 2701)
Master cylinder to footrest assembly	8
Brake pedal to footrest assembly	21 (clean thread + Loctite 2701)
Brake lines/brake hose to brake components	18
Brake hose to brake lever fitting	18
ABS sensor	4 (handtight)
Front brake caliper bleed screw	14
Rear brake caliper bleed screw	6
Pressure modulator bleed screw	9
Grubscrew in filler adapter	10
ABS unit to holder M6 screw	 9
36 Wheels and tyres	
Quick-release axle clamp screws	22
Quick-release axle threaded connection	30
Rear wheel to rear wheel drive Hand-tighten wheel studs, then tighten in diagonally opposite sequence Initial tightening Final tightening	 50 105
46 Frame	
Front frame to engine, M12 bolts	82
Struts to front frame	58



Model		R 1100 S
Connection		**Nm**
46 Frame		
Main frame to engine		
M 10 screw, top right	Initial tightening	13
	Final tightening	42
M 10 screw, top left		42
M 10 bolts at top (struts to engine)		50
M 10 screw, long, frame/gearbox		55
M 12 screw, bottom		80
M 8 screw, long, bottom		24
Rear frame to main frame		31
Side stand pivot mount to engine		
M 8 screw		21
M 12 screw		80
Side stand to pivot mount		42 (clean thread + Loctite 243)
Centre stand to main frame		42
Footrest assembly to main frame		21
Pillion footrest holder to rear frame		21
Front fairing bracket to front frame		21
51 Equipment		
Mirrors		10 (clean thread + Loctite 243)
Ignition/steering lock to fork bridge		15 (microencapsulated)
61 General electrical equipment		
Horn to holder		21
Ground (earth) strap to engine block		7

Table of consumables

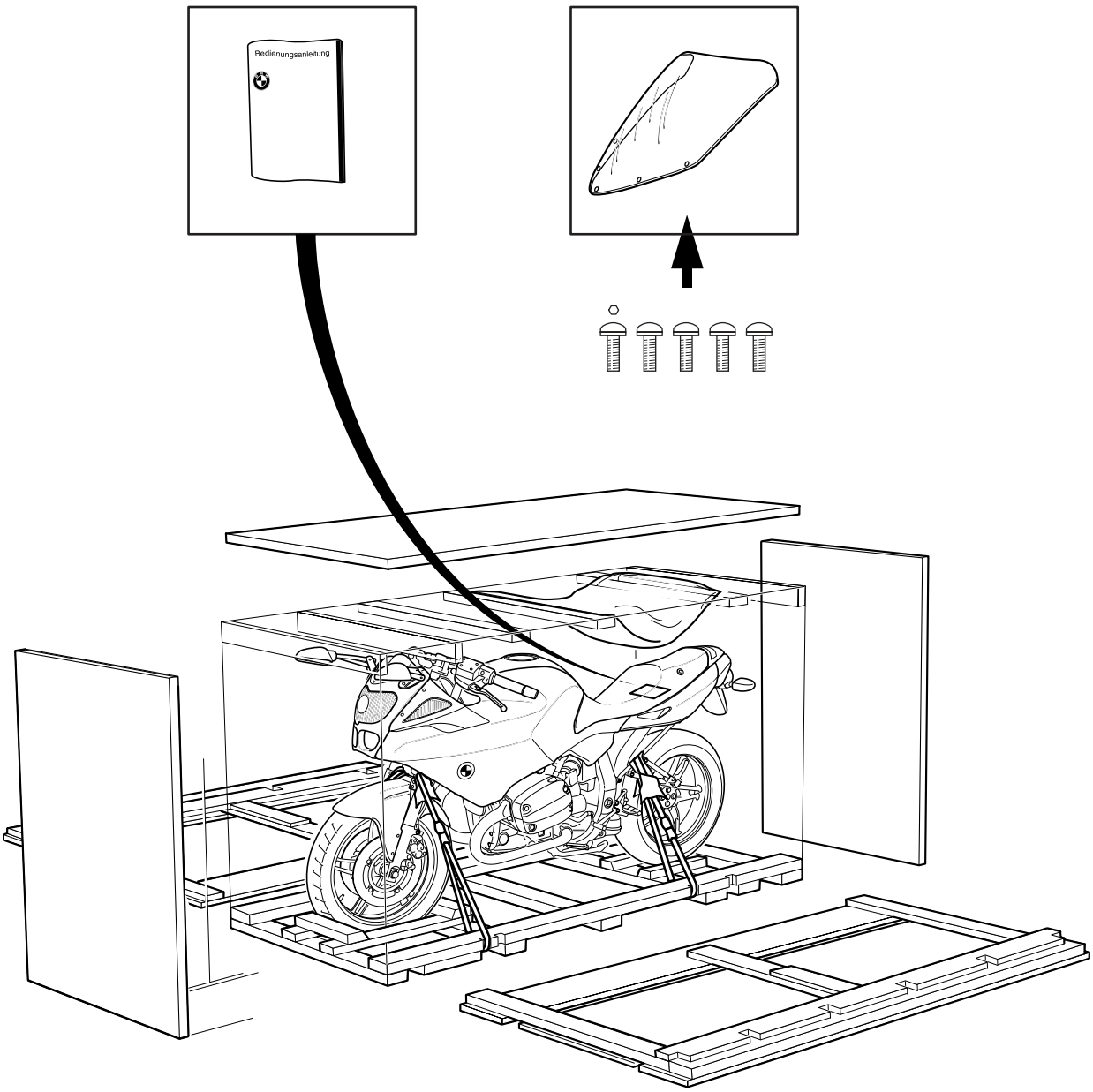


Item	Use	Order number	Quantity
Lubricant			
Optimoly MP 3	High-performance lubricating paste	07 55 9 062 476	100 g tube
Optimoly TA	High-temperature assembly paste	18 21 9 062 599	100 g tube
Silicone grease 300, heavy	Damping grease	07 58 9 058 193	10 g tube
Retinax EP2	Wheel, steering head and taper roller bearing grease	83 22 9 407 845	100 g tube
Contact spray	Contact spray	81 22 9 400 208	300 ml spray
Chain spray	Drive chain	72 60 2 316 676 72 60 2 316 667	50 ml spray 300 ml spray
Sealants			
Staburags NBU 30 PTM	High-performance lubricating paste	07 55 9 056 992	75 g tube
3-Bond 1110 B	Surface sealant	07 58 9 056 998	5 g tube
3-Bond 1209	Surface sealant	07 58 9 062 376	30 g tube
omni VISC 1002	Surface sealant	07 58 1 465 170	90 g tube
Loctite 574	Surface sealant	81 22 9 407 301	50 ml tube
Curil K 2	Heat-conductive sealant	81 22 9 400 243	250 g can
Hylomar SQ 32 M	Permanently elastic sealant	81 22 9 400 339	100 g tube
Adhesives and retaining agents			
Loctite 648	Joint adhesive (low clearance)	07 58 9 067 732	5 g bottle
Loctite 638	Joint adhesive (greater clearance)	07 58 9 056 030	10 ml bottle
Loctite 243	Thread retainer, medium-strength	07 58 9 056 031	10 ml bottle
Loctite 270	Thread retainer, strong	81 22 9 400 086	10 ml bottle
Loctite 2701	Thread retainer, strong	33 17 2 331 095	10 ml bottle
Loctite 454	Cyanacrylate adhesive (gel)	07 58 9 062 157	20 g tube
Cleaners			
Brake cleaner	Brake cleaner	83 11 9 407 848	600 ml spray
Metal polish	Polish for chrome-plated parts	82 14 9 400 890	100 g tube
Testing agents			
Penetrant MR 68	Crack testing agent for aluminium housings	83 19 9 407 855	500 ml spray
Developer MR 70	Crack testing agent for aluminium housings	81 22 9 407 495	500 ml spray
Installation aid			
BMW cooling spray	Cooling spray	83 19 9 407 762	300 ml spray



Pre-delivery check

General view of crated motorcycle



Checking the crate for damage

- When the motorcycle arrives, check the crate immediately for damage and if necessary examine the contents for consequential damage.



In case of damage in Germany

- Note the damage on the delivery slip.
- Read the information sheet on damage in transit.
- Immediately notify the freight carrier (e.g. freight forwarder or DB) and
  Bavaria Wirtschaftsagentur GmbH
  Abteilung ZW - 12
  80788 München
  Phone 089/14327-632
  Fax. 089/14327-709

In case of damage in importer markets

- Note the damage on the delivery slip.
- Comply with specific national market procedures.
  In case of doubt, please submit enquiries to:
  Bavaria Wirtschaftsagentur GmbH
  Abteilung ZW - 12
  D-80788 München
  Tel. +49 89 14327 632
  Fax. +49 89 14327 709
- Immediately notify the freight carrier (e.g. freight forwarder).

Unpacking the motorcycle

- Lever off the cover.
- Take out the separate pack of items:
  – Spare keys
  – Owner's Manual
  – Windscreen and securing screws
- Pry off the cross struts with a suitable lever.

Caution:
Do not hammer out the cross struts or the motorcycle may be damaged.

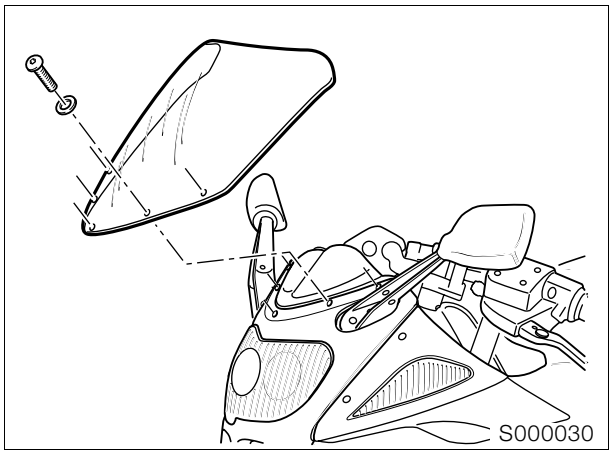
- Remove the end panels.
- Remove the side panels.

Caution:
Remove all nails projecting from the base of the crate or lying on the floor.

- Dispose of the packing materials in an environmentally responsible manner as described in Service Information 23/91 - Sales.

Installing remaining items on motorcycle

- Wheel the motorcycle clear of the wooden pallet.



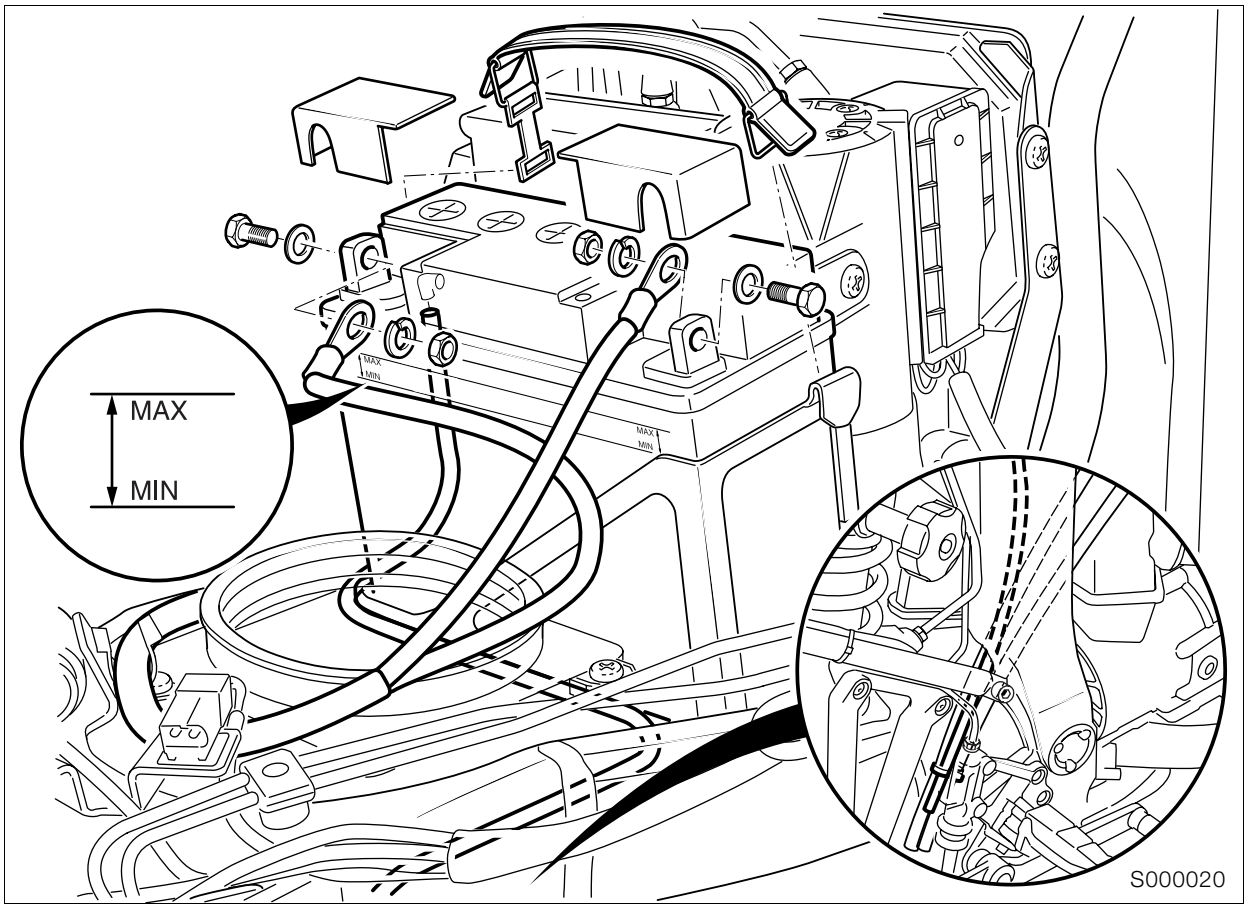
- Carefully tighten the securing screws by hand.

Inspecting motorcycle for damage

- Check for defects.
- Send an “Urgent notification” to
  BMW AG, Sparte Motorrad, UX-VS-1
  Fax No. +49 89 382 33220
- Rectify the defect.
- Use the electronic parts list to order parts, if needed.
- Costs are to be processed by the warranty claim system (stage 4). Defect codes:
  – Parts missing 10 01 00 00 00
  – Parts damaged 10 02 00 00 00
  – Incorrect parts delivered 10 03 00 00 00
- If the parts that are needed do not appear in the electronic parts list (e.g. parts for official-user motorcycles), send an order form to:
  Fax No. +49 30-3396-2262

Checking that delivery is complete

– All optional extras
– Toolkit
– Documentation



Filling and charging the battery

Disengaging and raising the fuel tank

- Remove seat.
- Remove right and left side trim panels.

Caution:
Fuel is flammable and a hazard to health. Observe relevant safety regulations.

- Remove the fuel tank.
- Raise the rear of the fuel tank and prop it in this position on a wooden block or similar.

Filling and charging the battery

Warning:
Battery acid is severely caustic.
Protect your eyes, face, hands and clothing and the paintwork.

- Disengage the rubber strap holding the battery.
- Disconnect the battery breather hose.
- Remove the battery.
- Add battery acid up to the MAX mark.
- Allow the battery to stand for at least an hour.
- Shake the battery slightly to allow the remaining air bubbles to escape.
- If necessary, top up again to the MAX mark with battery acid.
- Charge the battery and allow to stand for 24 hours.

Charge current (amps)
..... 10 % of rated battery capacity (Ah)

- If necessary, top up the acid level to the MAX mark with distilled water.
- Make a note of the charging date on the battery.

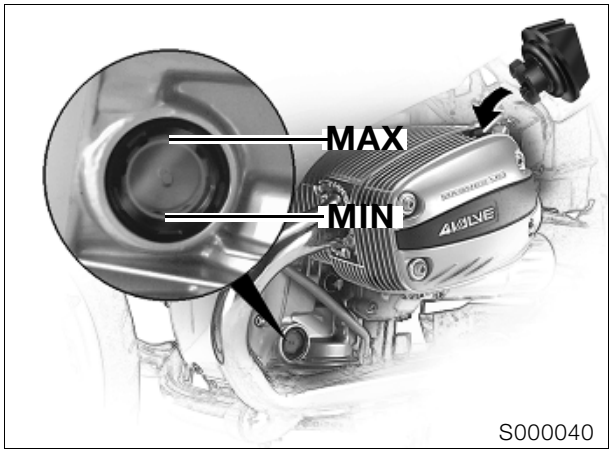
Caution:
Connect the positive battery terminal first, then the negative terminal.

- Apply acid-proof grease to the battery terminal posts.
- Install the battery.
- Secure the fuel tank in position.
- Install right and left side trim panels.
- Install dualseat.
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

Tightening torque:
Fuel tank to rear frame ..... 10 Nm

Checking engine oil level when cold, adding oil if necessary



- Check the oil level with the motorcycle upright: if necessary, use stand, **BMW No. 00 1 560**, to keep the motorcycle in the upright position.

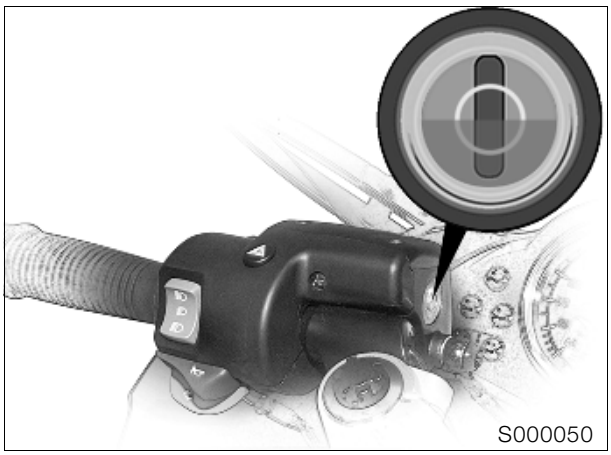
Caution:
Never top up the engine-oil level past the MAX mark.

Required level:..... MAX

Checking clutch fluid level

Caution:
Keep the brake fluid in the clutch operating system away from painted surfaces on the motorcycle because brake fluid attacks paint.

- Motorcycle upright; if necessary, use stand, **BMW No. 00 1 560**, to hold the motorcycle upright.
- Turn the handlebar fully to the right.



- Check clutch fluid level.

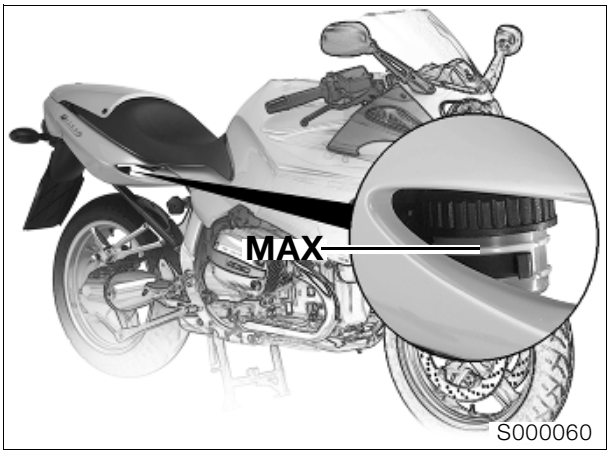
Required level with a new clutch liner: .....
.....Half way up sight glass

Checking brake fluid level

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

Rear brake

- Motorcycle upright; if necessary, use stand, **BMW No. 00 1 560**, to hold the motorcycle upright.

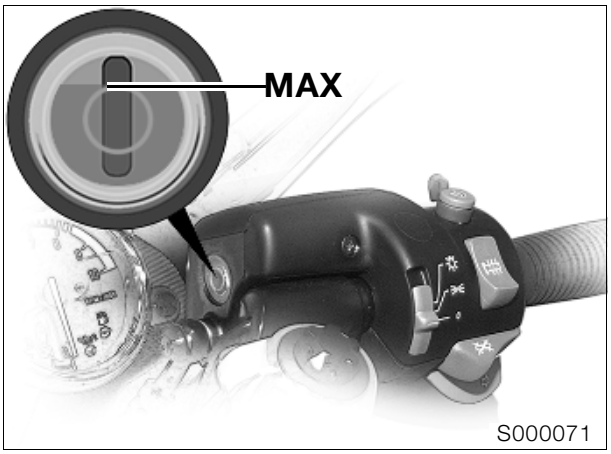


- Check the brake fluid level by looking through the opening in the right-hand side panel.

Required level:..... MAX

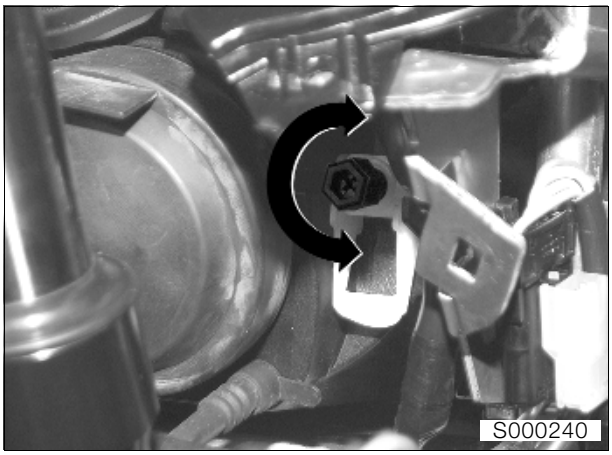
Front brake

- Motorcycle upright; if necessary, use stand, **BMW No. 00 1 560**, to hold the motorcycle upright.
- Handlebar centred.



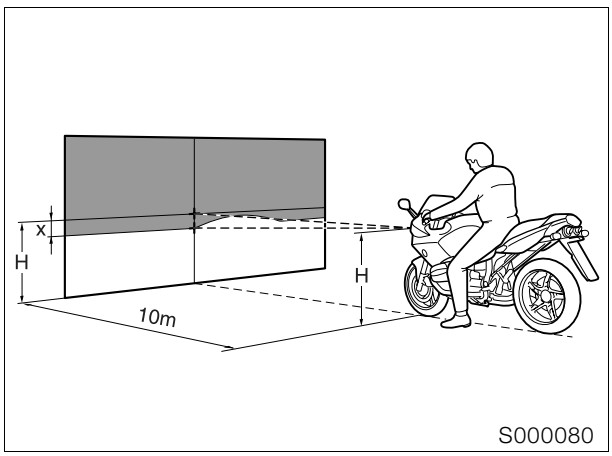
Required level:..... MAX

Checking headlight beam angle, adjusting if necessary



- Motorcycle on level surface.
- Rider's weight on motorcycle (approx. 80 kg/ 176 lbs).
- Move swivel lever to horizontal position (basic setting).
- Turn the adjusting screw to correct the headlight beam throw.

Lateral adjustment:
..... Adjusting screw on left of headlight
Vertical adjustment:
.....Adjusting screw on right of headlight
Turn screw anti-clockwise:..... longer throw
Turn screw clockwise: ..... shorter throw



Setting for headlight beam angle adjuster
.... -12 cm (4.7 in) over a distance of 10 m (32.8 ft)

Checking tightness of rear wheel studs

Tightening torque:
Rear wheel studs ..... 105 Nm

Checking tyre pressures

- Check/correct tyre pressures.

Tyre pressures:

Solo ..... front 2.2 bar (31.3 psi)
..... rear 2.5 bar (35.6 psi)

Two-up ..... front 2.5 bar (35.6 psi)
..... rear 2.7 bar (38.4 psi)

Two-up + luggage ..... front 2.5 bar (35.6 psi)
..... rear 2.9 bar (41.2 psi)

Final inspection and function check

- Clutch
- Check gear shift action.
- Handbrake and foot brake
- Check lights and signalling equipment:

– Front and rear parking lights
– Instrument lighting
– Low and high headlight beams, headlight flasher
– Brake light (operate front and rear brakes)
– Turn signals left/right
– Hazard warning flashers
– Horn
– Telltale and warning lights
– Instruments

- Check function of optional extras:

– ABS: perform starting test. When a speed of 5 km/h (app. 3 mile/h) is reached, both ABS warning lights must go out.

- If necessary, take the motorcycle for a test ride.
- Confirm pre-delivery check in Service and Technical booklet.
- See “Inspecting motorcycle for damage” if defects are detected.

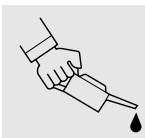
Final cleaning

- Clean the motorcycle.

Note:
Do not use a steam or high-pressure water jet. The high steam or water pressure could damage seals, the hydraulic system or electrical components.

Handing over the motorcycle

This is the ideal opportunity to familiarise the customer with the motorcycle in order to ensure the customer’s satisfaction and safety.



- The following points must be demonstrated and explained to the customer:

– documentation and stowage space
– toolkit and stowage space
– suspension preload adjustment to suit total weight
– checking brake fluid/clutch operating fluid
– provision for adjusting handlebar lever positions
– how to adjust the mirrors
– controls
– instruments and telltale lights
– optional equipment and accessories fitted.
– noise during the regular ABS self-diagnosis procedure

- The user must be given the following information:

– running-in recommendations and inspection intervals
– safety check
– the clutch fluid level rises gradually as the motorcycle is ridden (clutch lining wear)
– before checking the engine oil level, the engine must be switched off for at least 10 minutes and the motorcycle must be standing on a flat, level surface

Maintenance

Key to maintenance intervals

- BMW Inspection 1000 km/600 miles **I**
- BMW Service **II**
- BMW Inspection **III**
- BMW Annual Service **IV**

Reading out MoDiTeC fault memory

(Inspections I, II, III and IV)

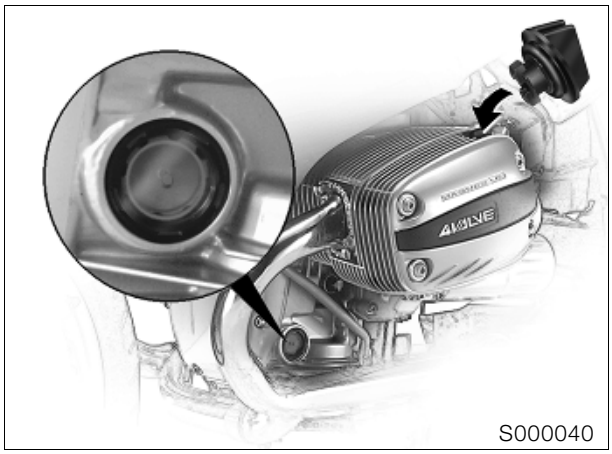
- Remove seat.
- Connect the **BMW** MoDiTeC to the diagnosis connector.
- Read out the fault memory.
- Perform all requisite repair work.

Changing engine oil, replacing oil filter element

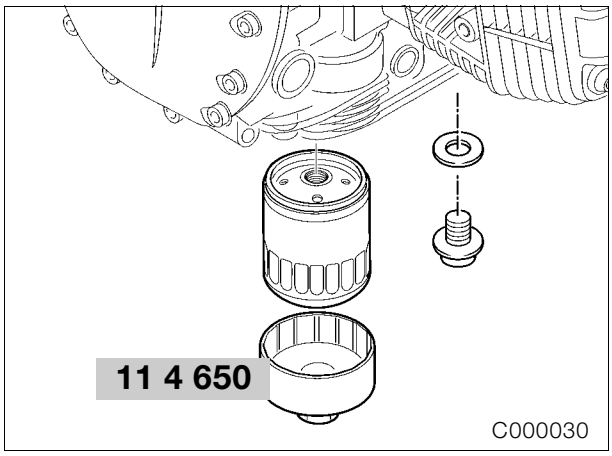
(Inspections I, II, III and IV)

Note:
If the motorcycle is ridden only for short distances or outside temperatures are below 0°C (32°F): change the oil and replace the oil filter element every 3 months or no later than every 3 000 km (1 800 miles).

- Use the auxiliary stand, **BMW No. 00 1 560,** if necessary.
- Change the oil at operating temperature.


S000040

- Remove screw plug.



C000030

- Remove oil drain plug and drain off oil.
- Fit new seal and screw in drain plug.
- Use oil filter wrench, **BMW No. 11 4 650**, to remove the oil filter.
- Coat sealing ring on new oil filter element with oil and install filter.
- Refill with oil to correct level.
- Insert and tighten the screw plug.

Caution:
Never top up the engine oil level past the MAX mark.

Tightening torque:
Oil filter..... 11 Nm
Oil drain plug..... 32 Nm

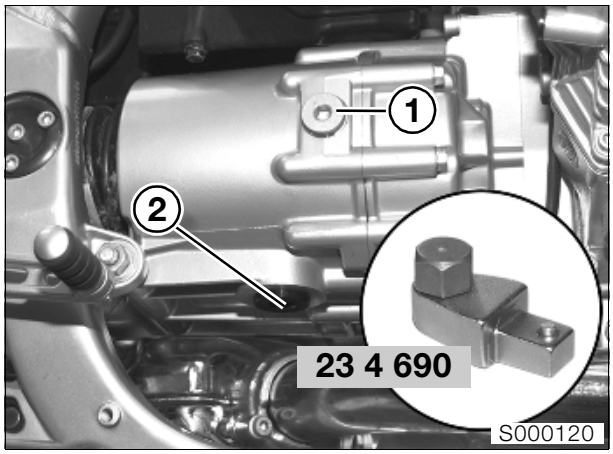
Engine oil quantities:
With oil filter
change.....3.75 l (6.6 Imp. pints/3.96 US quarts)
Without oil filter
change.....3.50 l (6.2 Imp. pints/3.69 US quarts)
Difference between MIN and MAX
marks..... 0.50 l (0.88 Imp. pint/0.52 US quart)

Engine oil grade:
Brand-name HD oil for spark-ignition engines, API classifications SF, SG, SH; combination with CD or CE specification.
Brand-name HD oil of CCMC classification G4, G5; amendment PD2 is permissible.

Changing oil in gearbox

(Inspections III and IV)
or every 2 years at the latest

- Change the gearbox oil at operating temperature.



- Remove oil filler plug (1).
- Use socket-head key, **BMW No. 23 4 690 and torque wrench**, to remove oil drain plug (2) and drain the oil into a suitable container.
- Clean the magnet in the oil drain plug.
- Fit new seal and reinstall drain plug.
- Refill with gearbox oil to correct level.
- Insert oil filler plug with new seal.

Tightening torque:
Oil drain plug..... 55 Nm
Oil filler plug ..... 23 Nm

Quantity:
Initial filling/oil changes
.....approx. 0.8 l (1.40 Imp. pint, 0.84 US quart)

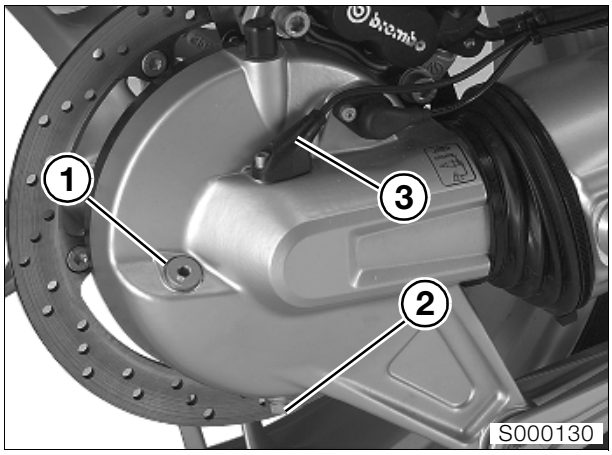
Oil grade for gearbox:
Brand-name hypoid gear oil, SAE 90, API class GL 5

Changing oil in rear wheel drive; cleaning inductive signal transmitter at rear wheel

(Inspections I, III and IV)
Every 40 000 km (24 000 miles) or every 2 years at the latest



- Change the oil with the rear wheel drive at operating temperature.

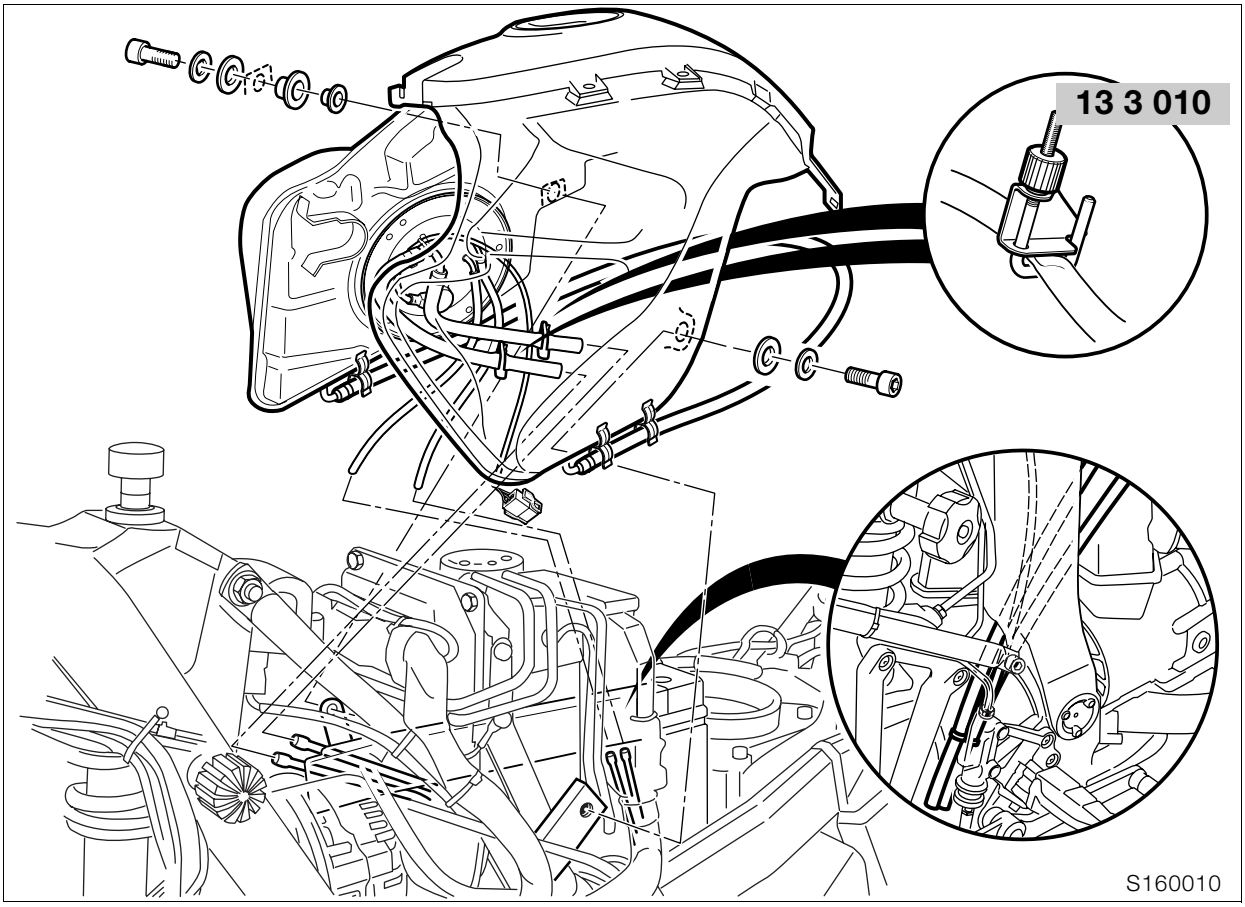


- Remove oil filler plug (1).
- Remove oil drain plug (2) and allow the oil to drain out.
- Fit new seal and reinstall drain plug.
- Refill with gearbox oil to correct level.
- Insert oil filler plug with new seal.
- Remove securing screw, pull out inductive signal transmitter (3) and clean it.

Tightening torque:
Oil drain plug..... 23 Nm
Oil filler plug ..... 23 Nm

Quantity:
To bottom edge of the filler opening
.....approx. 0.25 l (0.44 Imp. pint/0.26 US quart)

Oil grade for rear wheel drive:
Brand-name hypoid gear oil, SAE 90, API class GL 5



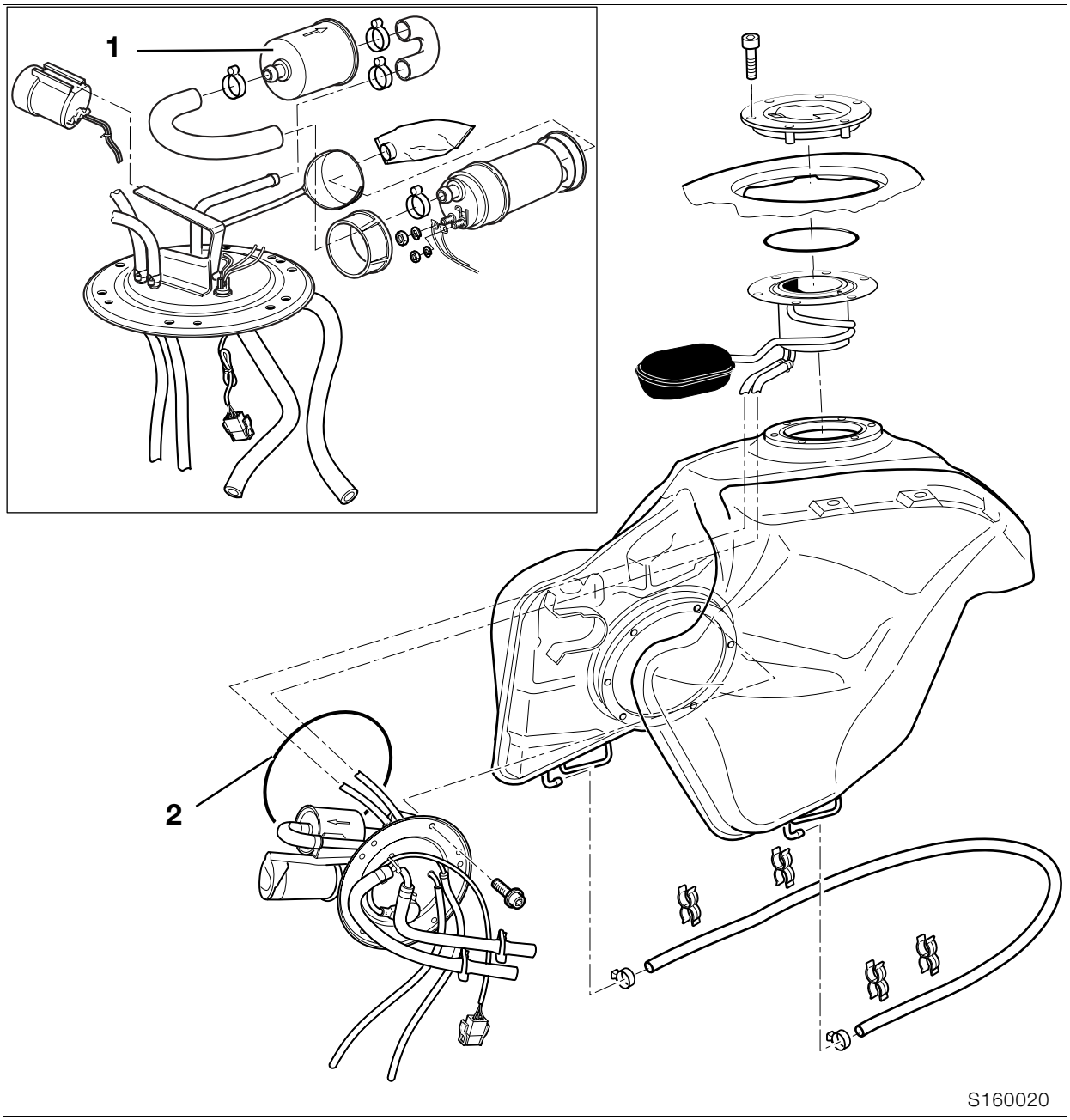
Replacing fuel filter

(Inspection III)
In normal operating conditions every 40 000 km (24 000 miles); if fuel quality is poor every 20 000 km (12 000 miles)

- Remove seat.
- Remove left fairing side section, followed by right fairing side section.
- Disconnect air intake pipe from air filter box and remove.

⚠ Caution:
Fuel is flammable and a hazard to health. Observe relevant safety regulations.

- Disengage the fuel tank.
- Seal the fuel feed and return lines with hose clips, **BMW No. 13 3 010**, and disconnect.
- Pull the plug connector off the fuel pump unit.
- Remove the fuel tank.



- Drain fuel tank.
- Remove fuel pump unit.
- Disconnect hoses from fuel filter (1).
- Fit new fuel filter.

Caution:
Note correct direction of flow through fuel filter.

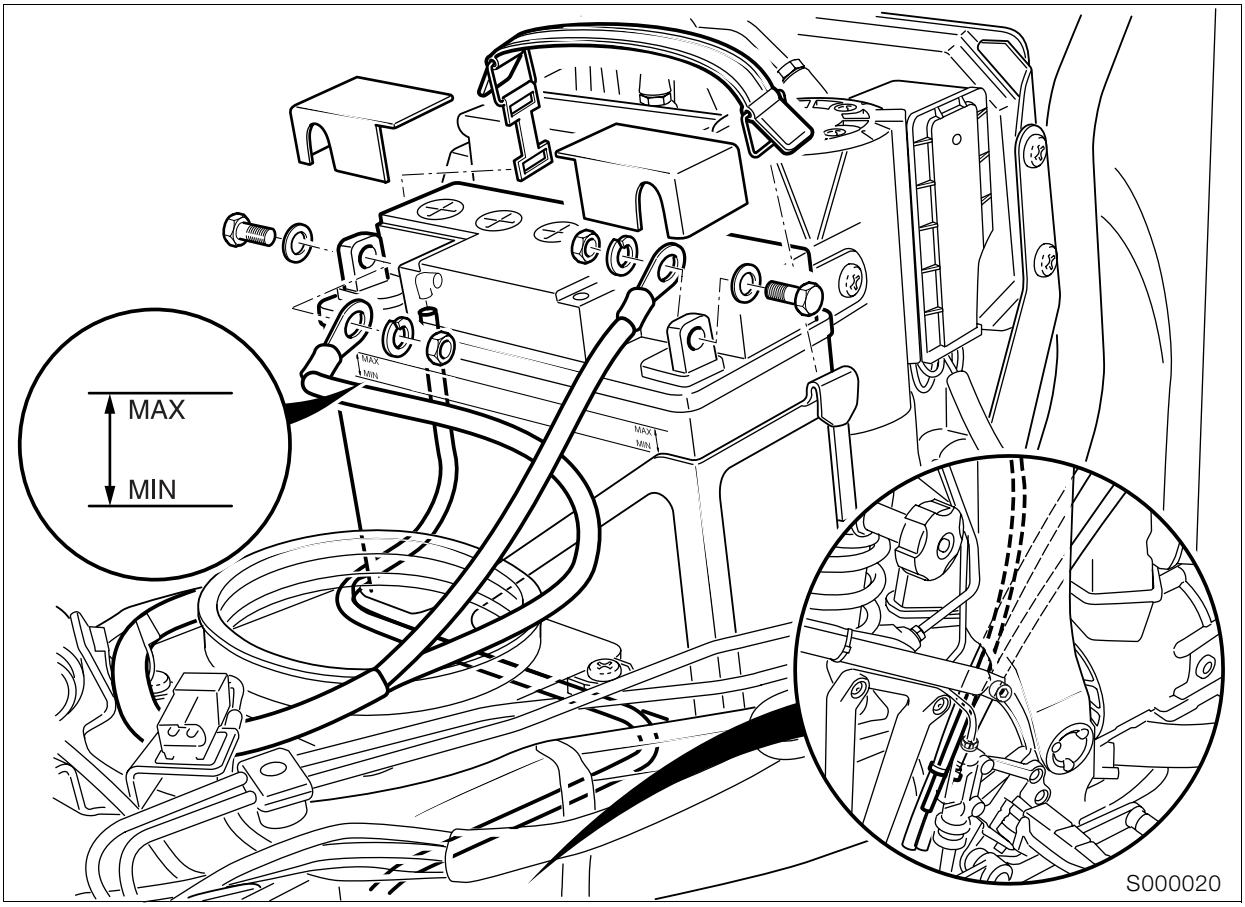
- Secure non-reusable hose clips with pliers, **BMW No. 13 1 500**.

Caution:
Make sure that O-ring (2) is in perfect condition.

Tightening torque:
Fuel pump unit ..... 5 Nm

Caution:
After installing, check fuel pump unit for leaks.

Note:
Make sure that breather lines are correctly routed.



Checking battery fluid level and topping up if necessary; cleaning and greasing the battery posts

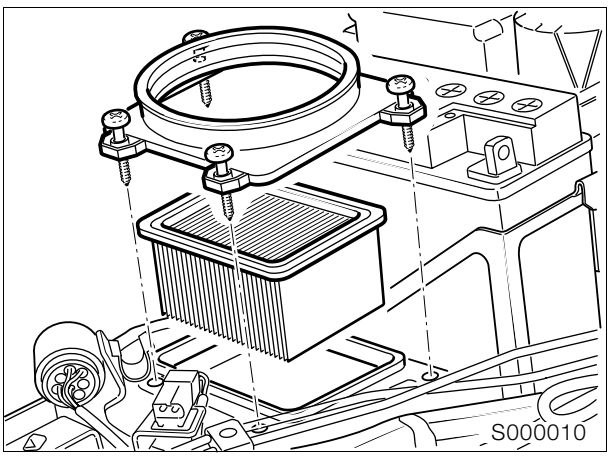
(Inspections III and IV)

- If necessary, disengage fuel tank and lift at rear.
- Release the rubber strap holding the battery.
- Check the battery fluid level.
- Top up the acid level to the MAX mark with distilled water.
- Grease the battery posts.

Acid-proof battery-post grease:
.....e.g. Bosch Ft 40 V1

Replacing intake air filter element

(Inspection III)
In very dirty and dusty operating conditions, replace every 10 000 km (6 000 miles) or even more frequently if necessary



- Remove top of air-filter housing.
- Replace air filter element.
- Install the fuel tank.
- Make sure that breather lines are correctly routed.
- Install right and left side trim panels.

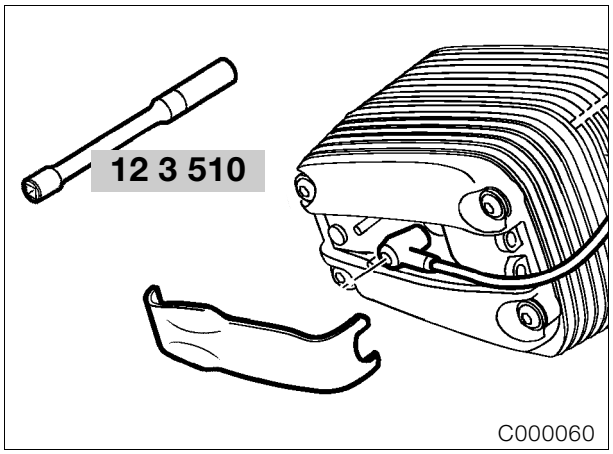
Tightening torque:
Fuel tank to rear frame ..... 10 Nm

Replacing Poly-V belt

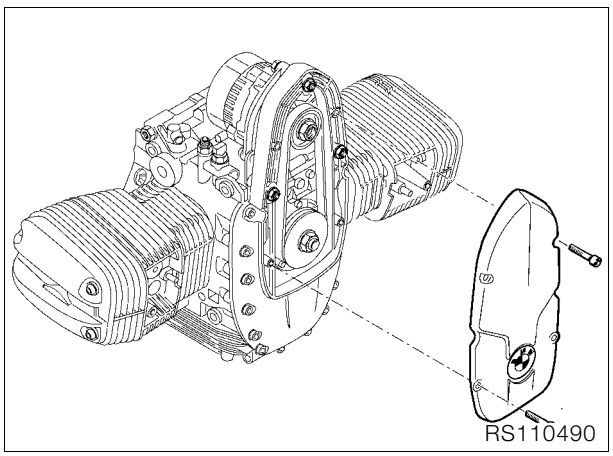
(every 60 000 km/36 000 miles)

(Inspection III)

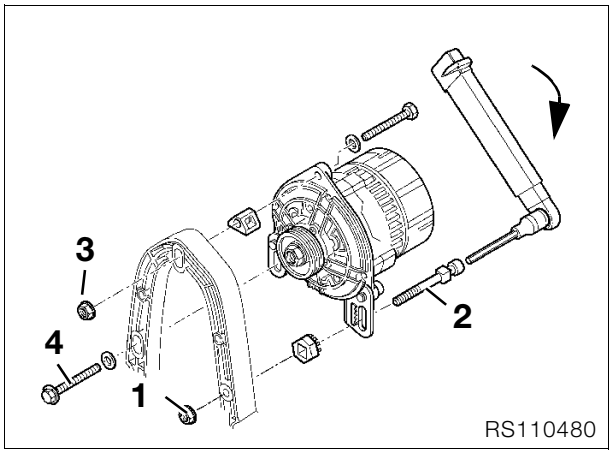
- If necessary, disengage fuel tank and pull to the rear.



- Remove cover to expose spark plug caps.
- Pull off spark plug caps with special puller, **BMW No. 12 3 520**.
- Use spark plug wrench, **BMW No. 12 3 510**, to remove the spark plugs.



- Remove front cover.



- Slacken alternator mounting screws and nuts (1,3,4) and install a new Poly-V belt if necessary.

Poly-V belt adjusting procedure:
Poly-V belt installation procedure:

- Place the Poly-V belt in position, tension it and turn the engine over once, then release belt tension.

Poly-V belt tensioning procedure:

1. Hand-tighten hex nut (1) on adjusting screw (2) (**do no use tools**).
2. Tighten adjusting screw (2) with a torque wrench and keep preload applied.
3. Tighten upper retaining nut (3), then remove torque wrench from adjusting screw.
4. Tighten all screws and nuts.

Tightening torque:

Poly-V belt preload..... 8 Nm
Alternator to alternator support cover..... 20 Nm

Checking brake system for correct operation and freedom from leaks; repairing/replacing if necessary

(Inspection III)

- Checking brake system for leaks.

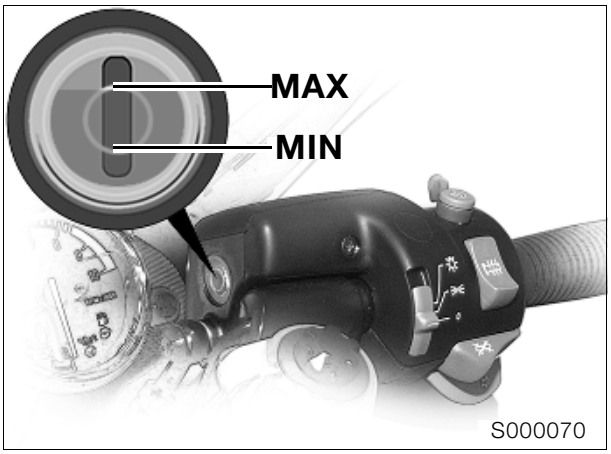
Checking brake fluid level

(Inspections I, II and III)

Note:
The brake fluid volume (between MIN and MAX) is sufficient for the complete range of pad wear from new to the wear limit.
It is not normally necessary to top up the fluid to accommodate pad wear.
If the level drops below the minimum mark, this indicates some other fault.

Front brake

- Motorcycle upright; if necessary, use stand, **BMW No. 00 1 560**, to hold the motorcycle upright.



- Handlebar centred.

Required level
Brake pads new ..... MAX

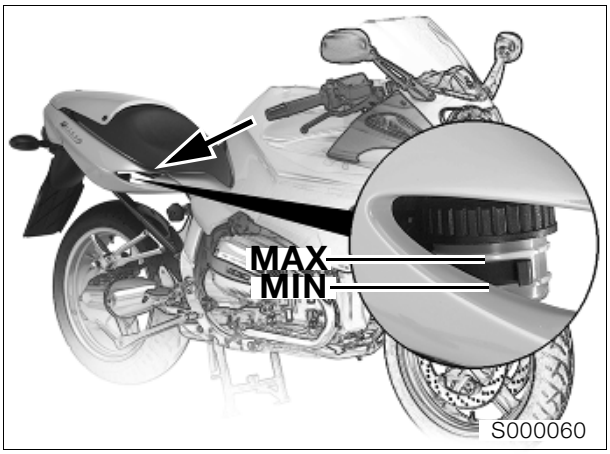
- Turn the handlebar fully to the left.

Required level
Brake pads worn: not less than..... MIN

Brake fluid grade .....DOT 4

Rear brake

- Motorcycle upright; if necessary, use stand, **BMW No. 00 1 560**, to hold the motorcycle upright.



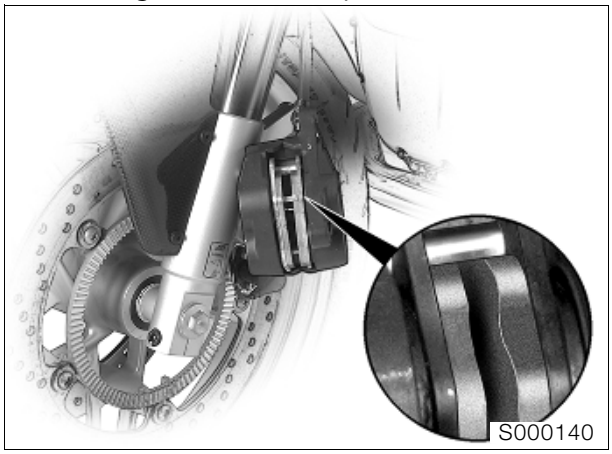
Required level
Brake pads new: ..... MAX
Brake pads worn: not less than..... MIN

Brake fluid grade .....DOT 4

Checking brake pads and discs for wear/replacing

(Inspections II and III)

Checking front brake pad wear

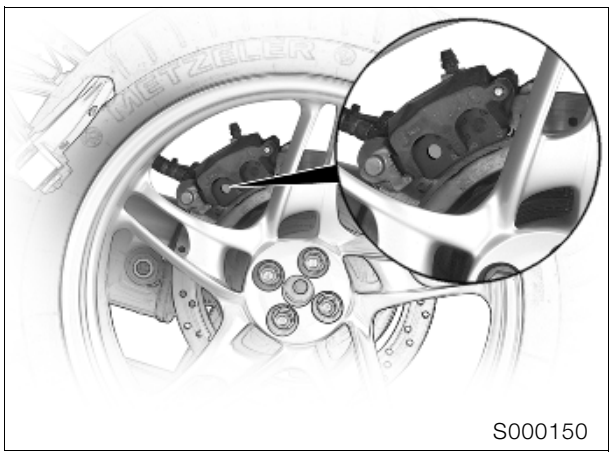


- Check/measure thickness of brake pads.

Caution:
Never permit brake pads to wear past the minimum permissible thickness.
Always replace the brake pads as a complete set.

Minimum pad thickness: ..... 1.0 mm (0.04 in)

Checking rear brake pad wear

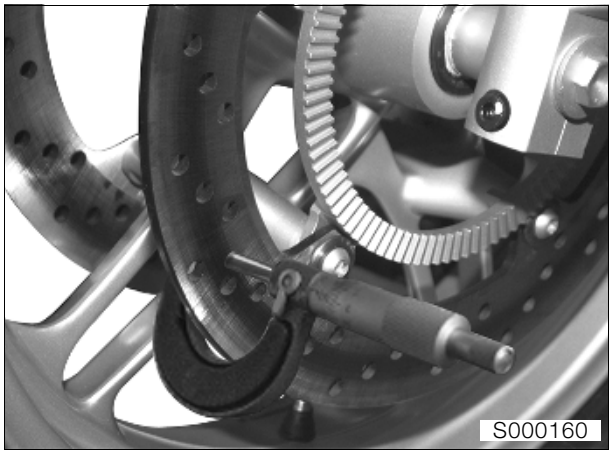


- Make sure that the brake disc is not visible through the bore (arrow) in the inner brake pad.
- If necessary, check/measure thickness of brake pads.

Caution:
Never permit brake pads to wear past the minimum permissible thickness.
Always replace the brake pads as a complete set.

Minimum pad thickness: ..... 1.5 mm (0.06 in)

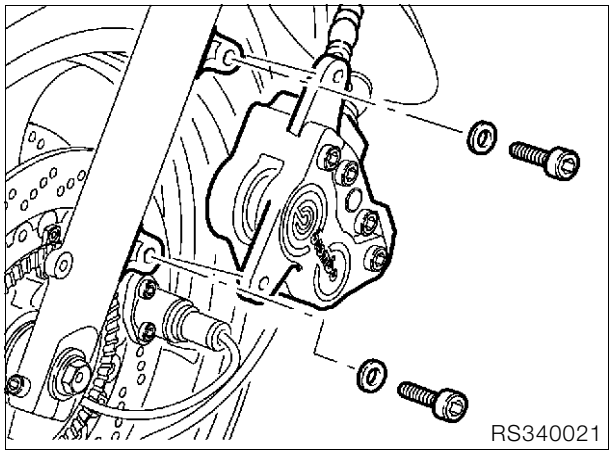
Checking brake disc wear



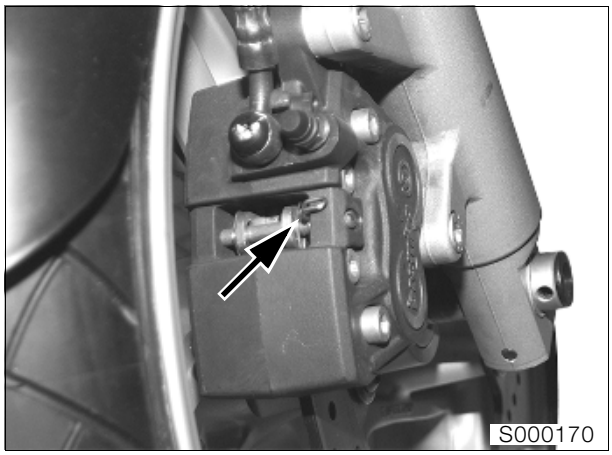
- Examine the brake discs carefully for cracks, damage, distortion, wear and score-marks.

Brake disc wear limit:
front:..... 4.0 mm (0.16 in)
rear:..... 4.5 mm (0.18 in)

Replacing brake pads, front brake



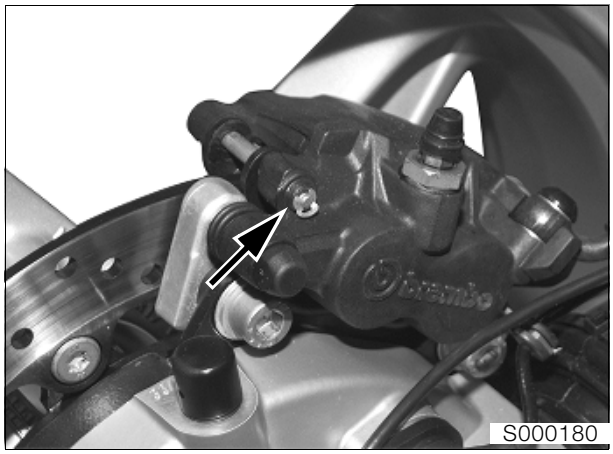
- Remove brake caliper.



- Remove keeper (arrow) from retaining pin.
- Drive out retaining pin.
- Remove brake pads.
- Installation is the reverse of the removal procedure.
- Before installing the brake caliper, force the pistons fully back with resetting tool, **BMW No. 34 1 500**.

Tightening torque:
Brake caliper to fork slider tube..... 40 Nm

Replacing brake pads, rear brake



- Remove brake caliper.
- Remove keeper (arrow) from retaining pin.
- Drive the retaining pin out towards the wheel side.
- Remove brake pads.
- Installation is the reverse of the removal procedure.
- Before installing the brake caliper, force the pistons fully back.

Tightening torque:
Brake caliper to rear wheel drive..... 40 Nm

Changing brake fluid and bleeding brake system

Change the brake fluid annually (Inspection IV)

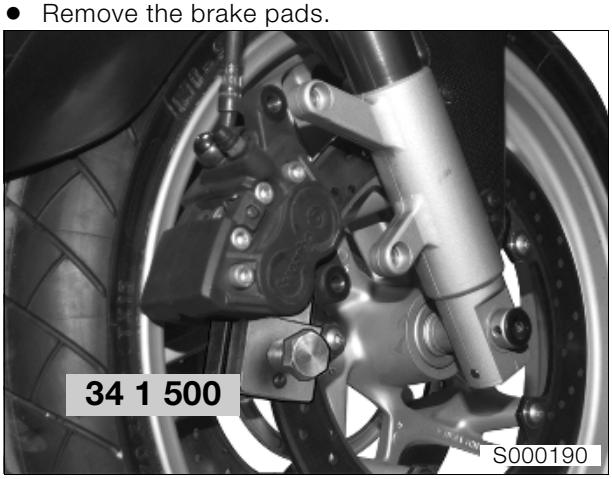
Bleeding front brake circuit/changing brake fluid

Note:
This description applies to brake filling and bleeding devices with vacuum extraction of the brake fluid at the brake caliper.
If other devices are used, comply with their manufacturers' instructions.

- Remove brake calipers.

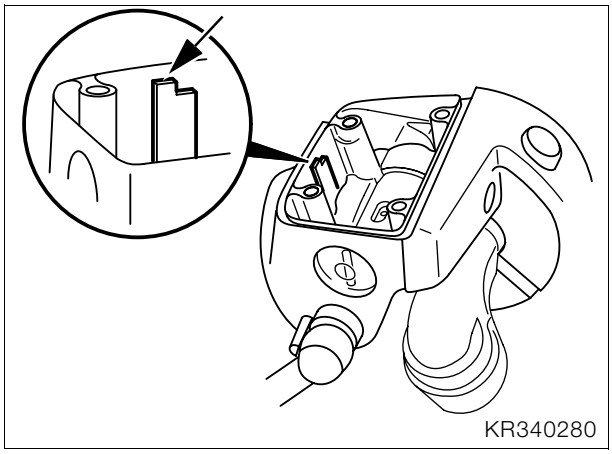
Caution:
Keep the brake caliper parallel to the brake disc when removing and installing.
There is a risk of damage to the brake pads.

- Remove the brake pads.



- Use resetting tool, **BMW No. 34 1 500**, to force the pistons of the right-hand brake caliper fully back.
- Turn the handlebars to the left.
- Release the right handlebar switch.
- Loosen the clamp screw for the handbrake fitting and turn the fitting until the brake fluid reservoir is horizontal.
- Tighten the clamping screw.
- Remove reservoir cover with rubber diaphragm.

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

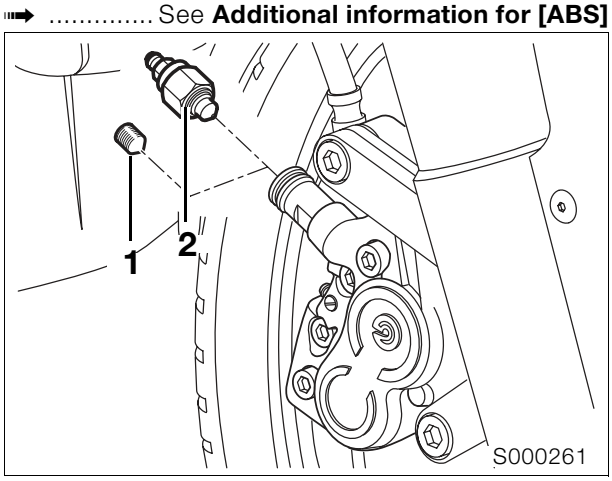


- Top up the brake fluid level to the MAX mark (arrow).

Caution:
When adding brake fluid, do not allow it to enter the holes for the reservoir cover screws.

- **[ABS]** Begin by bleeding the pressure modulator.

➟ ..... See **Additional information for [ABS]**



- Wrap a cloth around the filler adapter in the right brake calliper.
- Remove socket-head grub screw (1) from the filler adapter in the right brake calliper.
- Connect the brake bleeding device to bleed screw (2).
- Fully tighten the bleed screw in the filler adapter (valve in filler adapter closed).
- Open the bleed screw by half a turn (valve open).
- Draw off brake fluid until it emerges clear and free from air bubbles.

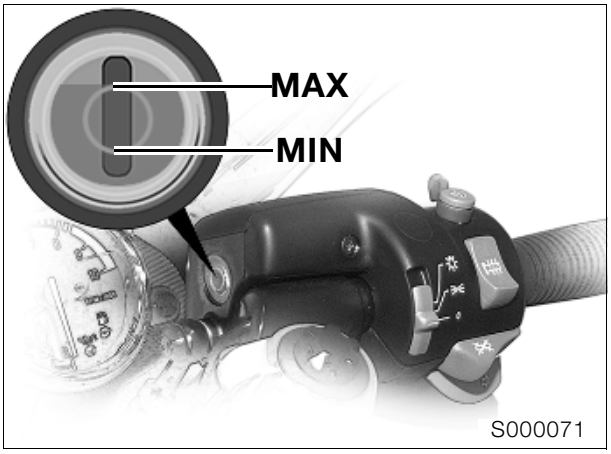
Caution:
While bleeding the brakes, do not allow the brake fluid level to drop below the "MIN" mark, or else air will be drawn into the brake system.
Bleed the system again if this happens.

- Remove the bleed screw.
- Disconnect the brake bleeding device from the bleed screw.

- Install socket-head grub screw (1) in the filler adapter and tighten.

Caution:
The motorcycle is not permitted on the road without the grubscrew in place and secure in the filler adapter.

- Connect the brake bleeding device to the bleed screw of the left-hand brake caliper.
- Open the bleed screw a half turn.
- Draw off brake fluid until it emerges clear and free from air bubbles.
- Close the bleed screw.
- Assembly is the reverse of the disassembly procedure.
- Top up the brake fluid until the level reaches the “MAX” mark.
- Wipe the rim of the reservoir, the rubber gaiter and the cover to remove brake fluid, and carefully re-install the components.
- Align the handbrake fitting with the mark on the handlebar.
- Recheck the brake-fluid level.
- Motorcycle upright; if necessary, use stand, **BMW No. 00 1 560**, to hold the motorcycle upright.



- Handlebar centred.

Required level
Brake pads new ..... MAX

- Turn the handlebar fully to the left.

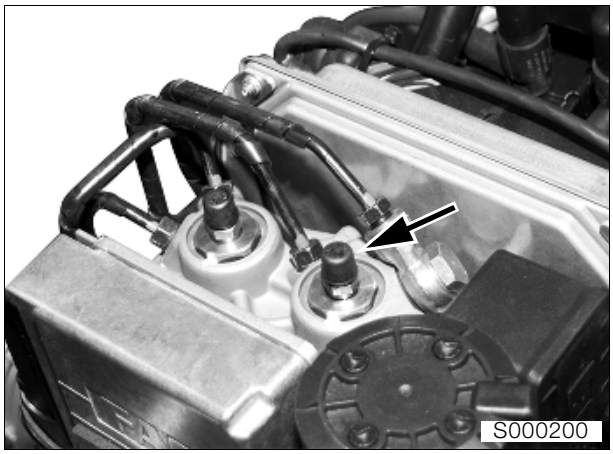
Required level
Brake pads worn: not less than ..... MIN

- Check the function of the brake system.

Brake fluid grade .....DOT 4

Tightening torque:
Brake caliper to fork tube ..... 40 Nm
Grubscrew in filler adapter ..... 10 Nm
Bleed screw in front brake caliper ..... 14 Nm

Additional information for [ABS]



- Before bleeding the brake caliper, connect the brake bleeding device to the bleed screw on the pressure modulator for the front brake (arrow) marked **VR** (mark for rear brake is **HR**).
- Open the bleed screw by half a turn.
- Draw off brake fluid until it emerges clear and free from air bubbles.
- Close the bleed screw.

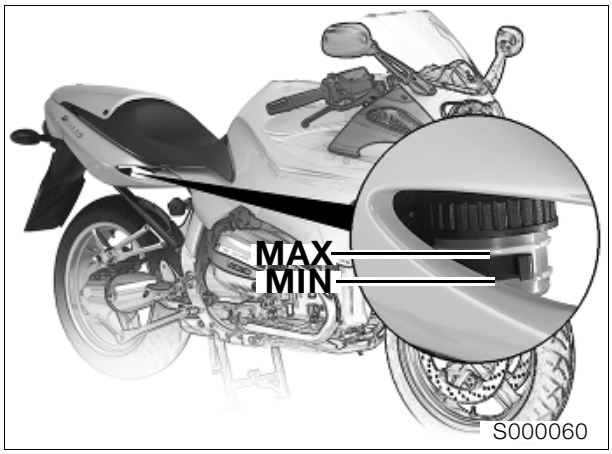
Tightening torque:
Bleed screw in pressure modulator ..... 9 Nm

Bleeding rear brake circuit/changing brake fluid

- **[ABS]** Begin by bleeding the pressure modulator.

➠ .....See **Additional information for [ABS]**

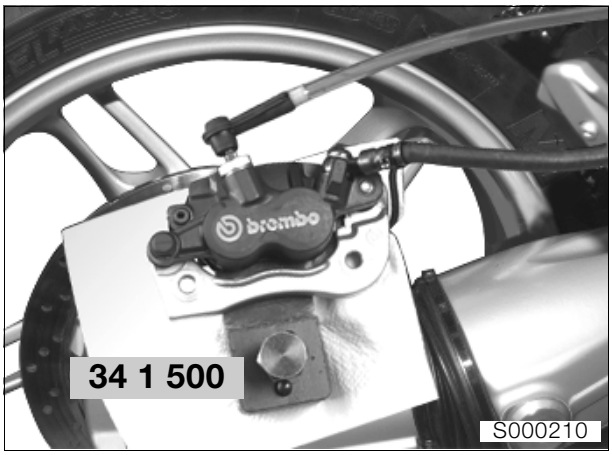
- Use the auxiliary stand, **BMW No. 00 1 560**.
- Remove reservoir cover.



- Top up the brake fluid level to the “MAX” mark.

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

- Remove the brake caliper.
- Remove the inner brake pad.
- Move the brake caliper to a horizontal position.



- Force the pistons fully back with resetting tool, **BMW No. 34 1 500**.
- Connect the brake bleeding device and open the bleed screw.
- Draw off brake fluid until it emerges clear and free from air bubbles.

Caution:
While bleeding the brakes, do not allow the brake fluid level to drop below the “MIN” mark, or else air will be drawn into the brake system.
Bleed the system again if this happens.

- Close the bleed screw.
- Top up the brake fluid level to the “MAX” mark.
- Assembly is the reverse of the disassembly procedure.
- Check the function of the brake system.

Brake fluid grade .....DOT 4

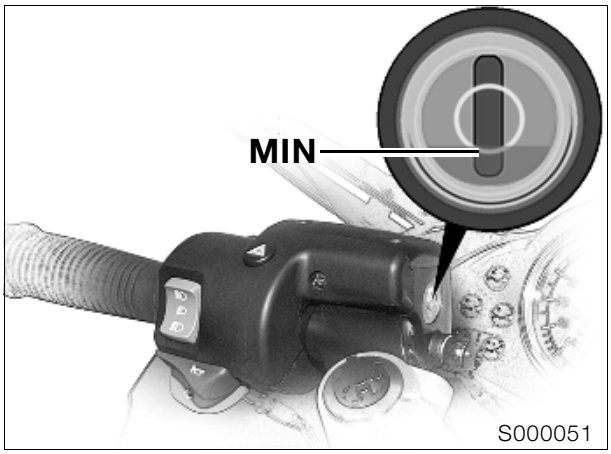
Tightening torque:

Bleed screw in rear brake caliper ..... 6 Nm
Brake caliper to rear wheel drive ..... 40 Nm

Checking clutch fluid level

(Inspections I, II and III)

- Place the motorcycle on the auxiliary stand, **BMW No. 00 1 560**.
- Turn the handlebars to the right.



Fluid level:
not below ..... MIN

Required level with a new clutch liner: .....Half way up sight glass

Note:
As the clutch lining wears, the fluid level in the reservoir rises.

- If necessary, remove reservoir cover with insert.
- Correct the fluid level. Mark in reservoir: same as brake circuit.

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

- Reinstall the reservoir cover with insert.
- Tighten the reservoir cover without using force.

Brake fluid grade ..... DOT 4

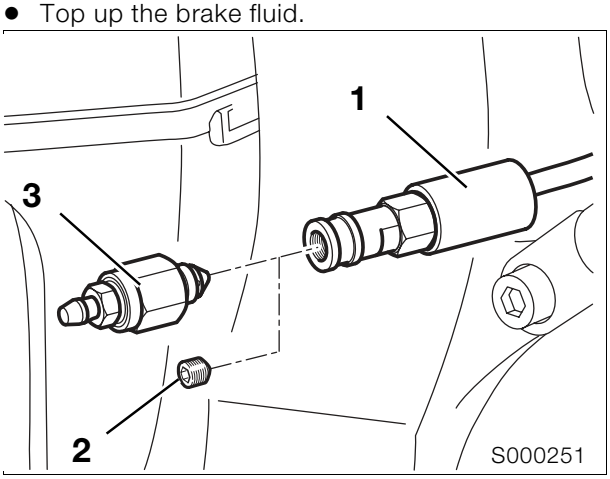
Changing the clutch fluid

(Inspections III and IV)
Every 40 000 km (24 000 miles) or every 2 years at the latest

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

Note:
The description applies to a brake system filling and bleeding device with vacuum extraction of brake fluid at the bleed line.
If other devices are used, comply with their manufacturers' instructions.

- Place the motorcycle on the auxiliary stand, **BMW No. 00 1 560**, and turn the handlebars fully to the right.
- Remove reservoir cover with rubber diaphragm.
- Top up the brake fluid.



- Pull back protective hose (1).
- Wrap a cloth around the filler adapter.
- Remove socket-head grubscrew (2) from the filler adapter.
- Connect the brake bleeding device to bleed screw (3).
- Fully tighten the bleed screw in the filler adapter (valve in filler adapter closed).
- Open the bleed screw by half a turn (valve open).
- Draw off brake fluid until it emerges clear and free from air bubbles.

Caution:
While bleeding the system, do not allow the brake fluid level to drop below the bottom edge of the ring mark, as otherwise air will be drawn into the clutch system. Bleed the system again if this happens.

- Remove the bleed screw.
- Disconnect the brake bleeding device from the bleed screw.
- Install socket-head grub screw (2) in the filler adapter and tighten.

Caution:
The motorcycle is not permitted on the road without the grubscrew in place and secure in the filler adapter.



- Correct the fluid level.
- Place the reservoir cover with rubber diaphragm in position.
- Tighten the reservoir cover without using force.

Tightening torque:
Grubscrew in filler adapter ..... 10 Nm

Consumables
Brake fluid.....DOT 4

Checking tightness of rear wheel studs

(Inspection I)

- Check security of the rear wheel studs with a torque wrench.

Tightening torque:
Rear wheel studs ..... 105 Nm

Checking rear wheel bearing play by tilting wheel

(Inspection III)

- Tilt the rear wheel to and fro across its axle.
- If play is detected, fit new shims to rear wheel drive or replace bearings.

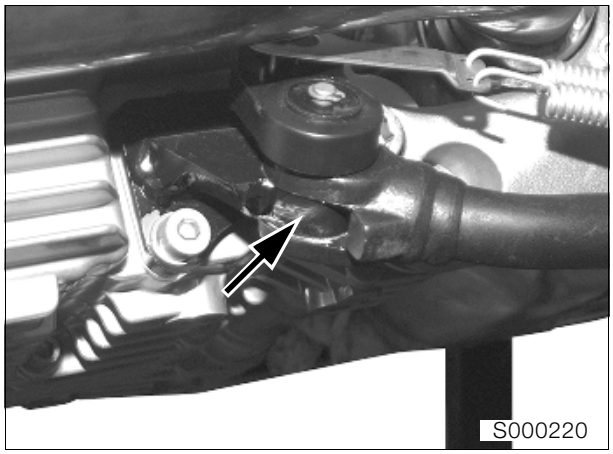
Checking swinging arm bearings, adjusting if necessary

(Inspections I and III)

- Grip rear tyre and try to move it sideways, bracing against the frame.

Greasing the side stand pivot

(Inspections I, II and III)



- Check free movement of side stand and grease if necessary.
- Grease pivot point (arrow).

Lubricant:
For side stand pivot..... Shell Retinax EP2

Checking function of side stand switch

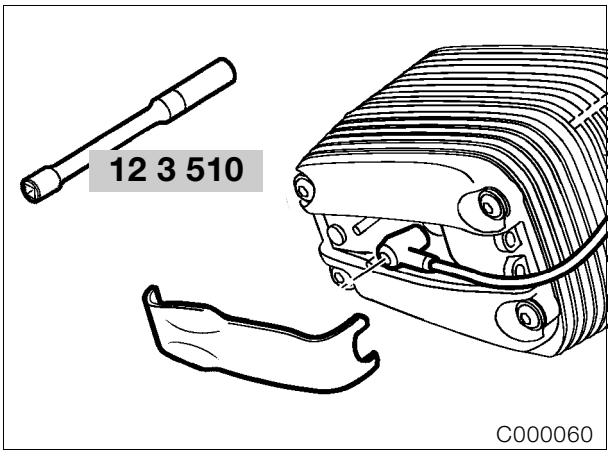
(Inspections I, II, III and IV)

- Place the motorcycle on the auxiliary stand, **BMW No. 00 1 560**.
- Select a gear and switch on the ignition.
- Slowly extend the side stand and watch the neutral indicator light.

Note:
As the stand is extended, the neutral indicator light must come on briefly.

Checking/replacing spark plugs

(Inspection II) check/(Inspection III) replace



- Remove spark plugs with the spark plug wrench, **BMW No. 12 3 510**.

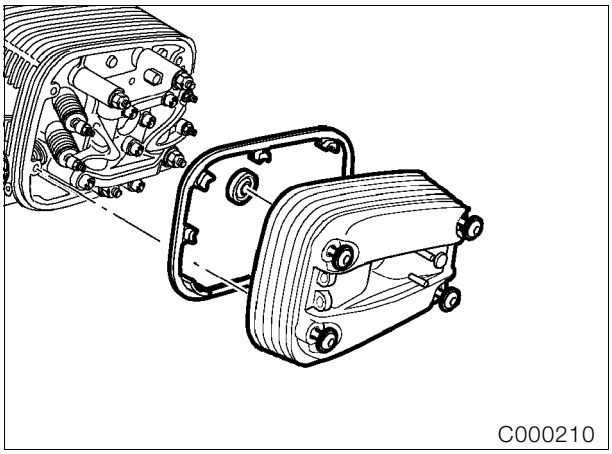
Caution:
Do not bend electrodes – risk of breakage!

Electrode gap: ..... 0.8 mm (0.031 in)
Gap wear limit:..... 1.0 mm (0.039 in)

Tightening torque:
Spark plug ..... 20 Nm

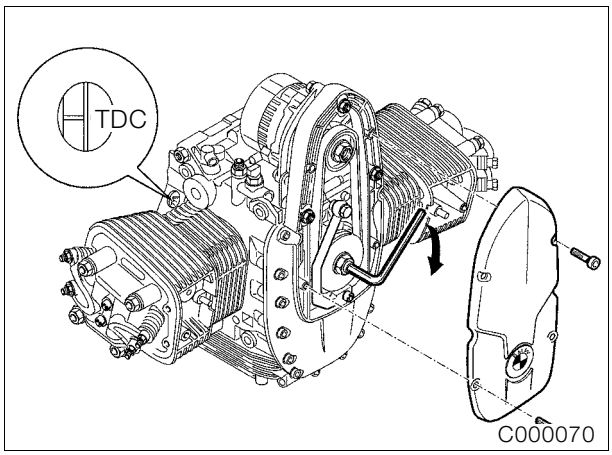
Tightening cylinder heads

(Inspection I)



- Remove cylinder head cover.

Caution:
Catch escaping oil.



- Select a gear and turn the rear wheel, or set the piston to TDC on the ignition stroke by turning the belt pulley.

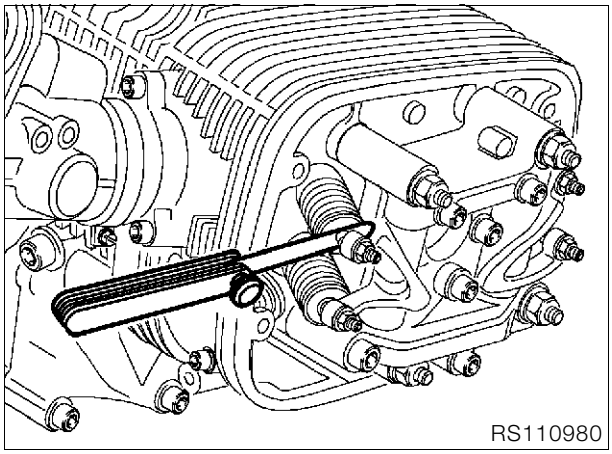
Top dead centre on ignition stroke:
- The TDC mark is visible and the inlet and exhaust valves in the cylinder concerned are closed.

- Tighten cylinder head nuts.

Tightening procedure after 1 000 km (600 miles)
1. Tighten the cylinder head nuts one after the other in diagonally opposite sequence
1.1. Slacken off one nut at a time
1.2. Tighten nut to initial torque ..... 20 Nm
1.3. Tighten nut to specified wrench angle ..... 180°
2. Release/retighten M10 screw ..... 40 Nm

Checking/adjusting valve clearances

(Inspections I, II and III)



- Check valve clearance with feeler gauge and, if necessary, correct with adjusting screw.

Adjust valve clearances with the engine cold (max. 35 °C/95 °F):
Inlet ..... 0.15 mm (0.006 in)
Exhaust ..... 0.30 mm (0.012 in)

Tightening torque:
Locknut ..... 8 Nm

- Recheck valve clearances after adjusting. Feeler gauge must pull through between valve stem and adjusting screw with slight resistance.
- Assemble in the reverse of the disassembly procedure.

Caution:
Make sure that gasket is correctly seated. Gaskets and sealing faces must be free from oil or grease.

Tightening torque:
Cylinder head cover ..... 9 Nm

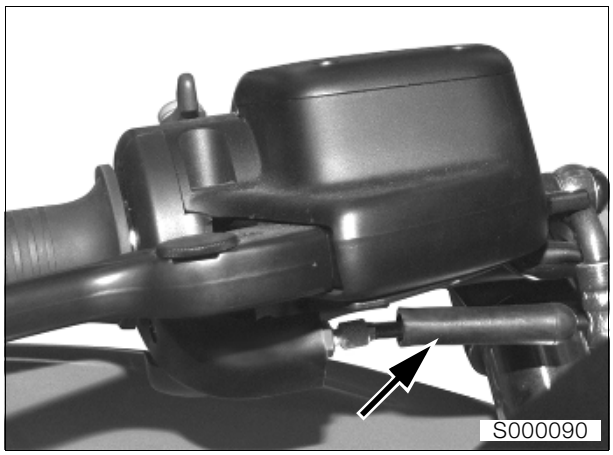
Checking throttle cable for ease of movement, abrasion and kinks; replacing if necessary
Checking throttle-cable play
Checking/adjusting idle speed and throttle-valve synchronisation

(Inspections I, II, III and IV)

- Test-drive the motorcycle until the engine is warm, or allow the engine to idle for approximately 10 minutes.

Caution:
Do not allow the engine to idle for longer than 20 minutes.

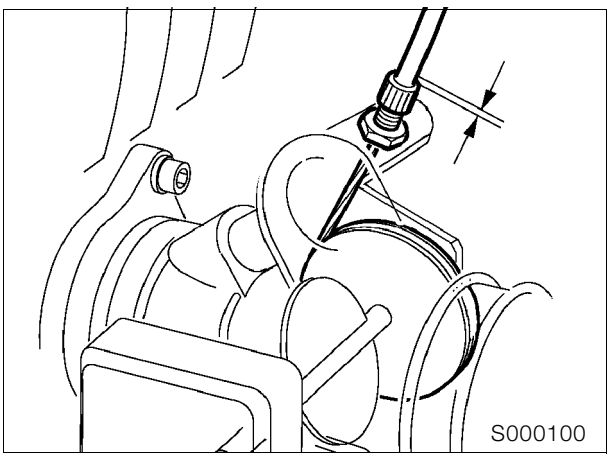
Oil temperature:.....at least 90 °C (194 °F)



- Push back rubber cap (arrow) on throttle and choke cables.
- Use the adjusting screws to adjust play of throttle and choke cables.

Play of choke cable: ..... approx. 1 mm (0.04 in)
Play of throttle cable: ..... approx. 1 mm (0.04 in)

- Remove right and left fairing panels.



- Turn the adjusting screws to adjust the play of the cables for the left and right throttle valves.

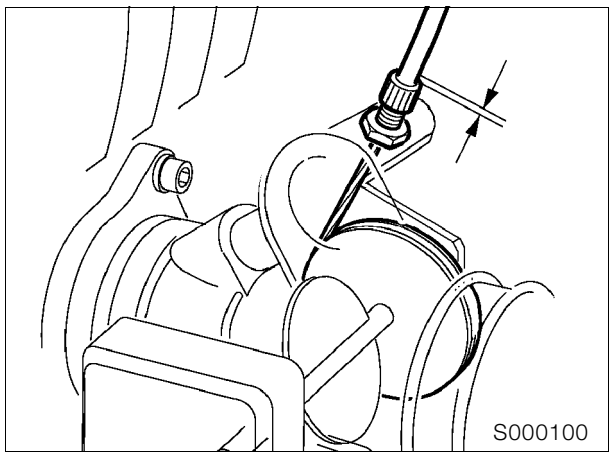
Play of throttle cable: .....approx. 2 mm (0.08 in)

- Connect hose of **BMW** Synchro to vacuum adapter and connect cables to **BMW** MoDiTeC.
- Adjust idle speed by turning the air bypass screws while checking that the carburettors are balanced.

Idle speed: ..... 1100 $^{\pm 50}$ min-1

Note:
Make sure that both throttle valves are closed.

Caution:
Do not tamper with the sealed stop screws of the throttle valves, as otherwise the idle-speed volume flow will have to be reset by the manufacturer.

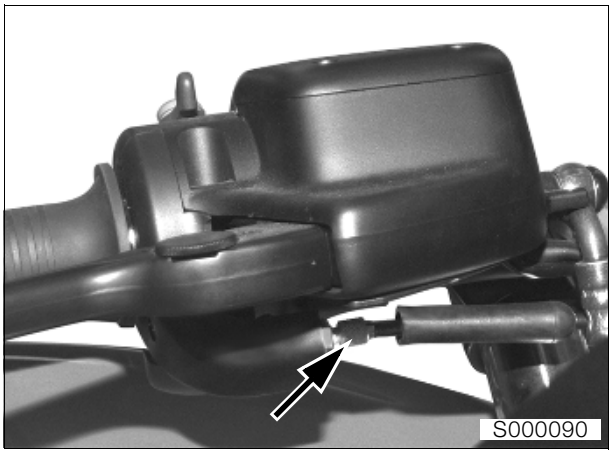


- Carefully turn the adjusting screw of the left throttle valve and reduce play until the reading of the Synchro tester changes.
- Turn the adjusting screw very slightly in the opposite direction until the reading returns to its original value.
- Tighten the locknut to secure.

Note:
Make sure that the reading does not change when you tighten the locknut.

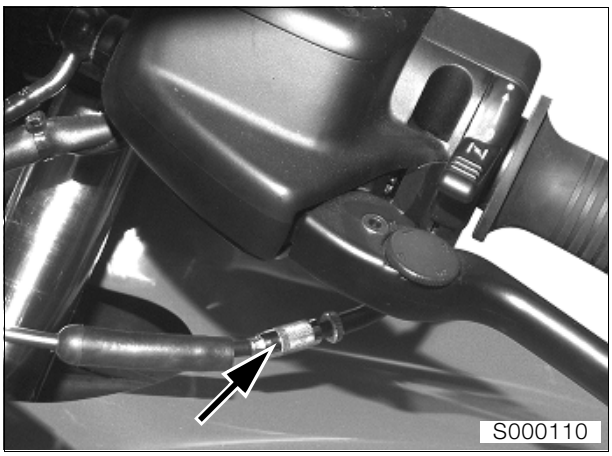
- Adjust the right throttle valve in the same way.

Note:
Zero play can cause the throttle valves to rattle.



- Use the adjusting screws (arrow) to adjust play of the throttle cables.
- Push the rubber cap into position over the adjusting screw.

Play of throttle cable: ..... approx. 0.5 mm (0.02 in)



- Use the adjusting screw (arrow) to adjust play of the choke cable to zero.
- Push the rubber cap into position over the adjusting screw.
- Move the handlebars all the way from left to right and check the settings. Make sure that engine speed does not vary when the handlebars are moved in this way.
- Repeatedly open the throttle gradually and increase engine speed from idle to approximately n = 2500 min^{-1} to check throttle-valve synchronisation. (Readings shown by Synchro tester must increase and decrease together). If necessary, correct by turning the adjusting screws of the connecting cable.

Note:
Make sure that when the throttle grip is released both throttle valves return to their fully closed positions.

- Tighten the locknuts and recheck carburettor balance.
- Seal off the vacuum bores.

Final inspection with road safety and functional check

(Inspections I, II, III and IV)

Road safety check
- Check wheels and tyres.
- Check/correct tyre pressures.
- Wait at least 10 minutes after the trial run/road test before checking/correcting engine oil level.

Tyre pressures:
Solo ..... front 2.2 bar (31.3 psi)
..... rear 2.5 bar (35.6 psi)
Two up..... front 2.5 bar (35.6 psi)
..... rear 2.7 bar (38.4 psi)
Two up + luggage ..... front 2.5 bar (35.6 psi)
..... rear 2.9 bar (41.2 psi)

Roadworthiness check
- Lights
- Telltale/warning lights
- Horn
- Instruments
- Special equipment
- Clutch
- Gear shift
- Steering
- Foot brake and handbrake
- If necessary, take the motorcycle for a test ride.

11 Engine

Contents

Page

Technical Data 5

Cutaway drawing of engine
Lubricating-oil circuit 11

Cooling-oil circuit 13

Removing engine 15

Disassembling engine 17

Removing cylinder head cover 18

Locking the engine at TDC 19
- Firing TDC 19

Removing and installing chain tensioner 20
- Work instructions, timing-chain tensioner 20

Removing valve gear holder 21

Disassembling/assembling valve gear holder 22

Removing cylinder head 24

Disassembling, checking, repairing and reassembling cylinder head 25
- Removing and installing valves 25
- Removing valve stem seals 25
- Checking valves for wear 26
- Remachining valve seat 26
- Checking and repairing cylinder head 26
- Checking valve guide for wear 26
- Replacing valve guides 27
- Installing valve and valve stem seal 28

Removing cylinder 29

Removing and disassembling piston 29

Checking pistons and cylinders 30

Assembling pistons 30

Removing and installing conrod 31

Removing and installing alternator mount cover with engine installed 32

Removing alternator mount cover 32

Replacing radial shaft seal in alternator mount cover 32

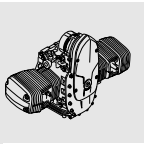
Contents

Page

Removing auxiliary shaft drive 33

Removing oil pump 34

Removing radial shaft seal from crankshaft with engine installed 35



Disassembling crankcase 36

Removing crankshaft, auxiliary shaft and timing chain tensioning and slide rails 38

Removing and installing oil intake strainers 39

Replacing oil level sight glass 39

Removing and installing oil thermostat 39

Removing conrods 39

Checking conrods 39

Measuring crankshaft bearing play 40
- Measuring radial bearing play 40
- Installing main bearings 41
- Measuring axial bearing play 41

Measuring big end bearing play 42

Assembling engine 43

Installing conrods 43

Installing crankshaft 44

Installing timing chain tensioning and slide rails 44

Installing auxiliary shaft/timing chains 44

Assembling engine block 45

Installing radial shaft seals on crankshaft 48
- Installing the crankshaft-end radial shaft seal 48
- Installing the clutch-end radial shaft seal 48

Installing clutch housing 49

Installing oil pump 50

Installing auxiliary shaft drive 51

Installing piston 52

Installing cylinder 53

Installing cylinder head 54

Contents

Page

Adjusting valve clearances 55

Installing right cylinder head 56
Adjustment specification 56

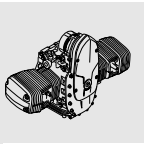
Installing left cylinder head 57
Adjustment specification 57

Installing alternator mount cover 59

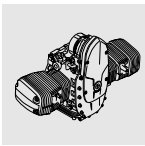
Installing magnetic gate/belt pulley 59
Timing the ignition 60

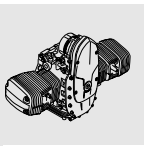
Installing alternator 61

Installing engine 62



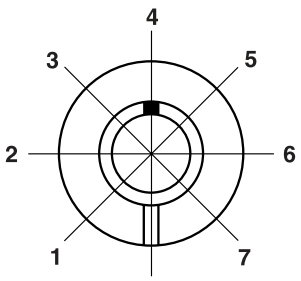
Technical Data		R 1100 S
Engine, general		
Engine design		Four-stroke flat twin, air-cooled with oil-cooled exhaust ports, installed longitudinally, 4 valves per cylinder, two overhead camshafts, electronic fuel injection.
Location of engine number		Crankcase
Cylinder bore	mm (in)	99 (3.9)
Stroke	mm (in)	70.5 (2.78)
Effective displacement	cc	1085
Compression ratio		11.3 : 1
Power output	kW(bhp)/min^{-1}	72(98)/7500
Max. torque	Nm/min^{-1}	97/5750
Permissible maximum engine speed	min^{-1}	8210
Idle speed	min^{-1}	$1100^{\pm 50}$
Direction of rotation		Clockwise, looking at ignition system
Compression test pressure		
good	bar (psi)	above 10 (142)
normal	bar (psi)	8.5...10 (121...142)
poor	bar (psi)	below 8.5 (121)
Intake port dia./cylinder head	mm (in)	45 (1.8)
Lubrication system		
Theoretical volume in circulation at 6000 min^{-1}		
Lubricating oil	l (Imp. gal/US gal)	30 (6.6/7.9)
Cooling oil	l (Imp. gal/US gal)	33 (7.3/8.7)
Oil filter		Full-flow type
Pressure differential needed to open bypass valve	bar (psi)	1.5 (21.3)
Oil pressure warning light comes on below	bar (psi)	0.3 (4.2)
Pressure relief valve opens at	bar (psi)	5.5 (78.3)
Operating pressure	bar (psi)	3.5...6.0 (49.8...85.4)
Oil capacity Without filter change	l (Imp. pints/US quarts)	3.50 (6.16/3.70)
With filter change	l (Imp. pints/US quarts)	3.75 (6.60/3.96)
min/max	l (Imp. pints/US quarts)	0.5 (0.88/0.53)
Permissible oil consumption l/1000 km (miles per Imp. pint/miles per US quart)		1.0 (350/390)
Oil pump		
Oil pump		2 Duocentric pumps
Housing depth Cooling oil	mm (in)	11.02...11.05 (0.434...0.435)
lube oil	mm (in)	10.02...10.05 (0.394...0.396)
Height of rotor Cooling oil	mm (in)	10.95...10.98 (0.431...0.432)
lube oil	mm (in)	9.95...9.98 (0.392...0.393)
Axial play	mm (in)	0.04...0.1 (0.002...0.004)
Wear limit	mm (in)	0.25 (0.010)

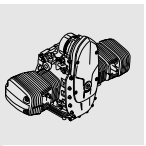




Technical Data		R 1100 S
Valves		
Included valve angle	°	41
Valve clearances with engine cold (max. 35 °C/95 °F)		
Inlet valve	mm (in)	0.15 (0.059)
Exhaust valve	mm (in)	0.30 (0.012)
Valve timing		without valve clearance, 3 mm (0.12 in) valve lift
Inlet opens		5° after TDC
Inlet closes		33° after BDC
Exhaust opens		27° before BDC
Exhaust closes		5° before TDC
		Tolerance ± 3°
Valve head dia.		
Inlet	mm (in)	34 (1.3)
Exhaust	mm (in)	29 (1.1)
Stem dia.		
Inlet	mm (in)	4.966...4.980 (0.1955...0.1960)
Wear limit	mm (in)	4.946 (0.1947)
Exhaust	mm (in)	4.956...4.970 (0.1951...0.1956)
Wear limit	mm (in)	4.936 (0.1943)
Valve head edge thickness		
Inlet	mm (in)	$1.00\ ^{\pm 0.2}$ ($0.039\ ^{\pm 0.008}$)
Wear limit	mm (in)	0.5 (0.02)
Exhaust	mm (in)	$1.00\ ^{\pm 0.2}$ ($0.039\ ^{\pm 0.008}$)
Wear limit	mm (in)	0.5 (0.02)
Max. runout of valve head at valve seat		
Inlet, exhaust	mm (in)	0.035 (0.0014)
Valve seat ring		
Valve seat angle		
Inlet	°	45
Exhaust	°	45
Valve seat width		
Inlet	mm (in)	$1.1\ ^{\pm 0.15}$ ($0.043\ ^{\pm 0.006}$)
Wear limit	mm (in)	2.5 (0.10)
Exhaust	mm (in)	$1.4\ ^{\pm 0.15}$ ($0.055\ ^{\pm 0.006}$)
Wear limit	mm (in)	3.0 (0.12)
Valve seat extl. dia. (dimension for machining seat)		
Inlet	mm (in)	$33.4\ ^{\pm 0.1}$ ($1.315\ ^{\pm 0.004}$)
Exhaust	mm (in)	$28.4\ ^{\pm 0.1}$ ($1.118\ ^{\pm 0.004}$)
Seat ring dia. (oversize +0.2 mm/+0.008 in)		
Inlet	mm (in)	36.617...36.633 (1.4416...1.4422)
Exhaust	mm (in)	32.134...32.150 (1.2651...1.2658)
Seat dia. in cylinder head (oversize +0.2 mm/+0.008 in)		
Inlet	mm (in)	36.500...36.525 (1.4370...1.4380)
Exhaust	mm (in)	32.000...32.025 (1.2599...1.2608)

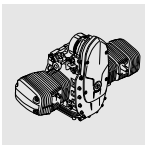
Technical Data			R 1100 S
Valve guide			
Valve guide	Extl. dia.	mm (in)	12.533...12.544 (0.4934...0.4939)
Bore in cylinder head		mm (in)	12.500...12.518 (0.4921...0.4928)
Overlap		mm (in)	0.015...0.044 (0.0006...0.0017)
Repair stages			
Replacement valve guide	Extl. dia.	mm (in)	12.550...12.561 (0.4941...0.4945)
Oversize valve guide	Extl. dia.	mm (in)	12.733...12.744 (0.5013...0.5017)
Valve guide	Intl. dia.	mm (in)	5.0...5.012 (0.1969...0.1973)
Radial clearance			
Inlet		mm (in)	0.020...0.046 (0.0008...0.0018)
Wear limit		mm (in)	0.15 (0.006)
Exhaust		mm (in)	0.030...0.056 (0.0012...0.0022)
Wear limit		mm (in)	0.17 (0.007)
Valve spring			
Spring length, off-load		mm (in)	41.1 (1.62)
Wear limit		mm (in)	39.0 (1.54)
Rocker			
Bore		mm (in)	16.016...16.027 (0.6306...0.6310)
Rocker shaft dia.		mm (in)	15.973...15.984 (0.6289...0.6293)
Radial clearance		mm (in)	0.032...0.054 (0.0016...0.0021)
Wear limit		mm (in)	0.1 (0.004)
Axial play min.		mm (in)	0.05 (0.002)
max.		mm (in)	0.40 (0.016)
Camshaft			
Opening angle, inlet/exhaust cams			300°
Cam spread, inlet/exhaust			109°/106°
Marking			Mark in position **4**
Inlet valve lift		mm (in)	9.7 (0.38) (valve clearance = 0)
Exhaust valve lift		mm (in)	9.3 (0.36) (valve clearance = 0)
Camshaft bearing bore		mm (in)	21.02...21.04 (0.8276...0.8284)
Camshaft dia.		mm (in)	20.97...21.00 (0.8256...0.8268)
Radial clearance		mm (in)	0.02...0.07 (0.0008...0.0028)
Wear limit		mm (in)	0.15 (0.006)
Width of guide bearing		mm (in)	15.92...15.95 (0.6268...0.6280)
Width of camshaft bearing		mm (in)	16.0...16.05 (0.6299...0.6319)
Axial play		mm (in)	0.08...0.13 (0.0031...0.0051)
Wear limit		mm (in)	0.25 (0.010)

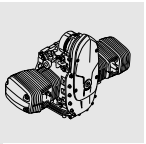




Technical Data		R 1100 S
Bucket-type tappet		
Extl. dia.	mm (in)	23.947...23.960 (0.9428...0.9433)
Bore in cylinder head	mm (in)	24.000...24.021 (0.9449...0.9457)
Radial clearance	mm (in)	0.040...0.074 (0.0016...0.0029)
Wear limit	mm (in)	0.18 (0.007)
Auxiliary shaft		
Bore in crankcase front/back	mm (in)	25.020...25.041 (0.9851...0.9859)
Auxiliary shaft dia. front/back	mm (in)	24.959...24.980 (0.9827...0.9835)
Radial clearance	mm (in)	0.040...0.082 (0.0016...0.0032)
Wear limit	mm (in)	0.17 (0.007)
Crankshaft		
Marking of main bearing and crankpin on front crank web		
no paint mark		Grinding stage 0
paint mark		Grinding stage 1 (-0.25 mm/-0.010 in)
Grinding stage 0 (grinding stage 1 = –0.25 mm/–0.01 in)		
Guide bearing bore	mm (in)	64.949...64.969 (2.5571...2.5579)
Guide bearing dia.	mm (in)	Green: 59.964...60.003 (2.3609...2.3624)
	mm (in)	Yellow: 59.974...60.013 (2.3612...2.3628)
Main bearing journal dia.	mm (in)	Green: 59.939...59.948 (2.3598...2.3602)
	mm (in)	Yellow: 59.949...59.958 (2.3602...2.3606)
Radial clearance	mm (in)	0.016...0.064 (0.0006...0.0025)
Wear limit	mm (in)	0.1 (0.004)
Main bearing bore	mm (in)	60.000...60.019 (2.3622...2.3629)
Main bearing dia.	mm (in)	Green: 54.998...55.039 (2.1653...2.1669)
	mm (in)	Yellow: 55.008...55.049 (2.1657...2.1673)
Main bearing journal dia.	mm (in)	Green: 54.971...54.980 (2.1643...2.1646)
	mm (in)	Yellow: 54.981...54.990 (2.1646...2.1650)
Radial clearance	mm (in)	0.018...0.068 (0.0007...0.0028)
Wear limit	mm (in)	0.13 (0.005)
Width of guide bearing	mm (in)	24.890...24.940 (0.9799...0.9819)
Width of main bearing journal	mm (in)	25.020...25.053 (0.9851...0.9864)
Axial play	mm (in)	0.080...0.163 (0.0031...0.0064)
Wear limit	mm (in)	0.2 (0.008)
Grinding stage 0 (grinding stage 1 = –0.25 mm/–0.01 in)		
Crankpin dia.	mm (in)	47.975...47.991 (1.8888...1.8894)
Width of crankpin	mm (in)	22.065...22.195 (0.8687...0.8738)

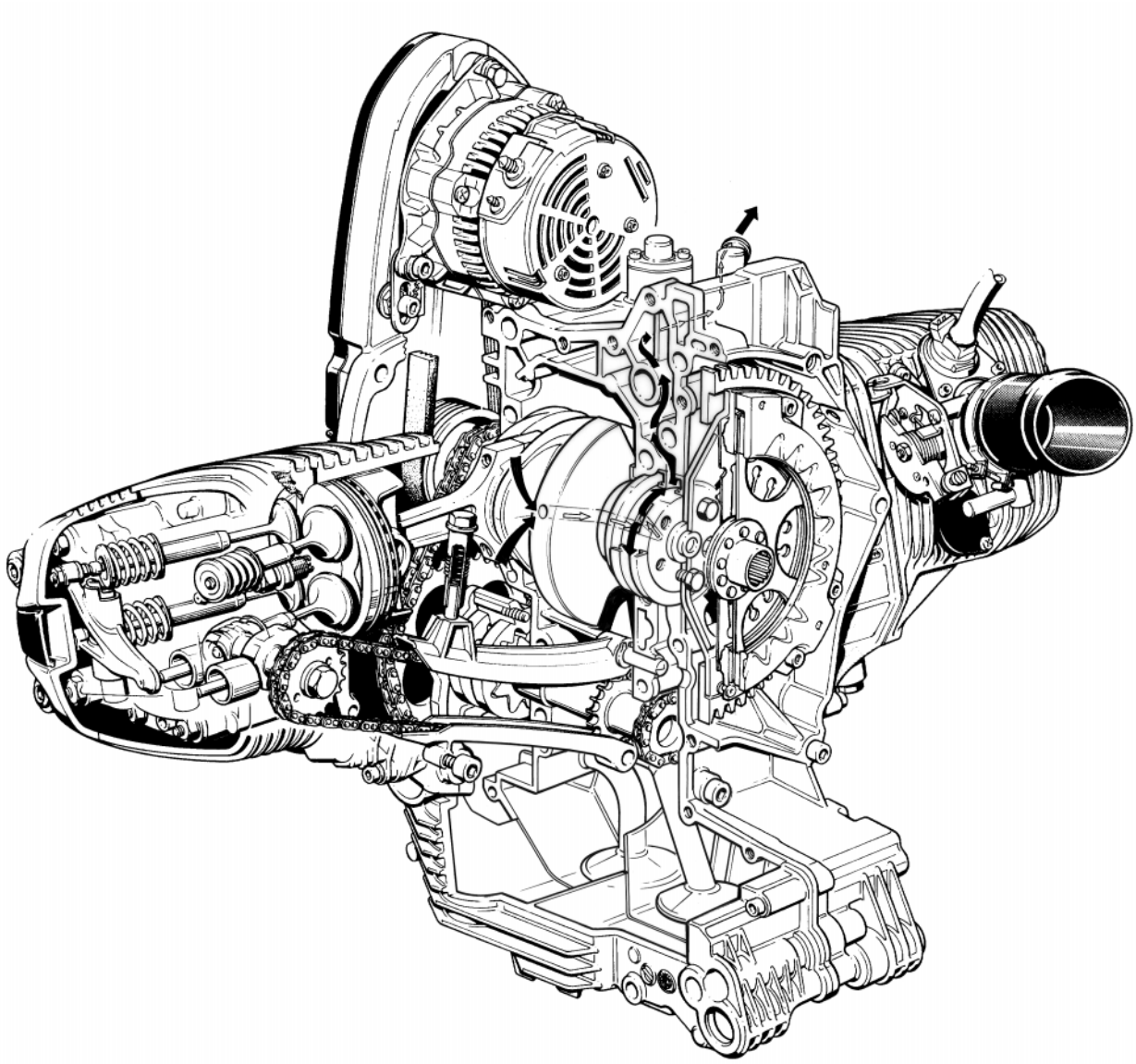
Technical Data		R 1100 S
Connecting rod		
Big-end bore	mm (in)	51.000...51.013 (2.0079...2.0084)
Big end bearing dia.	mm (in)	48.016...48.050 (1.8904...1.8918)
Radial clearance	mm (in)	0.025...0.075 (0.010...0.0030)
Wear limit	mm (in)	0.13 (0.005)
Width of big end bearing eye	mm (in)	21.883...21.935 (0.8616...0.8636)
Conrod end float	mm (in)	0.130...0.312 (0.0051...0.0123)
Wear limit	mm (in)	0.5 (0.02)
Small-end bore	mm (in)	22.015...22.025 (0.8664 ... 0.8671)
Radial clearance	mm (in)	0.015...0.030 (0.0006...0.0012)
Wear limit	mm (in)	0.06 (0.002)
Distance between centers	mm (in)	125 (4.92)
Max. deviation from parallel of conrod bores at distance of 150 mm (5.90 in)	mm (in)	0.07 (0.003)
Cylinders		
Bore		(20 mm/0.79 in from top edge)
A	mm (in)	98.992...99.000 (3.8974...3.8977)
Wear limit	mm (in)	99.050 (3.8997)
B	mm (in)	99.000...99.008 (3.8977...3.8980)
Wear limit	mm (in)	99.058 (3.9000)
Total wear clearance of piston and cylinder	mm (in)	0.12 (0.005)
Permitted out-of-round of cylinder bore		
20 mm (0.79 in) from the top edge	mm (in)	0.03 (0.001)
100 mm (3.94 in) from the top edge	mm (in)	0.04 (0.002)
Pistons		
Piston dia.		(Measuring plane A – see Checking pistons and cylinders)
A	mm (in)	98.971...98.983 (3.8966...3.8970)
Wear limit	mm (in)	98.895 (3.8936)
B	mm (in)	98.983...98.995 (3.8970...3.8975)
Wear limit	mm (in)	98.905 (3.8940)
AB	mm (in)	98.979...98.987 (3.8969...3.8972)
Wear limit	mm (in)	98.900 (3.8938)
Installed clearance	mm (in)	0.005...0.029 (0.0002...0.0011)
Total wear clearance of piston and cylinder	mm (in)	0.12 (0.005)
Piston pin bore	mm (in)	22.005...22.011 (0.8664...0.8666)
Weight classes		+ and –
Weight difference in one class	grammes (oz.)	10 (0.353) (complete with pins and rings)
Direction of installation		Arrow on piston crown pointing to exhaust side Production locating point towards exhaust side (see Installing piston)



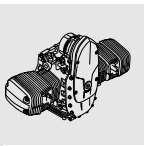


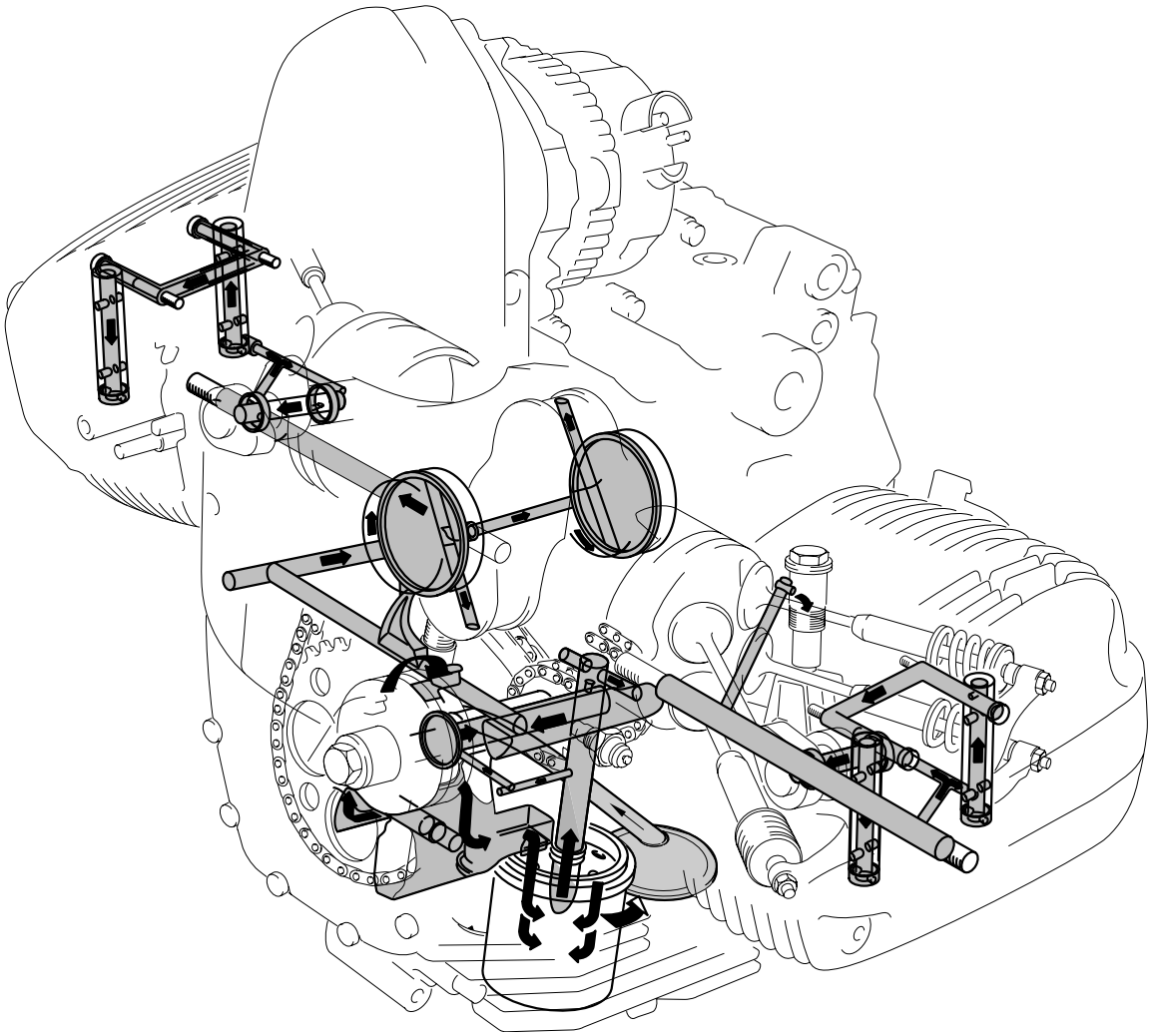
Technical Data			R 1100 S
Piston rings			
1st groove	Piston ring asymmetric, convex oval		
	Thickness	mm (in)	1.170...1.190 (0.0461...0.0469)
	Wear limit	mm (in)	1.1 (0.04)
End gap		mm (in)	0.1...0.3 (0.004...0.012)
	Wear limit	mm (in)	0.8 (0.03)
Side clearance		mm (in)	0.030...0.070 (0.0012...0.0027)
	Wear limit	mm (in)	0.15 (0.006)
2nd groove	Micro-taper compression ring		
	Thickness	mm (in)	1.175...1.190 (0.0463 ...0.0469)
	Wear limit	mm (in)	1.1 (0.04)
End gap		mm (in)	0.1...0.3 (0.004...0.012)
	Wear limit	mm (in)	0.8 (0.03)
Side clearance		mm (in)	0.030...0.065 (0.0012...0.0026)
	Wear limit	mm (in)	0.15 (0.006)
3rd groove	3 - S ring		
	Height	mm (in)	2.0 (0.078)
	Wear limit	mm (in)	1.9 (0.075)
End gap		mm (in)	0.30...0.60 (0.012...0.024)
	Wear limit	mm (in)	1.20 (0.047)
Side clearance		mm (in)	0.020...0.055 (0.0008...0.0022)
	Wear limit	mm (in)	0.15 (0.006)
Installed direction of piston rings			“Top” marking uppermost
Piston pin			
Piston pin dia.		mm (in)	21.995...22.000 (0.8664...0.8662)
	Wear limit	mm (in)	21.960 (0.8646)
Bore in piston		mm (in)	22.005...22.011 (0.8664...0.8666)
Radial clearance in piston		mm (in)	0.005...0.016 (0.0002...0.0006)
	Wear limit	mm (in)	0.070 (0.0028)

Cutaway drawing of engine

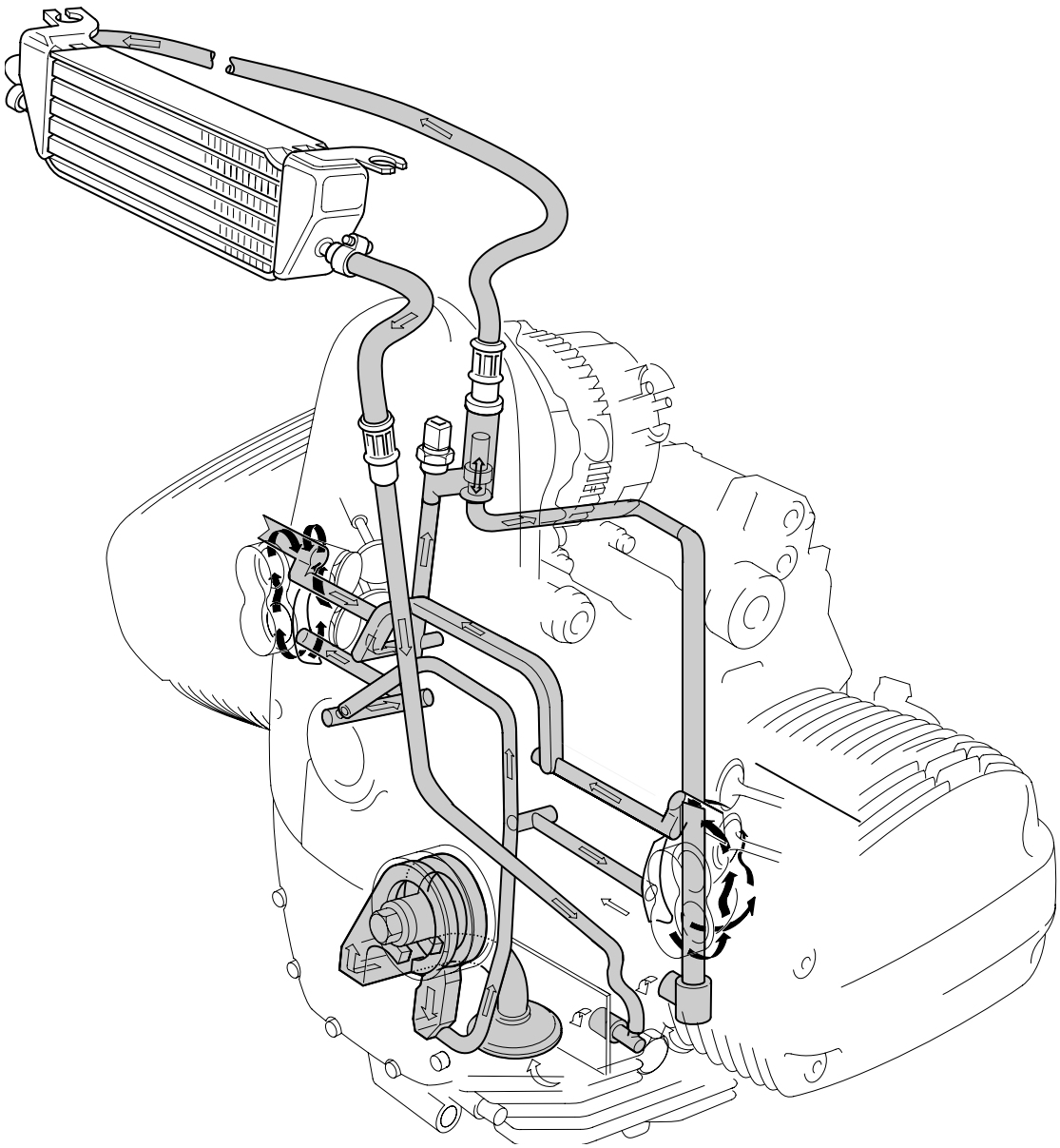


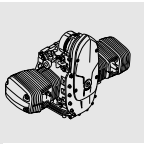
Lubricating-oil circuit





Cooling-oil circuit

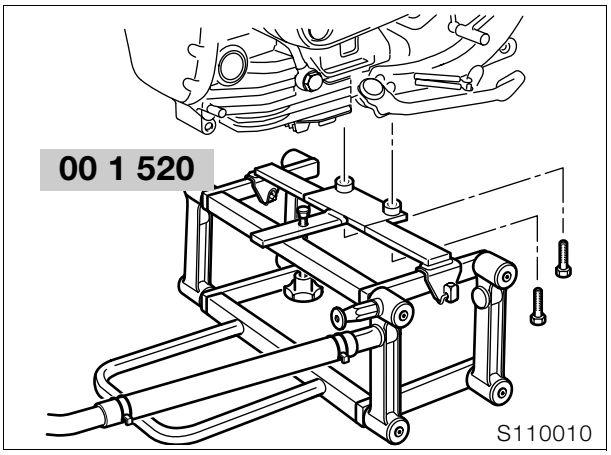




Removing engine

Note:
Auxiliary shaft, timing chains, chain tensioner/guide rails and crankshaft can only be disassembled after the engine has been removed. All other components can be disassembled with the engine installed.

- Drain engine oil.
- **[ABS]** Fully drain the brake system.



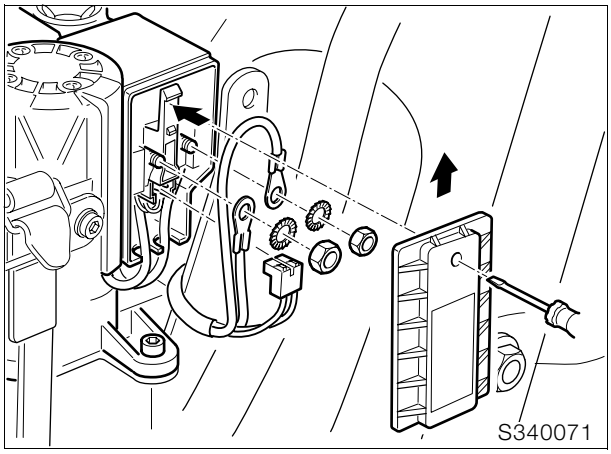
- Secure stand, **BMW No. 00 1 520**, to motorcycle.
- Remove seat.
- Remove left side trim.
- Remove right side trim.
- Remove the intake air pipe.
- Disengage the fuel tank.

Caution:
Fuel is flammable and a hazard to health. Observe relevant safety regulations.

- Seal the fuel feed and return lines with hose clips, **BMW No. 13 3 010**, and disconnect.
- Pull the plug connector off the fuel pump unit.
- Lift off fuel tank.
- Remove the battery.

Caution:
Disconnect negative terminal first, then positive terminal.

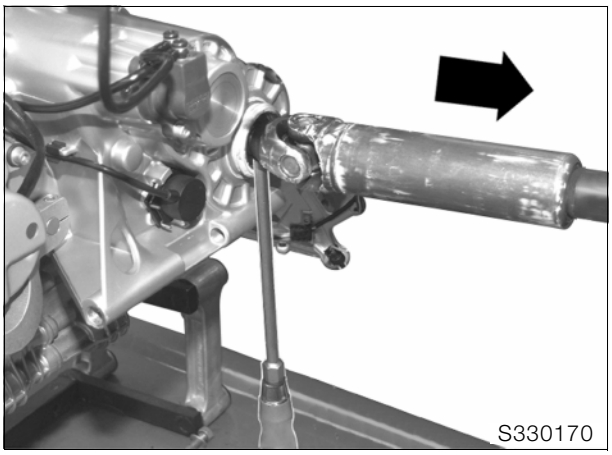
- Remove the rear brake caliper.
- **[ABS]** Remove rear sensor.
- Remove inductive sensor from rear wheel drive.
- The motorcycle is heavy at the rear; use a ratchet-lock belt to pull the motorcycle down at the nose on the lifting platform.
- Remove rear wheel.
- Remove retainer from rubber bellows of swinging arm at rear wheel drive.
- Swinging-arm bearing studs are secured with Loctite: heat to max. 120 °C (248 °F) to release.
- Slacken nut of swinging-arm floating bearing.
- Loosen the floating bearing stud bolt.
- Loosen the fixed bearing stud bolt.
- Disengage reaction link from rear wheel drive.
- Remove fixed and floating bearing stud bolts and remove rear wheel drive.
- Remove screw at top of suspension strut.
- **[ABS]** Disconnect plug from pressure modulator.
- **[ABS]** Disconnect brake lines from pressure modulator.



- **[ABS]** Remove cover and disconnect cables.

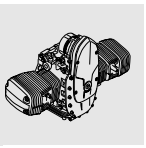
Caution:
Comply exactly with the instructions in the Repair Manual.
➡Group 34/Removing ABS unit

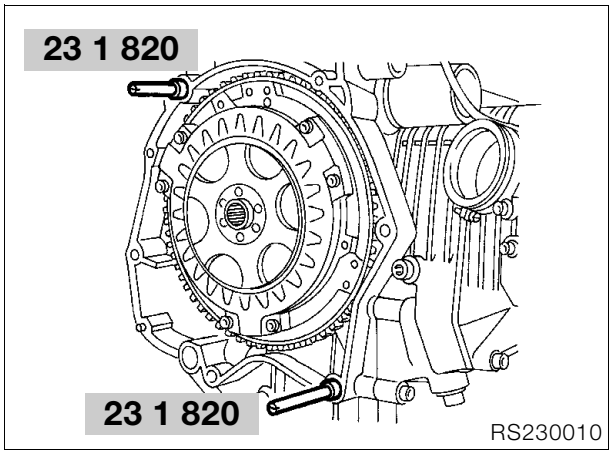
- **[ABS]** Remove the pressure modulator.
- Remove the rear side panel on the right.
- Disconnect plug for rear wiring harness.
- **[ABS]** Disconnect sensor plug.
- Disconnect plug for brake-light switch.
- Disconnect plug for inductive sensor, speedometer.
- Release right footrest plate.
- **[ABS]** Remove rear brake lines.
- Disconnect gearshift linkage at ball head.
- Disconnect plug for lambda sensor.
- Disconnect rear silencer from front silencer.
- Remove lambda sensor.
- Disconnect main frame and use workshop crane, **BMW No. 46 5 640**, to lift main frame.



- Use a screwdriver to press out the universal shaft.
- Disconnect plug for air-temperature sensor from air filter box.
- Release hose clips at the air intake necks.
- Push the air intake necks into the air filter box.

- Use pliers, **BMW No. 17 5 500**, to release hose clip securing breather hose to air filter box.
- Remove air filter box.
- Remove starter-motor cover.
- Remove the starter motor.
- Disconnect plug for gearshift switch.
- Release the clutch slave cylinder and pull it out of the housing.
- Release the battery carrier can pull it up and out of the rubber mount.
- Remove the fuel distributor with injectors.
- Remove the gearbox securing screws.





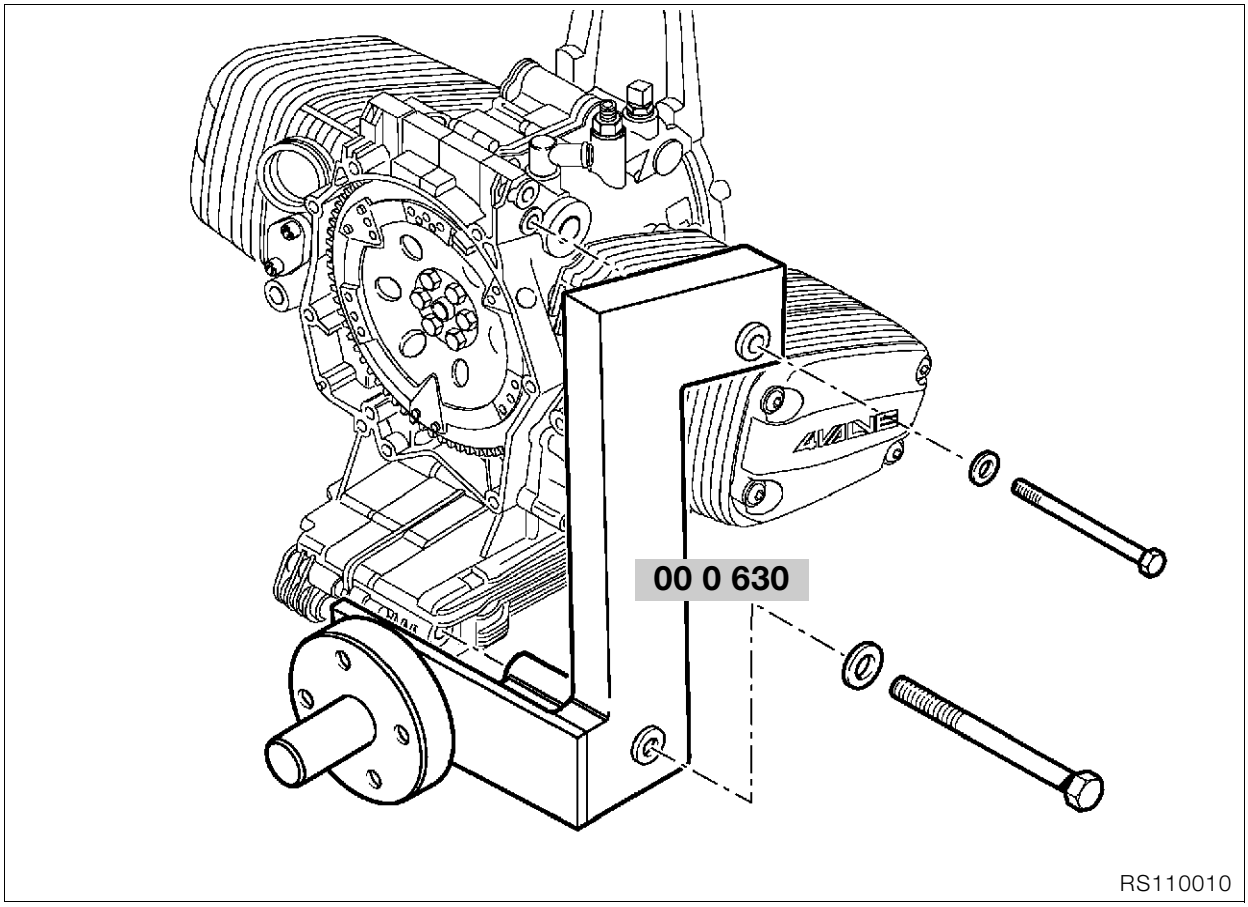
- Always use guide pins, **BMW No. 23 1 820**, when removing or installing the gearbox.
- Remove the windshield.
- Secure the top fork bridge to workshop crane, **BMW No. 46 5 640**.
- Disconnect suspension strut from leading link.
- Heat the ball joint mount at the leading link to max. 120 °C (248 °F) and disengage.
- Release throttle flap stub pipes.
- Remove the leading link caps.
- Remove the left screw cap.
- Remove the circlip at the right and the safety cap.
- Remove the screw at the right and pull the shaft out to the left.

Caution:
Do not scratch the surface of the leading link.

- Pull telescopic fork forwards.
- Remove the leading link.
- Disconnect oil cooler return line from oil cooler.
- Remove screws securing oil cooler return line to fairing bracket.
- Disconnect oil cooler supply line from engine.
- Disconnect plug for oil-temperature sensor.
- Disconnect plug for oil-pressure switch.
- Disconnect cables from three-phase generator.
- Disconnect cables from cable guide/engine.
- Disconnect plug from Hall sensor.
- Remove bolts from front frame.
- Pull off spark plug caps with special puller, **BMW No. 12 3 520**.
- Disconnect Motronic control unit.
- Remove battery carrier.
- Disconnect ground cable from engine.
- Disconnect plug for side stand.
- Remove side stand with retaining plate.
- Remove manifolds.
- Remove front silencer.
- Use a strap with ratchet latch to secure bottom fork bridge to top fork bridge.

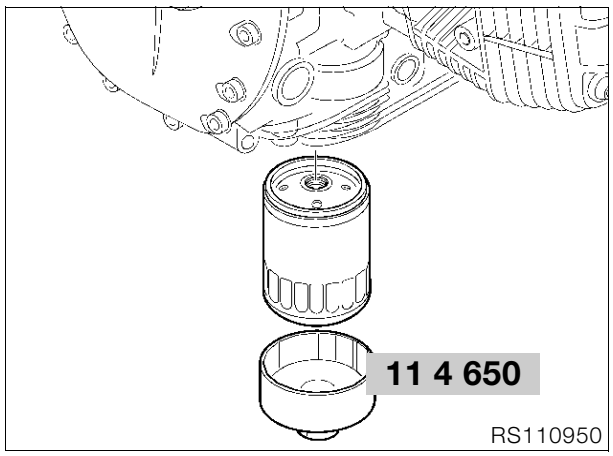
Note:
This precaution is necessary, as otherwise the fork would fall apart.

- Use workshop crane to raise the entire front end of the motorcycle.
- Installation is the reverse of the removal procedure.

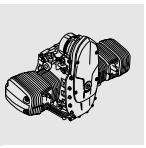


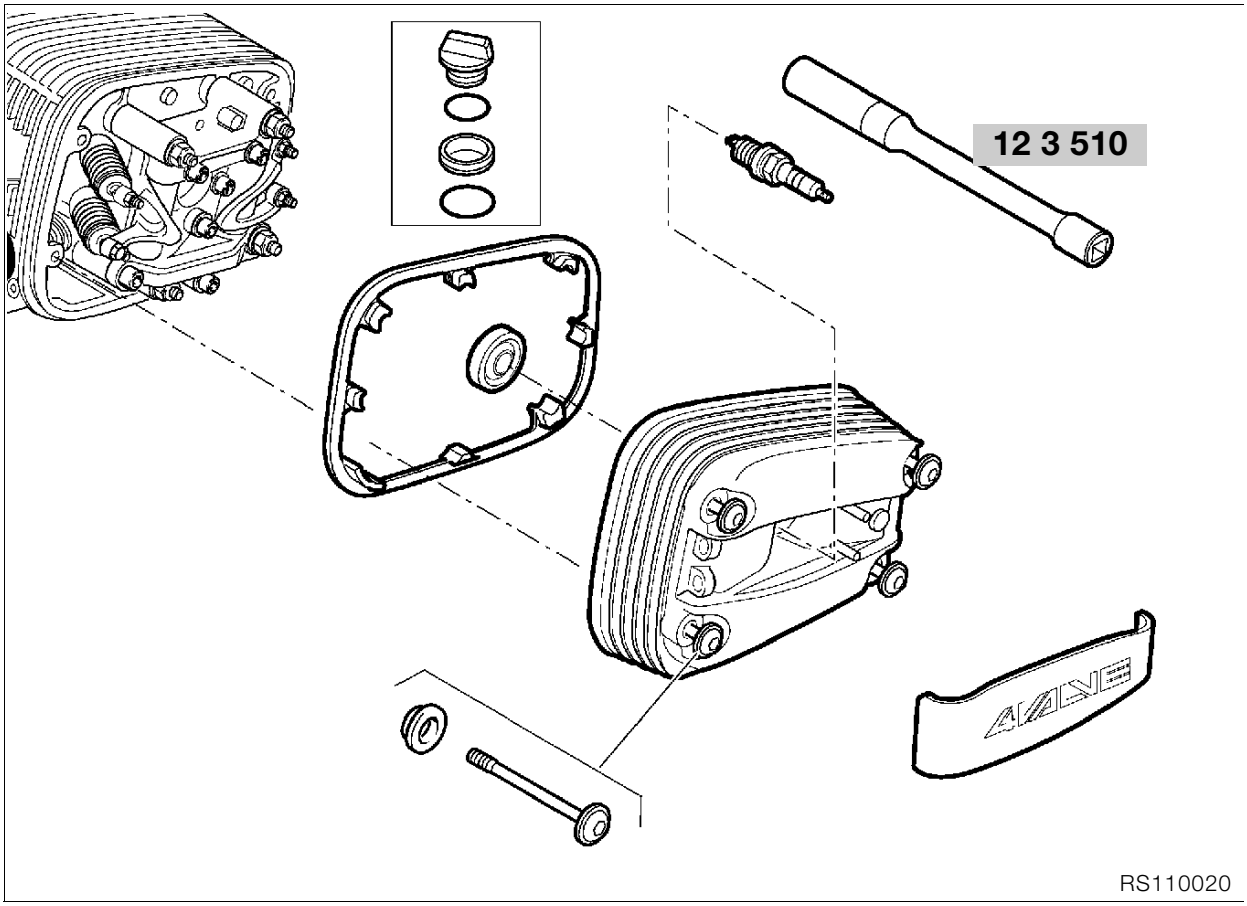
Disassembling engine

- Secure engine mount, **BMW No. 11 0 630**, to the engine block.
- Transfer engine to assembly frame.



- Drain engine oil.
- Remove the oil filter, using oil filter wrench, **BMW No. 11 4 650**.

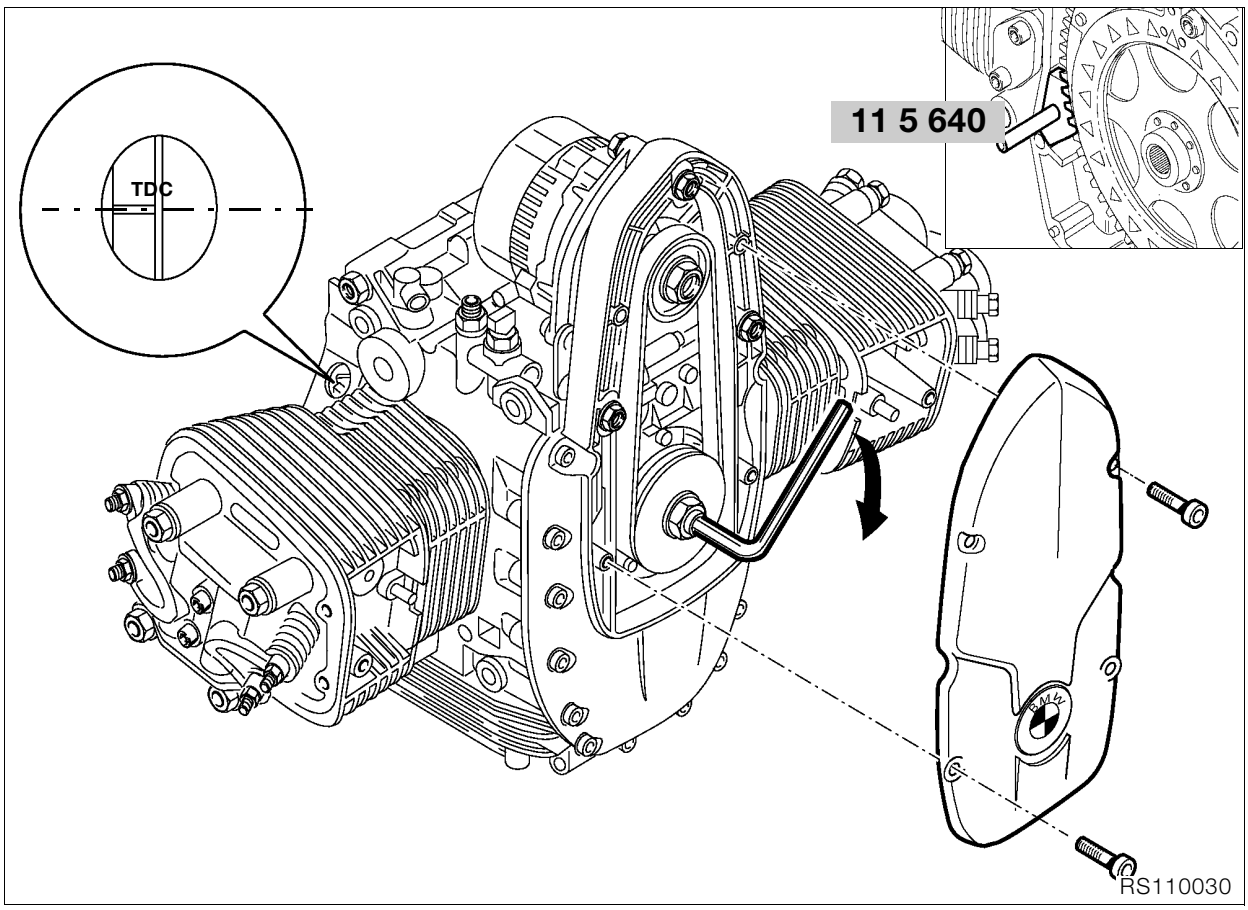




Removing cylinder head cover

- Remove spark plugs with the spark plug wrench, **BMW No. 12 3 510**.
- Remove cylinder head cover.

⚠ Caution:
Catch escaping oil.



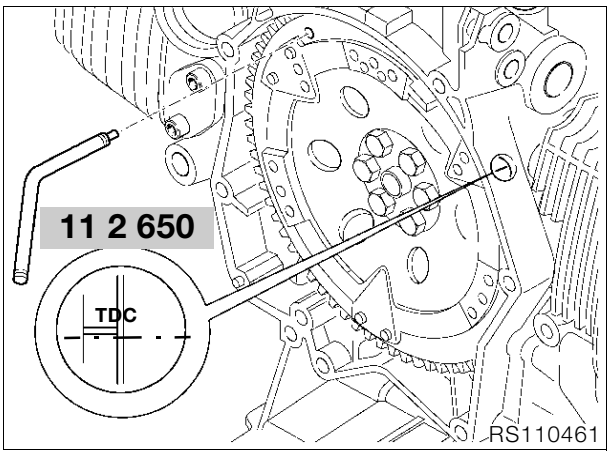
Locking the engine at TDC

- Remove front cover.
- Turn the belt pulley to bring the piston to firing TDC.

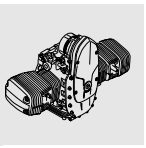
Firing TDC

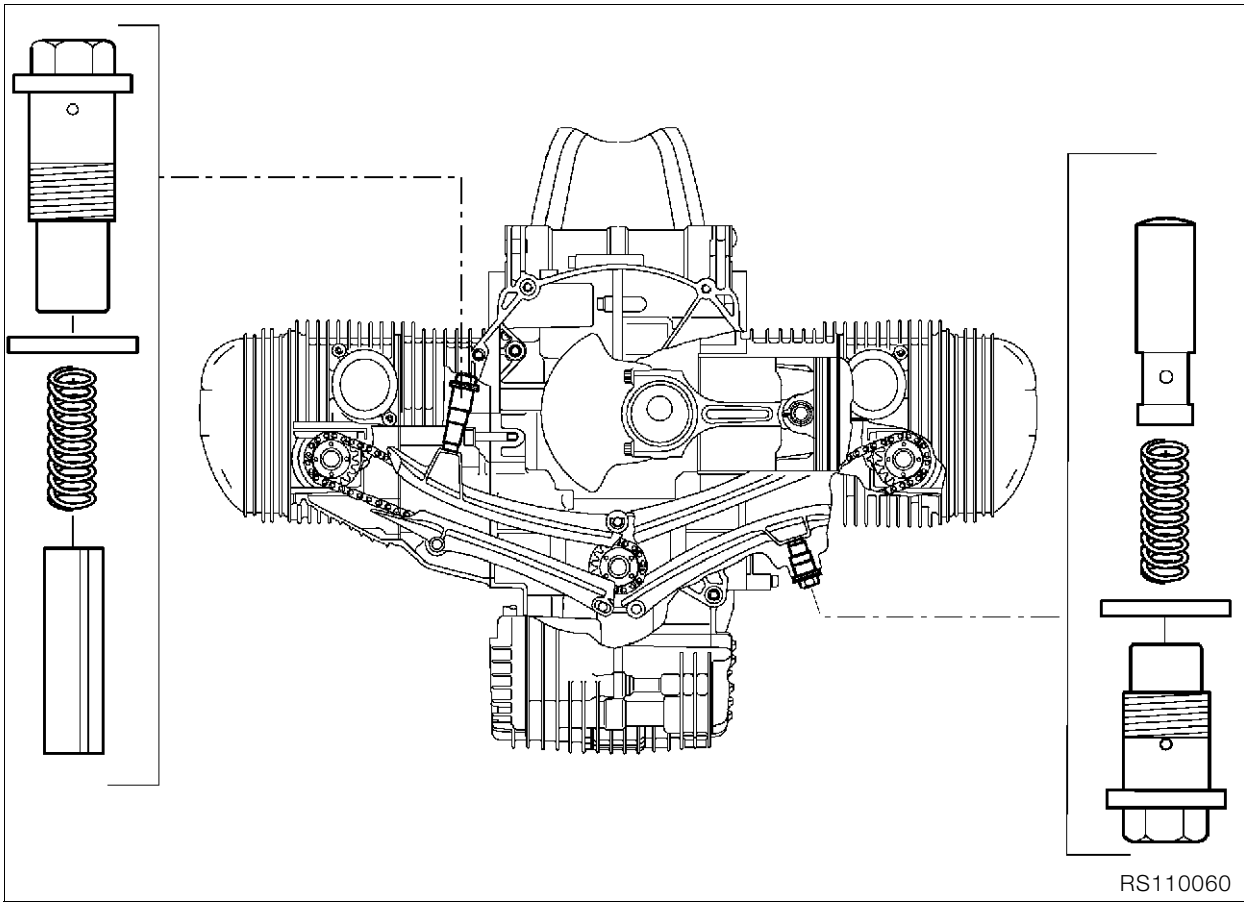
1. TDC mark is visible, and
2. The inlet and exhaust valves of the cylinder in question are closed.

- Lock the clutch housing with special tool, **BMW No. 11 5 640**.



Note:
The engine can be locked at TDC by inserting locating pin, **BMW No. 11 2 650**, through the hole in the clutch housing and the engine block.





Removing and installing chain tensioner

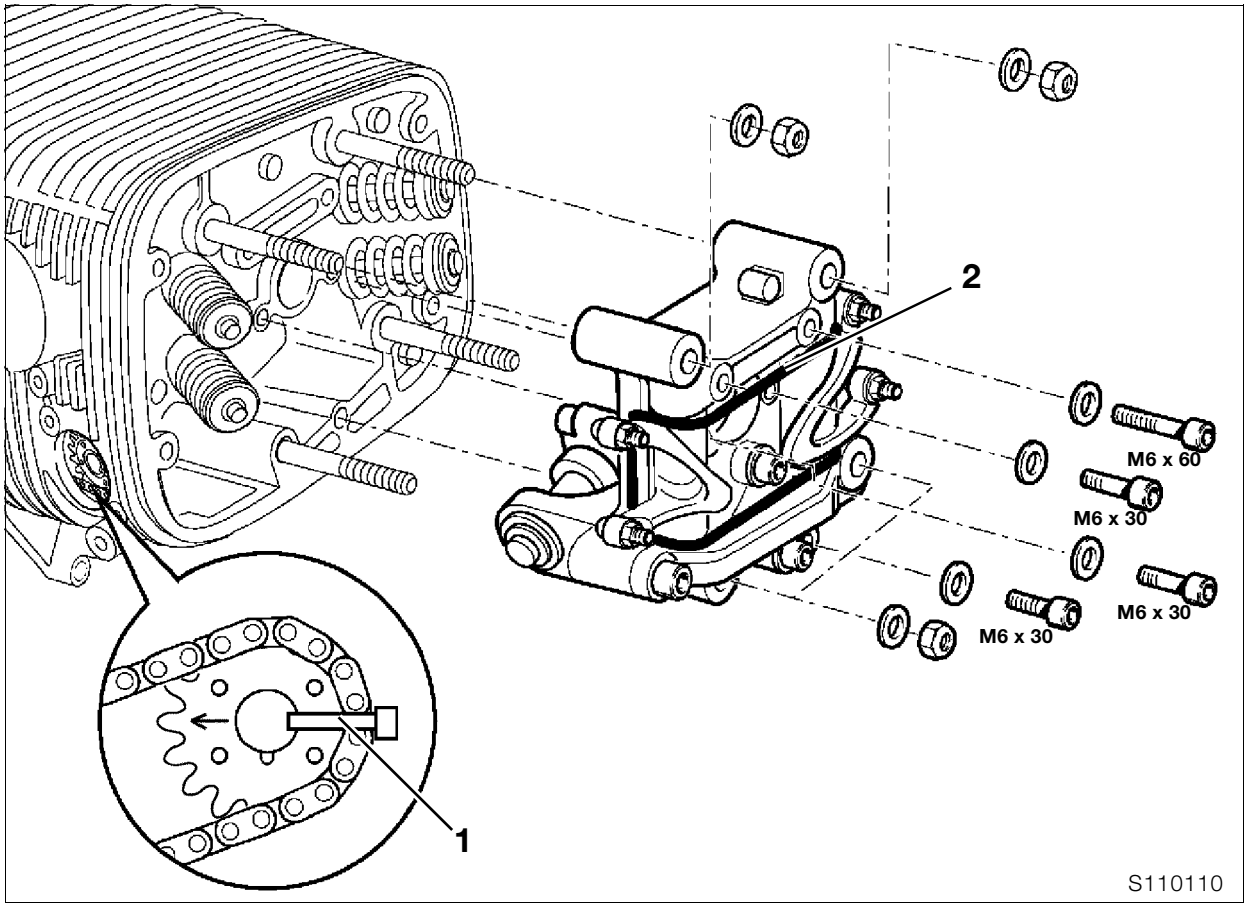
Caution:
Do not mix up the chain tensioner pistons. When installing, fit a new seal.

Work instructions, timing-chain tensioner
Removing:
- Remove timing chain tensioner, then remove camshaft sprocket from camshaft.

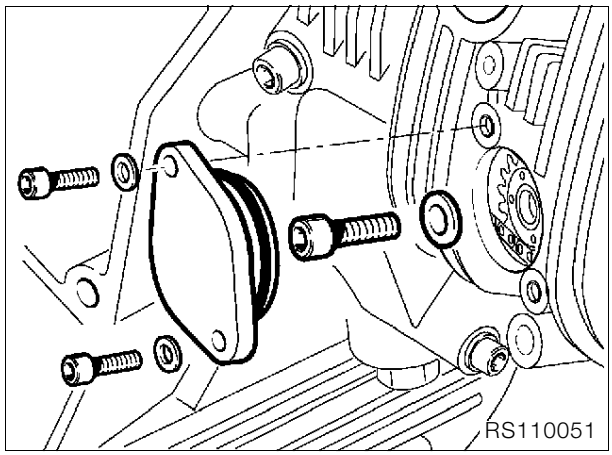
Installing:
- First install camshaft sprocket, then timing chain tensioner.

Caution:
Failure to observe this sequence can cause the chain tensioner piston on the left to drop into the timing-chain chamber.

Tightening torque:
Chain tensioner ..... 32 Nm



Removing valve gear holder

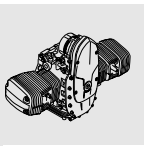


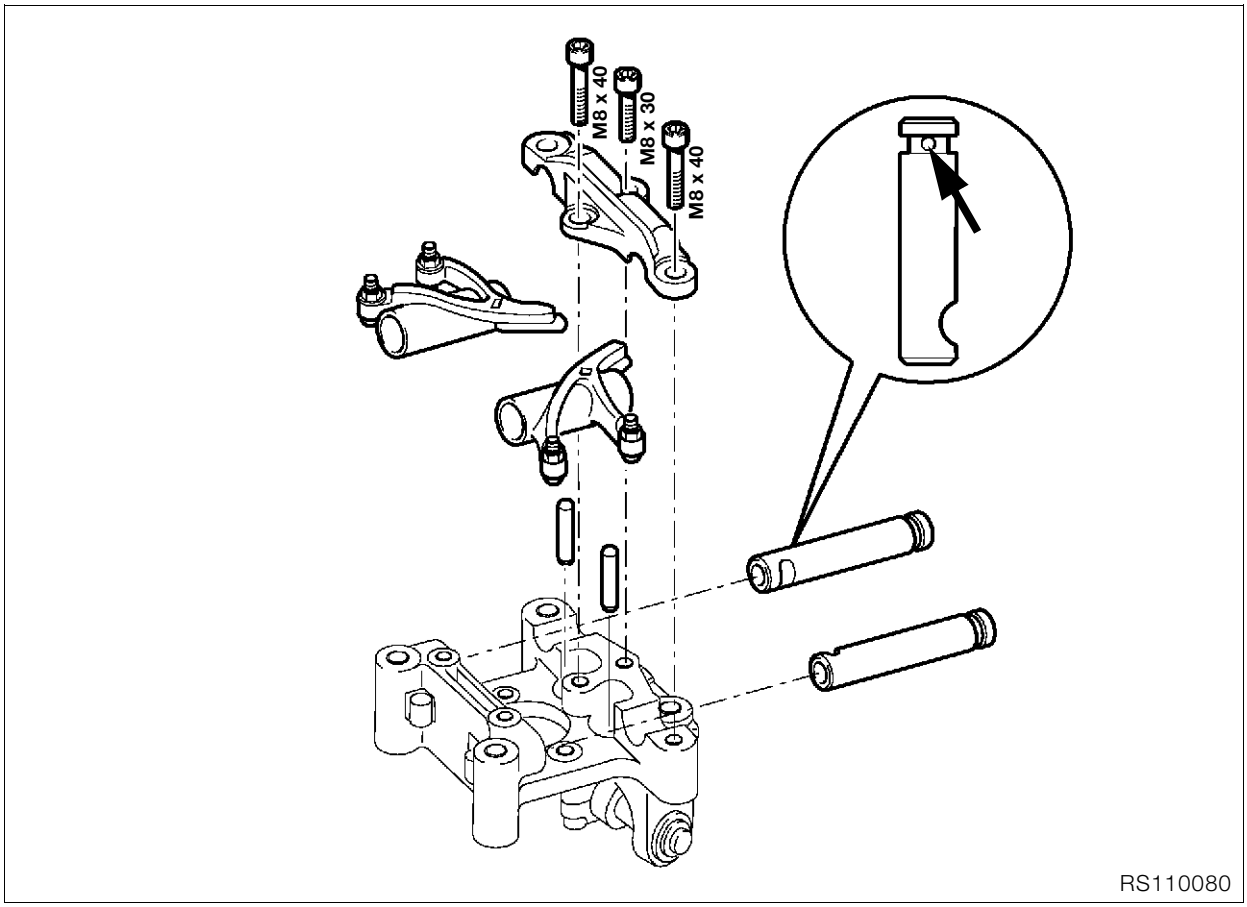
- Remove camshaft sprocket cover.
- Remove/pull off camshaft sprocket.

Note:
If the camshaft sprocket (1) is not removed after loosening, it must be held firmly and prevented from falling into the engine block (e.g. with a cable strap).

- Remove valve gear holder.
- Secure rockers with a rubber band (2).

Note:
If no work is carried out on the valve gear holder, remove it together with the cylinder head.

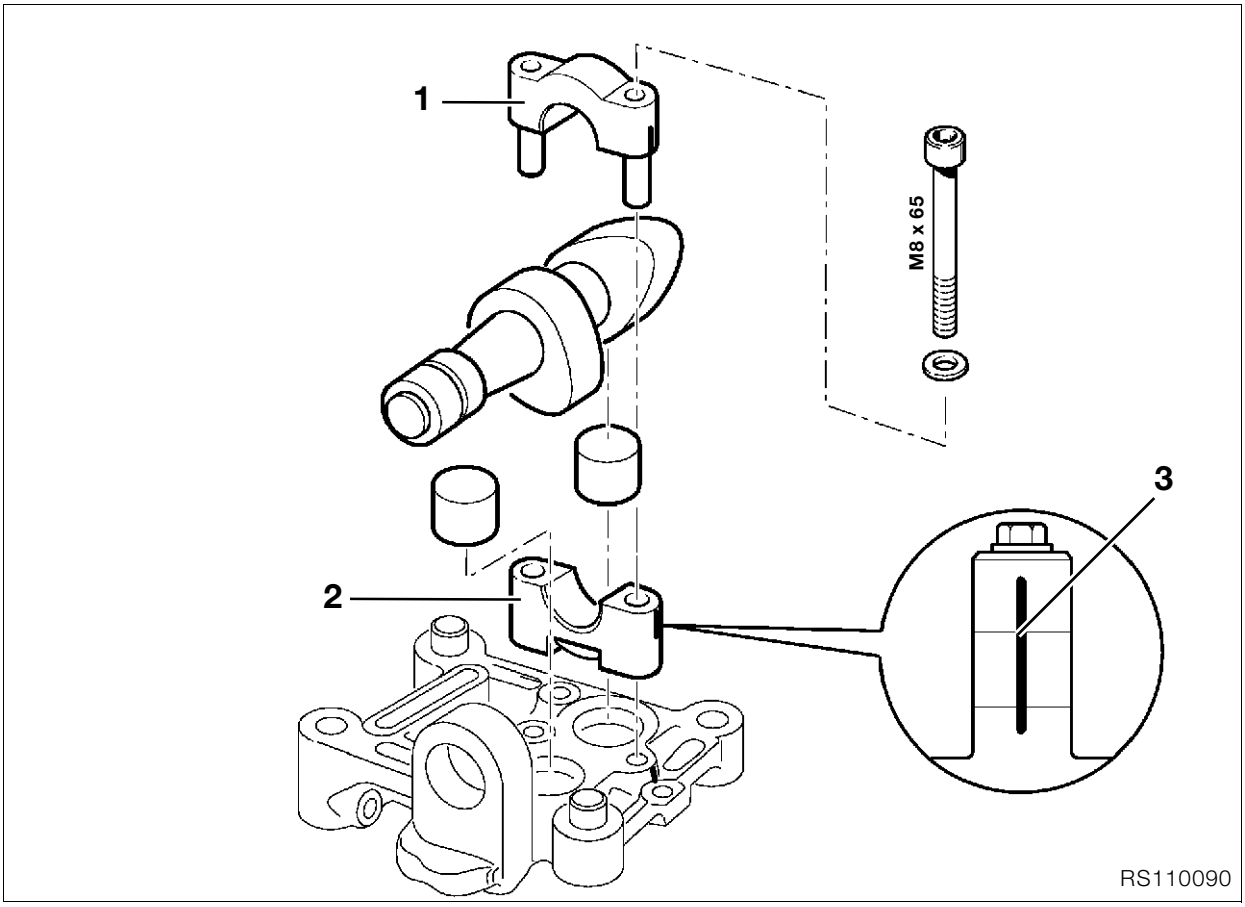




Disassembling/assembling valve gear holder

- Remove bearing cap.
- Insert a suitable pin into the bore (arrow) of the rocker shaft, and turn the shaft back and forth to remove it from its bearing.
- Remove pushrods.

⚠ Caution:
Do not mix up the rocker shafts and pushrods.



- Remove camshaft bearing cap (1).
- Remove camshaft and bearing (2).
- Remove bucket-type tappets.

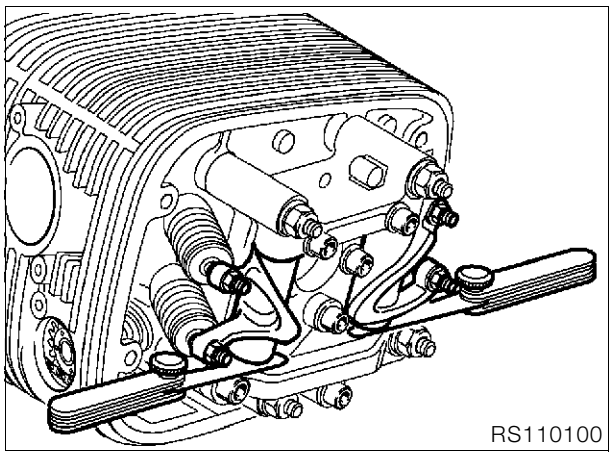
Caution:
Do not mix up the bucket-type tappets.

- Assembly is the reverse of the disassembly procedure.

Caution:
Note direction of installation (3) for camshaft bearing cap. Rocker-shaft recess must be aligned with the bores.

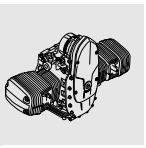
Note:
Locate pushrods in ball cups of rockers and hold the rockers together with a rubber band to secure the pushrods in position.

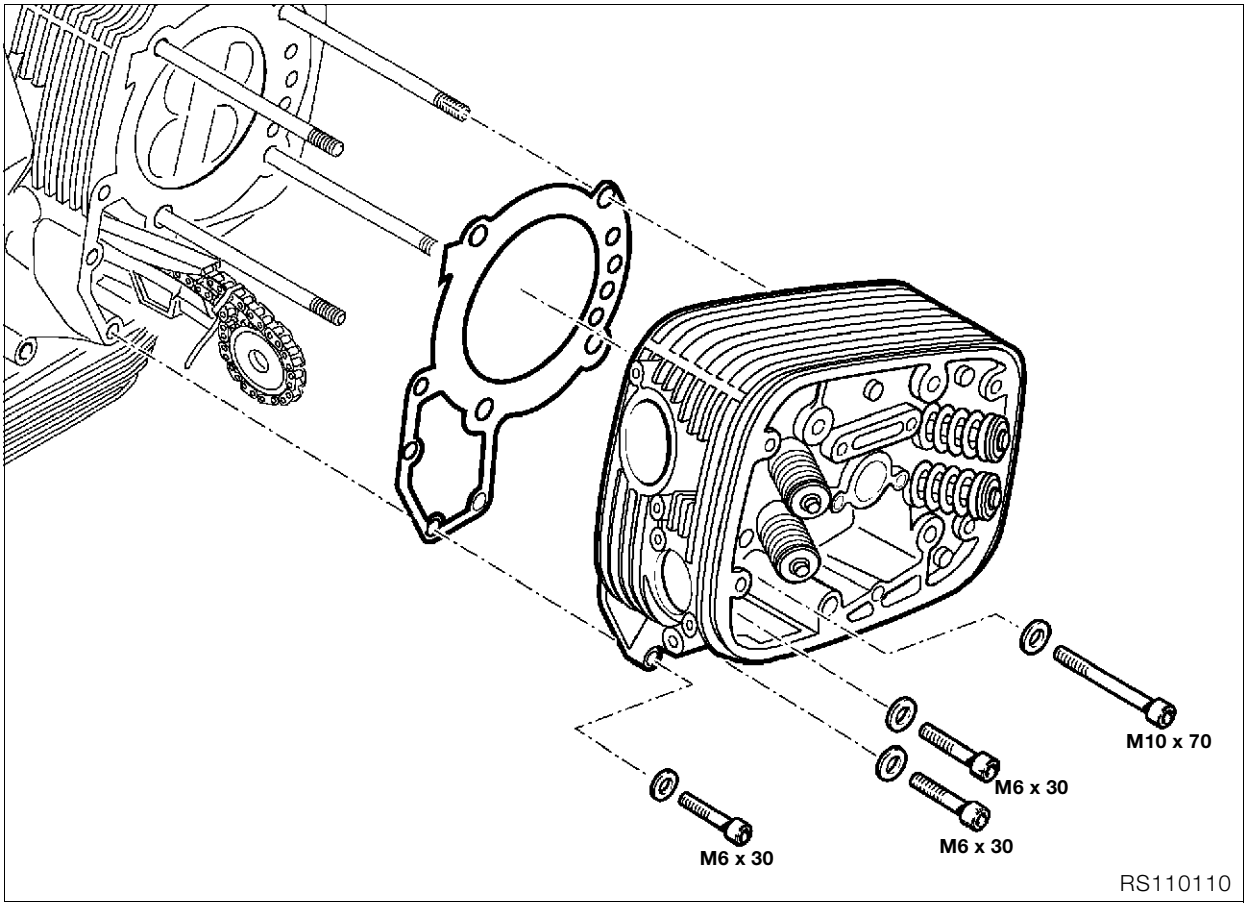
Tightening torque:
M 8 screw, rocker shaft bearing cap ..... 15 Nm
M 8 screw for camshaft bearing cap ..... 15 Nm



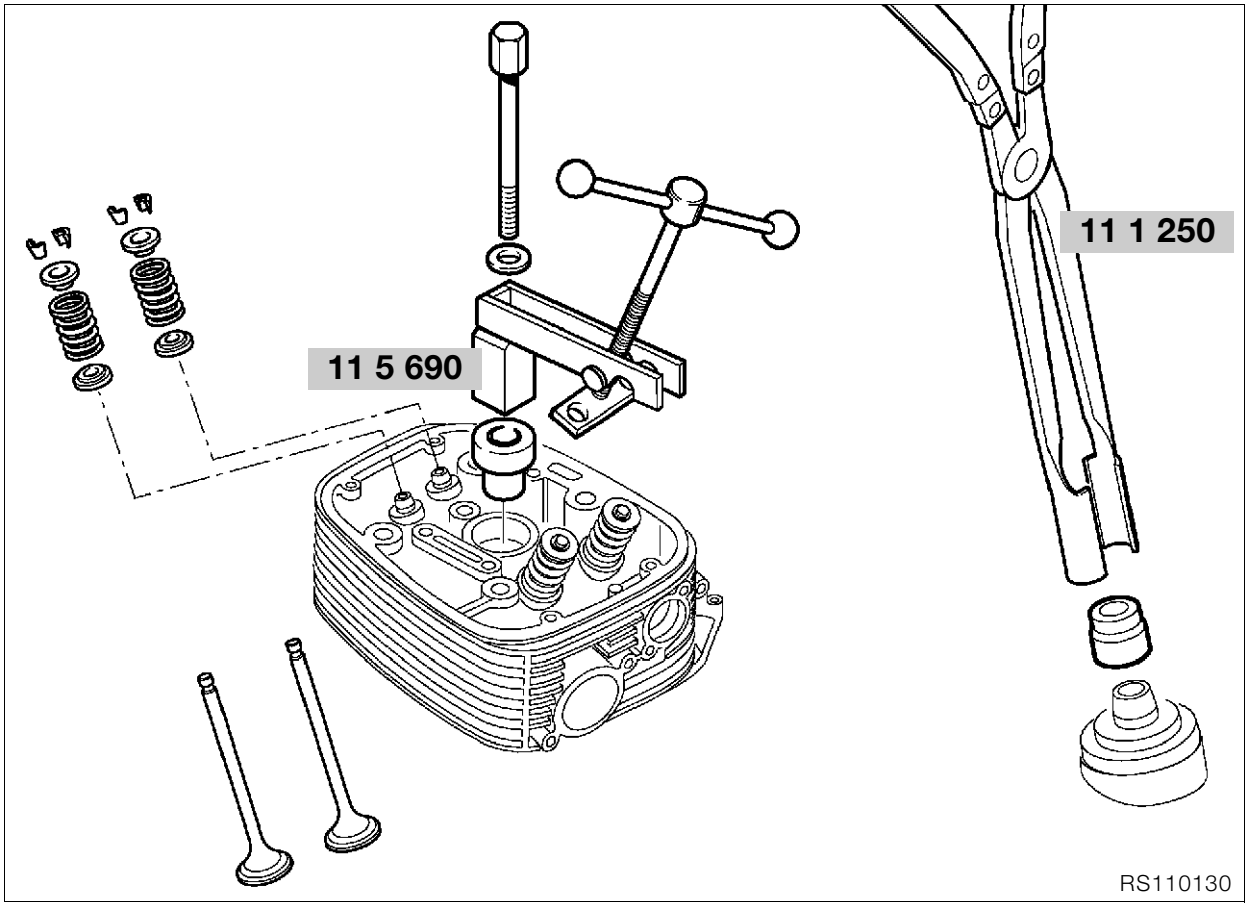
- Adjust the holder for minimum end float.

End float of rockers:
min. ..... 0.05 mm (0.002 in)
max. ..... 0.40 mm (0.016 in)





Removing cylinder head



Disassembling, checking, repairing and reassembling cylinder head

Removing and installing valves

Caution:
Do not scratch sealing face on cylinder head. Place the head on a clean, non-scratching surface.

- Mount valve spring compressor, **BMW No. 11 5 690**, on cylinder head.
- Compress the valve springs.
- Gently tap valve head to release collets from spring retainer.
- Remove valve collet sections.
- Relieve tension on valve springs.
- Remove top and bottom spring retainers, valve springs and valves.

Removing valve stem seals

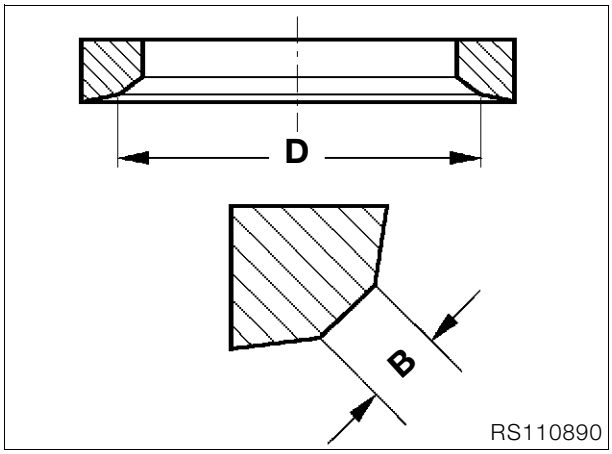
- Pull off valve stem seal with pliers, **BMW No. 11 1 250**.

Note:
If a valve is removed, the valve stem seal must be replaced.

Checking valves for wear
- Clean combustion residue from valves.
- Check valve dimensions.

➠ .....see Technical Data

Remachining valve seat



Caution:
Width (B) and diameter (D) must always be maintained if valve seat is machined.

➠ .....see Technical Data

Checking and repairing cylinder head
- Remove combustion residues from combustion chamber.
- Check sealing face for damage/distortion, and skim flat if necessary.

Skimming sealing face: ..... max. 0.2 mm (0.008 in) metal removal

Checking valve guide for wear
- Check valve guide bore.

➠ .....see Technical Data

Replacing valve guides

- Heat cylinder head slowly and uniformly to 200 °C (392 °F) in a suitable oven.

Caution:
Wear protective gloves when handling heated parts.

- Drive out valve guides with 5 mm (0.20 in) dia. drift, **BMW No. 11 5 674**, from the combustion chamber side.
- Allow cylinder head to cool down to room temperature (app. 20 °C/68 °F).
- Examine valve guide bore for:

– wear,
– widening taper and
– correct dimensions in H7 tolerance range (12.500...12.518 mm/0.4921...0.4928 in).

Note:
Valve guides are press-fitted in the cylinder head with an interference fit of 0.015...0.044 mm (0.0006...0.0017 in).

If valve guide bore is undamaged and dimensions are within correct 12.5 H7 tolerance range:

- Use original 12.5 U6 (12.533...12.544 mm/ 0.4934...0.4939 in) valve guide.
- Measure valve guides with micrometer.

If valve guide bore is undamaged but slightly larger than the 12.5 H7 tolerance range:

- Use replacement valve guide 12.550...12.561 mm (0.4941...0.4945 in).

If valve guide bore is damaged or not to correct dimensions in 12.5 H7 tolerance range:

- Use an oversize 12.7 U6 (12.733...12.744 mm/ 0.5013...0.5017 in) valve guide.

Repair method 1 – ream out the bore
(if bore is damaged or not to correct dimensions)

- Determine actual diameter of valve guide using micrometer.
- Ream bore with Ø12.7 H7 mm (12.700...12.718 mm/0.5000...0.5007 in) reamer.

Repair method 2 – turn the valve guide on a lathe
(bore must not be damaged)

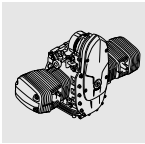
- Measure bore with internal measuring tool.
- Calculate the nominal diameter of the valve guide:

Required diameter of valve guide = bore dia. + interference-fit value (0.015...0.044 mm/ 0.0006...0.0017 in).

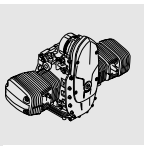
- Use an oversize 12.7 U6 (12.733...12.744 mm/ 0.5013...0.5017 in) valve guide.
- Machine oversize valve guide to required diameter.
- Slowly heat cylinder head to 200 °C (392 °F) in a suitable oven.
- Immerse valve guide in liquid grinding paste.
- Chill valve guide with dry ice.

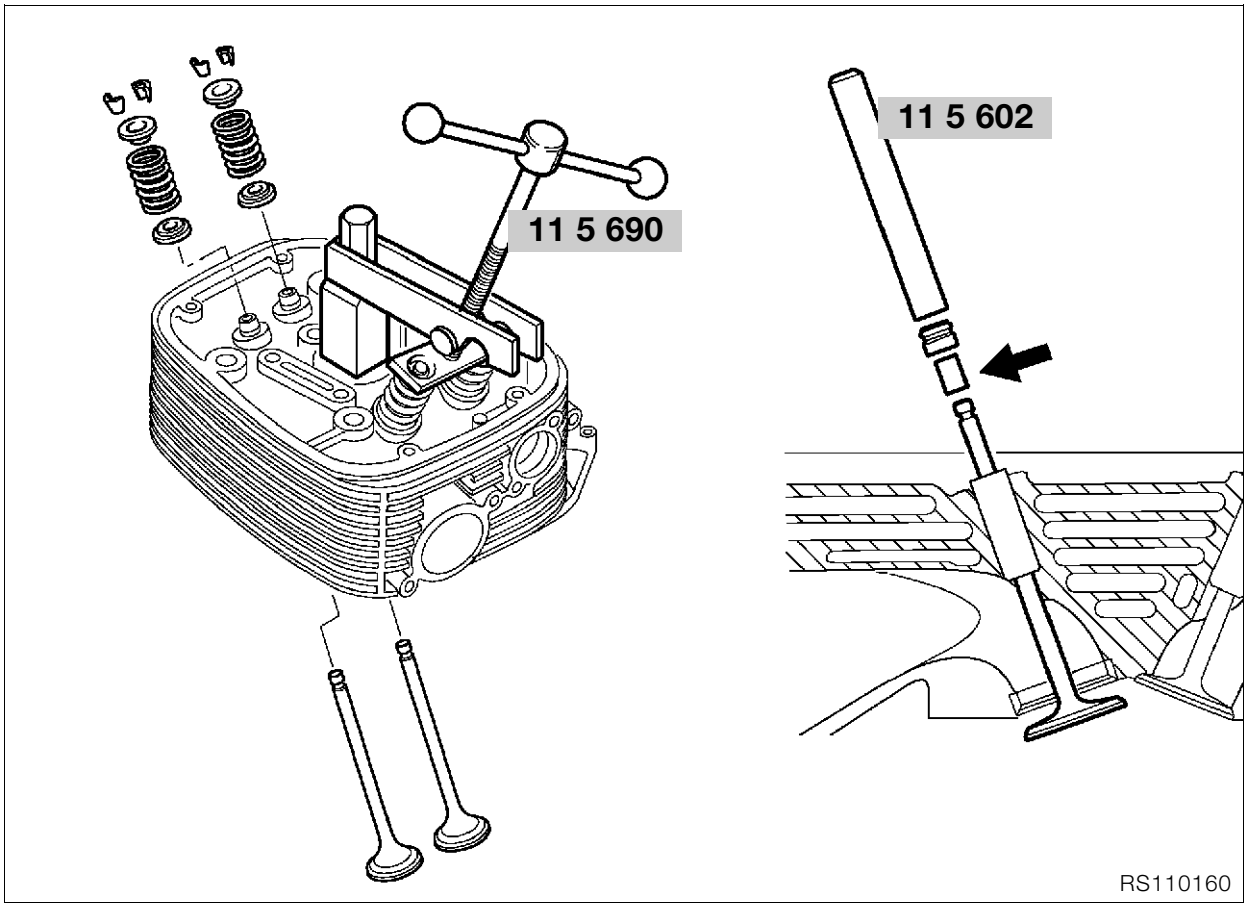
Caution:
Immediately before pressing in, the temperature must be –40 °C (–40 °F).

- Place heated cylinder head flat on workbench or a similar surface.
- Mount the chilled valve guide on Ø 5 mm (0.20 in) drift, **BMW No. 11 5 673**.
- Drive valve guides into cylinder head with no delay.
- Allow cylinder head to cool down to room temperature, app. 20 °C (68 °F).
- Inspect bores of valve guides.



Note:
Valve guides for repair purposes are produced with an internal diameter of 5.01 mm (0.1972 in) H7.
In most cases, the bore is within the 5.00 mm (0.1969 in) H7 tolerance range after pressing in.
If the bore is too narrow, ream it out to size.





Installing valve and valve stem seal

Note:
If a valve was removed, the valve stem seal must be replaced.

- Oil the stem before installing the valve.
- Shrink a short length of tube (arrow) on to the end of the valve stem.
- Install the valve stem seal with a 5 mm (0.20 in) dia. drift, **BMW No. 11 5 602**.

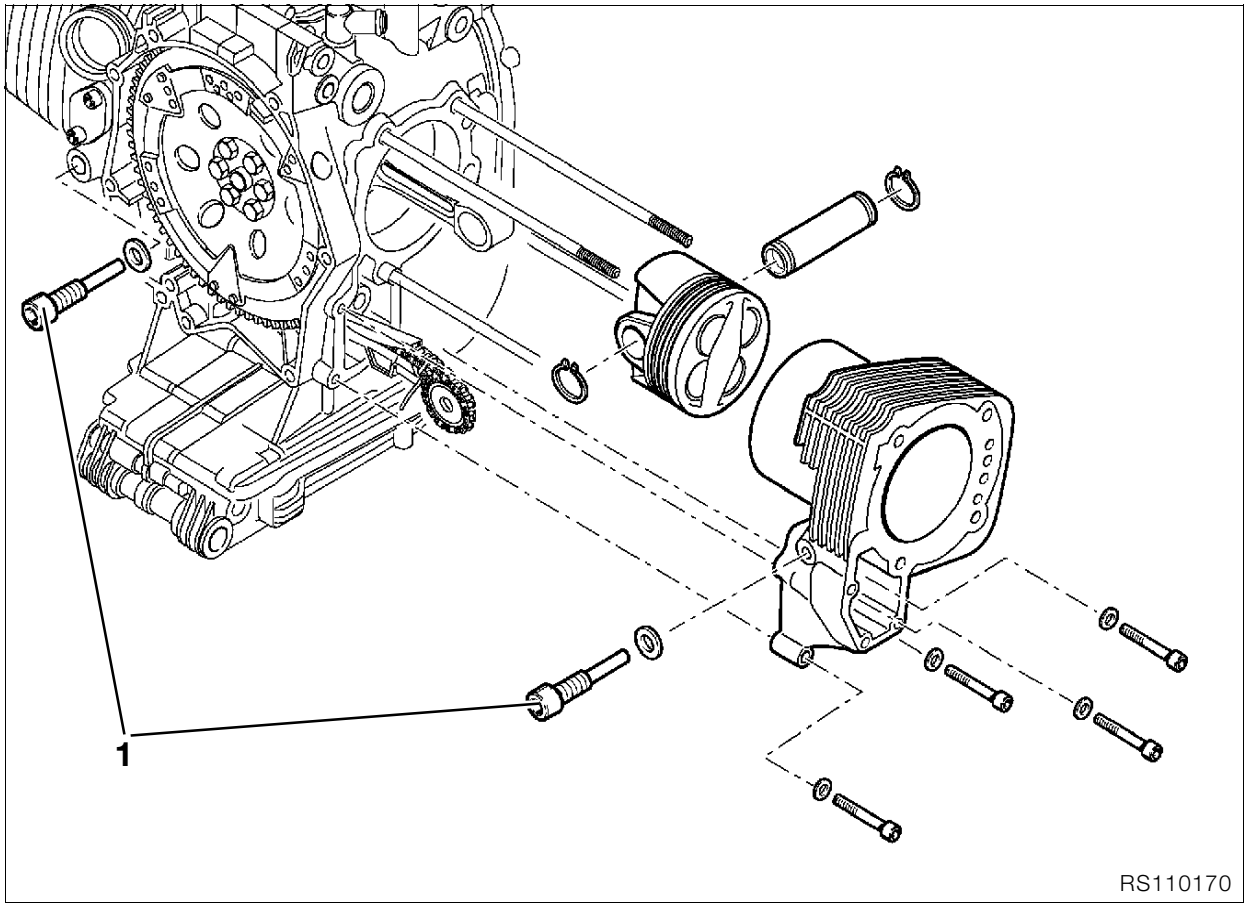
Caution:
Remove the shrink-fit tube.

- Install lower spring retainer, valve spring and upper spring retainer.
- Compress the valve springs with the valve spring compressor, **BMW No. 11 5 690**.

Note:
Apply grease to valve collets (to facilitate installation) and install.

Caution:
Make sure that valve collets are correctly seated in the valve stem grooves.

- Relieve tension on valve springs.
- Check valves for leakage (blow-by).



Removing cylinder

- Remove guide rail bearing screws (1).
- Remove cylinder retaining screws, and remove cylinder.

⚠ Caution:
When removing cylinder, make sure that the piston does not strike the engine block.

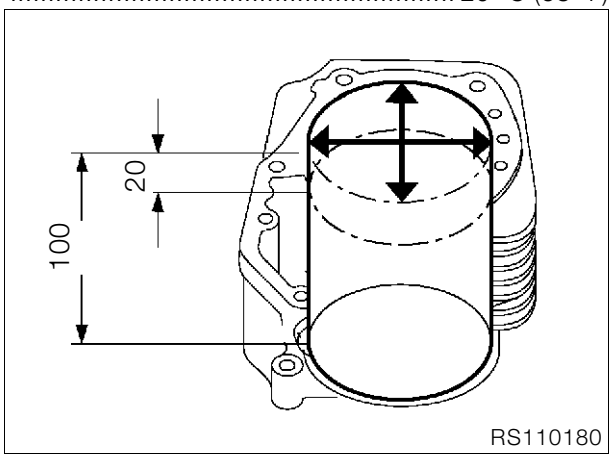
Removing and disassembling piston

- Remove both retaining rings from piston pin.
- Press out piston pin by hand.
- Remove piston.
- Carefully remove piston rings with piston ring pliers.
- Remove combustion residues from piston crown and clean piston.

⚠ Caution:
Do not mix up pistons, piston pins and piston rings.

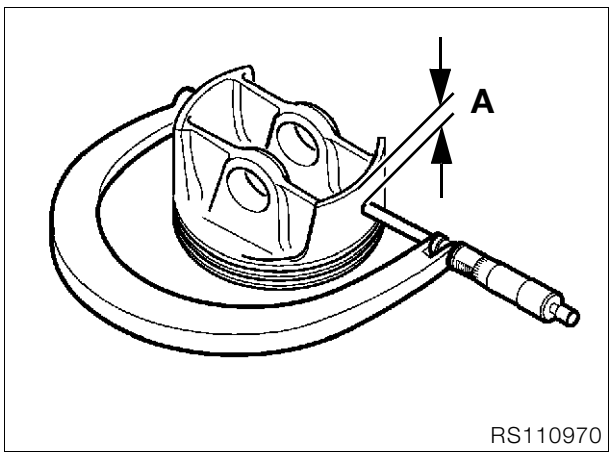
Checking pistons and cylinders

Reference temperature for measurements:
..... 20 °C (68 °F)



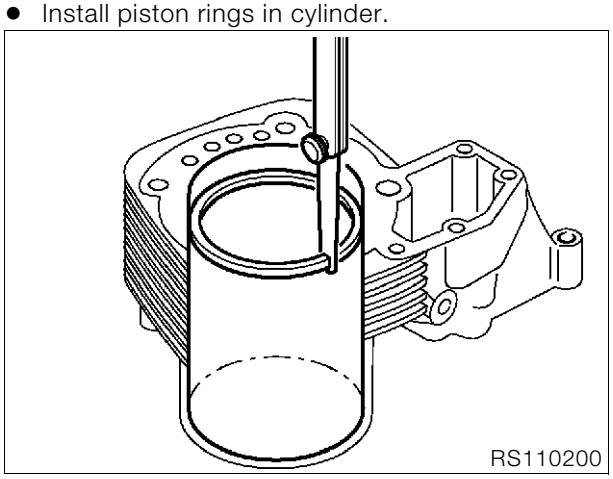
- Measure cylinder bore with internal probe at 20 mm (0.79 in) and 100 mm (3.94 in) from the top in direction of piston pin, and again at a right angle to the first measurement.

➠ .....See Technical Data



Measuring plane A: .....6 mm (0.24 in)
➠ .....See Technical Data

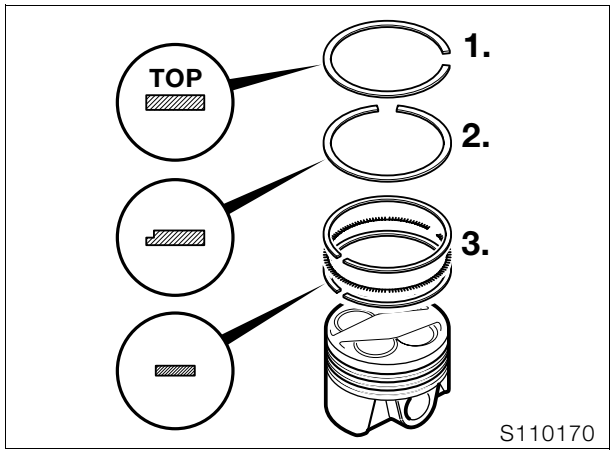
- Install piston rings in cylinder.



- Measure end gap using feeler gauge.

➠ .....See Technical Data

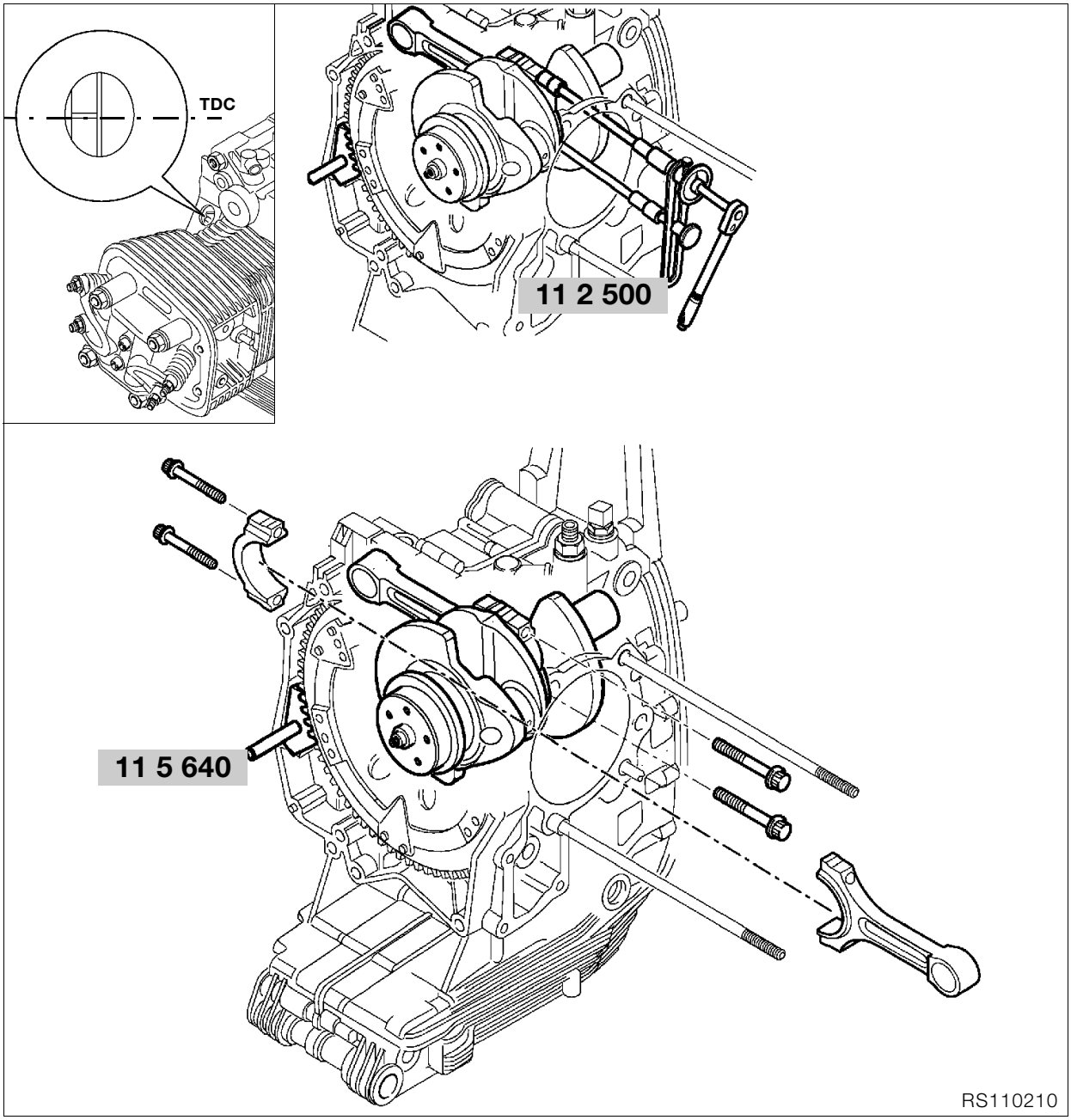
Assembling pistons



- Carefully fit piston rings to piston in the following sequence, using piston ring pliers:
  3rd groove - 3-S ring
  2nd groove - micro-chamfer ring
  1st groove - asymmetric piston ring, oval section

➠ .....See Technical Data

Note:
Make sure that the gap of the spring in the 3-S ring is offset approximately 180° from the gaps of the oil control rings.



Removing and installing conrod

- Turn crankshaft to TDC position.
- Lock the clutch housing with special tool, **BMW No. 11 5 640**.
- Remove conrods.

Note:
Conrods can also be removed and installed with the crankshaft removed.

Caution:
Make sure that conrods and bearing shells are reinstalled in their original positions.
Use a felt-tipped pen or similar to mark the installed positions on the conrods.

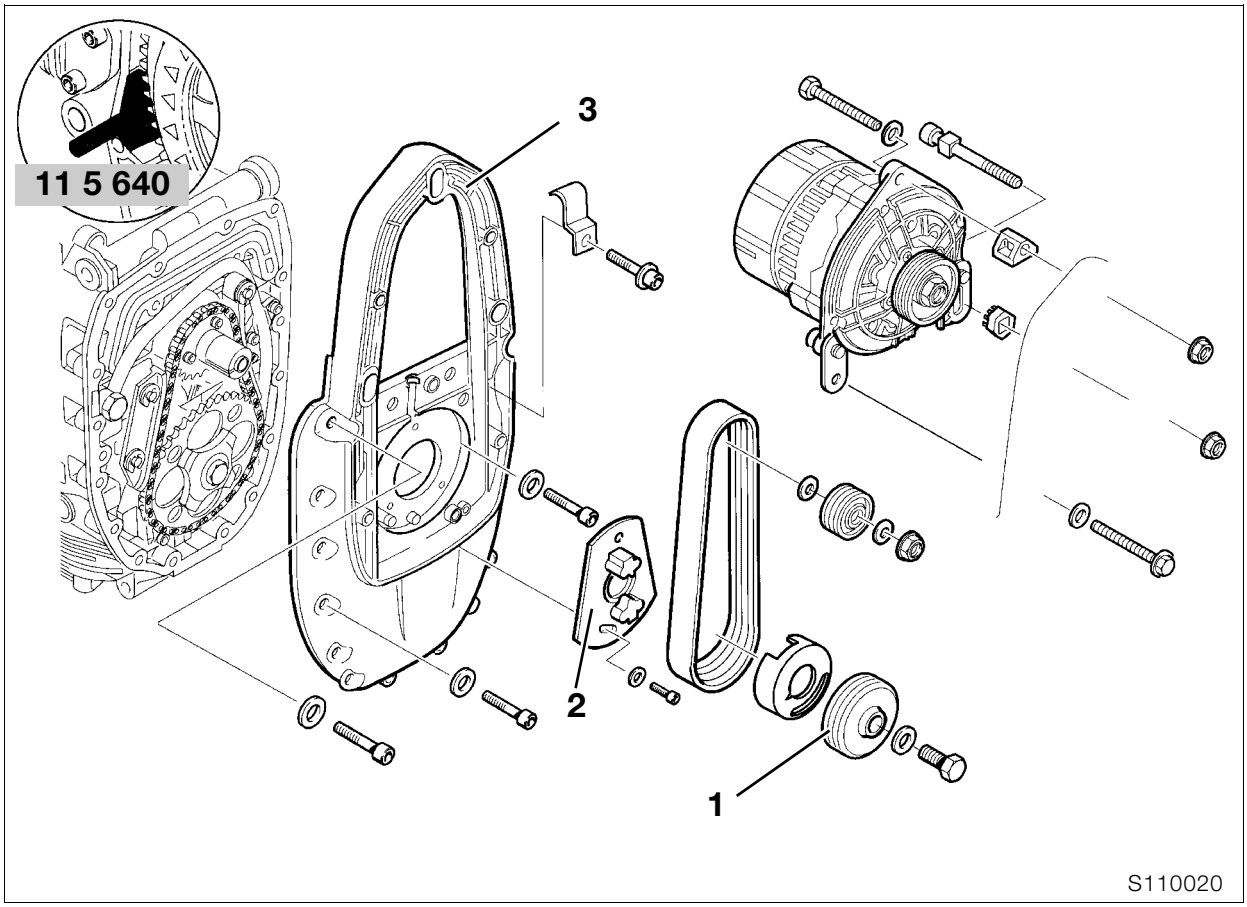
- Install conrods.

Caution:
Oil the bearings.

- Screw the big end bolts in by hand, then tighten them with a tightening angle indicator, **BMW No. 11 2 500**.

Caution:
Never re-use the big end bolts.

Tightening torque:
Big end bolts oiled
Joint torque ..... 20 Nm
Wrench angle ..... 80°



Removing and installing alternator mount cover with engine installed

Caution:
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove the horn.
- Remove the oil cooler line.
- Disconnect the Hall sensor.
- Remove the starter motor.
- Remove rear leading link mount.

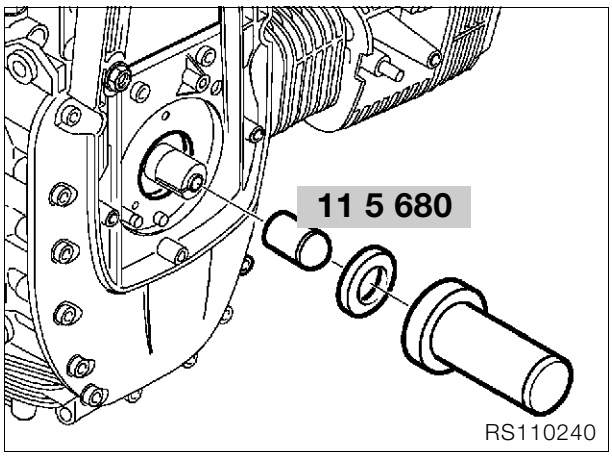
Removing alternator mount cover

- Remove the alternator.
- Lock the clutch housing with special tool, **BMW No. 11 5 640**.
- Remove pulley (1).
- Remove magnetic gate (2).

Note:
It is not necessary to remove magnetic gate (2) when removing the alternator mount cover as a unit.

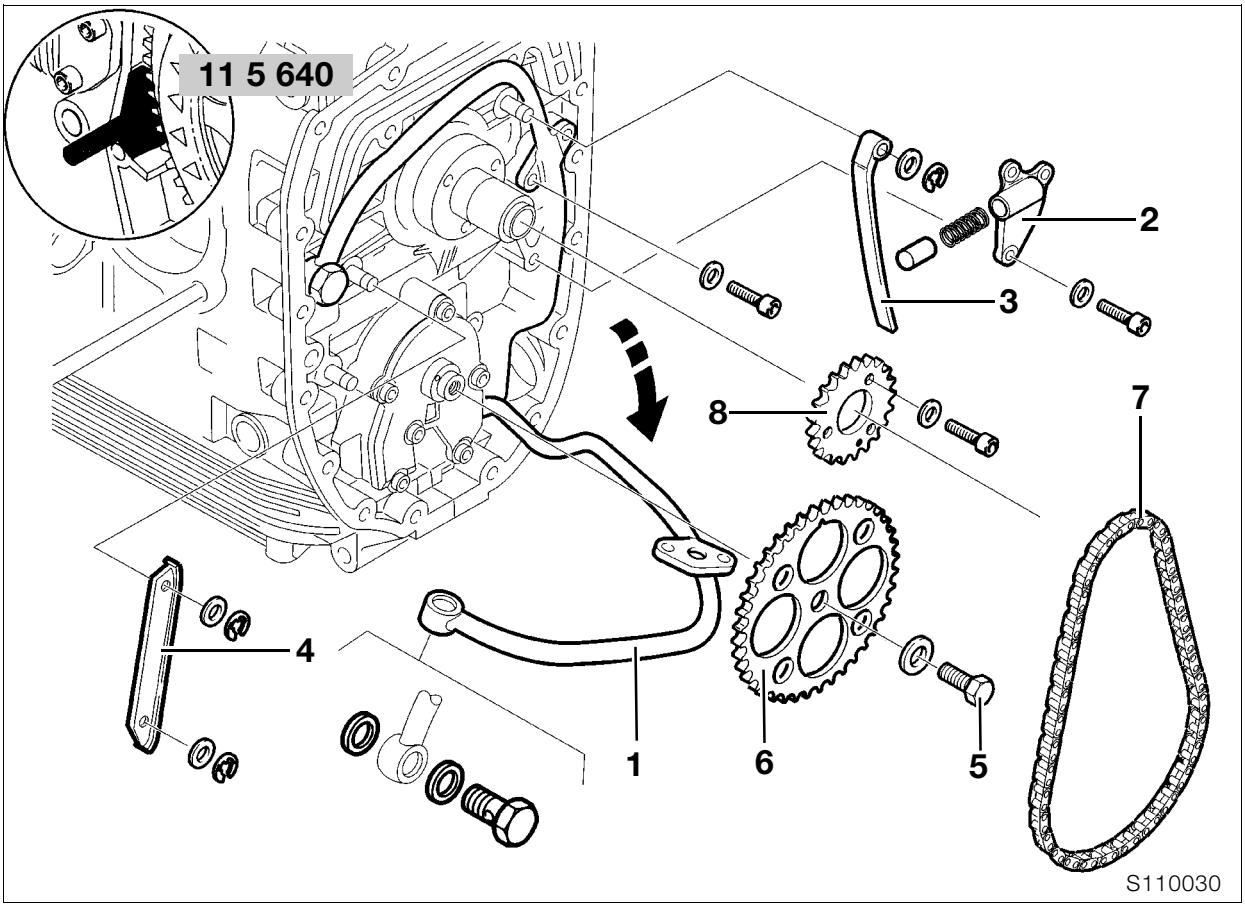
- Remove alternator mount cover (3).

Replacing radial shaft seal in alternator mount cover

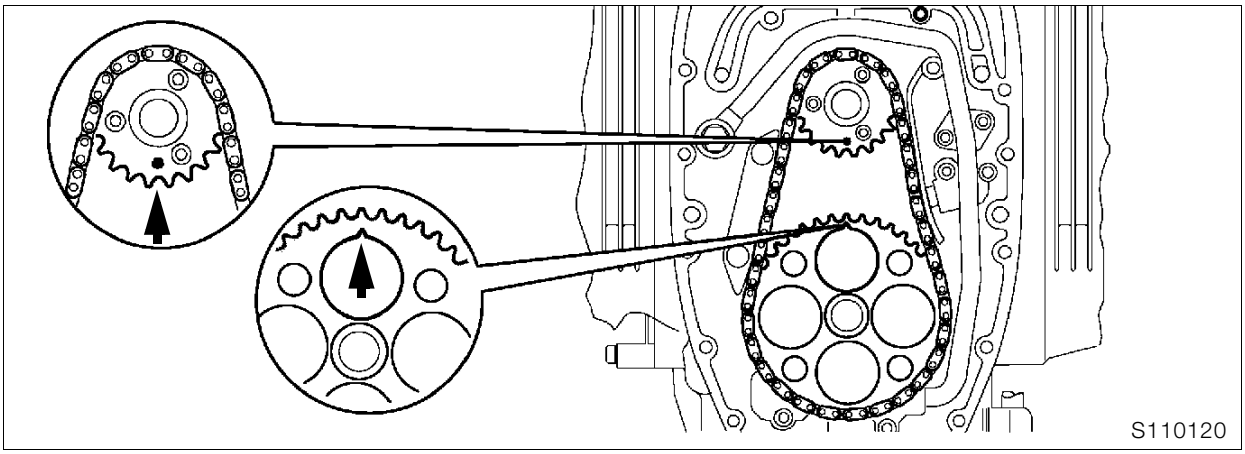


- Carefully lever out radial shaft seal, using a screwdriver.
- Drive in the new radial shaft seal with drift and sliding sleeve, **BMW No. 11 5 680**.

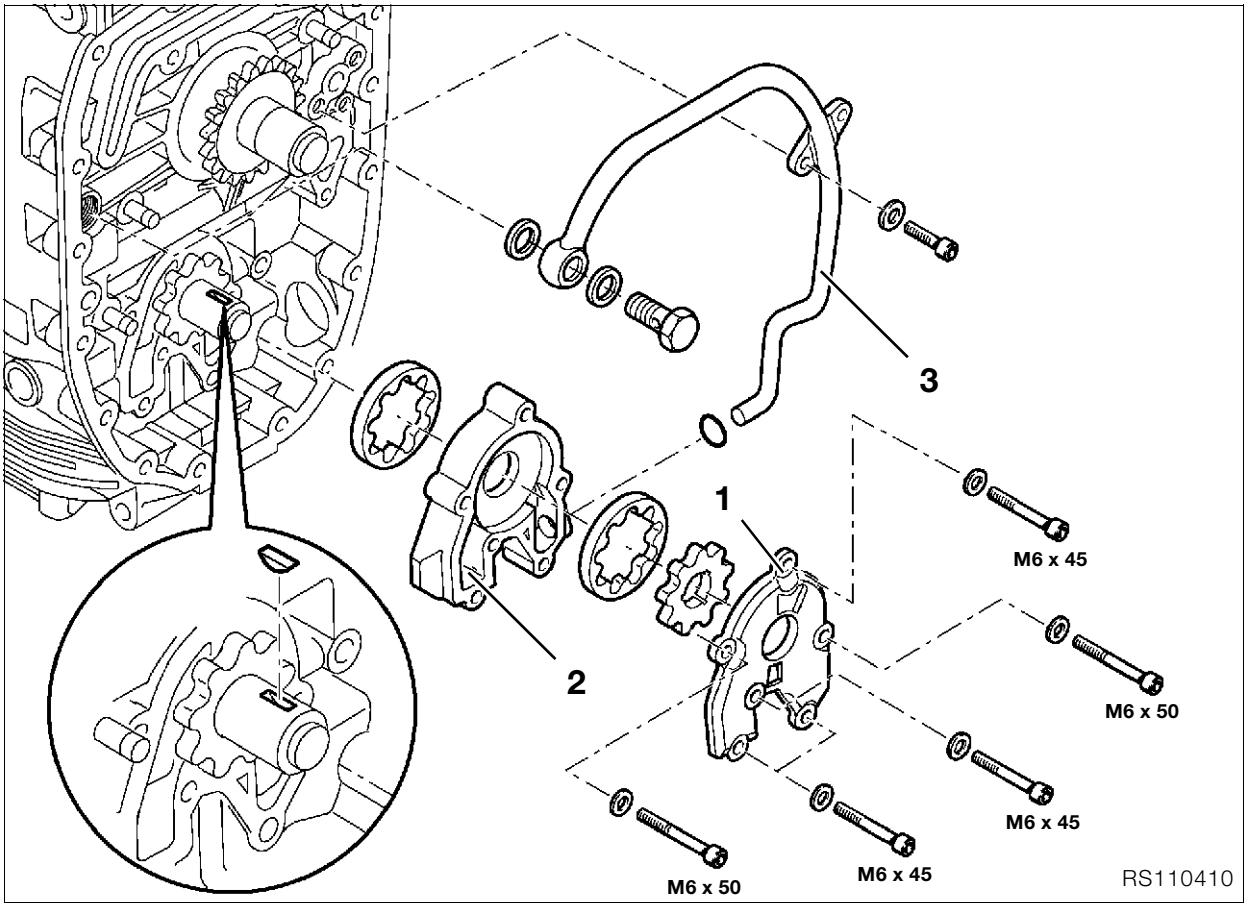
Note:
Slide new radial shaft seal over taper on sliding sleeve, pre-shape and pull off.



Removing auxiliary shaft drive



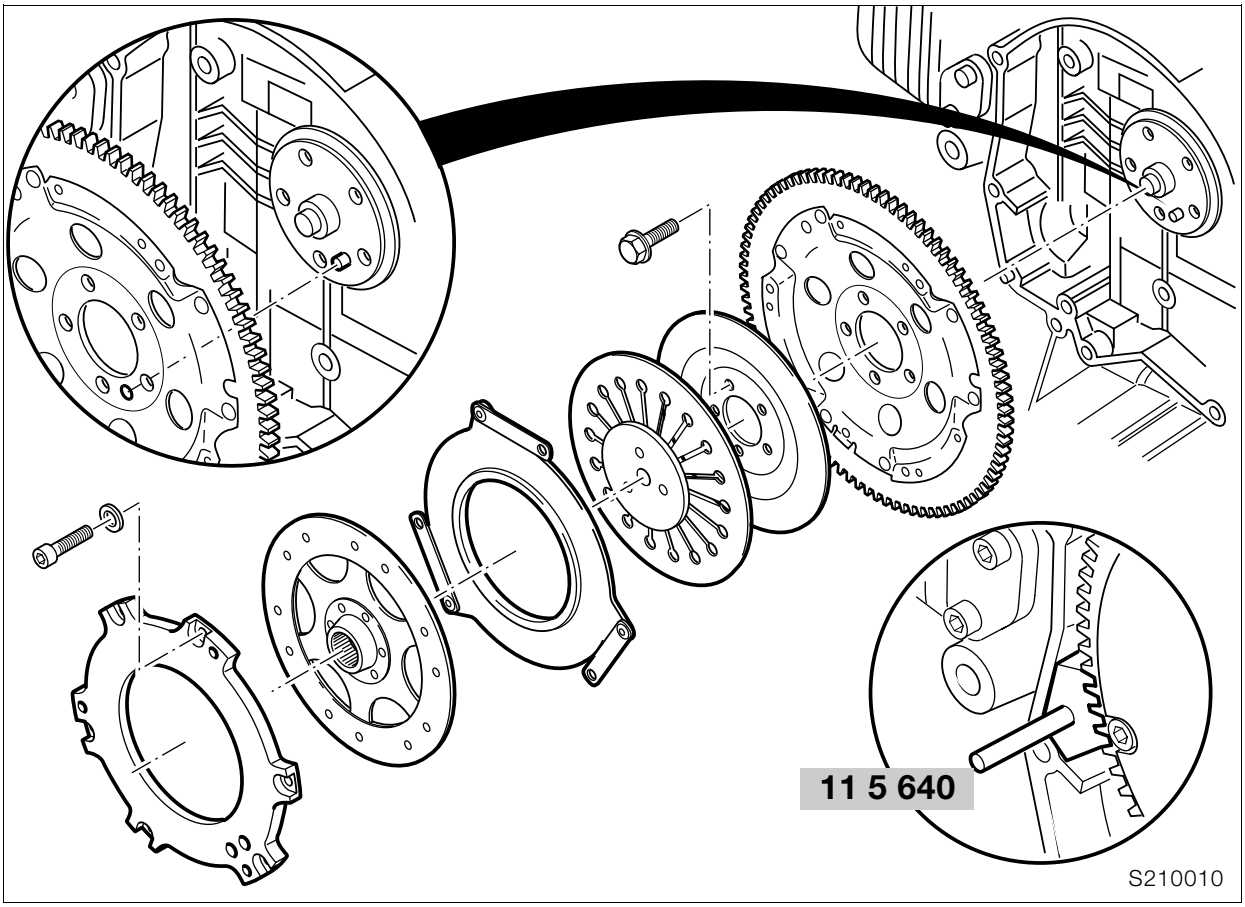
- Align marks (arrows) on timing pinion and chain sprocket.
- Remove banjo bolt of cooling oil pipe (1) and swing the pipe forwards.
- Remove chain tensioner (2).
- Remove chain tensioning rail (3).
- Remove chain guide rail (4).
- Lock the clutch housing with special tool, **BMW No. 11 5 640**.
- Remove chain sprocket retaining bolt (5).
- Remove sprocket (6) and timing chain (7).
- If necessary, remove chain sprocket (8).



Removing oil pump

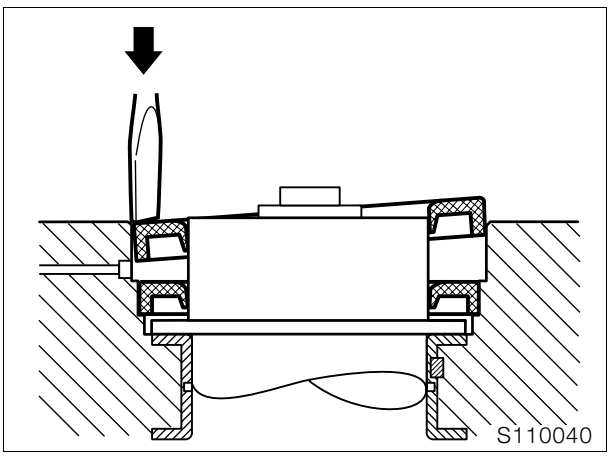
- Remove oil pump cover (1).
- Remove complete oil pump (2) together with cooling oil pipe (3), and disassemble.

⚠ Caution:
Check installed positions of parts which have already been run together.



Removing radial shaft seal from crankshaft with engine installed

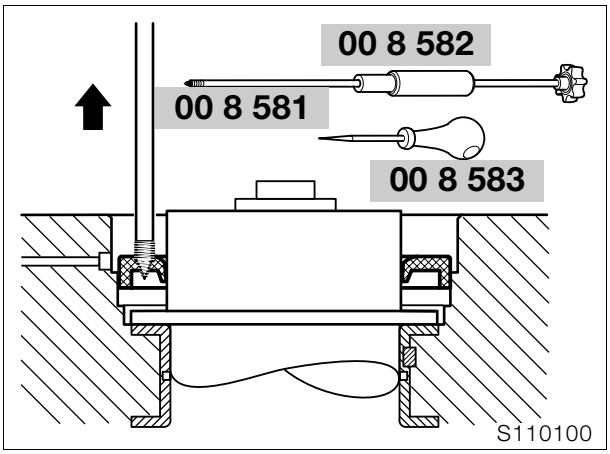
- Lock clutch housing with special tool, **BMW No. 11 5 640**.
- Remove the clutch.



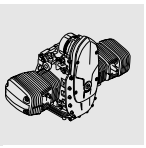
- Carefully lever out radial shaft seal, using a screwdriver.

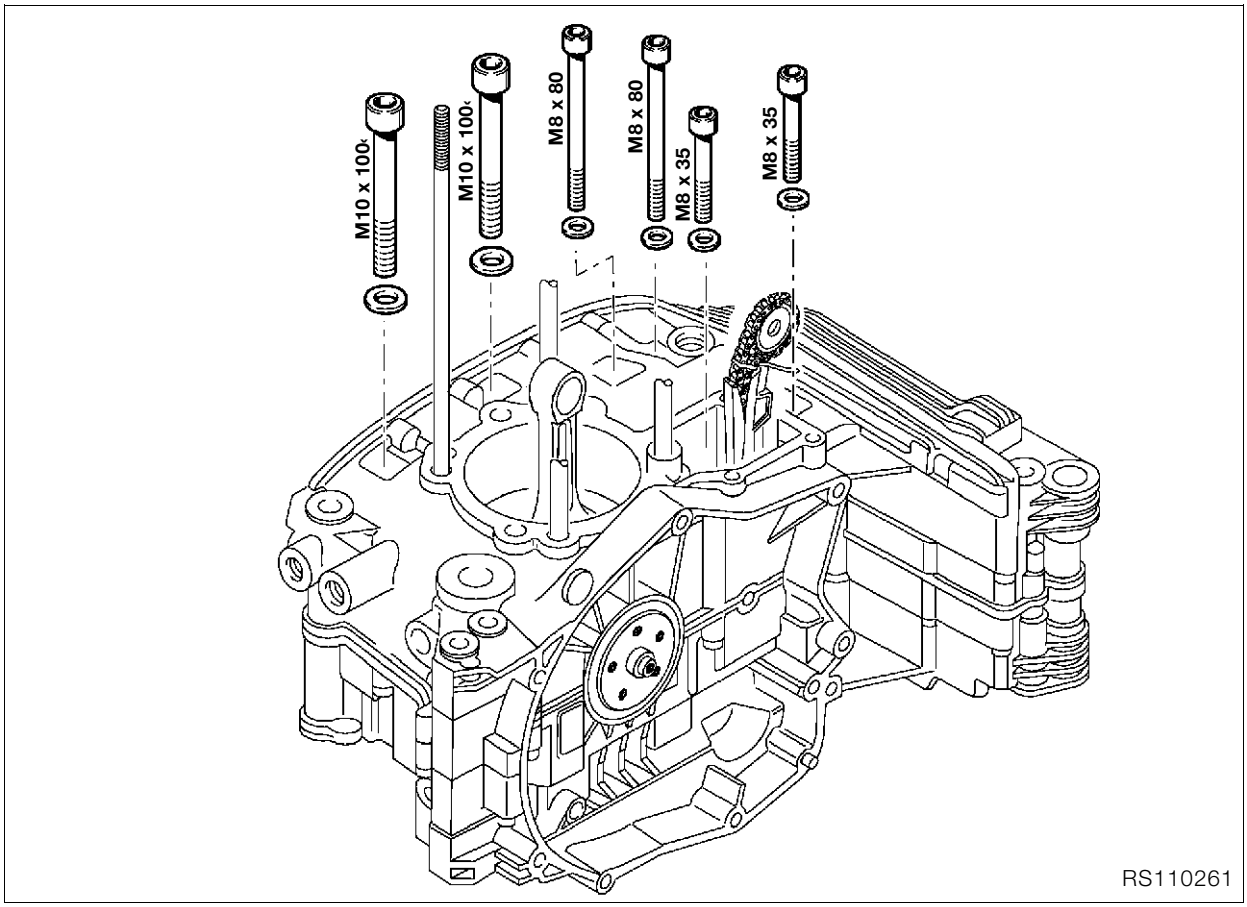
Caution:
Take care not to damage the sealing faces of crankcase and crankshaft.

Note:
The radial shaft seals can be removed when the crankcase is disassembled.



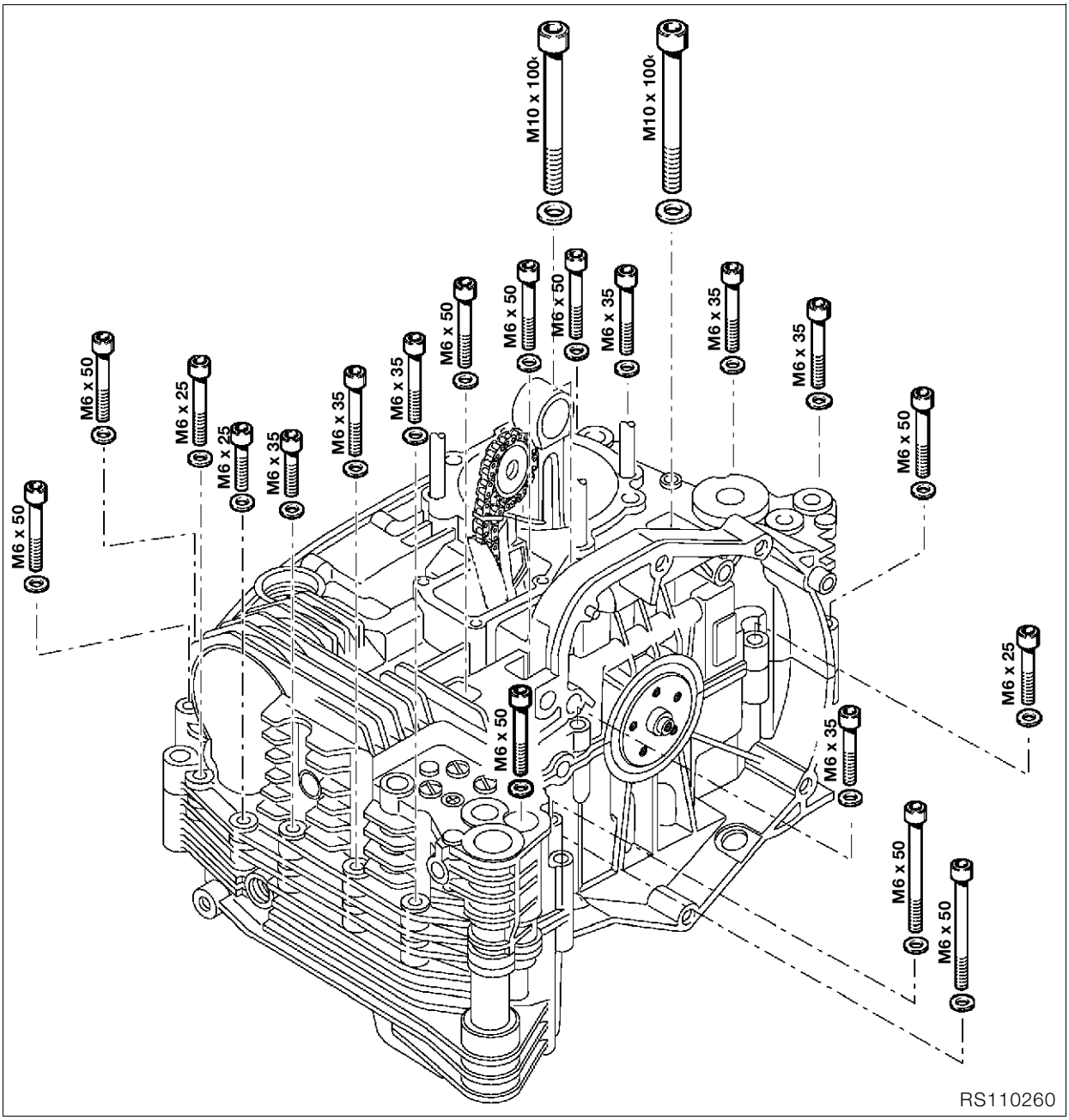
- Using awl, **BMW No. 00 8 583**, carefully punch a hole in the shaft sealing ring.
- Screw the pull rod, **BMW No. 00 8 581**, into the hole and use impact weight, **BMW No. 00 8 582**, to remove the shaft sealing ring.



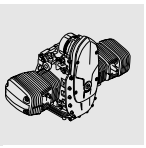


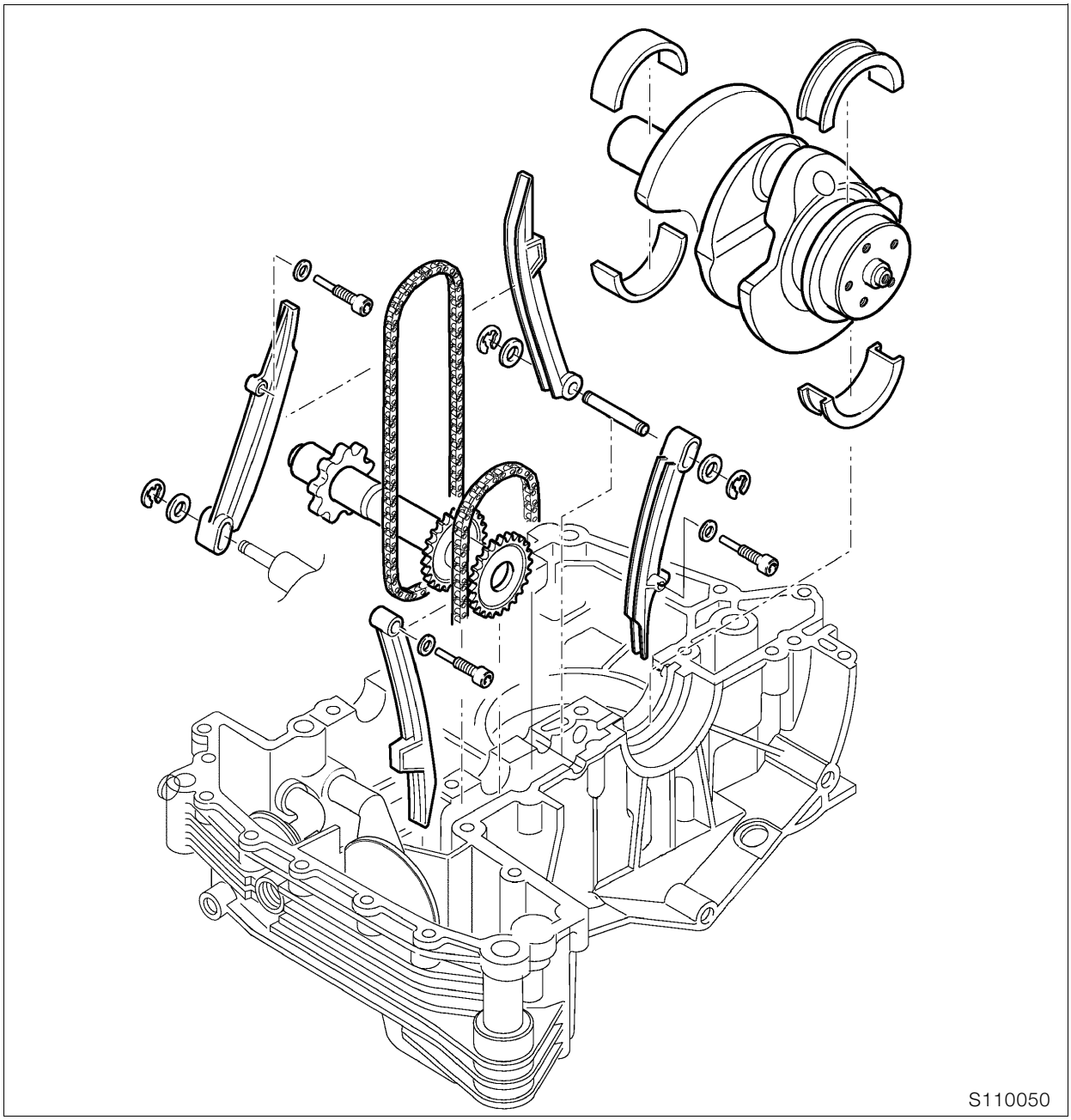
Disassembling crankcase

- Turn engine on to its side.
- Remove screws on right side.



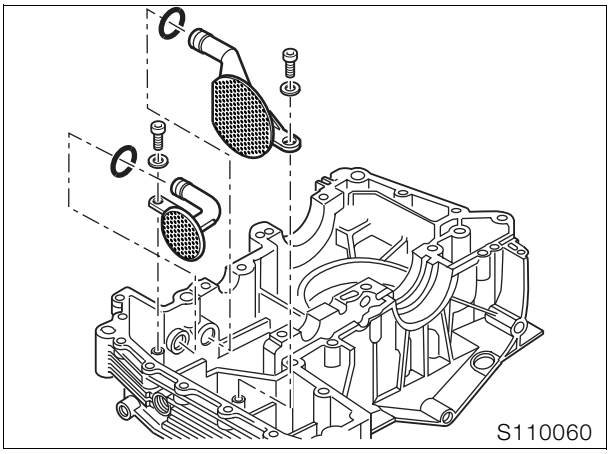
- Turn engine on to its side.
- Remove screws on left side.
- Remove upper section of crankcase.





Removing crankshaft, auxiliary shaft and timing chain tensioning and slide rails

Removing and installing oil intake strainers



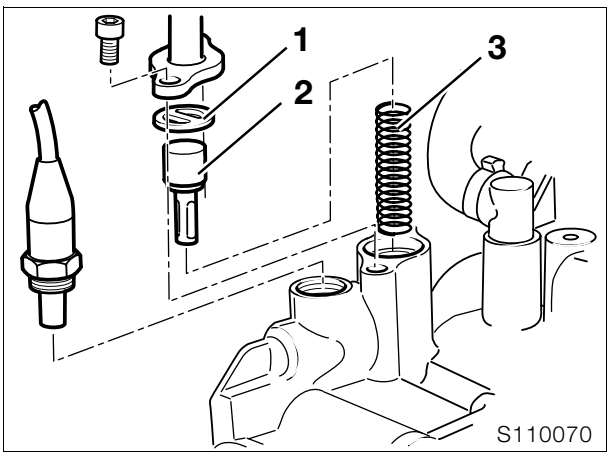
Tightening torque:
M 6 screw ..... 9 Nm

Caution:
Make sure that the O-ring is not omitted, and is installed undamaged.

Replacing oil level sight glass

- Pierce the plastic disc with a large screwdriver and lever out the oil level sight glass.
- Coat the sealing face of the new oil level sight glass with engine oil and drive it in with drift, **BMW No. 00 5 550**.

Removing and installing oil thermostat



- Remove screws securing oil cooler line to fairing bracket.
- Disconnect oil cooler line from crankcase.
- Remove support plate (1), control element (2) and spring (3).
- Installation is the reverse of the removal procedure.

Tightening torque:
M 6 screw ..... 9 Nm

Removing conrods

- Clamp crankshaft in a vise with protective jaws.
- Remove conrod.

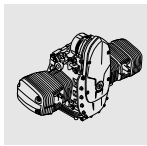
Caution:
Do not mix up the conrods.

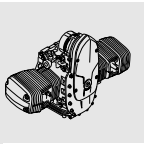
Checking conrods

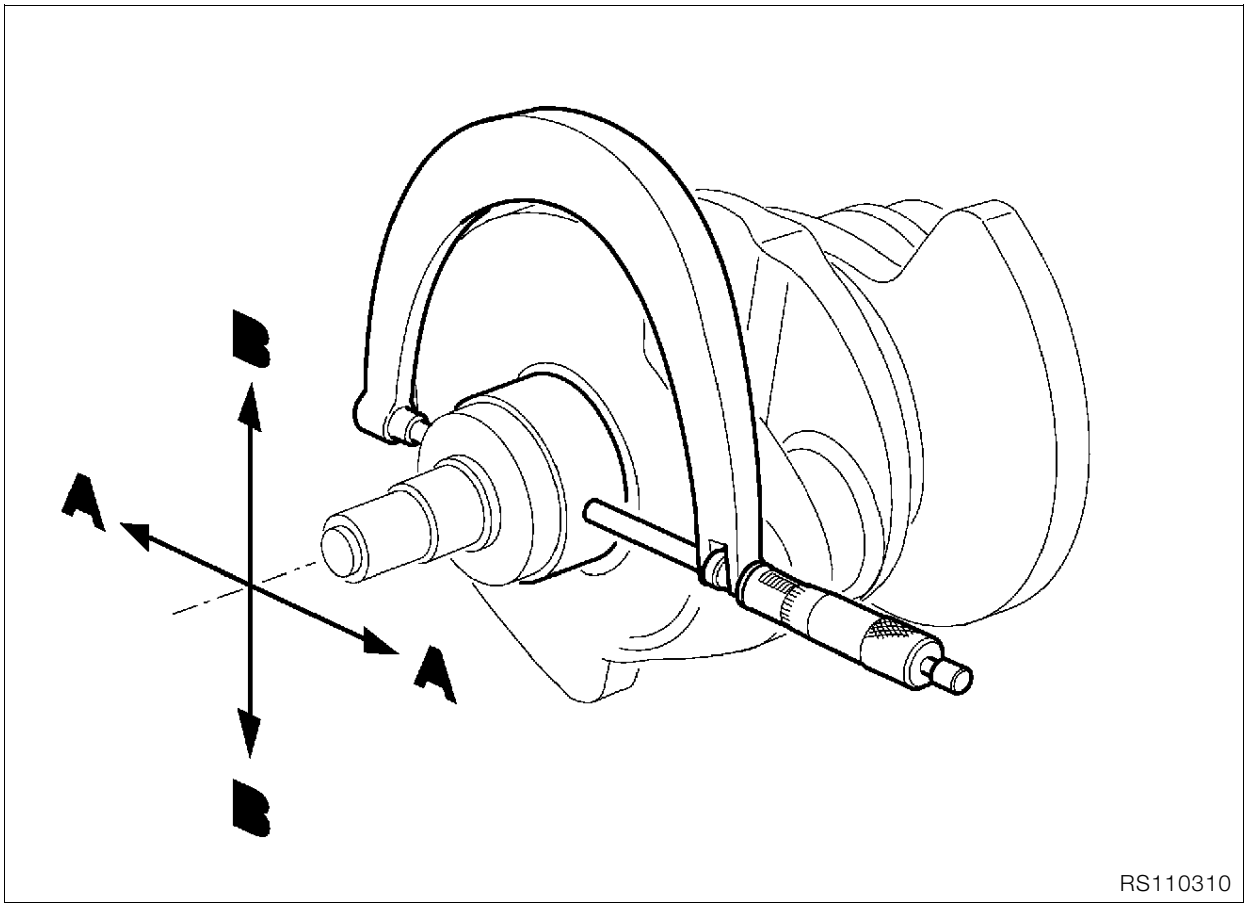
- Check conrod dimensions.

➡ ..... See Technical Data

Caution:
Do not attempt to straighten the sintered conrods – risk of fracture.







Measuring crankshaft bearing play

Measuring radial bearing play

- Measure main bearing journal with an external micrometer in two planes, A and B, at right angles.
- Enter measured values on record sheet.

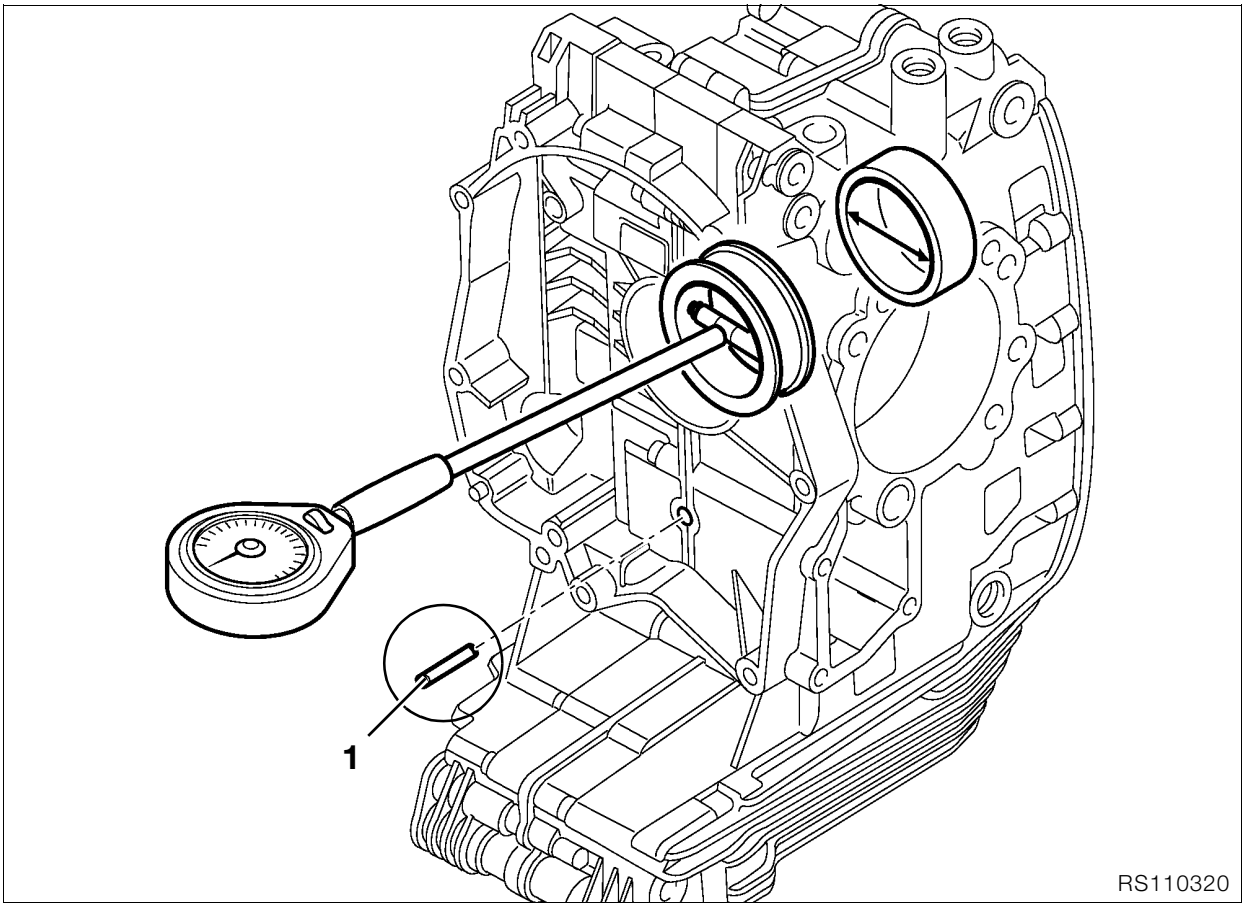
➠ ..... See Technical Data

⚠ Caution:

The crankshaft can only be reground in grinding stage 0; after this it must be rehardened and finished. Grinding stages are identified by a paint mark on the front crank web.

➠ ..... See Technical Data

When replacing the bearing shells, make sure that the colour marks on the crankpins and big end bearings match.



Installing main bearings

- Insert tensioner rail/slide rail pivot pin (1) for centering purposes.
- Tighten M 8 and M 10 crankcase screws.

Tightening torque/tightening order:

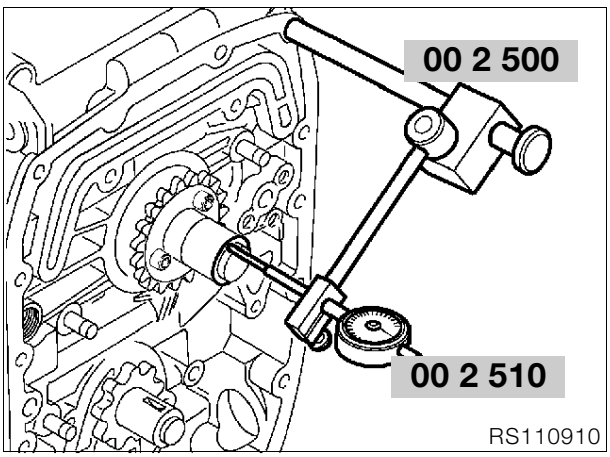
1. M 10 screw (oiled) Initial torque ..... 25 Nm
   Wrench angle ..... 90°
2. M 8 screw (oiled) ..... 22 Nm

- Measure front and rear main bearings in the load direction.
- Enter measured values on record sheet and calculate main bearing play.

➠ ..... See Technical Data

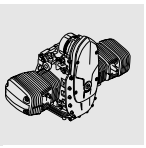
Measuring axial bearing play

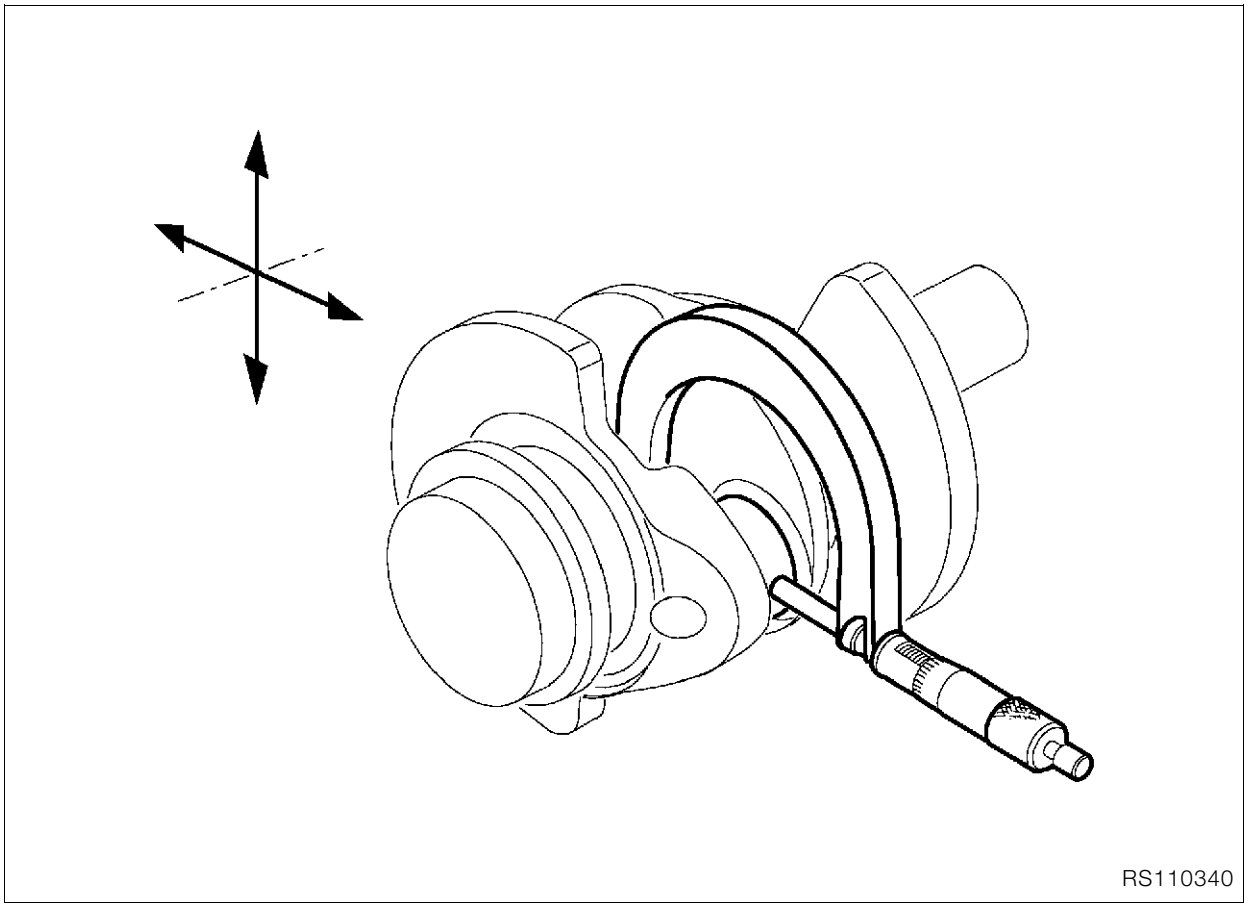
- Place crankshaft in crankcase.
- Insert tensioner rail/slide rail pivot pin (1) for centering purposes.
- Tighten crankcase screws.



- Screw measuring device, **BMW No. 00 2 500**, with dial gauge, **BMW No. 00 2 510**, into tapped hole for alternator carrier cover.
- Move crankshaft forwards and backwards and read axial play from dial gauge.

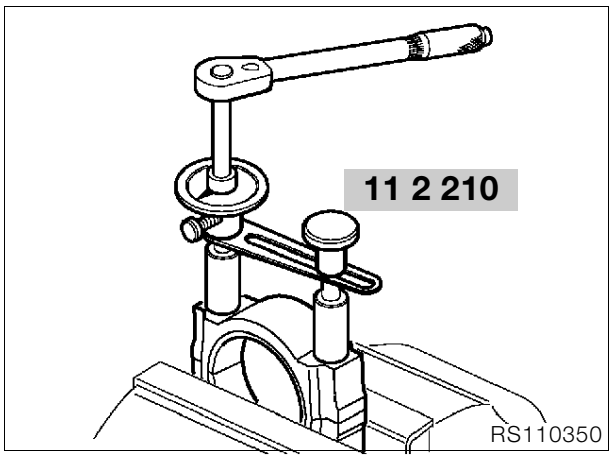
➠ ..... See Technical Data





Measuring big end bearing play

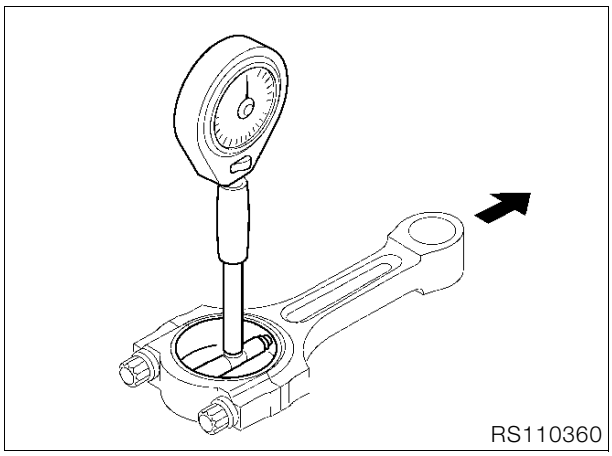
- Measure crankpin with an external micrometer in the thrust direction and at right angles to the thrust direction.



- Install bearing shells and assemble conrods.
- Using tightening angle indicator, **BMW No. 11 2 210**, tighten the big end bolts.

Tightening torque:

Big end bolts oiled
Joint torque ..... 20 Nm
Wrench angle ..... 80°

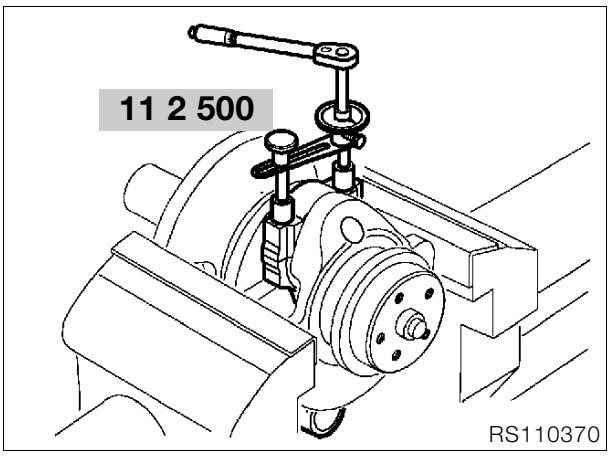


- Measure big end bearing with internal gauge in thrust direction.
- Enter measured values on record sheet and calculate big end bearing play.

➠ ..... See Technical Data

Assembling engine

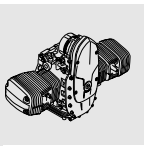
Installing conrods

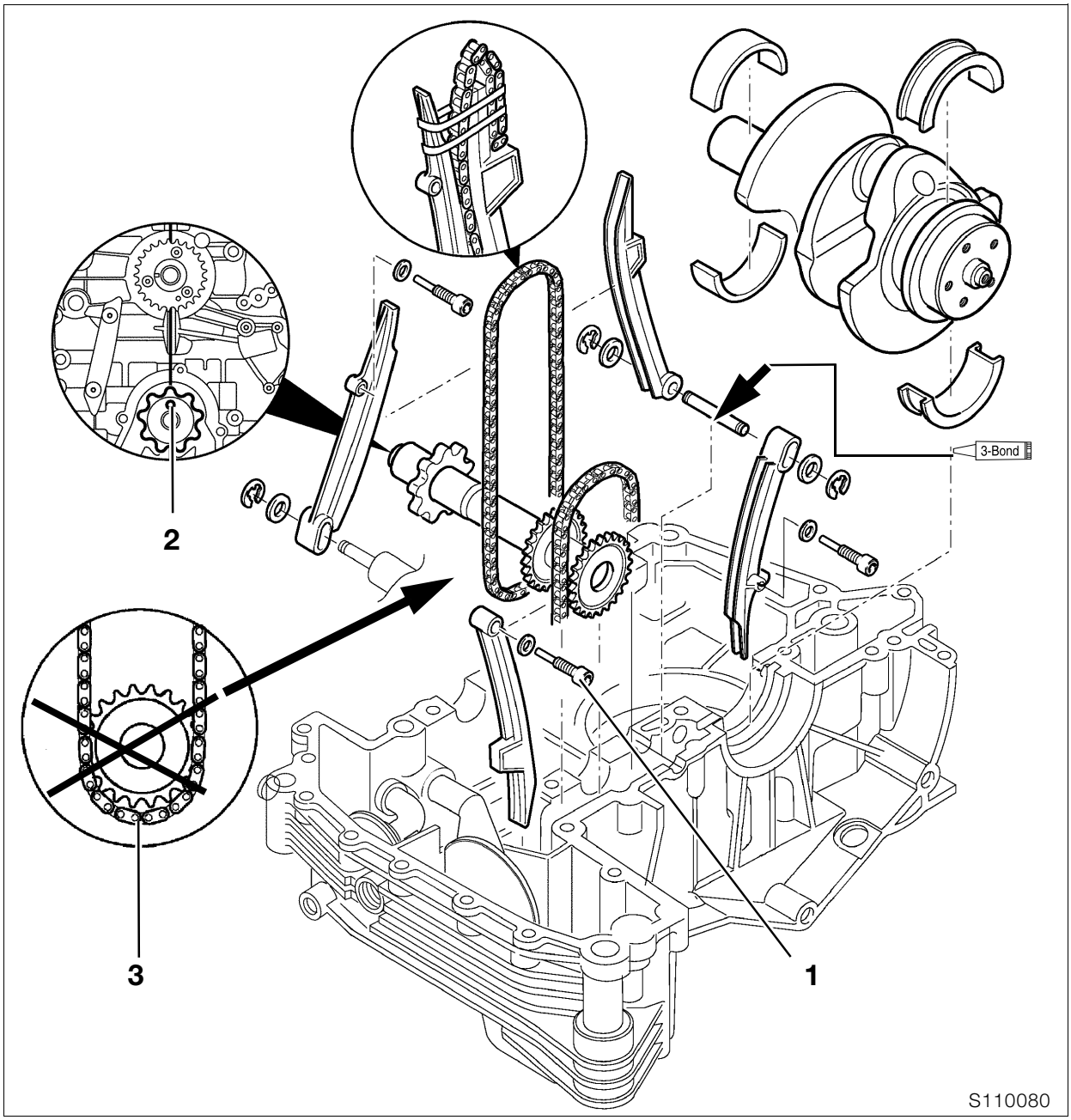


- Clamp crankshaft in a vise with protective jaws.
- Oil the big end bolts, screw them in by hand and tighten with tightening angle indicator, **BMW No. 11 2 500**.

Caution:
Oil the bearings.
Make sure that conrods and bearing shells are re-installed in their original positions.
Always use new big end bolts.
Use a felt-tipped pen or similar to mark the installed positions on the conrods.

Tightening torque:
Big end bolts (oiled)
Joint torque ..... 20 Nm
Wrench angle ..... 80°





Installing crankshaft

Caution:
Oil the bearings.

Installing timing chain tensioning and slide rails

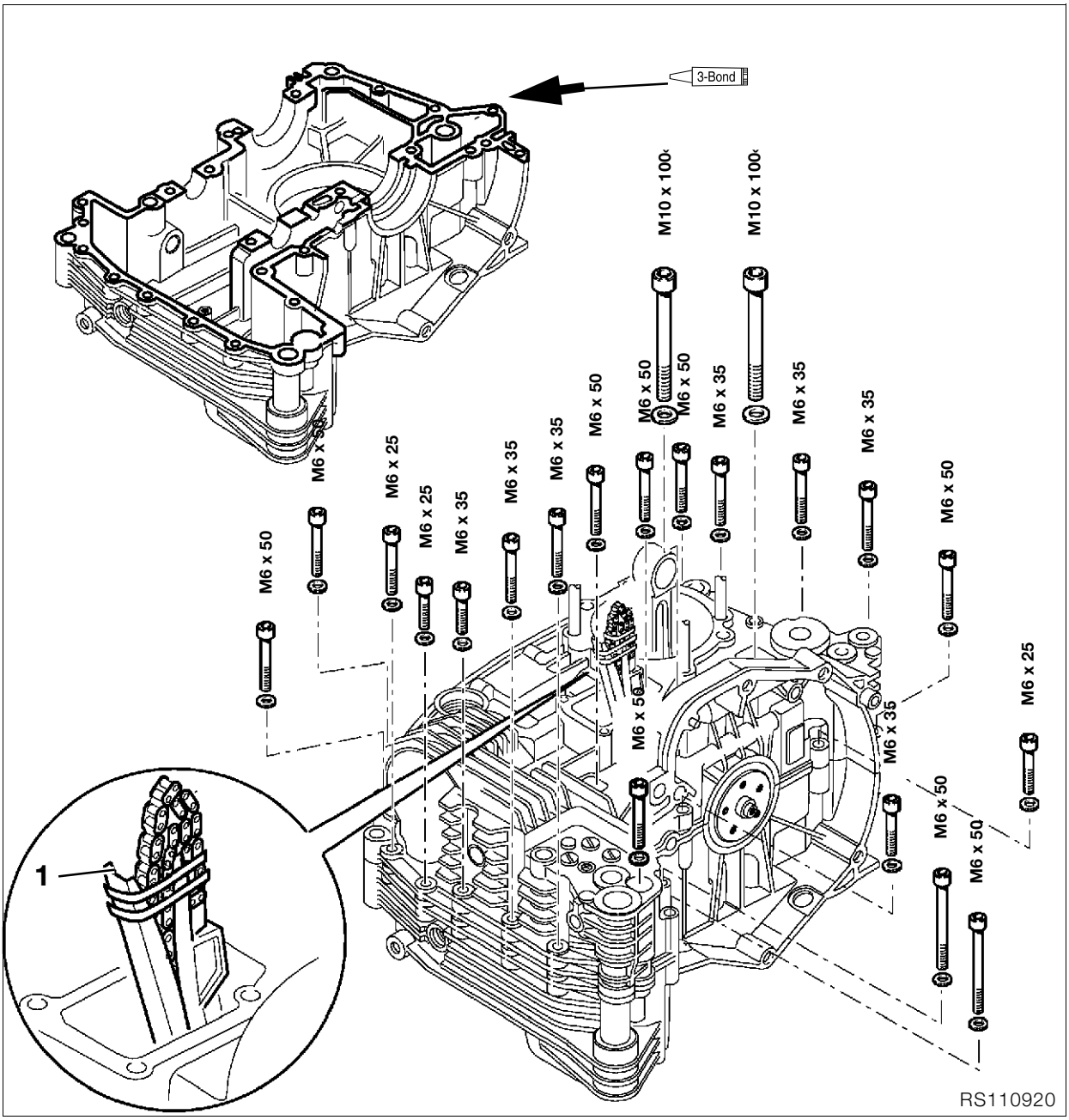
- Seal pivot pin for tensioner rail/slide rail at clutch side (arrow) with **3-Bond 1209**.
- Insert pivot screw (1) into chain tensioner rail, using a new seal.

Tightening torque:
Chain guide rail pivot pin ..... 18 Nm

Installing auxiliary shaft/timing chains

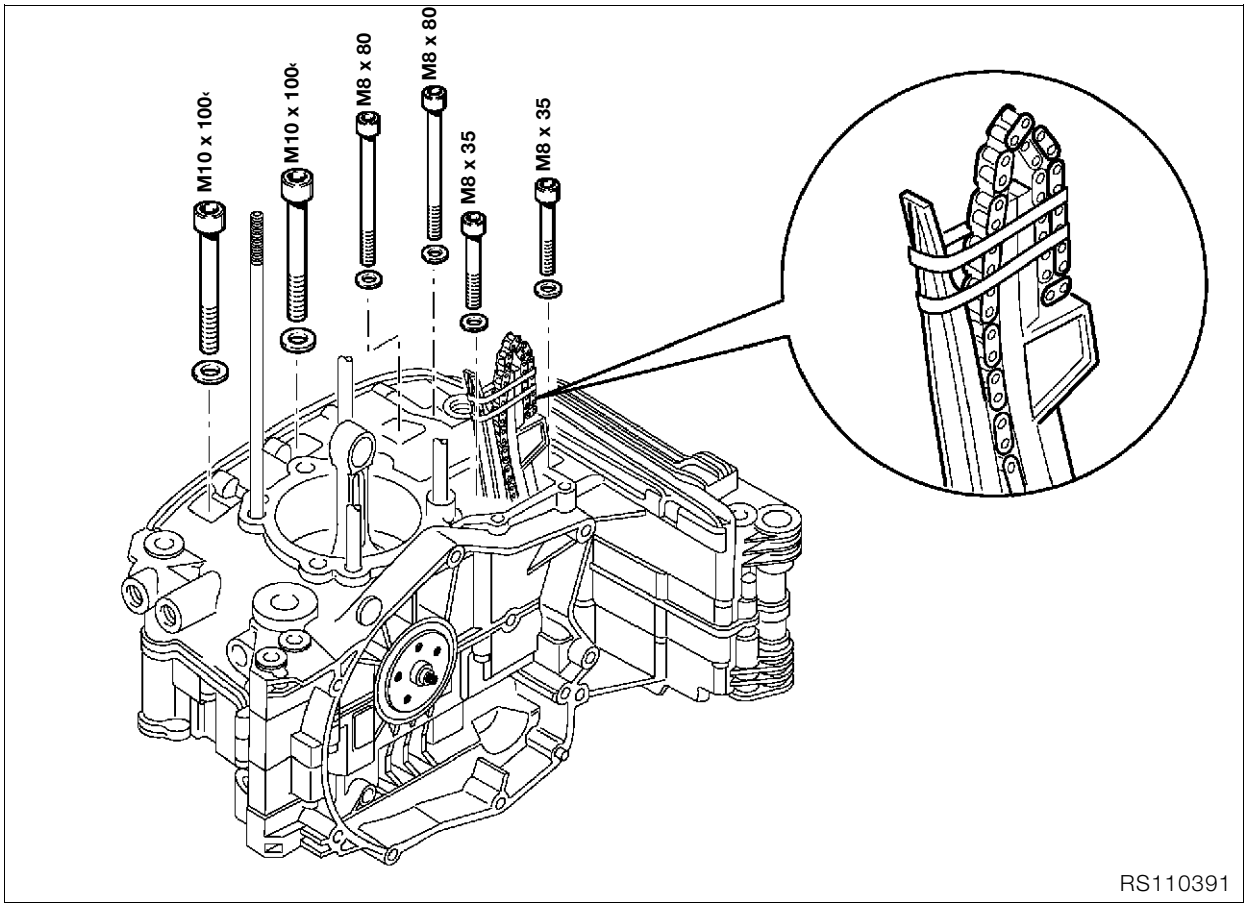
- When installing the auxiliary shaft, make sure that the bore in the auxiliary shaft (2) facing the crankshaft is in line with the crankcase mating face.

Caution:
Timing chains (3) must mesh fully with auxiliary shaft sprockets.



Assembling engine block

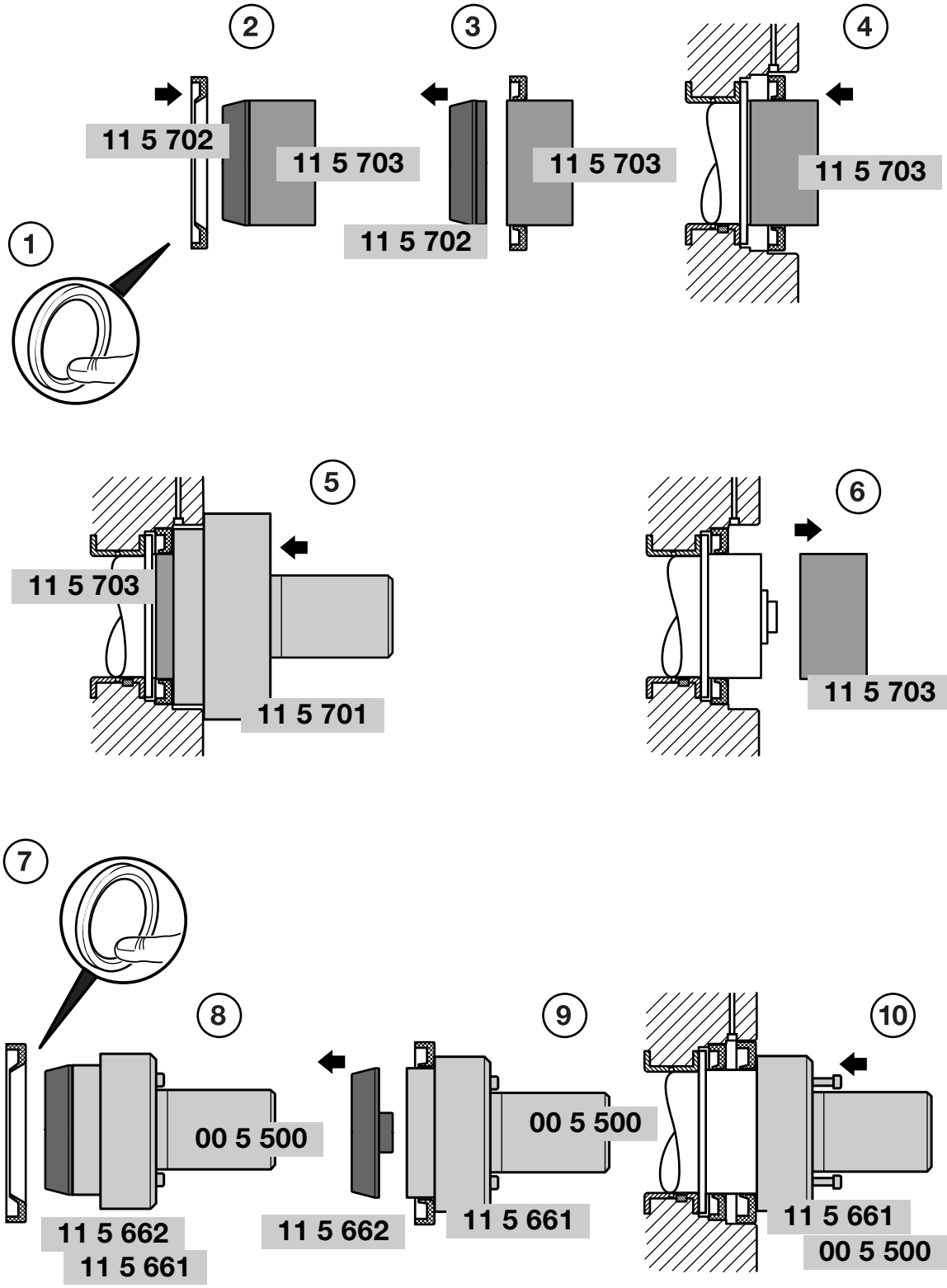
- Clean and degrease sealing faces (arrow) and coat with **3-Bond 1209**.
- Secure the timing chain with rubber band (1) to the timing chain tensioner and slide rail.



- Bolt the crankcase sections together.

Tightening torque/tightening order:

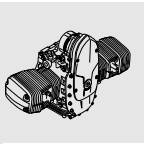
1. M 10 screw (oiled) Initial torque ..... 25 Nm
   Wrench angle ..... 90°
2. M 8 screw (oiled) ..... 22 Nm
3. M 6 screw ..... 9 Nm


1
2
11 5 702
11 5 703
3
11 5 703
11 5 702
4
11 5 703
5
11 5 703
11 5 701
6
11 5 703
7
8
00 5 500
11 5 662
11 5 661
9
00 5 500
11 5 662
11 5 661
10
11 5 661
00 5 500

Installing radial shaft seals on crankshaft

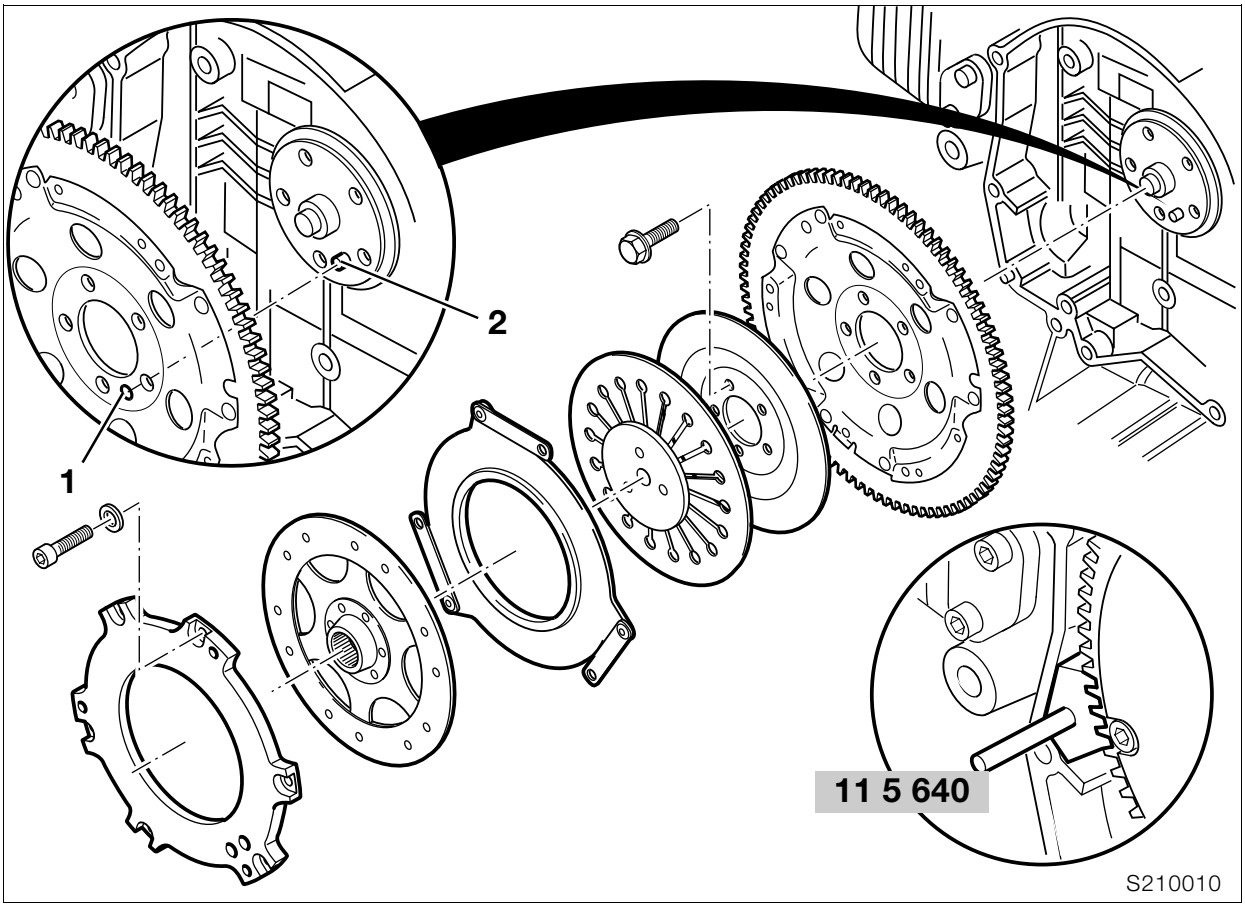
Installing the crankshaft-end radial shaft seal

- Shape the lip of the radial shaft seal carefully by hand (1).
- Oil the radial shaft seal at the sealing/contact surface.
- Using assembly sleeve, **BMW No. 11 5 702**, mount the radial shaft seal with the closed side toward the clutch onto sleeve, **BMW No. 11 5 703**, (2).
- Remove assembly sleeve (3).
- Mount sleeve complete with radial shaft seal on crankshaft (4).
- Use drift, **BMW No. 11 5 701**, together with the sleeve (5) to drive the radial shaft seal onto the crankshaft.
- Remove sleeve (6).



Installing the clutch-end radial shaft seal

- Shape the lip of the radial shaft seal carefully by hand (7).
- Oil the radial shaft seal at the sealing/contact surface.
- Using assembly sleeve, **BMW No. 11 5 662**, mount the radial shaft seal with the closed side toward the clutch onto drift, **BMW No. 11 5 661**, with handle, **BMW No. 00 5 500**, (8).
- Remove assembly sleeve (9).
- Using the drift, drive the radial shaft seal home (10).

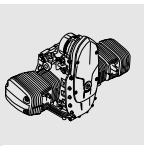


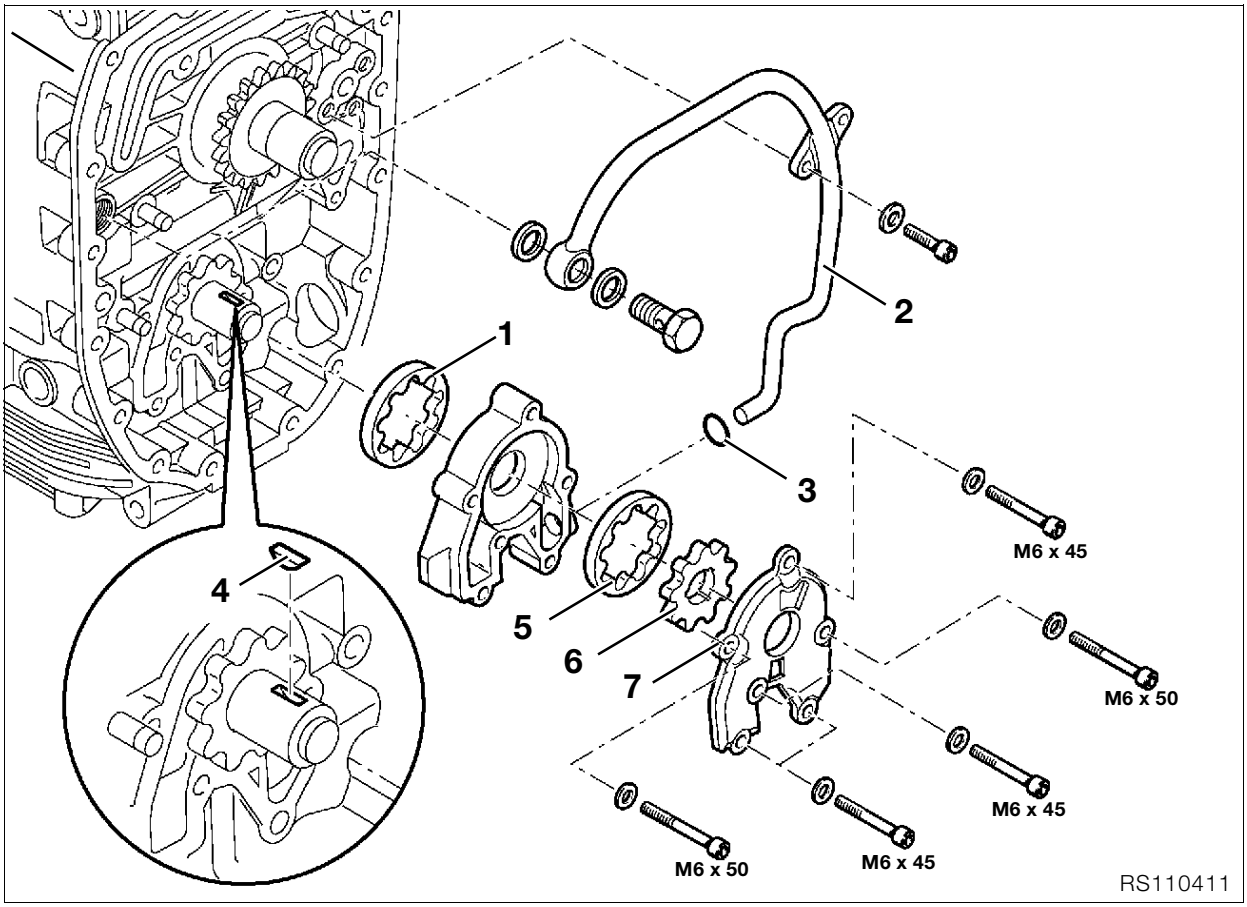
Installing clutch housing

Caution:
Always use new screws for housing and cover.

- Install clutch housing with mark (1) aligned with crankshaft mark (2).
- Lock the clutch housing with special tool, **BMW No. 11 5 640**.
- Insert all screws by hand and tighten down.

Tightening torque:
Clutch housing to crankshaft
(screw threads oiled) ..... 40 Nm
Wrench angle ..... 32°





Installing oil pump

Caution:
Oil the friction faces.

- Install outer rotor (1) of oil pump in pump housing.
- Install oil pump housing with cooling oil pipe (2).

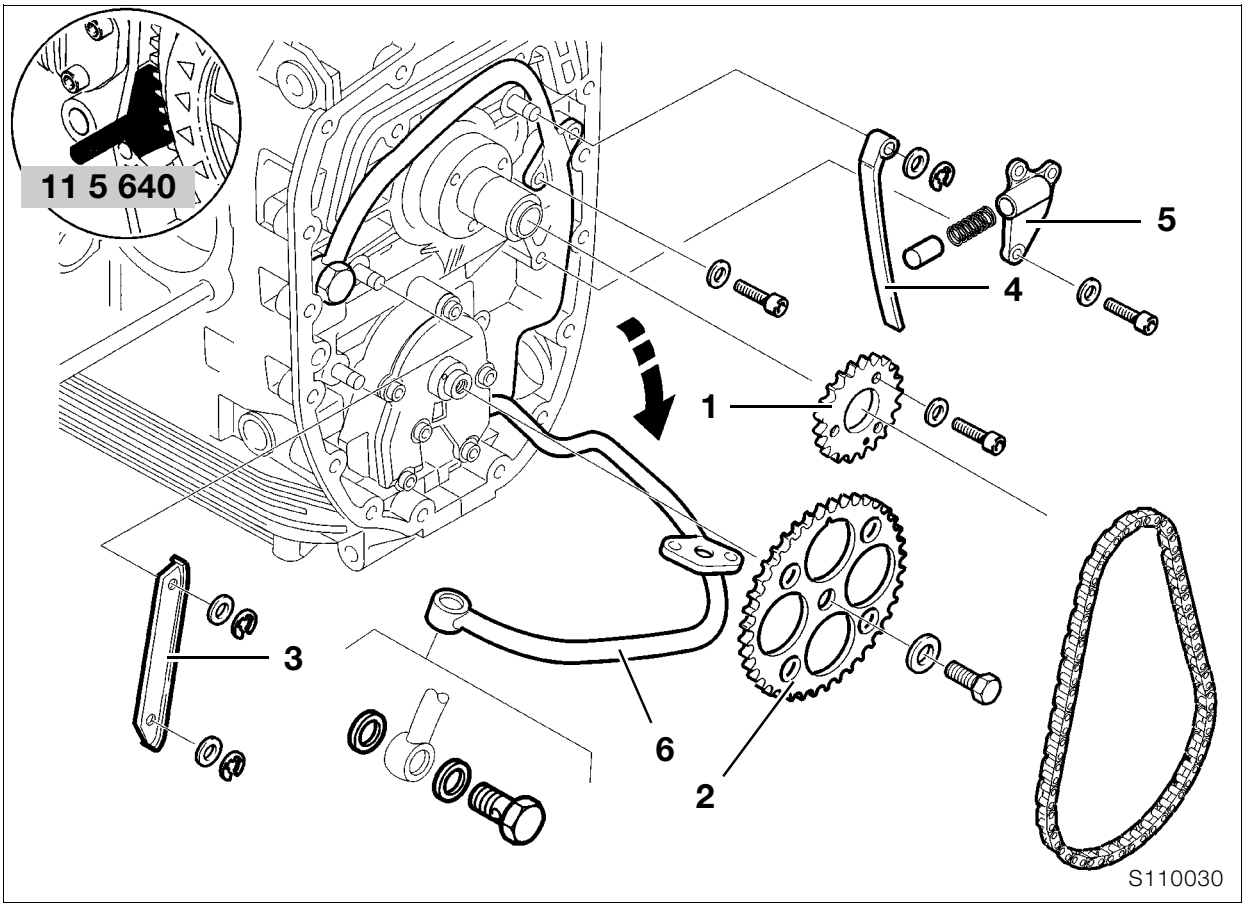
Caution:
O-ring (3) must be in perfect condition.

- Install Woodruff key (4), outer rotor (5) and inner rotor (6) in cooling oil pump.
- Secure housing cover (7) to oil pump.

Caution:
Note different lengths of screws.

Tightening torque:

M 6 screw ..... 9 Nm
Pressure relief valve ..... 42 Nm
Oil pressure switch..... 30 Nm



Installing auxiliary shaft drive

- Align crankshaft mark with mark on auxiliary shaft.

⚠ Caution:
Adjust according to the adjusting instructions.
➠ ..... See Technical Data

- Lock the clutch housing with special tool, **BMW No. 11 5 640**.
- Install chain sprocket (1).

Tightening torque:
M 6 screw ..... 10 Nm

- Install drive-shaft chain with chainwheel (2).

Tightening torque:
Securing screw in chainwheel ..... 70 Nm

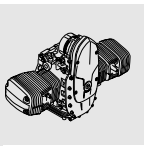
- Install and secure chain guide rail (3).
- Install and secure chain tensioner rail (4).
- Install chain tensioner housing (5) with piston and spring.

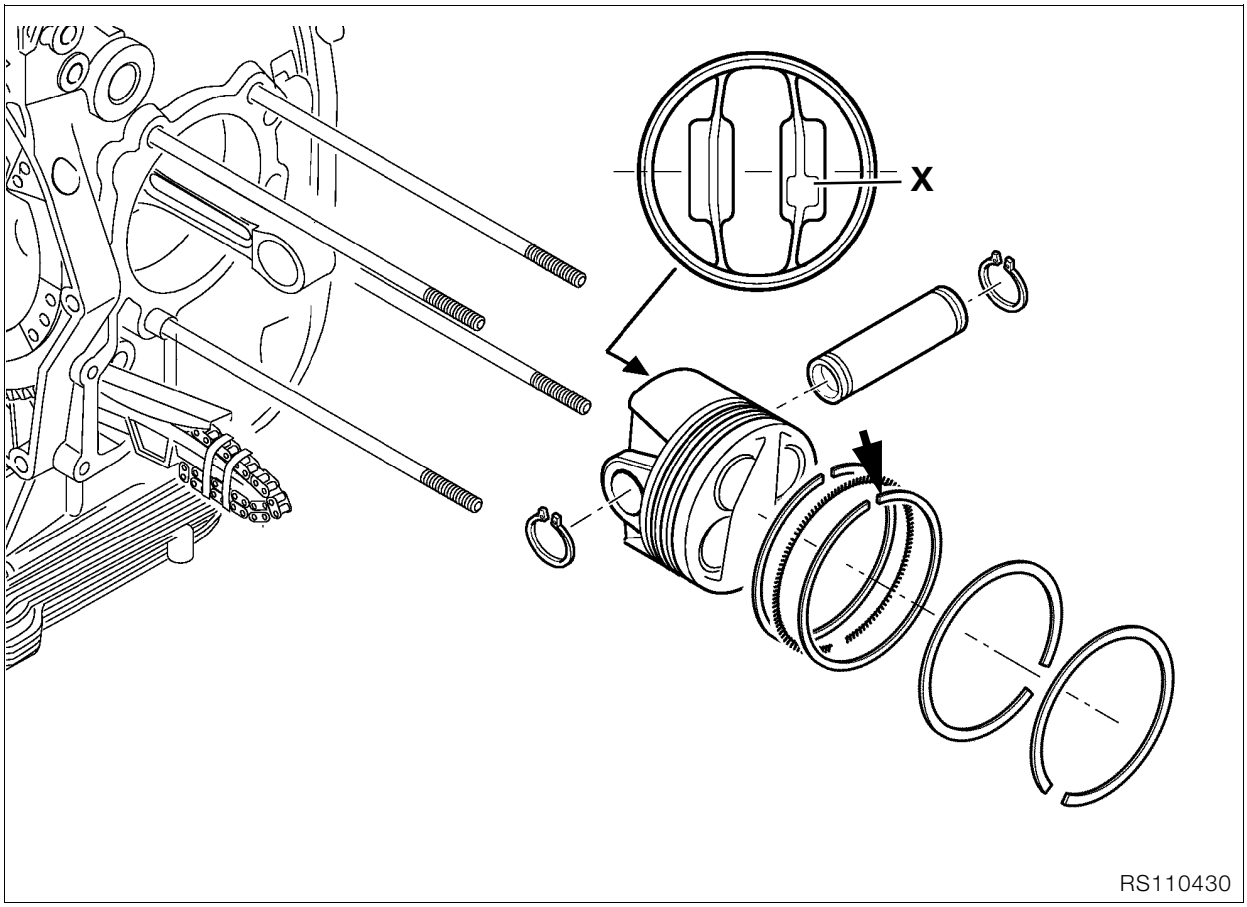
Tightening torque:
M 6 screw ..... 9 Nm

- Tighten down cooling oil line (6).

⚠ Caution:
Use a new sealing ring.

Tightening torque:
M 6 screw ..... 10 Nm
Banjo bolt for cooling oil line
with oil vent valve ..... 25 Nm





Installing piston

- Turn oil scraper ring so that gap (arrow) is at top.
- Install piston rings with gaps offset by 120°.

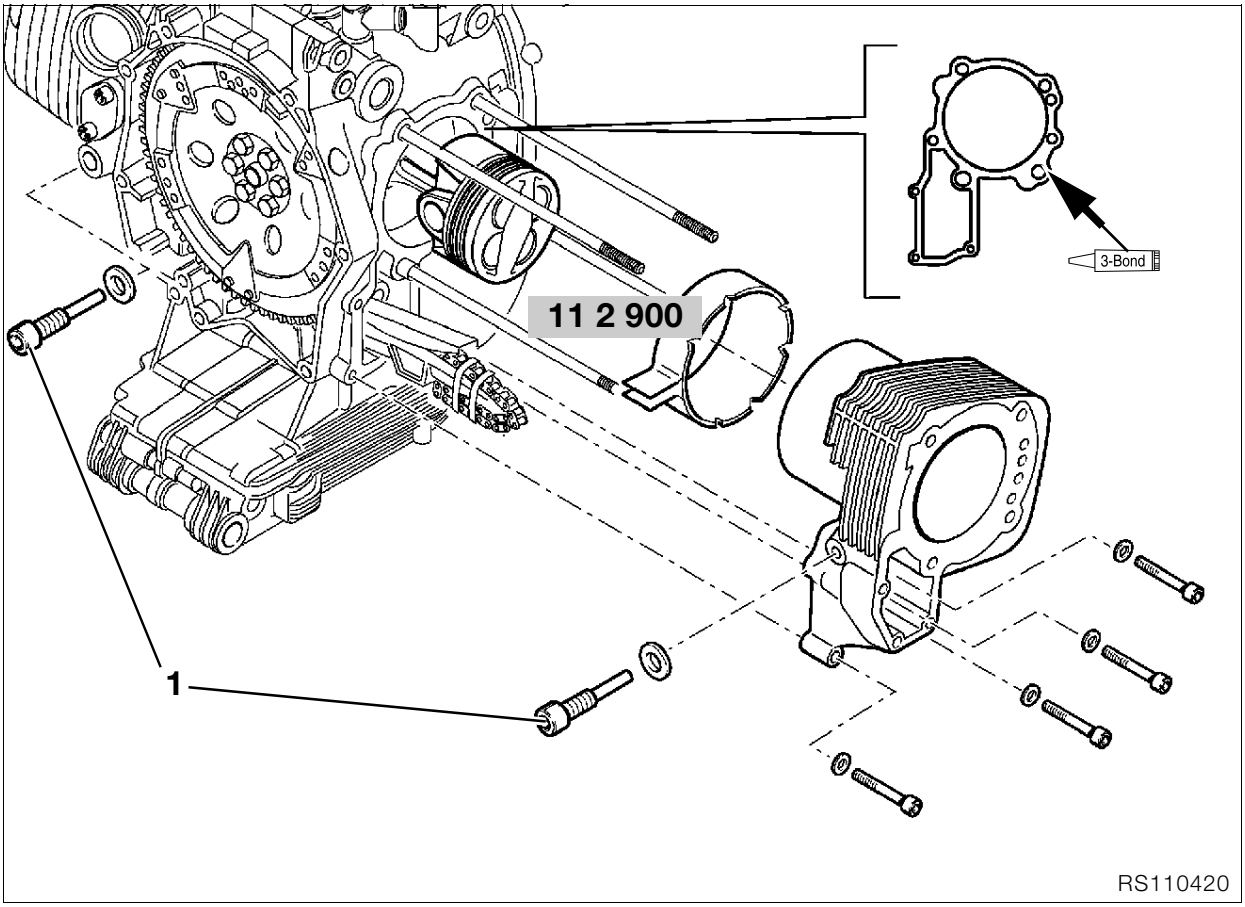
Production locating point **X** = install on exhaust side.

Caution:
Make sure that retaining rings are properly seated on piston pin.
Oil the friction faces.
Always use pistons of the same weight class in any one engine.

Markings: ..... + or –
➠ ..... See Technical Data

Caution:
Always install pistons and cylinders in pairs.
Do not mix up pistons and piston pins.

Piston size identification:
On piston crown A, B, AB (for either A or B cylinder), and on cylinder A, B.

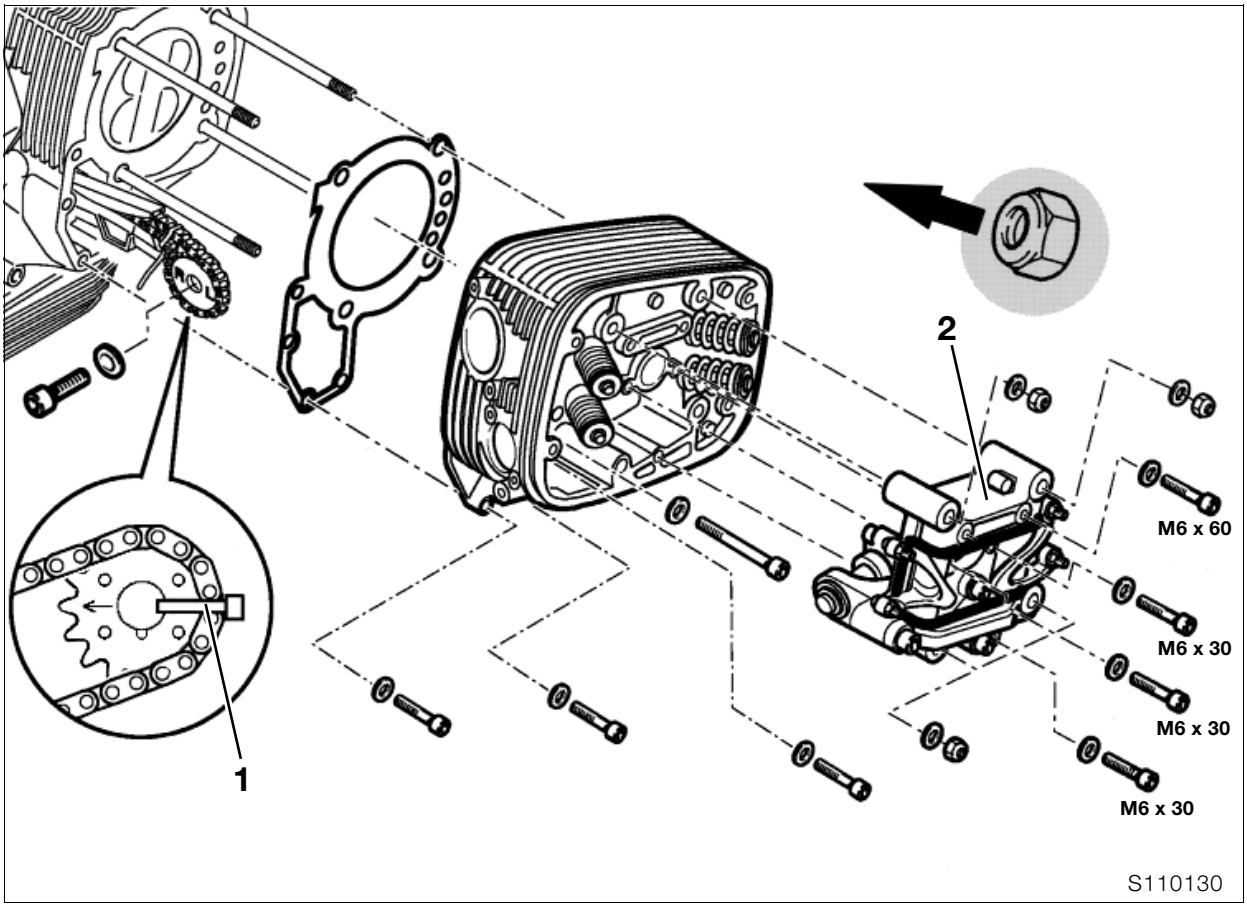


Installing cylinder

- Clean and de-grease cylinder base sealing face (arrow) and apply **3-Bond 1209**.
- Oil the cylinder wall.
- Compress the piston rings with a clamping strap, **BMW No. 11 2 900**.
- Install the cylinder and at the same time pass the timing chain and the tensioner and guide rails through the timing case cavity.
- Tighten cylinder securing screws.
- Fit new seals to pivot pins for chain guide rail (1).
- Install chain sprocket.

Tightening torque/tightening sequence:

1. M 8 screw ..... 20 Nm
2. M 6 screw ..... 9 Nm
3. Pivot screw for chain guide rail..... 18 Nm



Installing cylinder head

- Install cylinder head gasket.
- Fit cylinder head and insert correctly positioned camshaft chain sprocket (1) and timing chain into chain cavity.
- Install valve gear holder (2).
- Tighten cylinder head securing screws and nuts.

Caution:
Install cylinder head nuts with collar (arrow) toward cylinder head.

Tightening torque/tightening sequence:

1. Tighten cylinder head nuts (oiled) in diagonally opposite sequence

1.1 Tighten all nuts ..... 20 Nm
1.2 Tighten all nuts to correct angle ..... 90°
1.3 Tighten all nuts to correct angle ..... 90°
2. M 10 screw ..... 40 Nm
3. M 6 screw ..... 9 Nm

Tightening torque:
Retighten after 1000 km (app. 600 miles)
Tighten cylinder head nuts in diagonally opposite sequence

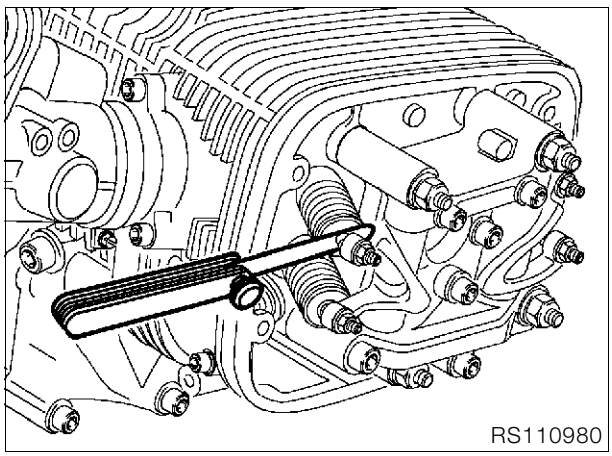
1. Slacken one nut
2. Tighten nut to initial torque ..... 20 Nm
3. Tighten nut to wrench angle ..... 180°
4. Slacken and retighten M10 screw ..... 40 Nm

- Fit camshaft chain sprocket in accordance with adjustment specification.
- Lock the clutch housing with special tool, **BMW No. 11 5 640**.
- Tighten camshaft chain sprocket.

Tightening torque:
Camshaft sprocket retaining screw ..... 65 Nm

- Insert the left-side camshaft sprocket with pin into the camshaft and set the left cylinder to firing TDC.
- Fit camshaft chain sprocket in accordance with adjustment specification.
- Tighten camshaft chain sprocket.
- Install chain tensioner.
- Check that marks on camshaft sprockets are in accordance with adjustment specification.

Tightening torque:
Chain tensioner ..... 32 Nm



Adjusting valve clearances

- Set piston to firing TDC.
- Measure valve clearance with feeler gauge.
- Correct valve clearance with adjusting screw and tighten locknut.

Valve clearances with engine cold (max. 35 °C/95 °F):

Inlet ..... 0.15 mm (0.006 in)
Exhaust ..... 0.30 mm (0.012 in)

Tightening torque:

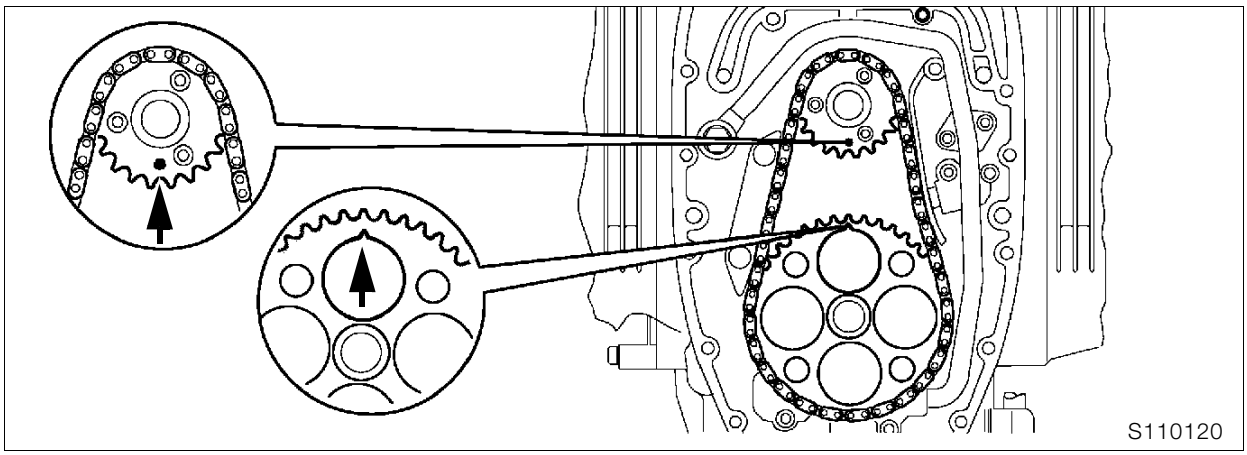
Locknut ..... 8 Nm

- Recheck valve clearances. Feeler gauge must pull through between valve stem and adjusting screw with slight resistance.

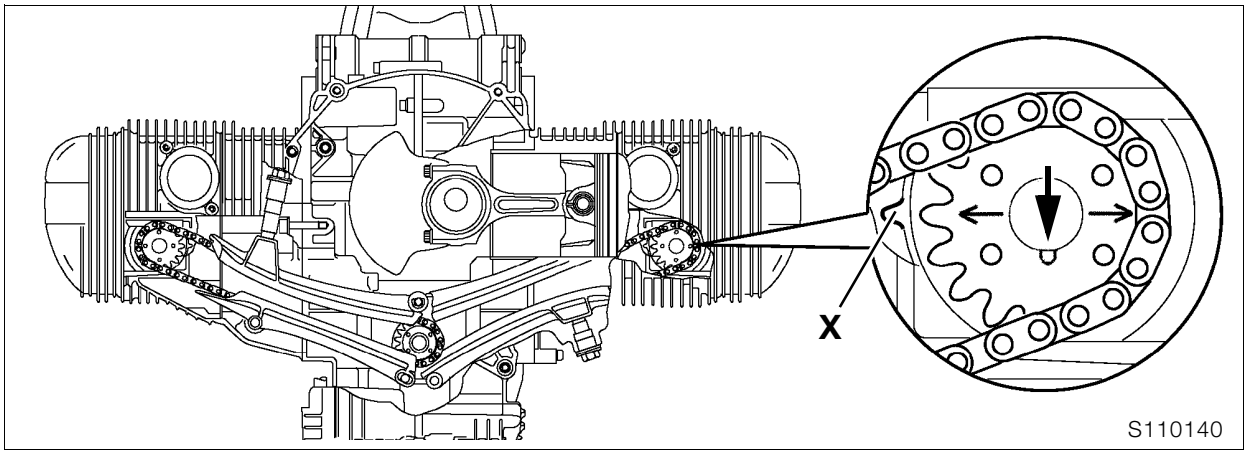
Installing right cylinder head

Adjustment specification

Caution:
When assembling, **always** start with the **right-hand** cylinder.



Right cylinder = at firing TDC:
marks (arrows) on chainwheel/auxiliary shaft and chain sprocket/crankshaft are aligned.



- Lock engine at firing TDC by inserting pin, **BMW No. 11 2 650**, through holes in clutch housing and engine block.

Note:
With engine installed, set engine to TDC with dial gauge holder, **BMW No. 00 2 650**, and dial gauge, **BMW No. 00 2 510**.

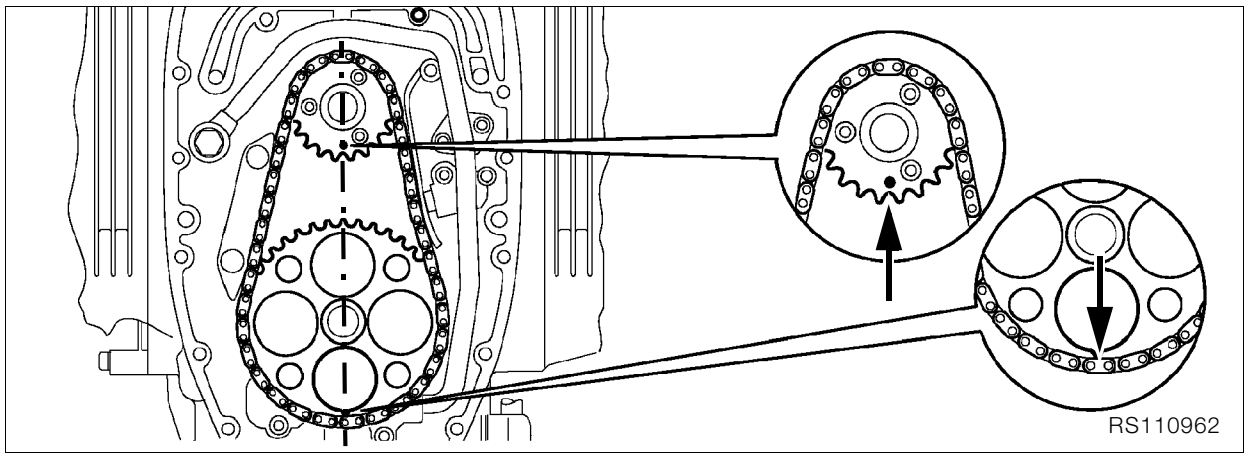
Right cylinder = at firing TDC:
Locating pin (arrow) on right camshaft sprocket points downwards.
Mark (**arrow**) and tip of tooth on right camshaft gear are **exactly aligned** with mark **X** on valve gear holder.

- Recheck setting with timing chain tensioner installed.

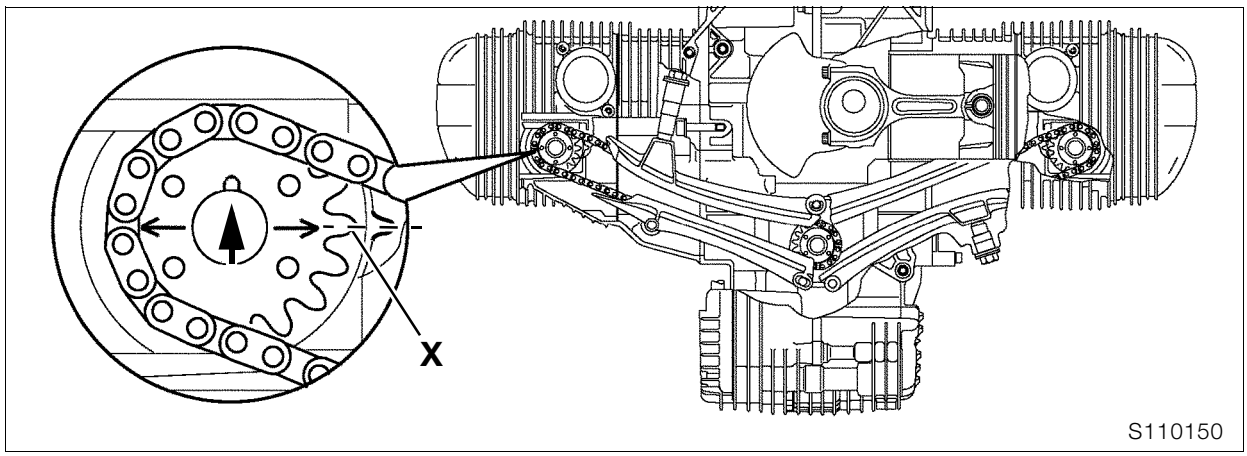
Installing left cylinder head

Adjustment specification

Caution:
When installing, **always** begin with the **right-hand** cylinder.



Left cylinder = at firing TDC: marks (arrows) on chain sprocket/auxiliary shaft and chainwheel/crankshaft at bottom

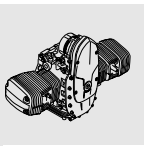


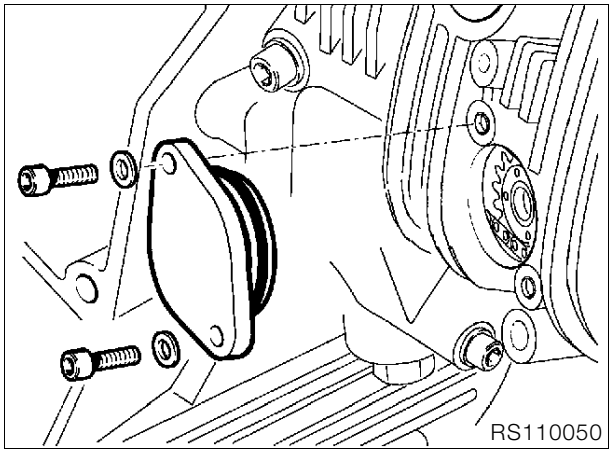
- Lock engine at firing TDC by inserting pin, **BMW No. 11 2 650**, through holes in clutch housing and engine block.

Note:
With engine installed, set engine to TDC with dial gauge holder, **BMW No. 00 2 650**, and dial gauge, **BMW No. 00 2 510**.

Left cylinder = at firing TDC:
Locating pin (arrow) on left camshaft sprocket points upwards.
Mark (**arrow**) and tip of tooth of left camshaft gear are **exactly aligned** with mark **X** on valve gear holder.

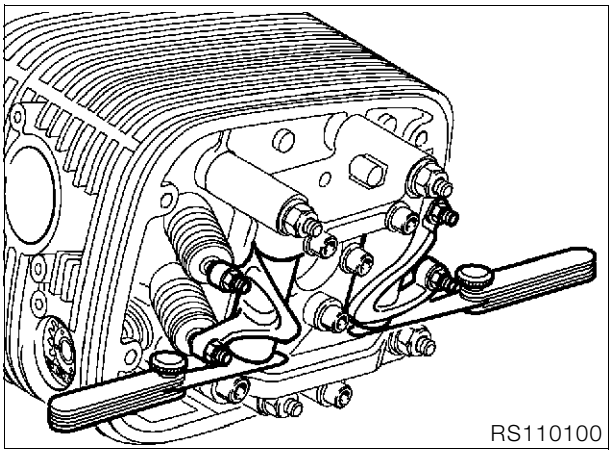
- Recheck setting with timing chain tensioner installed.





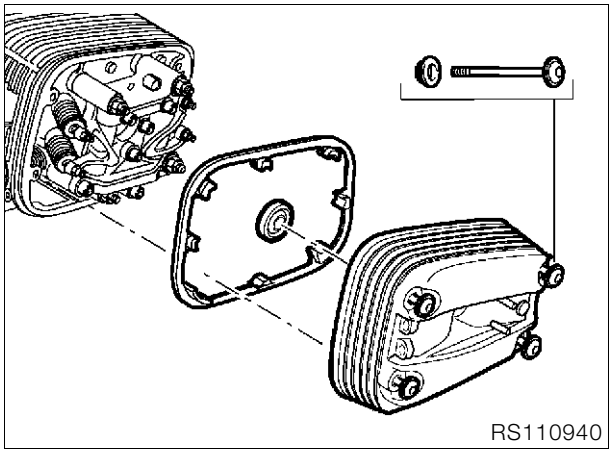
- Install the end cover with O-ring in perfect condition.

Tightening torque:
M 6 screw ..... 9 Nm



- Adjust the holder for minimum end float.

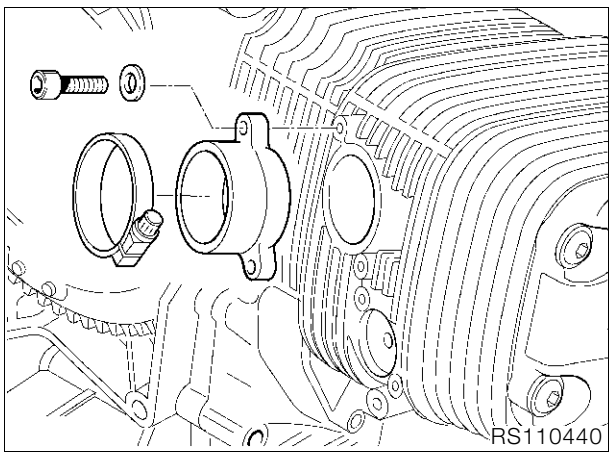
End float of rockers:
min. ..... 0.05 mm (0.002 in)
max. ..... 0.40 mm (0.016 in)



- Install cylinder head cover.

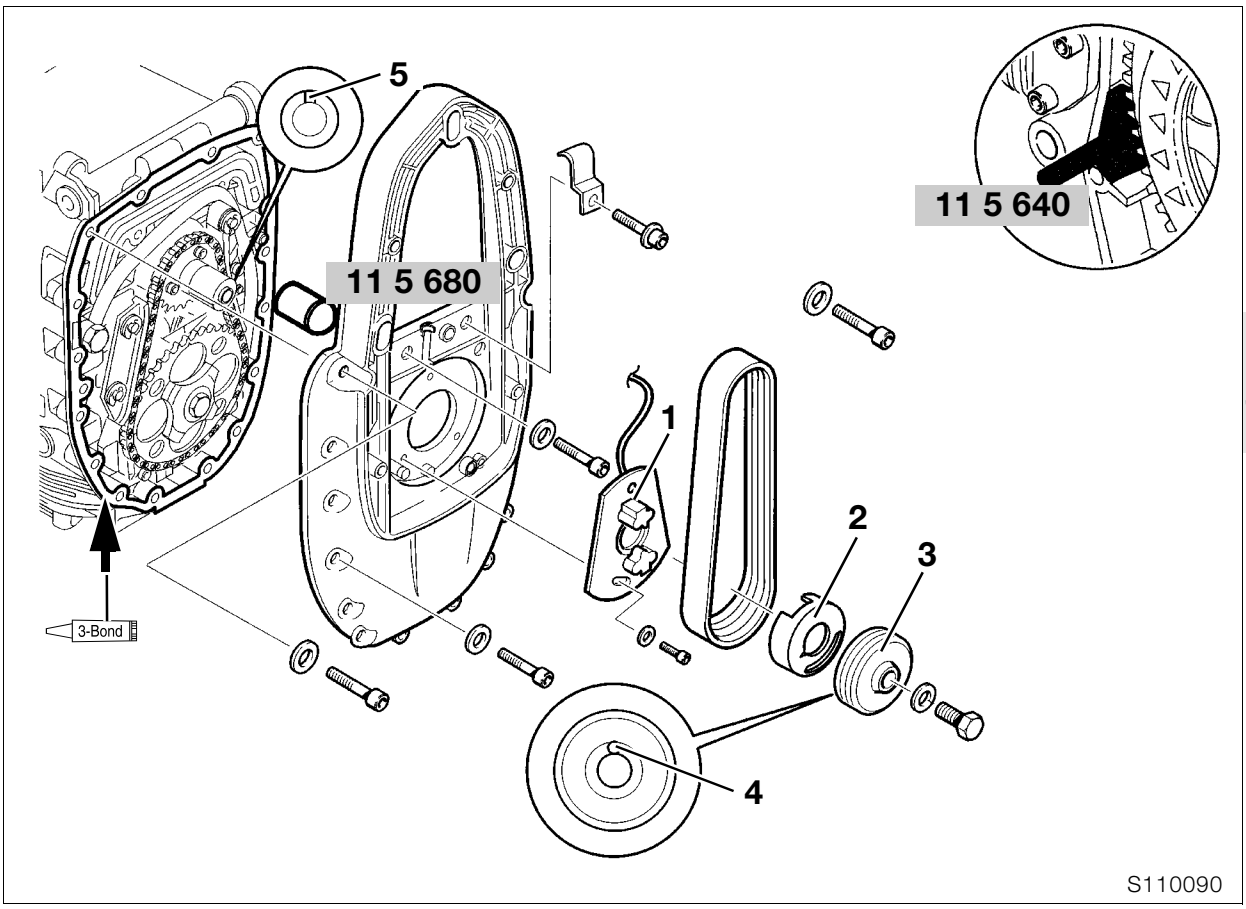
Caution:
Make sure that gaskets are correctly seated. Gaskets and sealing faces must be free from oil and grease.

Tightening torque:
Cover screw ..... 9 Nm



- Secure air intake stub pipe.

Tightening torque:
M 6 screw ..... 9 Nm



Installing alternator mount cover

- Place assembly sleeve, **BMW No. 11 5 680**, on crankshaft.
- Clean and de-grease sealing face (arrow) and apply **3-Bond 1209**.
- Install alternator mount cover.

Tightening torque:

M 8 screw ..... 20 Nm
M 6 screw ..... 9 Nm

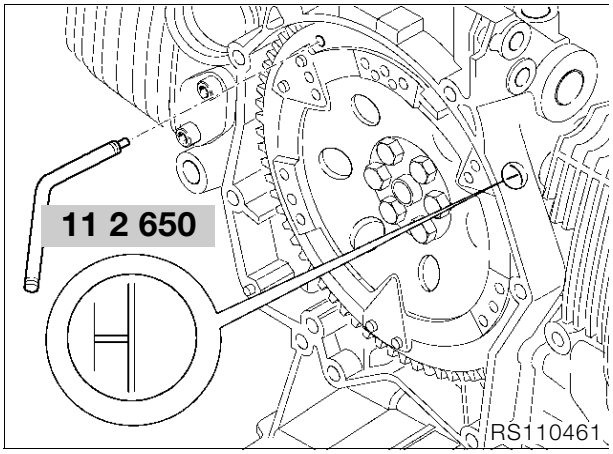
Installing magnetic gate/belt pulley

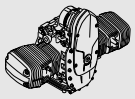
- Install Hall-effect trigger plate (1).
- Lock the clutch housing with special tool, **BMW No. 11 5 640**.
- Secure rotor (2) of Hall-effect gate to the Poly-V belt pulley (3) with, for example, **Loctite instant adhesive**.
- Install the Poly-V belt pulley.

Caution:
Seat retainer for Hall-effect gate rotor (4) in groove in crankshaft (5).

Tightening torque:

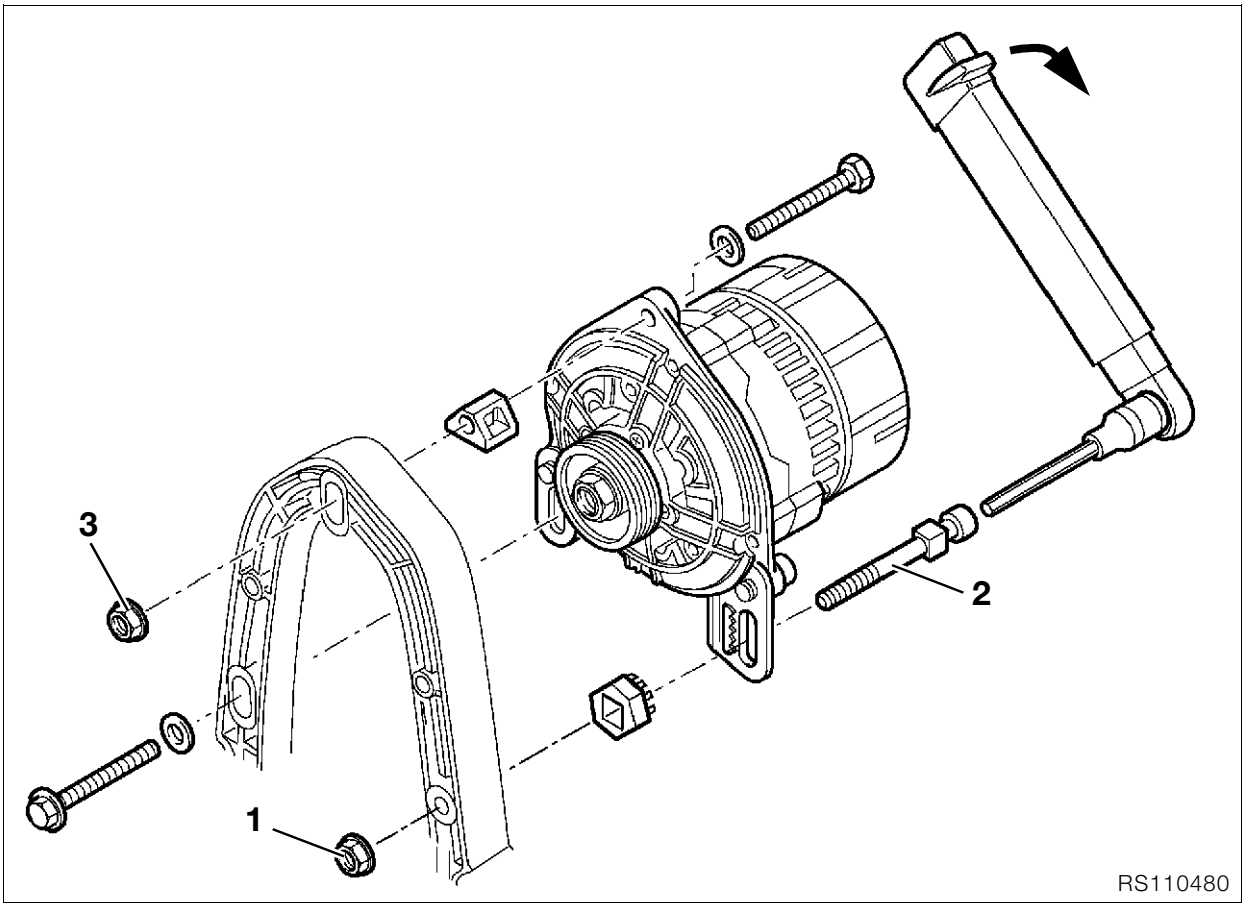
Retaining screw for belt pulley ..... 50 Nm





Timing the ignition

- Using TDC locating pin, **BMW No. 11 2 650**, lock the clutch housing.
- Connect **BMW** MoDiTeC with adapter cable to Hall-effect gate plate.
- Set the timing, following the tester instructions.
- Remove the TDC locating pin.



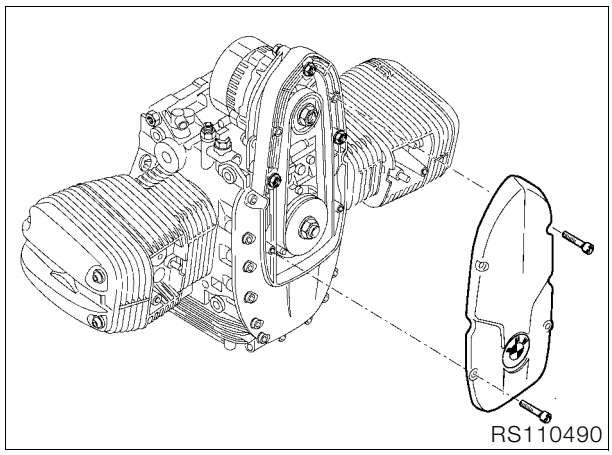
Installing alternator

- Install alternator.

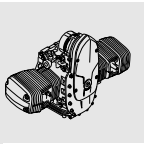
Poly-V belt adjusting procedure:
Poly-V belt installation procedure:

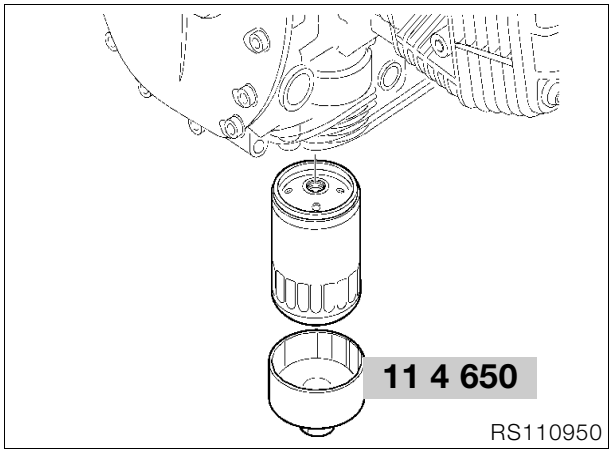
- Hand-tighten hex nut (1) on adjusting screw (2) (**do not use tools**).
- Tighten adjusting screw (2) with a torque wrench and keep preload applied. Tighten upper retaining nut (3), then remove torque wrench from adjusting screw.

Tightening torque:
Preload Poly-V belt with adjusting screw..... 8 Nm
Alternator to alternator support cover..... 20 Nm



- Install front cover.

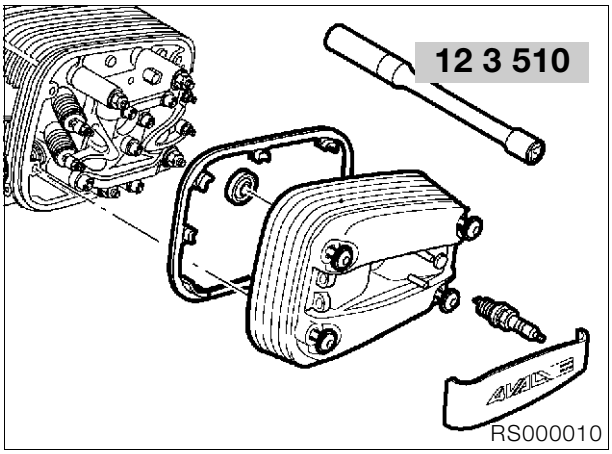




- Install oil filter with oil filter wrench, **BMW No. 11 4 650**.
- Insert and tighten oil drain plug with a new seal.

Tightening torque:

Oil filter (sealing face lightly oiled) ..... 11 Nm
Oil drain plug..... 32 Nm



- Install spark plugs with spark plug socket wrench, **BMW No. 12 3 510**.

Tightening torque:

Spark plug..... 20 Nm

Installing engine

- Installation is the reverse of the removal procedure.

12 Engine electrics

Contents

Page

Technical Data 3

Removing and installing coil and ignition leads 5

Checking ignition coil resistance 5

Removing and installing alternator 6

Poly-V belt adjusting procedure: 6

Disassembling/assembling alternator 7

Checking alternator 7

Checking armature for short to ground (earth) 7

Disassembling/assembling alternator 8

(Option 50 A) 8

Checking alternator 8

Checking armature for short to ground (earth) 8

Removing and installing starter motor 9

Disassembling/assembling starter motor 10

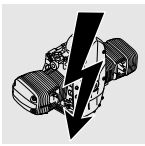
Replacing carbon brushes 10

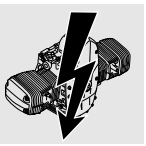
Checking starter motor 10

Checking starter relay 10

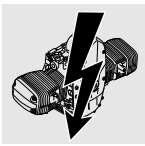
Removing and installing magnetic gate 11

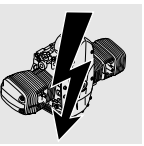
Timing the ignition 12

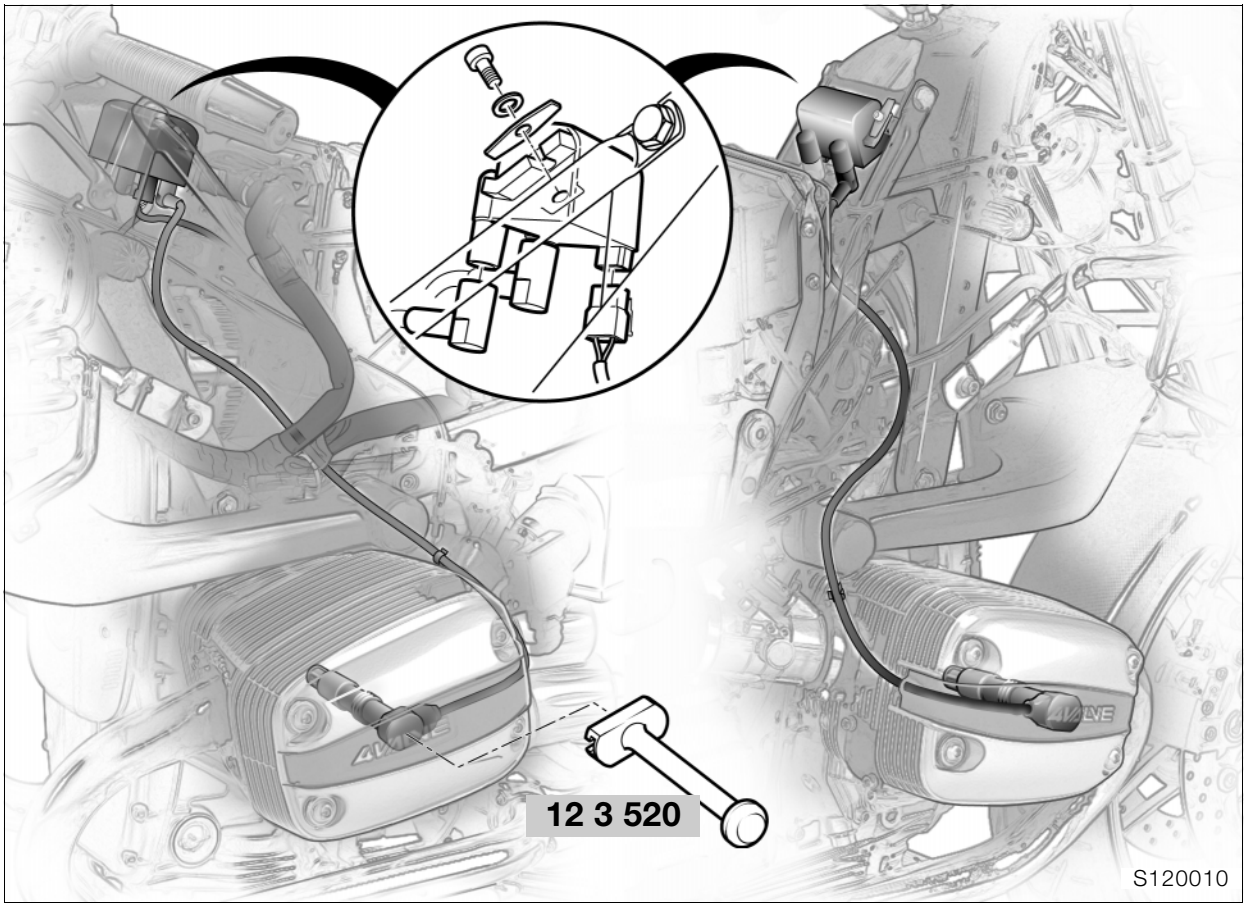




Technical Data		R 1100 S
Starter motor		
Type		Permanent-magnet motor with planetary gear drive
Gear ratio		Planetary gears 5.5 : 1
Power rating	kW	1.1
Alternator		
Type		Three-phase alternating-current generator with integrated all-electronic voltage regulator Standard: Denso Option: Bosch
Drive		Poly-V belt
Gear ratio		1 : 1.5
Maximum output rating	W/V	560/14 (option: 700/14)
Maximum current at engine speed 4000 min^{-1}	A	40 (option: 50)
Nominal current at engine speed 1000 min^{-1}	A	10 (option: 18)
Max. operating speed	min^{-1}	18000 (option: 20 000)
Spark plug		
Bosch		FR 6 LDC
Electrode gap	mm (in)	0.8 (0.03)
Wear limit	mm (in)	1.0 (0.04)
Thread	metric	M 14 x 1.25
Ignition		
Ignition system		Motronic MA 2.4 (mapped characteristic control)
Ignition trigger		Two magnetic gates (Hall-effect transmitters) driven by crankshaft
Ignition timing	°CS	0° ... + 43° before TDC
Static ignition timing	°CS	Adjustment at TDC
Ignition coil		
Twin-spark coil		Beru
Resistance: Primary between terminals 15 and 1	Ω	~0.5
Secondary between terminals 4a and 4b	kΩ	~7.5 when cold







Removing and installing coil and ignition leads

- Remove seat.
- Remove side trim.
- Remove fuel tank.

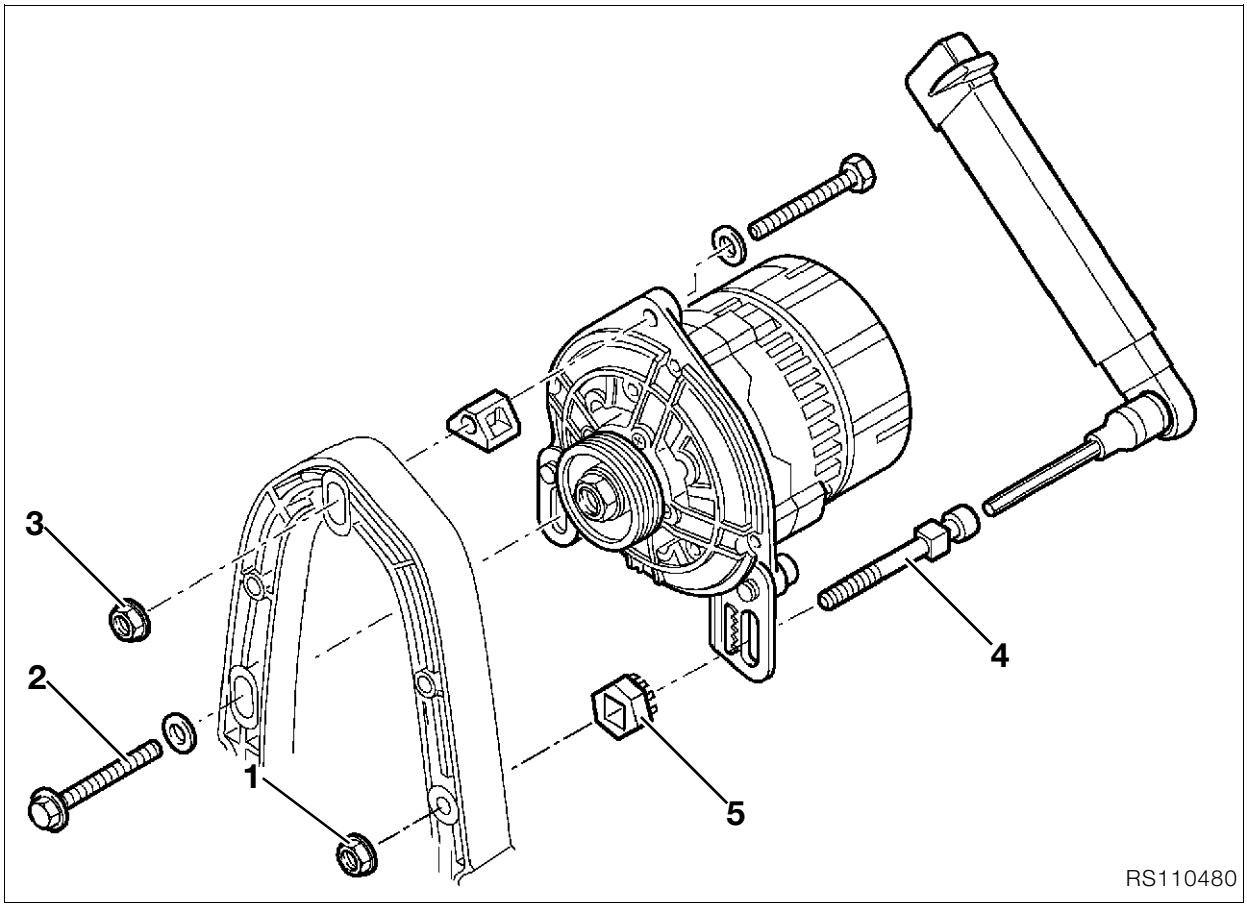
Caution:
Switch off ignition. Disconnect ground (earth) cable from battery and insulate it.

- Pull off spark plug cap with special puller, **BMW No. 12 3 520**.
- Remove ignition leads.
- Remove the ignition coil.
- Installation is the reverse of the removal procedure.
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

Checking ignition coil resistance

- Test with **BMW** MoDiTeC.



Removing and installing alternator

- Remove seat.
- Remove side trim.
- Remove fuel tank.

Caution:
Switch off ignition. Disconnect ground (earth) cable from battery and insulate it.

- Remove Motronic control unit.
- **[ABS]** Remove the pressure modulator.
- Remove front cover from engine.
- Disconnect the leads from the alternator.
- Remove alternator retainers (1, 2, 3).
- Remove bolt (4) and nut (5).
- Remove Poly-V belt.
- Remove the alternator.

Caution:
Avoid scratching the components; use masking tape if necessary.

- Installation is the reverse of the removal procedure.
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

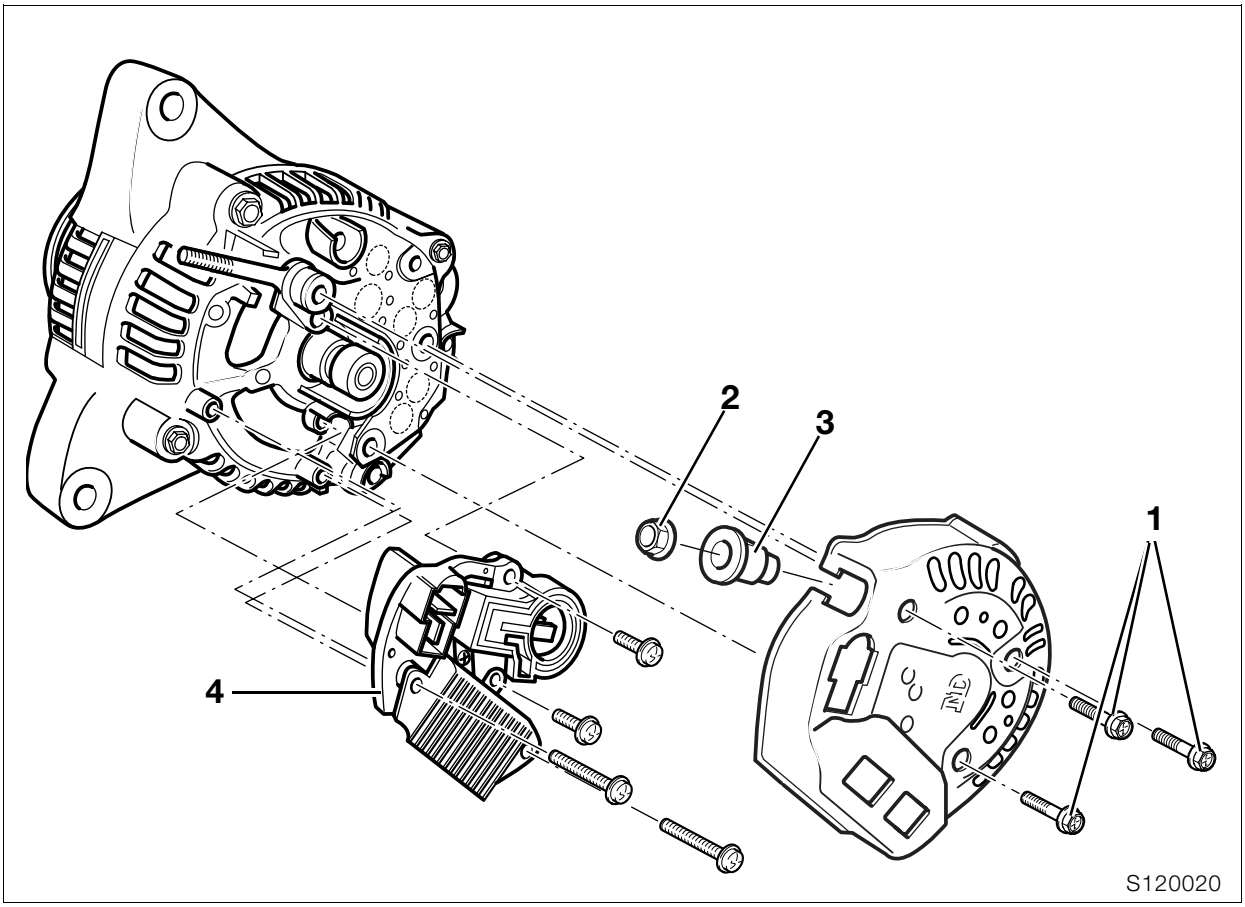
Poly-V belt adjusting procedure:
Poly-V belt installation procedure:

- Place the Poly-V belt in position, tension it and turn the engine over once, then relieve belt tension.

Poly-V belt tensioning procedure:

- Loosen alternator retainers (1, 2, 3).
- Slightly tighten hex nut (1) on adjusting screw (4) by hand (**do not use tools**).
- Tighten adjusting screw (4) with a torque wrench and keep preload applied. Tighten upper retaining nut (3), then remove torque wrench from adjusting screw.

Tightening torque:
Poly-V belt preload..... 8 Nm
Alternator
to alternator support cover..... 20 Nm



Disassembling/assembling alternator

- Remove the cover retaining screws (1).
- Unscrew nut (2) and remove sleeve (3).
- Remove the cover.
- Remove voltage regulator (4).
- Installation is the reverse of the removal procedure.

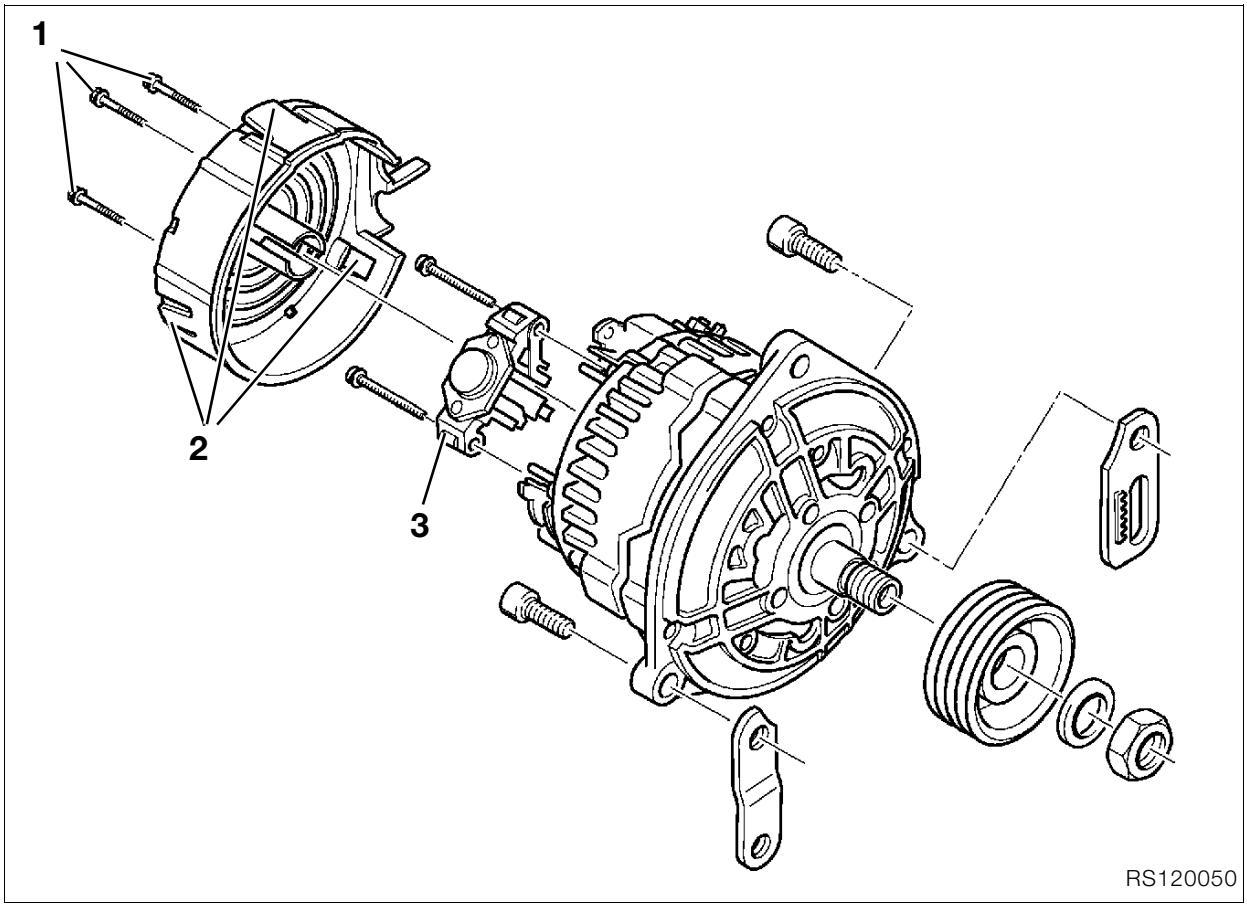
Note:
The belt pulley cannot be removed.

Checking alternator

- Test with **BMW** MoDiTeC.

Checking armature for short to ground (earth)

- Test with **BMW** MoDiTeC.



Disassembling/assembling alternator

(Option 50 A)

- Remove the cover retaining screws (1).
- Release clips (2) and remove the cover.
- Remove voltage regulator (3).
- Remove the Poly-V belt pulley.
- Installation is the reverse of the removal procedure.

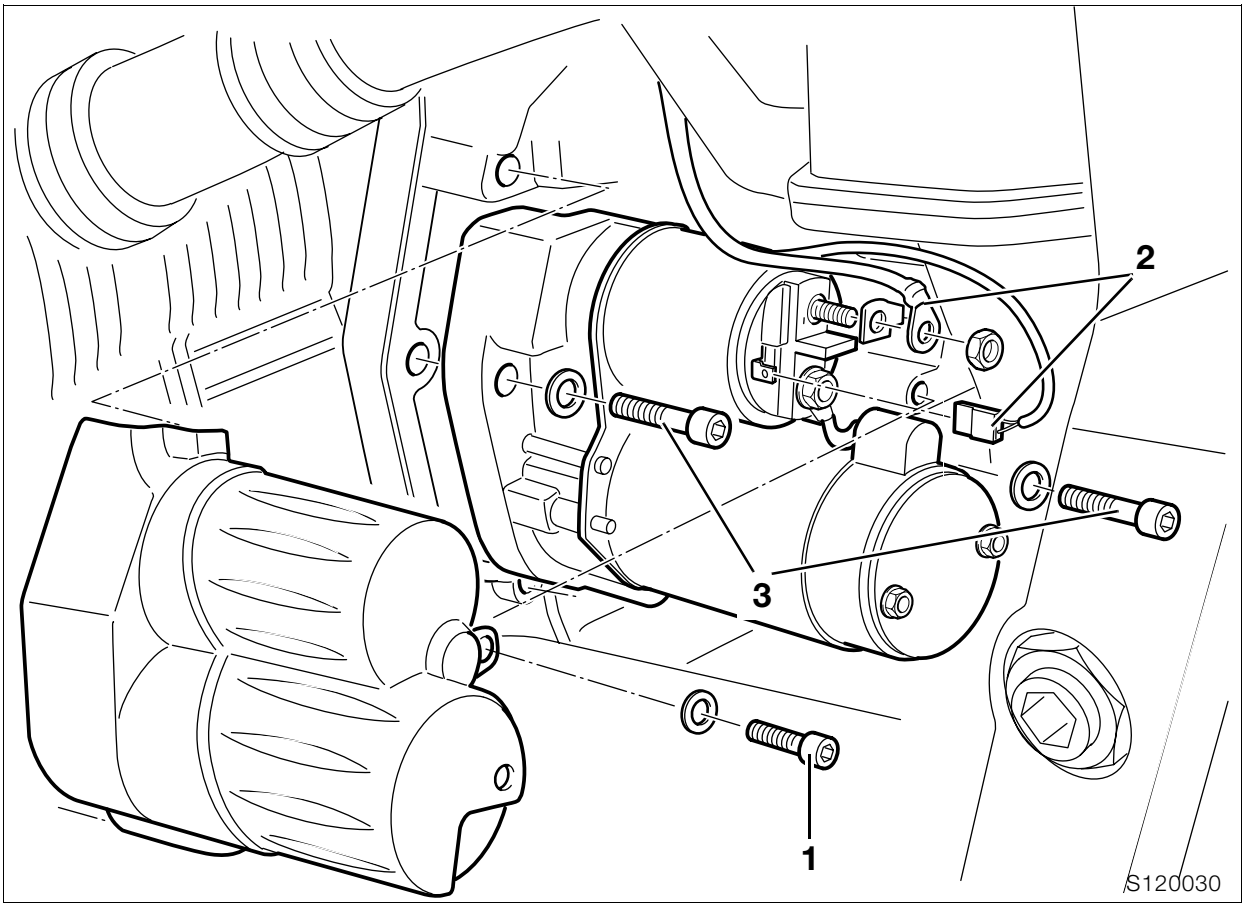
Tightening torque:
Belt pulley to alternator ..... 50 Nm

Checking alternator

- Test with **BMW** MoDiTeC.

Checking armature for short to ground (earth)

- Test with **BMW** MoDiTeC.



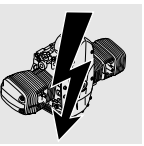
Removing and installing starter motor

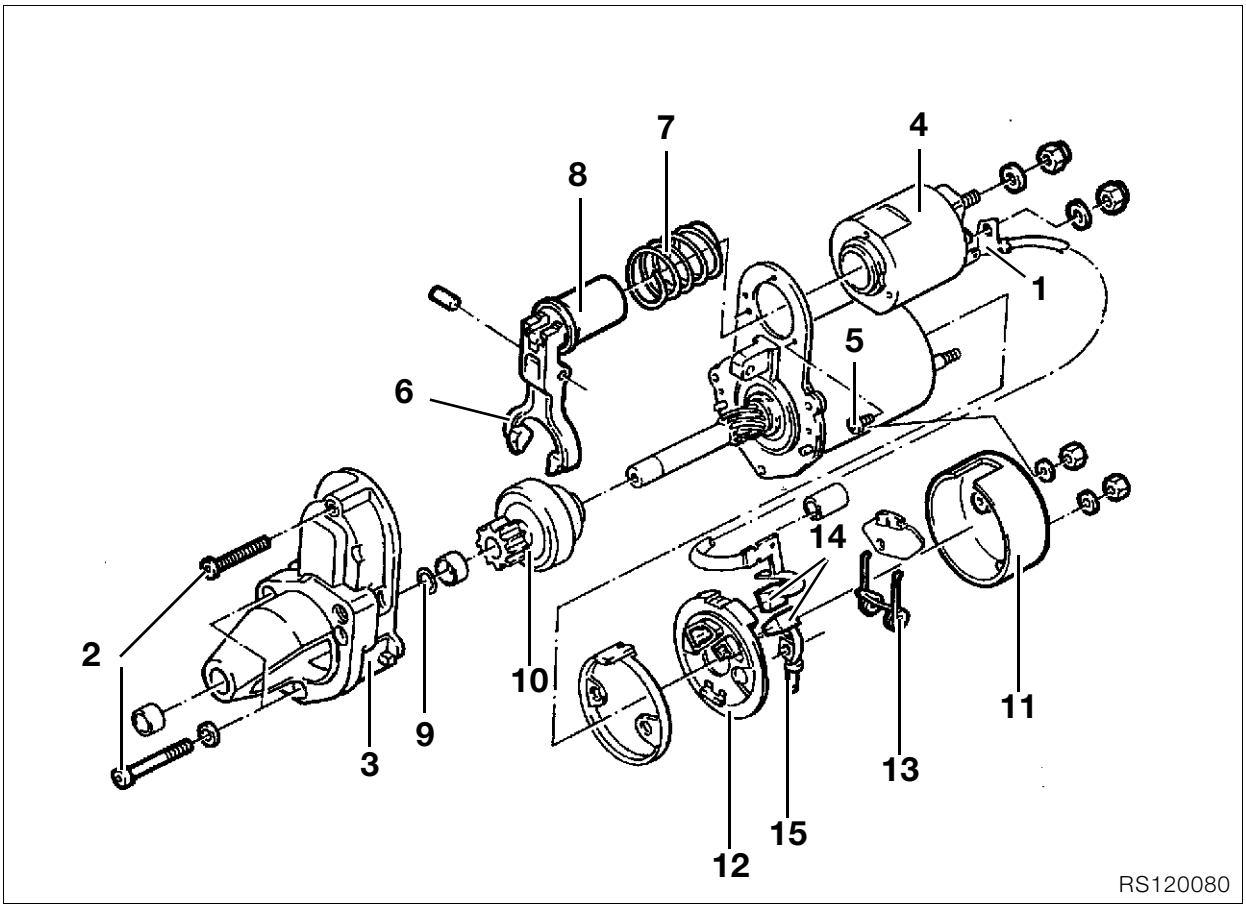
Caution:
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove screw (1) securing starter motor cover.
- Remove the cover.
- Disconnect leads (2).
- Remove screws (3) securing starter motor.
- Remove the starter motor.
- Installation is the reverse of the removal procedure.
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

Tightening torque:
Starter motor to engine ..... 20 Nm
Starter motor cover to gearbox housing .....7 Nm





Disassembling/assembling starter motor

- Disconnect lead (1).
- Remove securing screws (2).
- Remove flange (3).
- Remove solenoid switch (4) after taking out the retaining screws (5).
- Remove release lever (6) and spring (7) from solenoid switch (8).
- Fit a socket of correct size, tap it lightly to back off the bush and remove the retaining ring (9).
- Remove the starter gear (10) from the shaft.
- Installation is the reverse of the removal procedure.
- Coat the Bendix gear and pull-in ring with grease.

Lubricant:
.....Bosch PZ 2 V 3 silicone grease or equivalent

Replacing carbon brushes

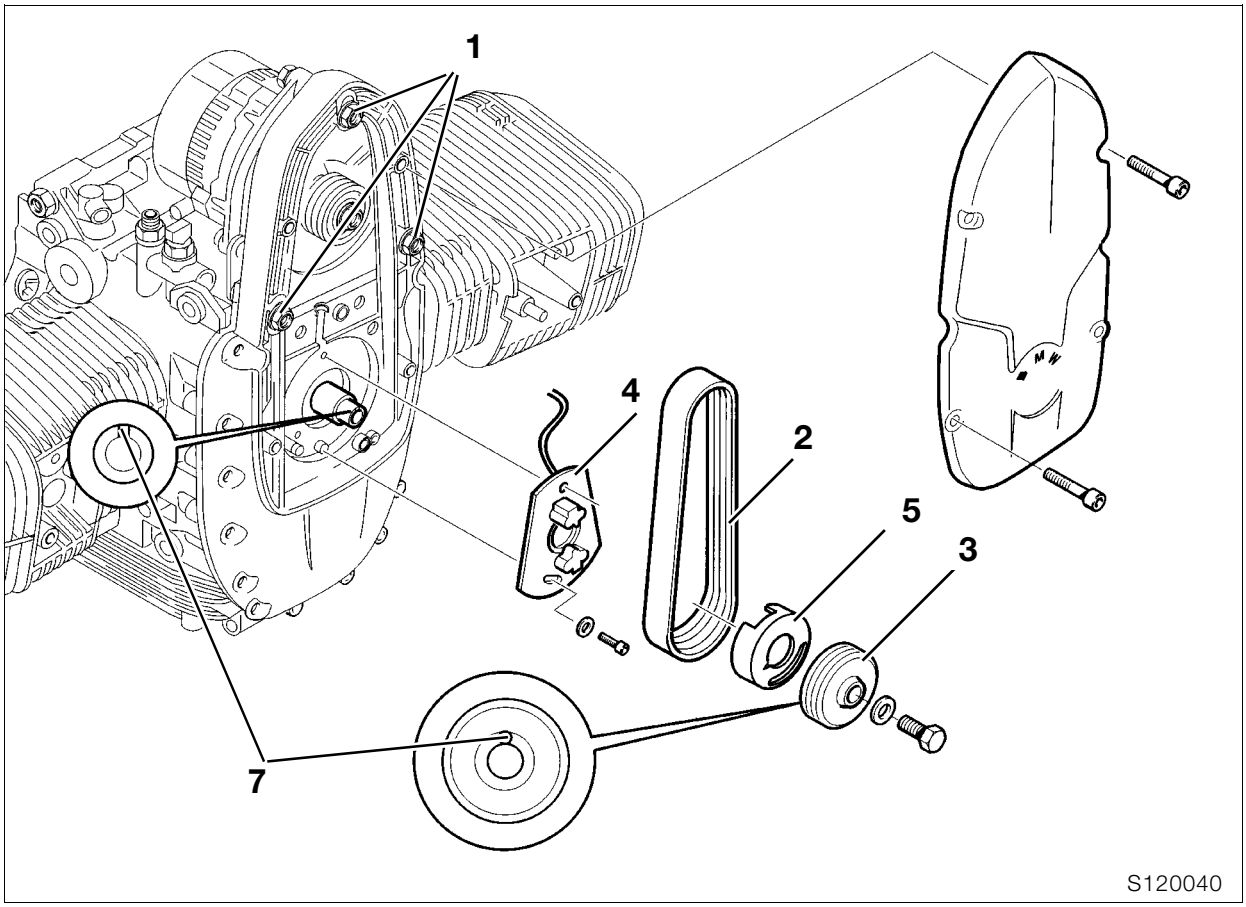
- Disconnect lead (1).
- Remove cover (11).
- Remove holder (12) for carbon brushes.
- Lift up retaining springs (13) and remove carbon brushes (14).
- Install carbon brushes with retaining plate.
- Slide short lead (15) on to threaded pin.
- Install cover (11).
- Connect lead (1).

Checking starter motor

- Test with **BMW** MoDiTeC.

Checking starter relay

- Test with **BMW** MoDiTeC.



Removing and installing magnetic gate

- Remove seat.
- Disengage fuel tank.
- Pull fuel tank to the rear and support it at the front with a piece of wood or similar.

Caution:
Avoid scratching components, for instance by inserting a piece of cloth between the fuel tank and the frame.

- Remove front cover from engine.
- Remove alternator retainers (1).
- Remove Poly-V belt (2).

Caution:
Disconnect ground (earth) lead from battery.
Insulate the ground (earth) lead.

- Remove the starter motor.
- Install locking device, **BMW No. 11 5 640**, to lock the clutch housing.
- Remove Poly-V belt pulley (3) with rotor gate from crankshaft.
- Disconnect plug of magnetic gate.

Note:
If necessary, mark position of magnetic gate for re-installation.

- Remove magnetic gate (4).
- Installation is the reverse of the removal procedure.
- Affix rotor (5) of Hall-effect gate with adhesive to the Poly-V belt pulley (3).

Adhesive: ..... Loctite instant adhesive or equivalent

Caution:
Seat retainer for Hall-effect gate rotor in groove in crankshaft (7).
Carefully route cable for magnetic gate. Tension Poly-V belt to specification.

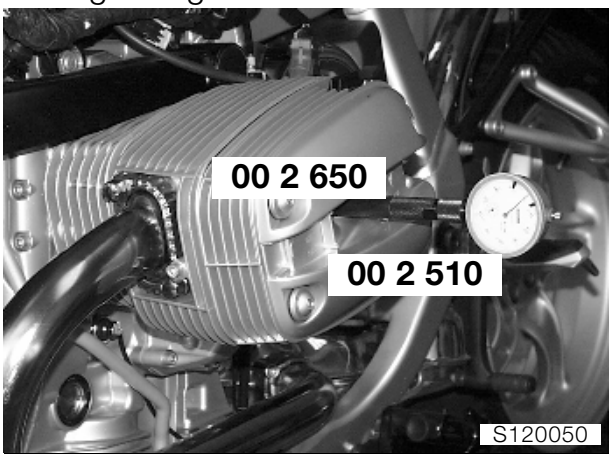
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

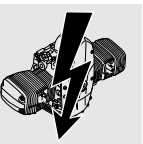
Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

Tightening torque:

Preload of Poly–V belt	8 Nm
Alternator to alternator mount cover	20 Nm
Belt pulley to crankshaft	50 Nm

Timing the ignition





- Screw dial gauge holder, **BMW No. 00 2 650**, and dial gauge, **BMW No. 00 2 510**, into right or left spark plug bore.
- Turn the engine over until the piston is at TDC.
- Set the dial gauge needle to zero.
- Check the dial gauge reading.
- Turn the engine over until the piston is at TDC.
- The dial gauge needle must be at zero.
- Connect **BMW** MoDiTeC with adapter cable to Hall-effect gate plate.
- Set the timing, following the tester instructions.

13 Fuel preparation and control

Contents

Page

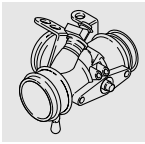
Technical Data 3

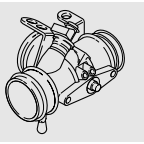
Removing and installing air filter housing 5

Removing and installing throttle-valve stub pipe 6

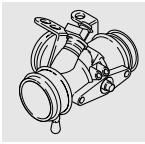
Removing and installing throttle-valve potentiometer 7

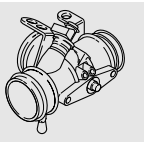
Removing and installing Motronic control unit 7

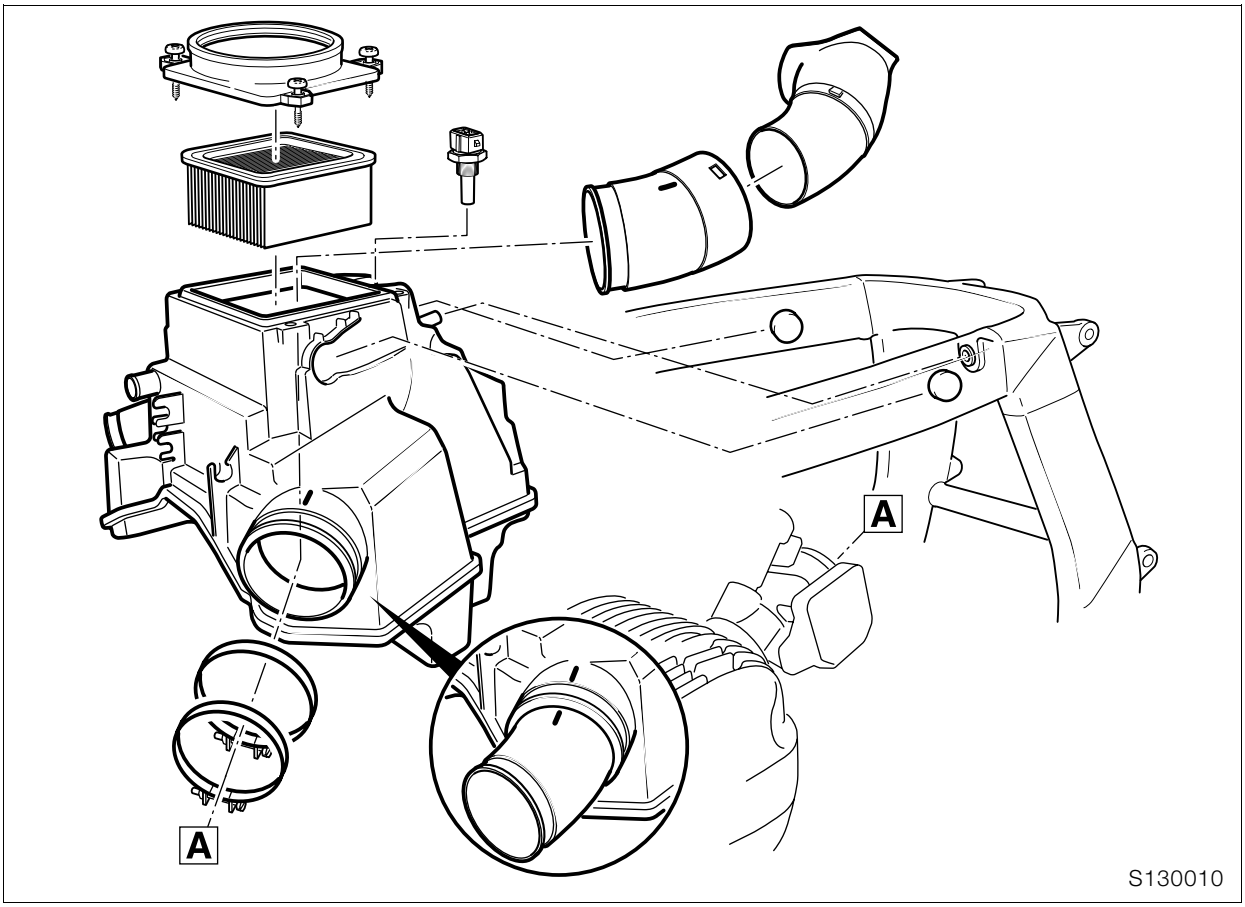




Technical Data	R 1100 S
Fuel grade	Super (premium), unleaded, 95 octane (RON)
Mixture preparation	Motronic MA 2.4
Throttle stub pipe intl. dia. mm (in)	45 (1.8)
Throttle angle in rest position	5°
Air filter	Flat-pattern paper element

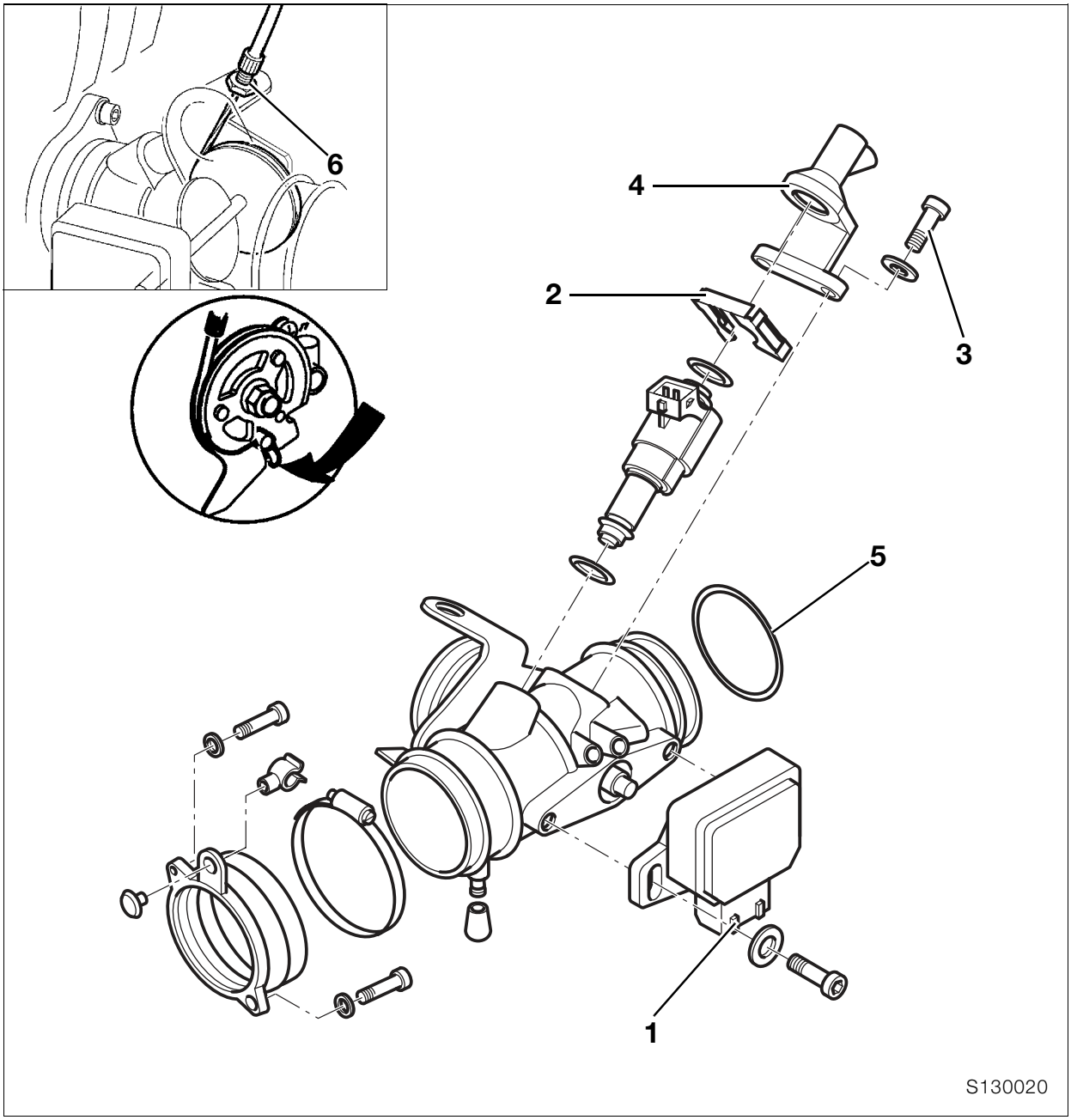






Removing and installing air filter housing

➠ Preparatory work .....
See Group 23 (removal of transmission)



Removing and installing throttle-valve stub pipe

- Press in spring keeper of multi-pin plug for throttle-valve potentiometer (1) and disconnect plug.

Note:
Do not remove throttle-valve potentiometer unless due for replacement (basic setting is necessary – see Motronic diagnosis instructions).

- Remove the keeper (2) and screws (3).
- Remove holder (4) with fuel line.
- Remove fuel injector, if necessary.
- Slacken hose clamps.
- Push intake neck into air filter box and remove throttle-valve stub.

Caution:
Make sure that O-ring (5) on throttle-valve stub is in perfect condition.

- Disengage throttle cables (6) from right and left throttle-valve stubs.
- Installation is the reverse of the removal procedure.

Adjusting speed increase, idle speed and synchronisation
➟ .....See Group 00

Removing and installing throttle-valve potentiometer

- Press in spring keeper of multi-pin plug for throttle-valve potentiometer (1) and disconnect plug.

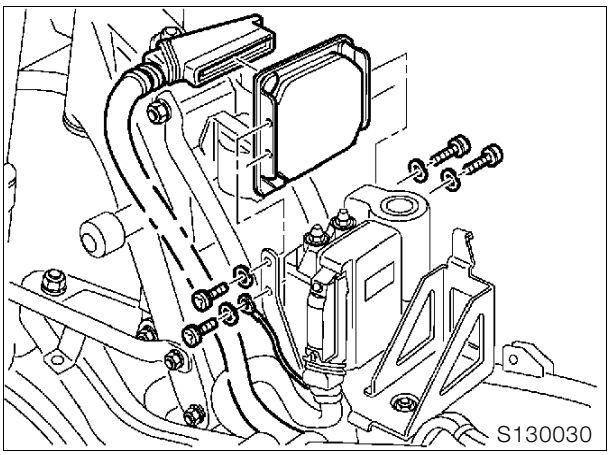
Note:
Do not remove throttle-valve potentiometer unless due for replacement (basic setting is necessary – see Motronic diagnosis instructions).

- Remove the throttle-valve potentiometer.
- Adjust throttle-valve potentiometer with **BMW** MoDiTeC after installing.
- Mark screws with a paint spot.

Removing and installing Motronic control unit

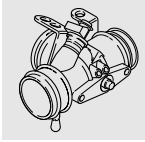
- Remove fuel tank.

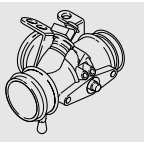
Caution:
Switch off ignition; disconnect earth (ground) lead from battery and insulate it.



- Disconnect plug from Hall sensor.
- Disconnect plug for engine-oil temperature.
- Remove Motronic control unit.
- Remove connector strip.
- Installation is the reverse of the removal procedure.
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.





16 Fuel tank and lines

Contents

Page

Technical Data 3

Removing and installing fuel tank 5

Removing and installing fuel filter, fuel pump and fuel level sensor 6

Removing and installing fuel filter 6

Removing and installing fuel pump and fuel level sensor 7

Checking fuel pump pressure 7

Removing and installing fuel distributor and pressure regulator 7

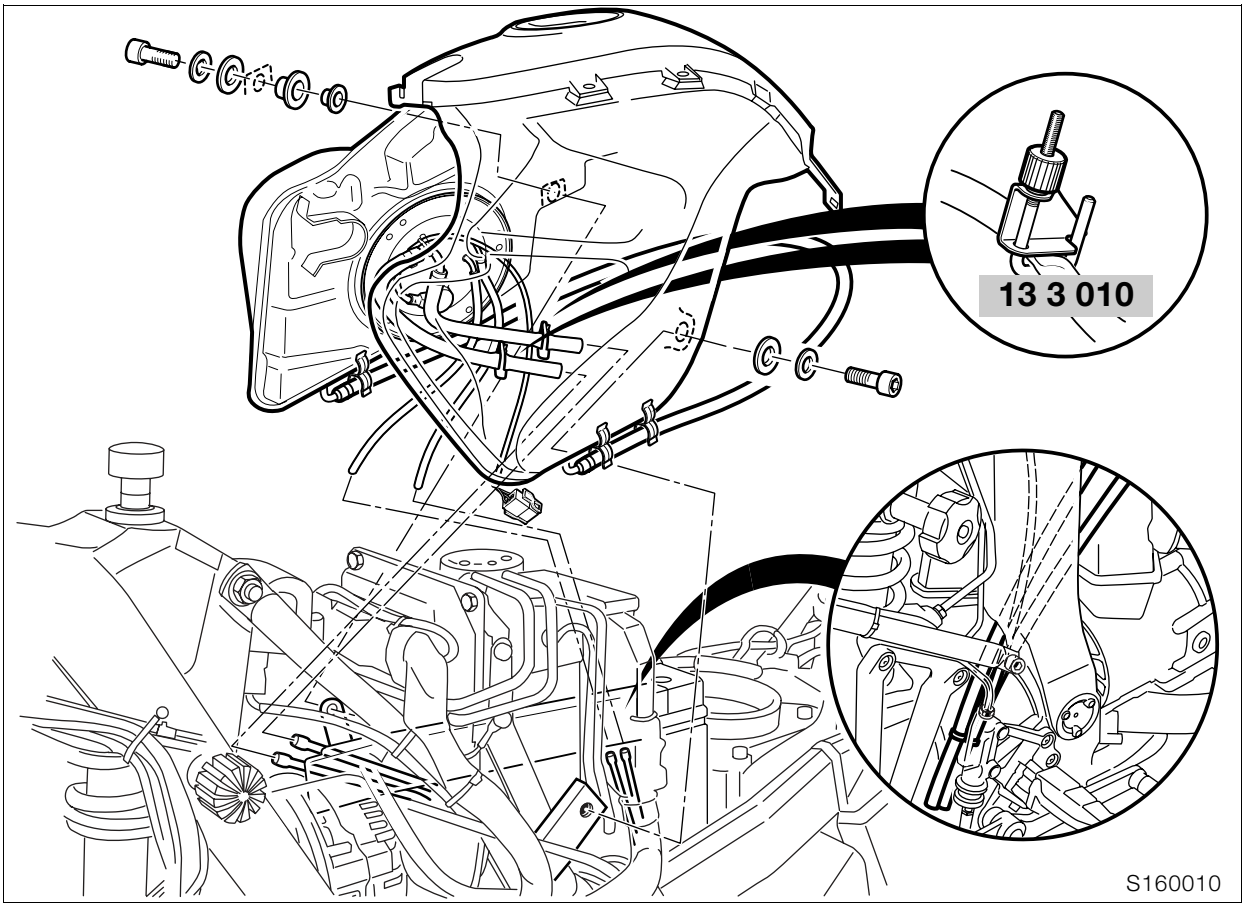




Technical Data		R 1100 S
Fuel tank		
Tank capacity	l (Imp. gal/ US gal)	18 (4.0/4.8)
including reserve of	l (Imp. pints/ US quarts)	approx. 5 (8.80/5.28)
Fuel pump		
Type		Gear-type
Make		VDO
Operating voltage	V	12
Fuel pressure	bar (psi)	3±0.2 (42.69±2.85)
Delivery rate	l/h (Imp. gal/h; US gal/h)	110 (24.2; 29.1)





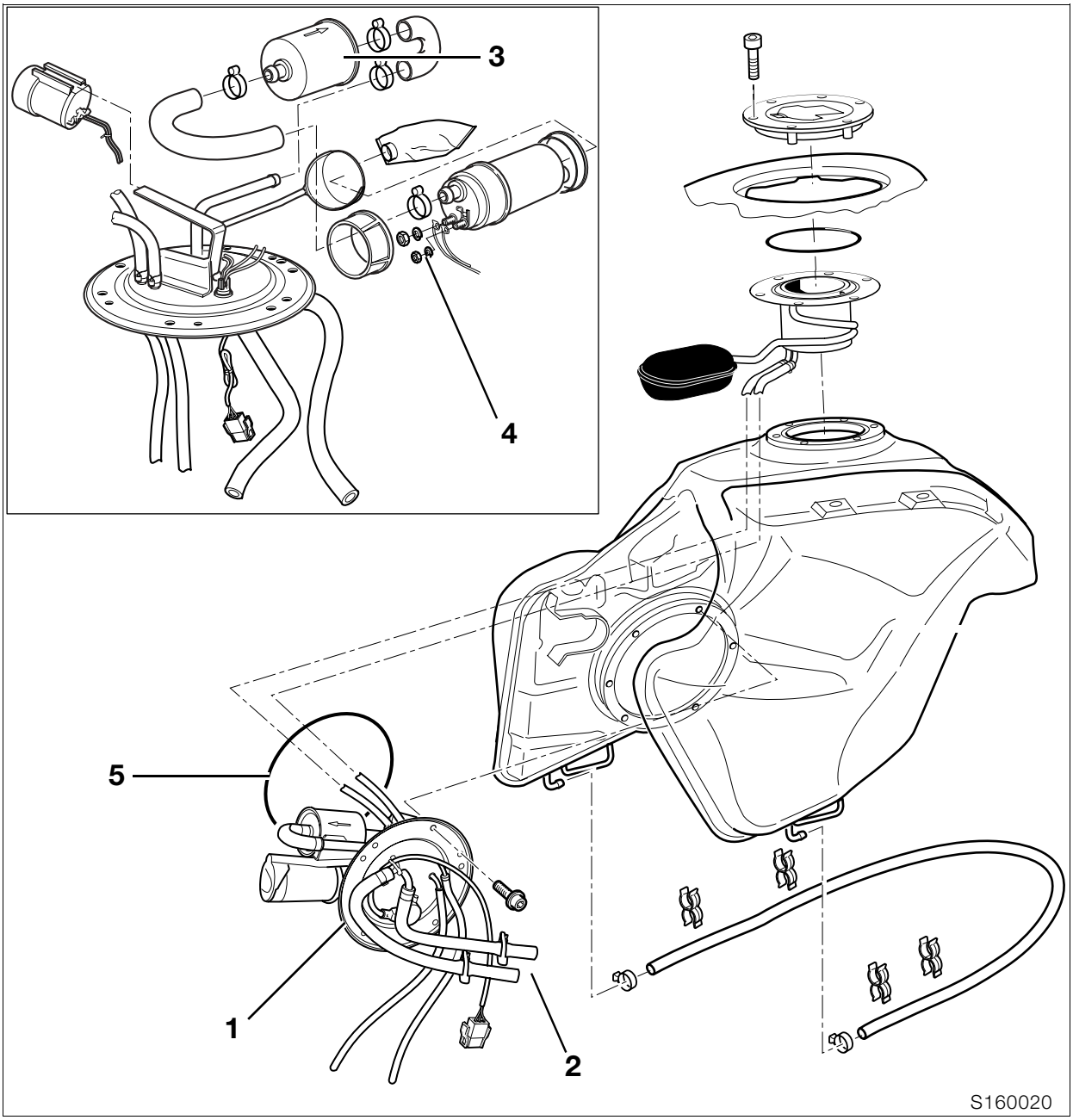


Removing and installing fuel tank

- Remove seat.
- Remove side trim.
- Remove the intake air pipe.
- Disconnect the plug from the fuel pump.
- Disconnect the breather and overflow hose at the connector.
- Seal the fuel feed and return lines with hose clips, **BMW No. 13 3 010**, and disconnect.
- Remove screws securing fuel tank.
- Lift tank at rear.
- Pull fuel tank to the rear and remove.
- Installation is the reverse of the removal procedure.

Tightening torque:

Fuel tank to frame ..... 10 Nm



Removing and installing fuel filter, fuel pump and fuel level sensor

Caution:
Fuel is flammable and a hazard to health.
Observe relevant safety regulations.

- Drain fuel tank.
- Remove fuel pump unit (1) and disconnect hoses (2).

Removing and installing fuel filter

- Release hose clips at fuel filter (3).

Caution:
Note correct direction of flow through fuel filter.

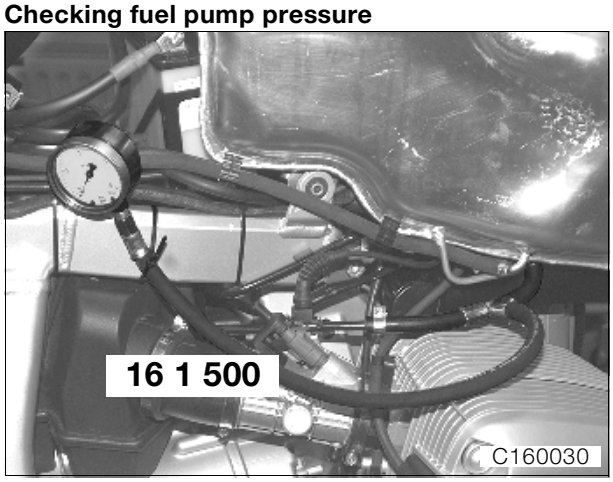
- Remove and install fuel filter.
- Secure non-reusable hose clips with pliers, **BMW No. 13 1 500**.

Removing and installing fuel pump and fuel level sensor

- Disconnect the electrical connections at the fuel pump (4).
- Release the hose clip at the fuel pump.
- Remove fuel pump.
- Installation is the reverse of the removal procedure.
- Secure non-reusable hose clips with pliers, **BMW No. 13 1 500**.

Caution:
Make sure O-ring (5) is in perfect condition.
After installing, check fuel pump unit for leaks.

Checking fuel pump pressure



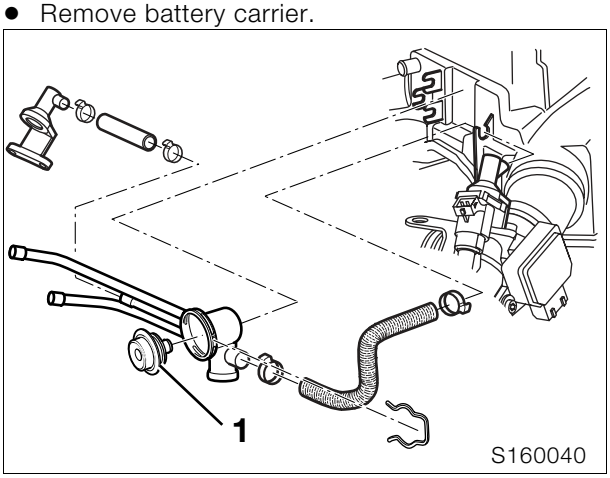
- Connect pressure gauge, **BMW No. 16 1 500**, to delivery side: use cable clips to secure if necessary.
- Start engine and allow to idle.

Fuel pressure:
Specification ..... 3±0.2 bar (42.69±2.85 psi)

Note:
If fuel pressure is low, check pump, fuel filter, pressure regulator and fuel line.

Removing and installing fuel distributor and pressure regulator

- Remove fuel tank.
- Remove the battery.
- **[ABS]** Remove the ABS unit.
- Remove battery carrier.



- Remove the fuel distributor with pressure regulator (1) from the holder.
- Installation is the reverse of the removal procedure.
- **[ABS]** Bleed the brake system.
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.



18 Exhaust system

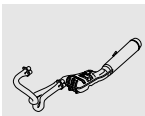
Contents

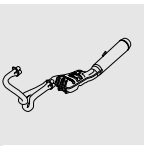
Page

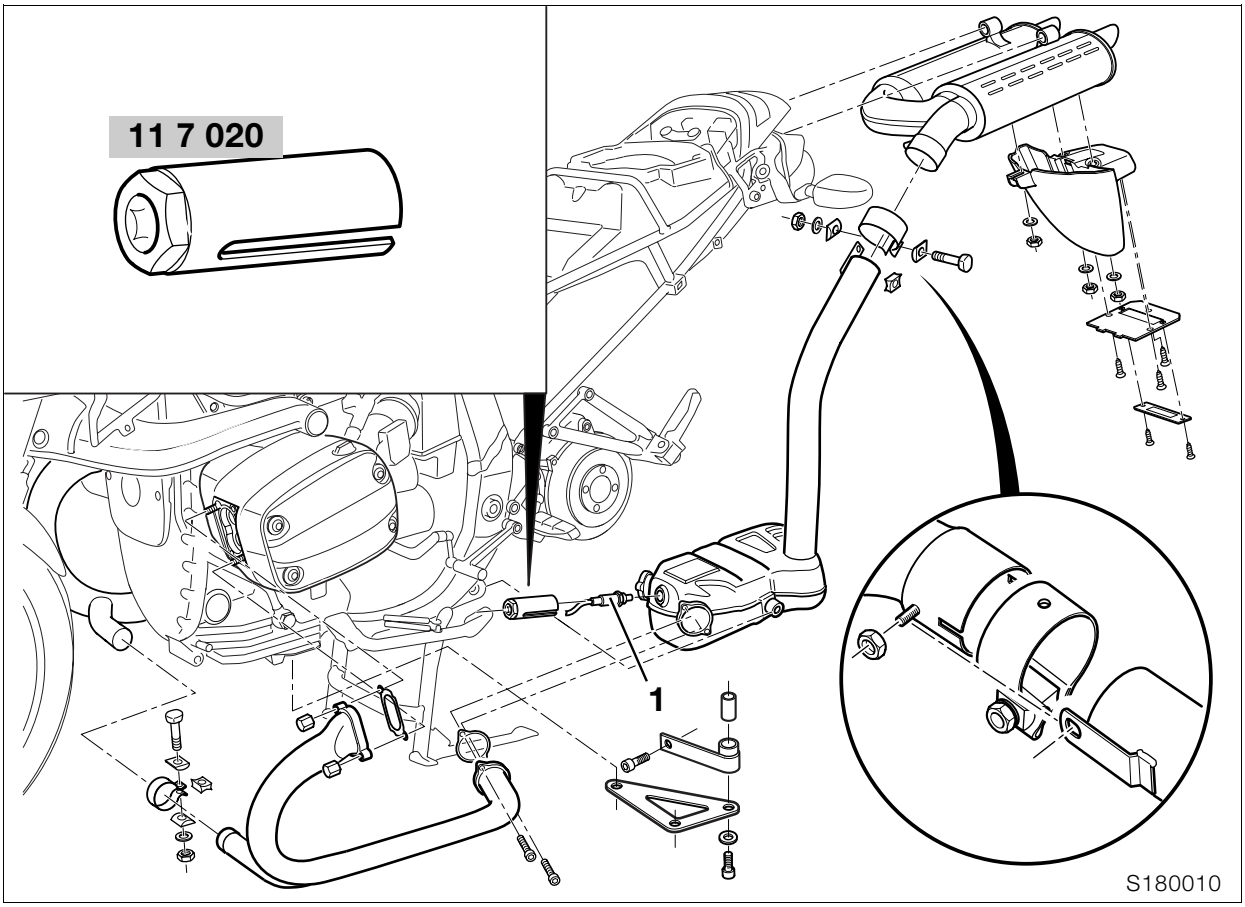
Removing and installing exhaust system 3

Removing and installing silencer (muffler) 3

Removing and installing exhaust manifolds 3







Removing and installing exhaust system

Removing and installing silencer (muffler)

- Disengage fuel tank and pull to the rear.
- Disconnect the oxygen-sensor plug and remove the cable holders.

Caution:
Do not pull the oxygen sensor cable.

- Remove the carrier plate for the number-plate light.
- Disconnect the cable.
- Remove number plate bracket.
- Remove the nut securing the metal tab of the pipe clamp securing the rear silencer and bend back the metal tab.
- Release the clamp securing the rear silencer to the front silencer.
- Remove rear silencer

Note:
Tap gently with a plastic-headed hammer and pull the silencer down and to the rear to remove.

- Disconnect manifolds from front silencer.
- Remove holder of front silencer.
- Push front silencer out of mounts on left and right.
- Remove oxygen sensor (1).
- Installation is the reverse of the removal procedure.
- Secure the oxygen sensor with special socket wrench insert, **BMW No. 11 7 020**.

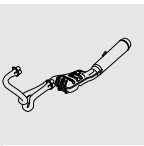
Caution:
After a trial run, read out Motronic fault memory.
Note routing of cable for oxygen sensor.
Always install new seals.

Tightening torque:
Clip at silencer (muffler)
(coat clip contact face with Never Seez)..... 55 Nm
Oxygen sensor
(coat thread with Never Seez)..... 45 Nm

Removing and installing exhaust manifolds

- Remove screws securing manifold to front silencer.
- Remove screws securing manifold to cylinder head.
- Release manifold union.
- Remove manifold.

Tightening torque:
Exhaust manifold to cylinder head..... 21 Nm
Clamp at connecting pipe
(coat clamp contact face with Never Seez)... 45 Nm
Exhaust manifold to front silencer ..... 12 Nm



21 Clutch

Contents

Page

Technical Data 3

Removing and installing clutch 5

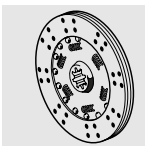
Removing clutch 5

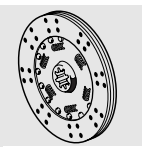
Installing clutch 5

Removing and installing clutch hydraulic line 6

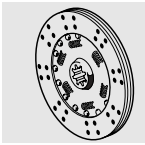
Removing and installing clutch slave cylinder 6

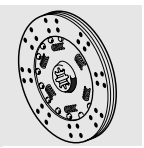
Filling/bleeding clutch line 7

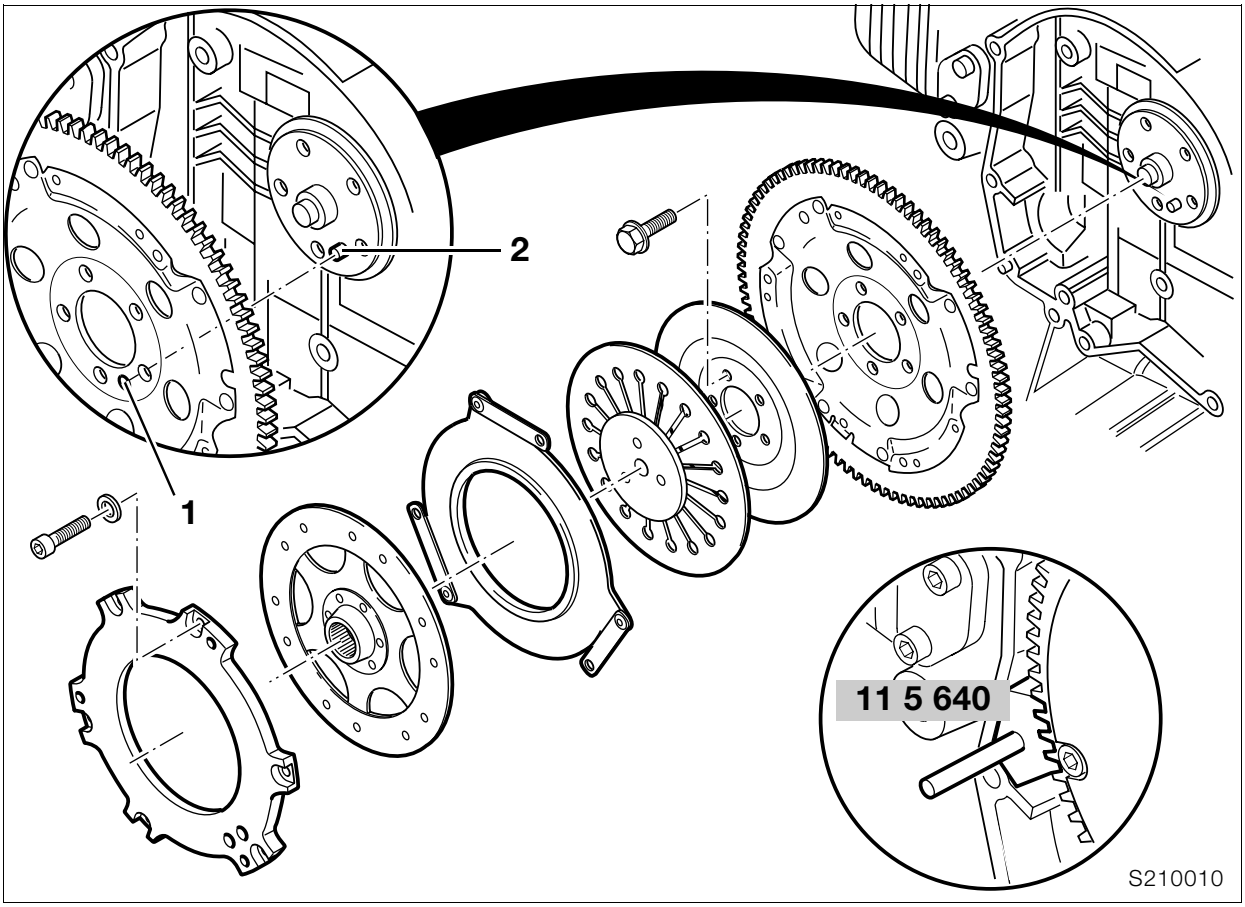




Technical Data		R 1100 S
Type of clutch		Single dry plate with increased-leverage diaphragm spring
Operation		Hydraulic, with master and slave cylinders
Master cylinder piston dia.	mm (in)	13 (0.5)
Slave cylinder piston dia.	mm (in)	24 (0.9)
Clutch fluid		DOT 4 brake fluid
Clutch plate dia.	mm (in)	165 (6.5)
Wear dimension	mm (in)	4.8 (0.19) (measured with tips of calipers pressed by hand against rivets of clutch plate)







Removing and installing clutch

Removing clutch

➠ Preparatory work ..... See Group 23 (removal of transmission)

- Lock the clutch housing with special tool, **BMW No. 11 5 640**.
- Remove the clutch.

Installing clutch

- Install clutch housing with crankshaft pin (2) located in bore (1).
- Install locking device, **BMW No. 11 5 640**, to lock clutch housing.

Caution:
Always use new screws for housing and cover.

- Insert all screws by hand and tighten down.

Tightening torque:
Clutch housing to crankshaft
(oil screw threads lightly)
Initial tightening ..... 40 Nm
Wrench angle ..... 32°

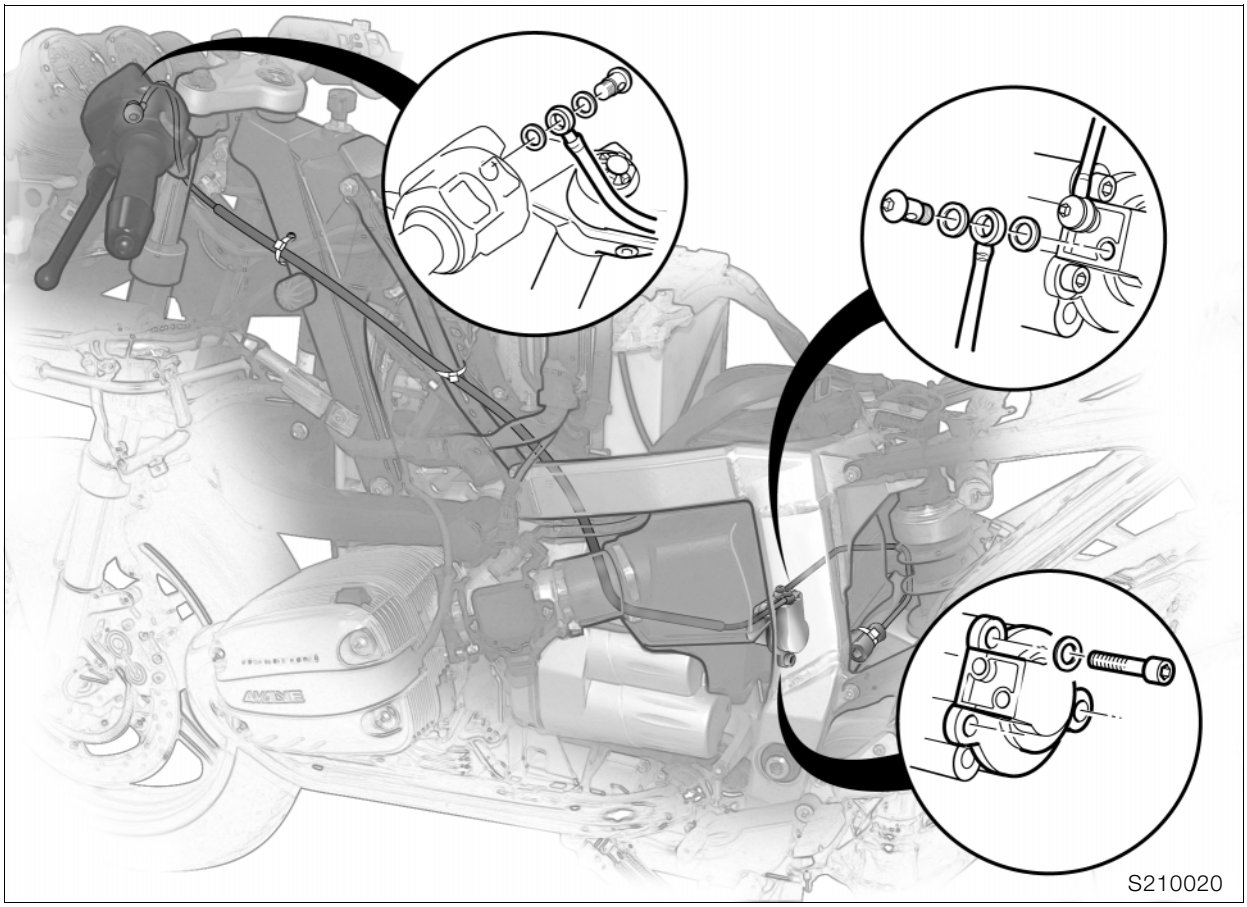
- Install clutch.

Caution:
Make sure that colour marks on clutch housing, thrust plate and housing cover are offset 120°.

- Secure the clutch with the retaining screws.
- Center the clutch plate with centering pin, **BMW No. 21 2 673**.
- Tighten retaining screws in diagonally opposite sequence.

Lubrication points:
Splines on clutch plate and gearbox input shaft.
Diaphragm spring contact surface on clutch housing.
Diaphragm spring contact surface on pressure plate.
..... Optimoly MP3 paste

Tightening torque:
Housing cover to flywheel ..... 12 Nm



Removing and installing clutch hydraulic line

- Remove fuel tank.
- Remove the rear brake caliper.
- Remove rear wheel.
- Release suspension strut at top and pull toward rear.
- Drain the clutch operating system.

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

- Disconnect line from master cylinder.
- Use a shortened cranked hex screwdriver or similar to disconnect the lines from the clutch slave cylinder.
- Installation is the reverse of the removal procedure.
- Fill the clutch operating system.

Note:
When installing, fit new sealing rings.

Tightening torque:
Clutch line to handlebar fitting ..... 18 Nm

Removing and installing clutch slave cylinder

- Secure stand, **BMW No. 00 1 520**, to motorcycle.
- Remove the rear brake caliper.
- Remove rear wheel.
- Disconnect manifold from front silencer.
- Release suspension strut at top and pull toward rear.
- Remove screws securing aluminium rear frame and pull approx. 5 mm (0.20 in) to the rear.

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

- Detach the clutch slave cylinder and pull it to the rear with the line.
- Disconnect line from slave cylinder.
- Remove clutch slave cylinder.
- Installation is the reverse of the removal procedure.
- Fill the clutch operating system.

Note:
When installing, fit new sealing rings.

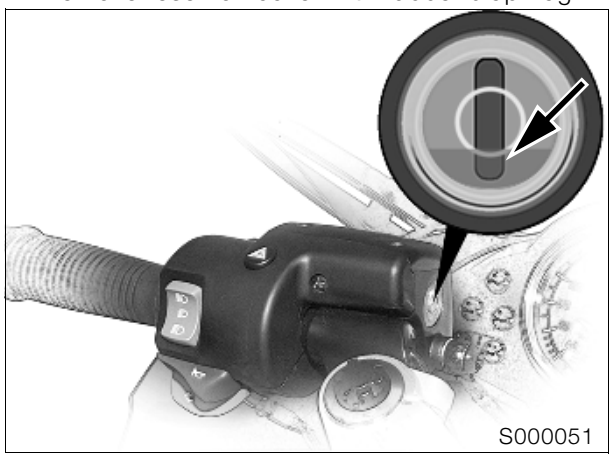
Tightening torque:
Clutch slave cylinder to gearbox ..... 9 Nm

Filling/bleeding clutch line

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

Note:
The description applies to a brake system filling and bleeding device with vacuum extraction of brake fluid at the bleed line.
If other devices are used, comply with their manufacturers' instructions.

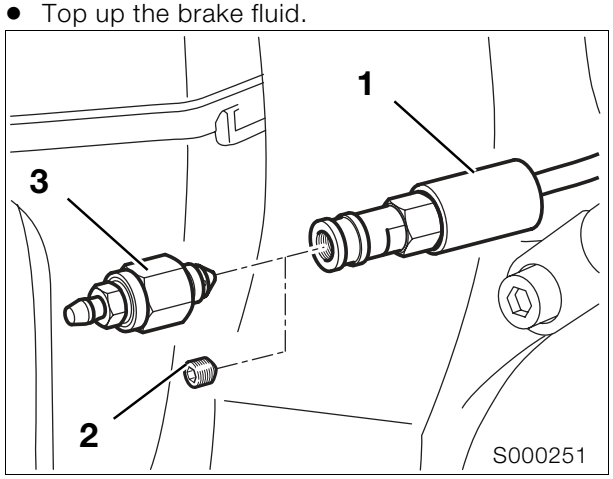
- Place the motorcycle on stand, **BMW No. 00 1 560**, and turn the handlebars fully to the right.
- Remove reservoir cover with rubber diaphragm.



Caution:
With the clutch lining in new condition the surface of the fluid (arrow) must be up to the lower edge of the ring mark; it must **not be below** normal.

Note:
As the clutch lining wears, the fluid level in the reservoir rises.

- Top up the brake fluid.



- Pull back protective hose (1).
- Wrap a cloth around the filler adapter.
- Remove socket-head grubscrew (2) from the filler adapter.
- Connect the brake bleeding device to bleed screw (3).
- Fully tighten the bleed screw in the filler adapter (valve in filler adapter closed).
- Open the bleed screw by half a turn (valve open).
- Draw off brake fluid until it emerges clear and free from air bubbles.

Caution:
While bleeding the system, do not allow the brake fluid level to drop below the bottom edge of the ring mark, as otherwise air will be drawn into the clutch system. Bleed the system again if this happens.

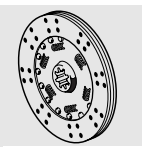
- Remove the bleed screw.
- Disconnect the brake bleeding device from the bleed screw.
- Install socket-head grub screw (2) in the filler adapter and tighten.

Caution:
The motorcycle is not permitted on the road without the grubscrew in place and secure in the filler adapter.

- Correct the fluid level.
- Reinstall the reservoir lid with rubber diaphragm in position.
- Tighten the reservoir cover carefully and without using force.

Tightening torque:
Grubscrew in filler adapter ..... 10 Nm

Consumables
Brake fluid.....DOT 4



23 Gearbox

Contents

Page

Technical Data 3

Removing and installing gear-shift lever 5

Removing gearbox 5

Replacing the shaft sealing rings in the gearbox housing and gearbox cover ...7
- Replacing input shaft sealing ring at input end 7
- Replacing output shaft sealing ring 7
- Replacing input shaft sealing ring at output end 8
- Replacing shaft sealing ring for selector drum 8
- Replacing sealing ring for selector shaft 8

Disassembling gearbox 9

Removing gearbox housing 9

Removing selector drum 10

Disassembling/assembling selector shaft 10

Removing gearbox shafts 11

Replacing grooved ball bearing on intermediate shaft 11

Disassembling/assembling input shaft 12
- Disassembling input shaft 12
- Assembling input shaft 13

Disassembling/assembling output shaft 14
- Disassembling output shaft 14
- Assembling output shaft 15

Checking endplay 16

Checking/adjusting fully assembled length of gearbox shafts and selector drum 17
- Checking/adjusting fully assembled length of intermediate shaft 17
- Checking/adjusting fully assembled length of output shaft 18
- Checking/adjusting fully assembled length of input shaft 19
- Checking/adjusting fully assembled length of selector drum 20

Shimming selector shaft 21

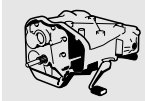
Assembling gearbox 22

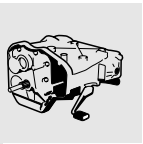
Installing input, output and intermediate shafts 22

Installing selector shaft 23

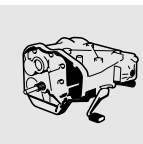
Installing selector drum 23

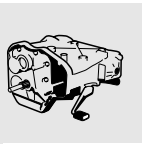
Installing gearbox housing 24



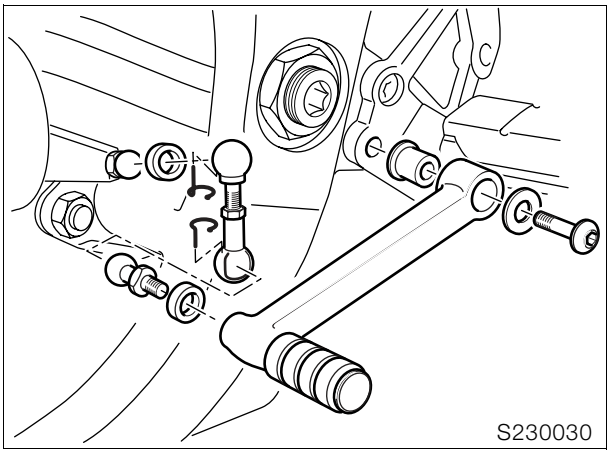


Technical Data		R 1100 S
Type of gearbox		6-speed gearbox with claw-action shift and integral reaction damper for all gears
Gear shift type		Pedal-operated lever and selector drum with overshoot detent
Gear ratios		
1st gear		3.863
2nd gear		3.022
3rd gear		2.393
4th gear		1.961
5th gear		1.700
6th gear		1.511
Oil grade (all the year round)		Brand-name SAE 90 hypoid gear oil, API class GL 5
Capacity	l (Imp. pint/US quart)	approx. 0.8 (1.40/0.84) (to lower edge of filler screw)
Endplay of spring segment at input shaft	mm (in)	0.4...0.6 (0.0157...0.0236)
Endplay at 1st gear, output shaft	mm (in)	0.1...0.33 (0.0039...0.0123)
Endplay at 2nd gear, output shaft	mm (in)	0.1...0.33 (0.0039...0.0123)
Endplay, 3rd/4th gear (total play) output shaft	mm (in)	0.1...0.67 (0.0039...0.0264)
Selector shaft endplay	mm (in)	0.1...0.3 (0.0039...0.0118)
Length of selector drum, fully compressed	mm (in)	111.80...111.90 (4.402...4.406)



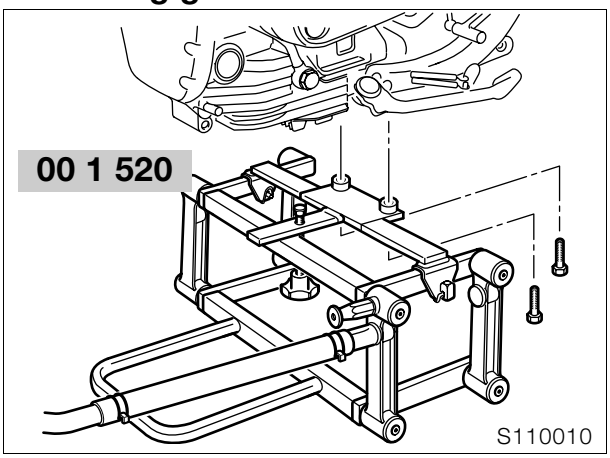


Removing and installing gear-shift lever



Tightening torque:
Gear-shift lever ..... 21 Nm

Removing gearbox



- Secure stand, **BMW No. 00 1 520**, to motorcycle.
- Remove seat.
- Remove left side trim.
- Remove right side trim.
- Remove the intake air pipe.
- Disengage the fuel tank.

Caution:
Fuel is flammable and a hazard to health. Observe relevant safety regulations.

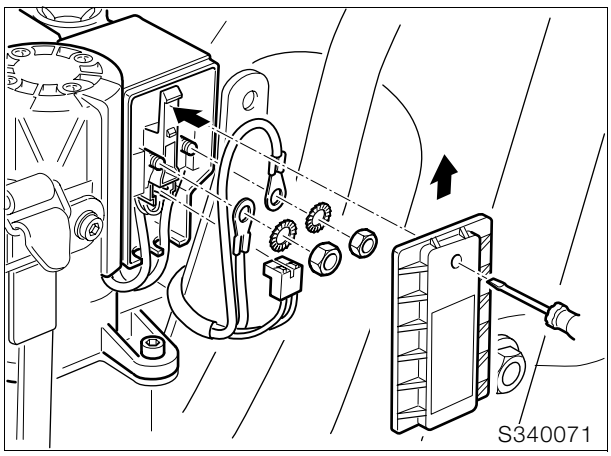
- Seal the feed and return fuel lines with hose clips, **BMW No. 13 3 010**, and disconnect the lines.
- Pull the plug connector off the fuel pump unit.
- Remove fuel tank.
- Remove the battery.

Caution:
Disconnect negative terminal first, then positive terminal.

- **[ABS]** Drain the brake system.

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

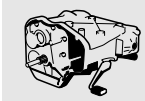
- Remove the rear brake caliper.
- **[ABS]** Remove rear sensor.
- Remove inductive sensor from rear wheel drive.
- The motorcycle is heavy at the rear; use a ratchet-lock belt to pull the motorcycle down at the nose on the lifting platform.
- Remove rear wheel.
- Remove retainer from rubber bellows of swinging arm at rear wheel drive.
- Swinging-arm studs are secured with Loctite: heat to max. 120 °C (248 °F) to release.
- Slacken nut of swinging-arm floating bearing.
- Loosen the floating bearing stud bolt.
- Loosen the fixed bearing stud bolt.
- Disengage reaction link from rear wheel drive.
- Remove fixed and floating bearing stud bolts and remove rear wheel drive.
- Remove screw at top of suspension strut.
- **[ABS]** Disconnect plug from pressure modulator.
- **[ABS]** Disconnect brake lines from pressure modulator.

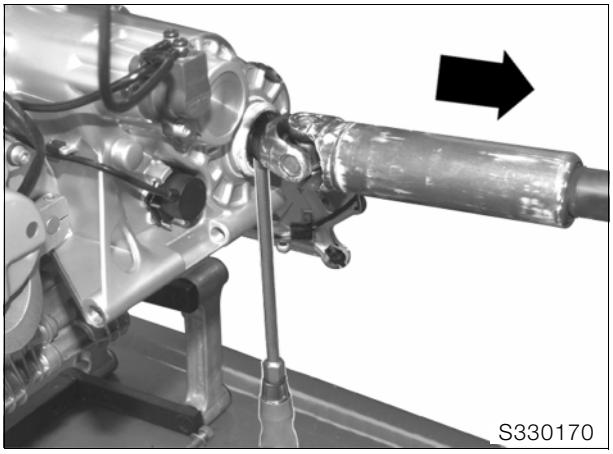


- **[ABS]** Remove cover and disconnect cables.

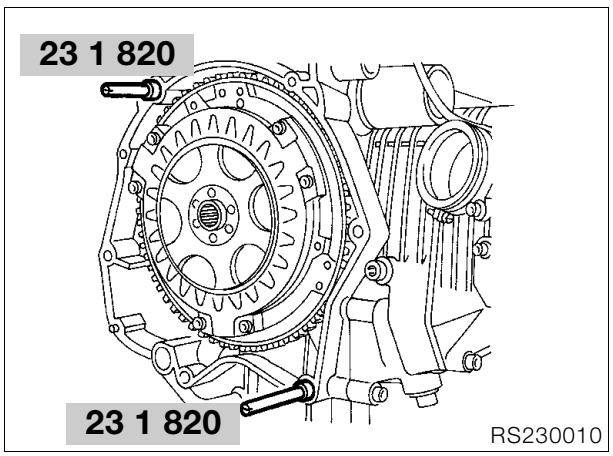
Caution:
Always follow the instructions in the Repair Manual.
➡Group 34/Removing ABS unit

- **[ABS]** Remove the pressure modulator.
- Remove the rear side panel on the right.
- Disconnect plug for rear wiring harness.
- **[ABS]** Disconnect sensor plug.
- Disconnect plug for brake-light switch.
- Disconnect plug for inductive sensor, speedometer.
- Release right footrest plate.
- **[ABS]** Remove rear brake lines.
- Disconnect gearshift linkage at ball head.
- Disconnect plug for oxygen sensor.
- Disconnect rear silencer from front silencer.
- Remove oxygen sensor.
- Disconnect main frame and use workshop crane, **BMW No. 46 5 640**, to lift main frame.



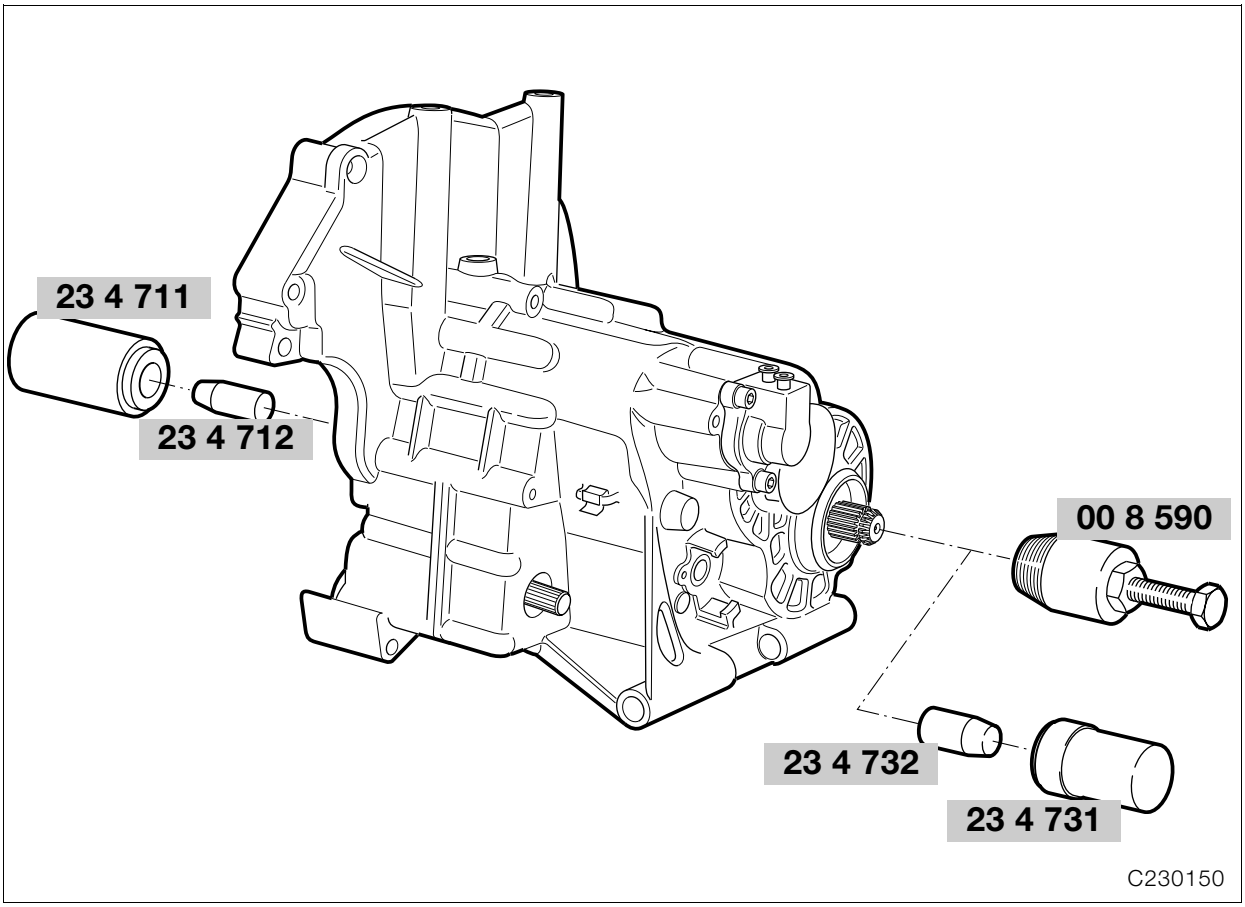


- Use a screwdriver to press out the universal shaft.
- Disconnect plug for air-temperature sensor from air filter box.
- Release hose clips at the air intake necks.
- Push the air intake necks into the air filter box.
- Use pliers, **BMW No. 17 5 500**, to release hose clip securing breather hose to air filter box.
- Remove air filter box.
- Remove starter-motor cover.
- Remove the starter motor.
- Disconnect plug for gearshift switch.
- Release the clutch slave cylinder and pull it out of the housing.
- Release the battery carrier and pull it up and out of the rubber mount.
- Remove the fuel distributor with injectors.
- Remove the gearbox.



- Always use guide pins, **BMW No. 23 1 820**, when removing or installing the gearbox.
- Installation is the reverse of the removal procedure.
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.



Replacing the shaft sealing rings in the gearbox housing and gearbox cover

Note:
All shaft sealing rings can be replaced with the gearbox installed, apart from the input-side shaft sealing ring on the input shaft.
Replace all shaft sealing rings if the gearbox is fully disassembled.
Lightly oil the sealing lips before installing the shaft sealing rings.

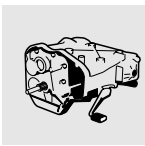
Replacing input shaft sealing ring at input end

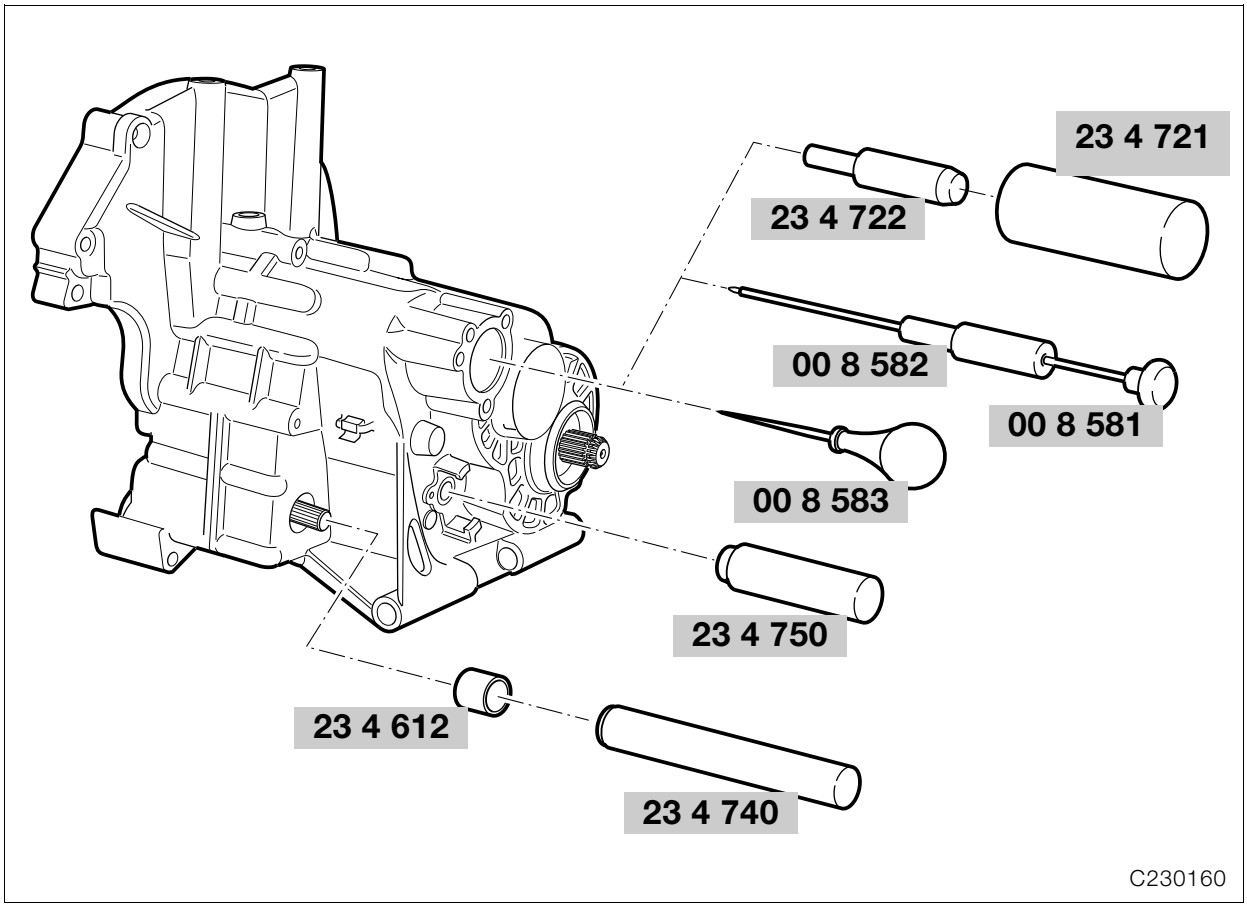
- Lever out the shaft sealing ring with a screwdriver.
- Drive the new sealing ring in with the sealing lip facing inwards, using assembly sleeve, **BMW No. 23 4 712**, and drift, **BMW No. 23 4 711**.

Replacing output shaft sealing ring

Caution:
Do not use pointed tools to remove the shaft sealing ring of the output shaft, because they could damage the plastic washer of the grooved ball bearing behind the sealing ring.

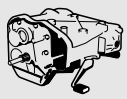
- Pull the shaft sealing ring out with puller, **BMW No. 00 8 590**.
- Install the sealing ring with the sealing lip facing inwards, using assembly sleeve, **BMW No. 23 4 732**, and drift, **BMW No. 23 4 731**.





Replacing input shaft sealing ring at output end

- Pierce the shaft sealing ring with awl, **BMW No. 00 8 583**.
- Screw the pull rod, **BMW No. 00 8 581**, into the pierced hole and use impact weight, **BMW No. 00 8 582**, to remove the shaft sealing ring.
- Install the new sealing ring with the sealing lips facing inwards, using guide, **BMW No. 23 4 722**, and impact driver, **BMW No. 23 4 721**.

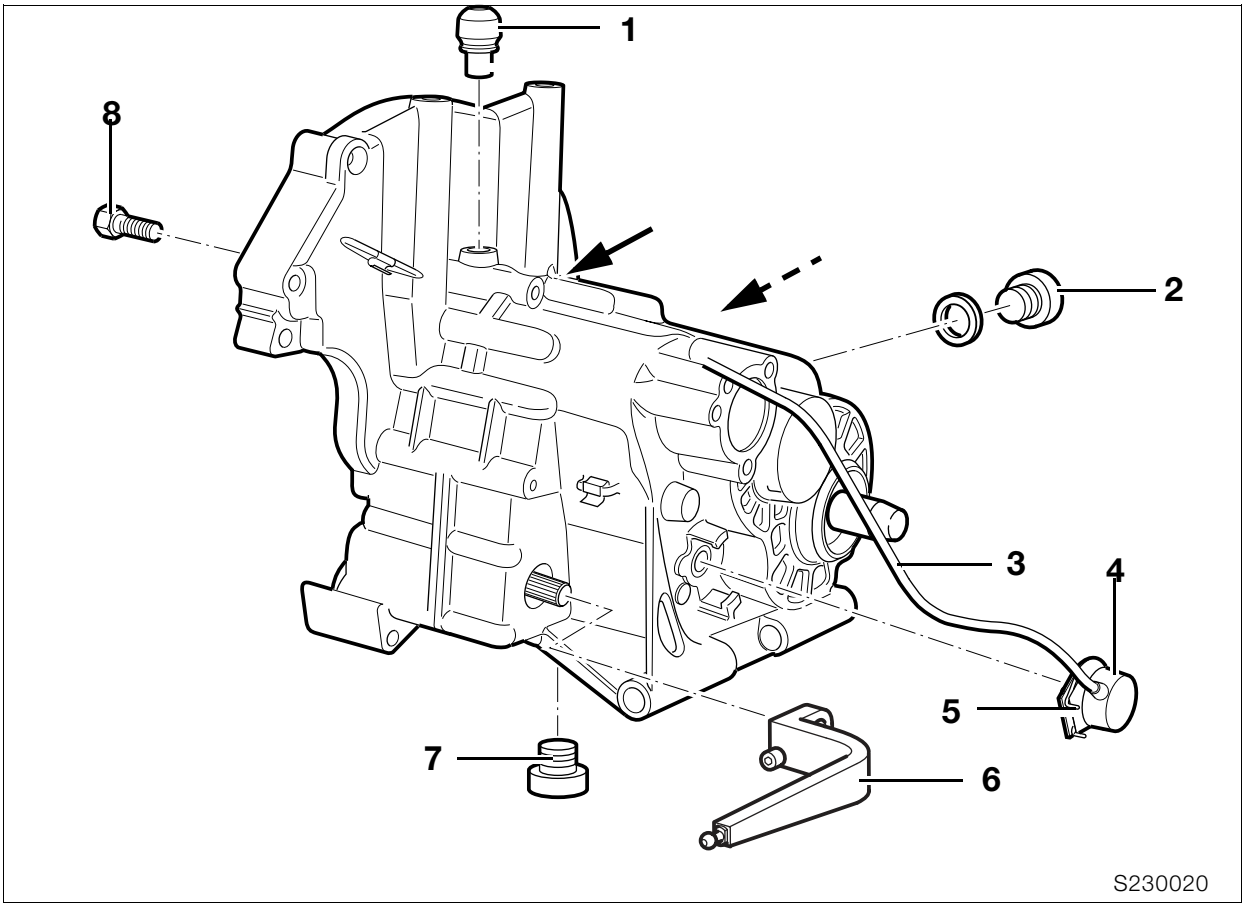


Replacing shaft sealing ring for selector drum

- Lever out the shaft sealing ring with a screwdriver.
- Install the new sealing ring with the sealing lip facing inwards, using impact driver, **BMW No. 23 4 750**.

Replacing sealing ring for selector shaft

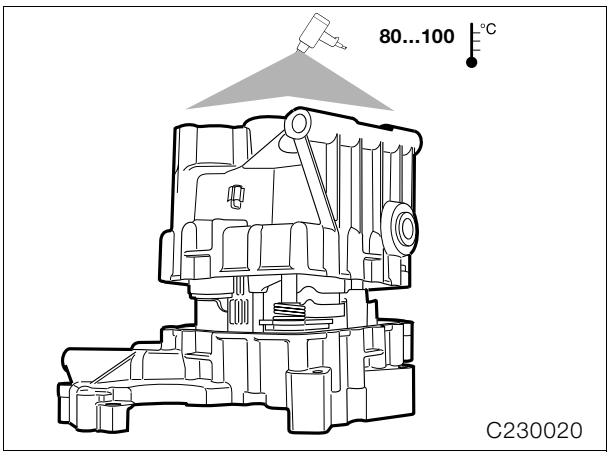
- Lever out the shaft sealing ring with a screwdriver.
- Install the new sealing ring with the sealing lip facing inwards, using assembly sleeve, **BMW No. 23 4 612**, and impact driver, **BMW No. 23 4 740**.



Disassembling gearbox

Removing gearbox housing

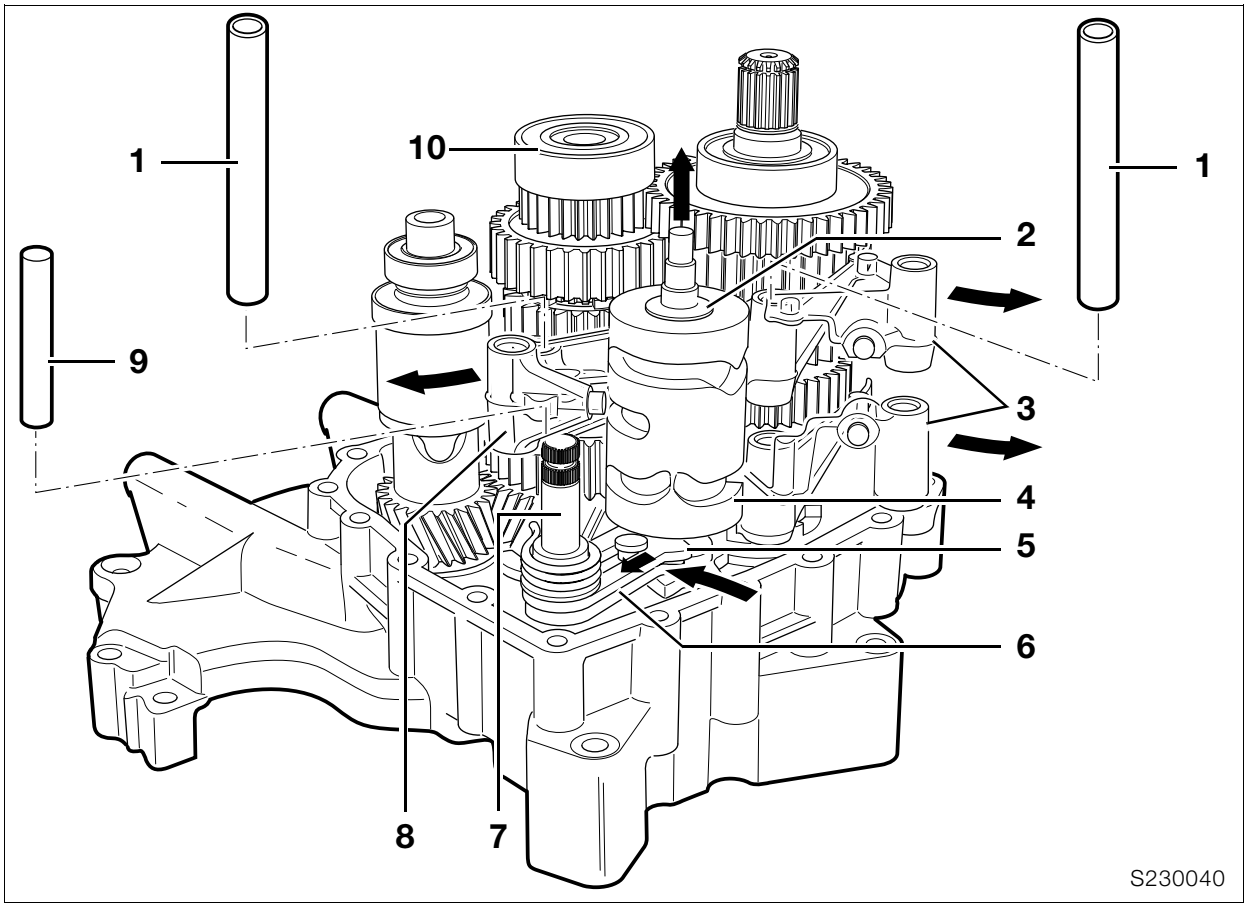
- Remove oil filler/level check screw (2).
- Remove oil drain plug (7) and drain the oil from the gearbox into a suitable tray.
- Remove breather (1).
- Unclip cable (3) for neutral indicating switch (4).
- Compress spring (5) and take off neutral indicating switch (4).
- Remove selector lever (6).
- Carefully press back centering pins (arrows), working from the back of the gearbox.
- Remove screws (8) securing cover to housing.



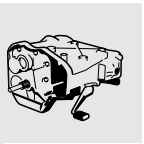
- Set the gearbox down on its cover.

⚠ Caution:
Avoid damage to the housing cover and painted surfaces.

- Heat the bearing points in the housing to 80 °C... 100 °C (176 °F...212 °F).
- Tap lightly with a plastic-faced hammer to disengage the housing.

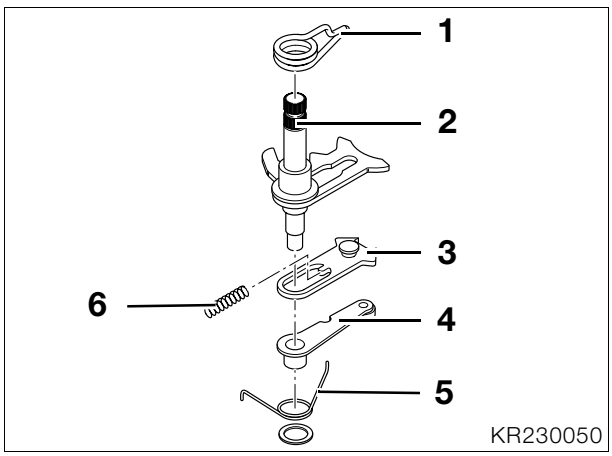


Removing selector drum

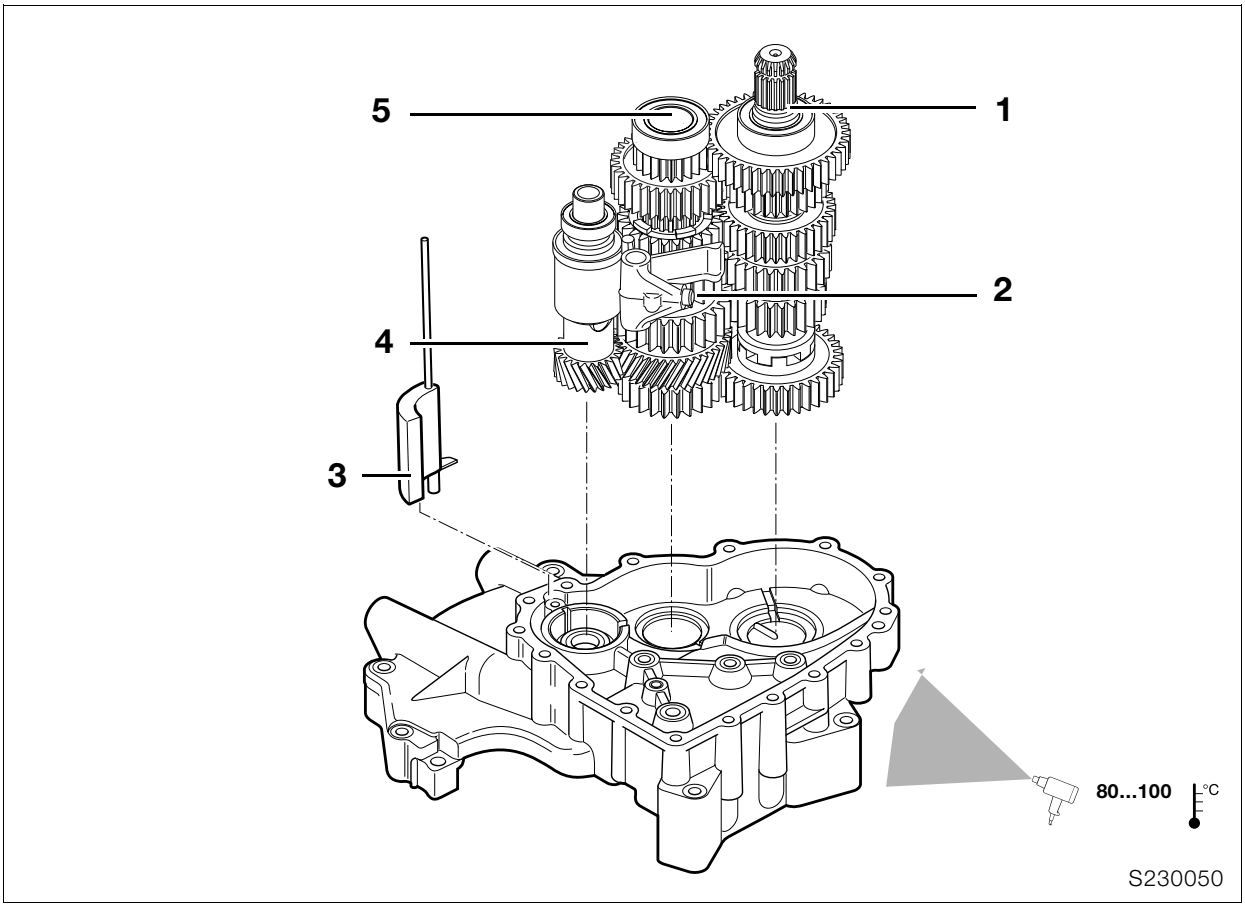


- Pull the selector shafts (1) out of the selector forks.
- Swing the selector forks (3/8) out towards the edge of the cover (arrows).
- Remove locking pin (9).
- Press guide plate (5) in the opposite direction to the spring loading (arrow).
- Swing locking lever (6) towards input shaft (7), hold it there and pull out the selector drum (4), turning it slightly at the same time.
- Remove the thrust washers and spacing washer.
- Release the locking lever (6).
- Remove the selector shaft (7) with spacing washer.
- Remove selector forks (3).
- Selector fork (8) remains in the intermediate shaft (10).

Disassembling/assembling selector shaft



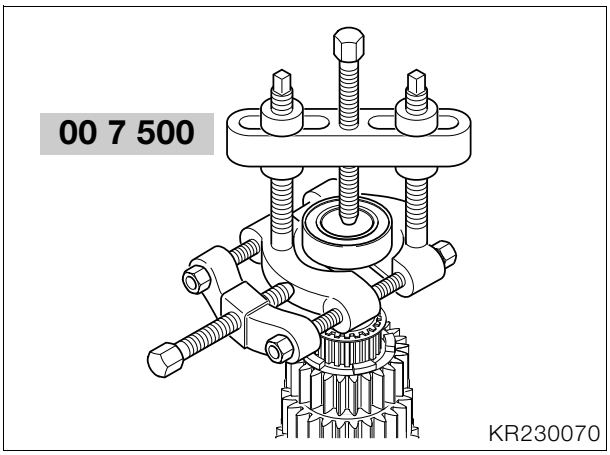
- Remove torsion spring (5) with locking lever (4) from selector shaft (2).
- Remove torsion spring (1).
- Disengage coil spring (6) and remove together with guide plate (3).
- Assembly is the reverse of the disassembly procedure.



Removing gearbox shafts

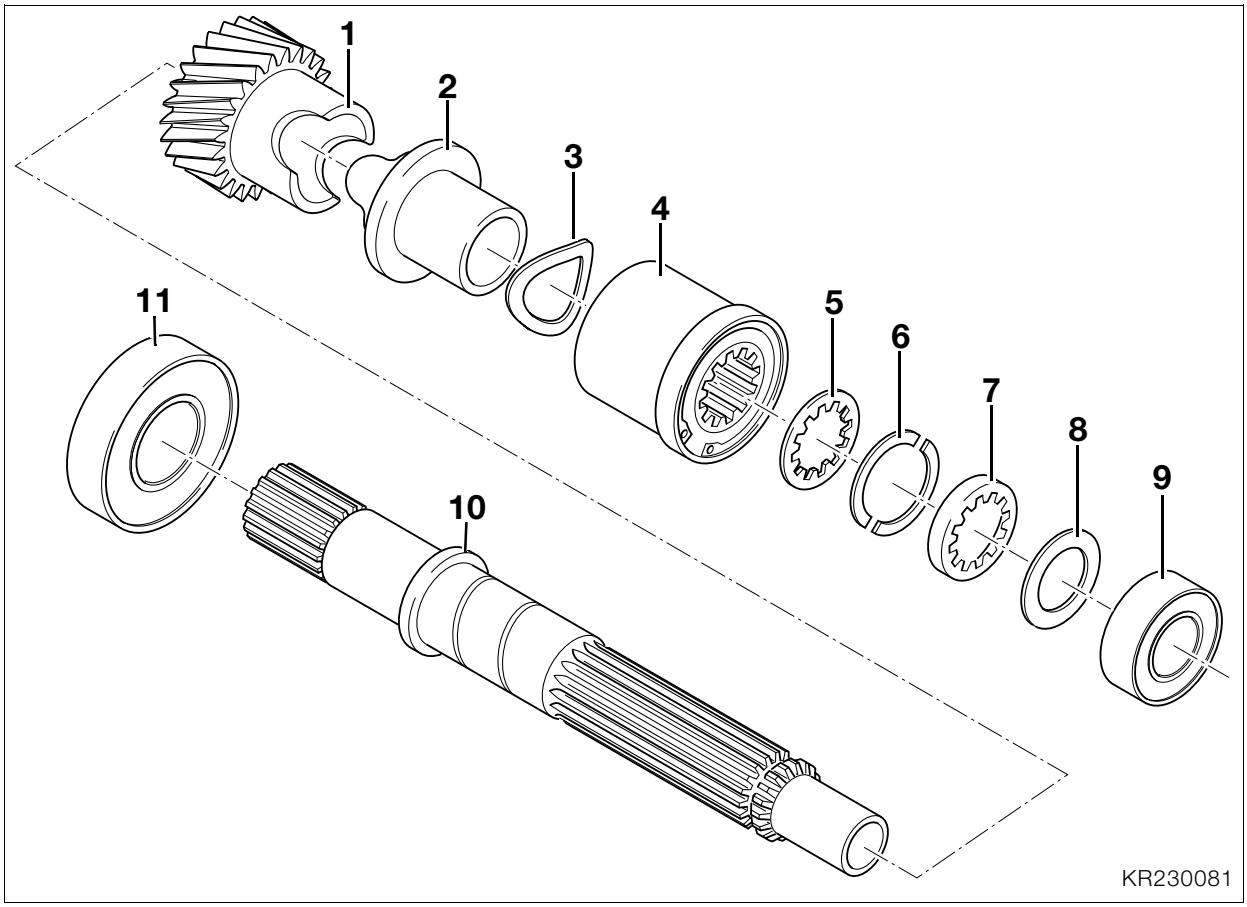
- Remove breather tube (3).
- Heat bearing points in gearbox cover to 80 °C ... 100 °C (176 °F ... 212 °F).
- Remove input shaft (4), output shaft (1) and intermediate shaft (5) together from the cover.
- Remove selector fork (2) from intermediate shaft.

Replacing grooved ball bearing on intermediate shaft



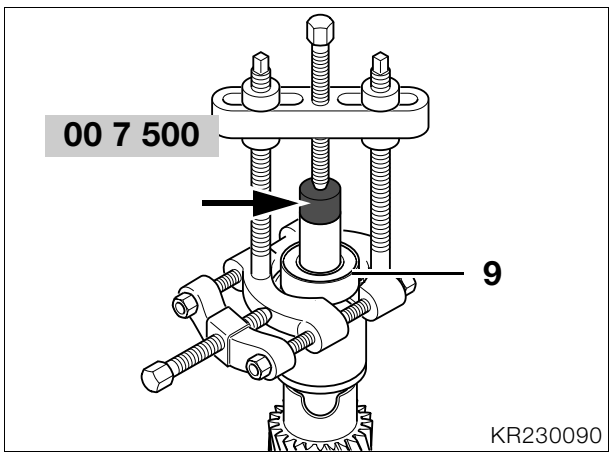
Caution:
If the grooved ball bearings are replaced, the fully-compressed length must be re-adjusted.

- Pull off the grooved ball bearings with a universal puller, **BMW No. 00 7 500**.
- Press the output-side grooved ball bearing on to the intermediate shaft.
- Check/adjust fully assembled length (➟ 23.17).
- Place spacing washer of calculated thickness in position and press on the input-side grooved ball bearing.

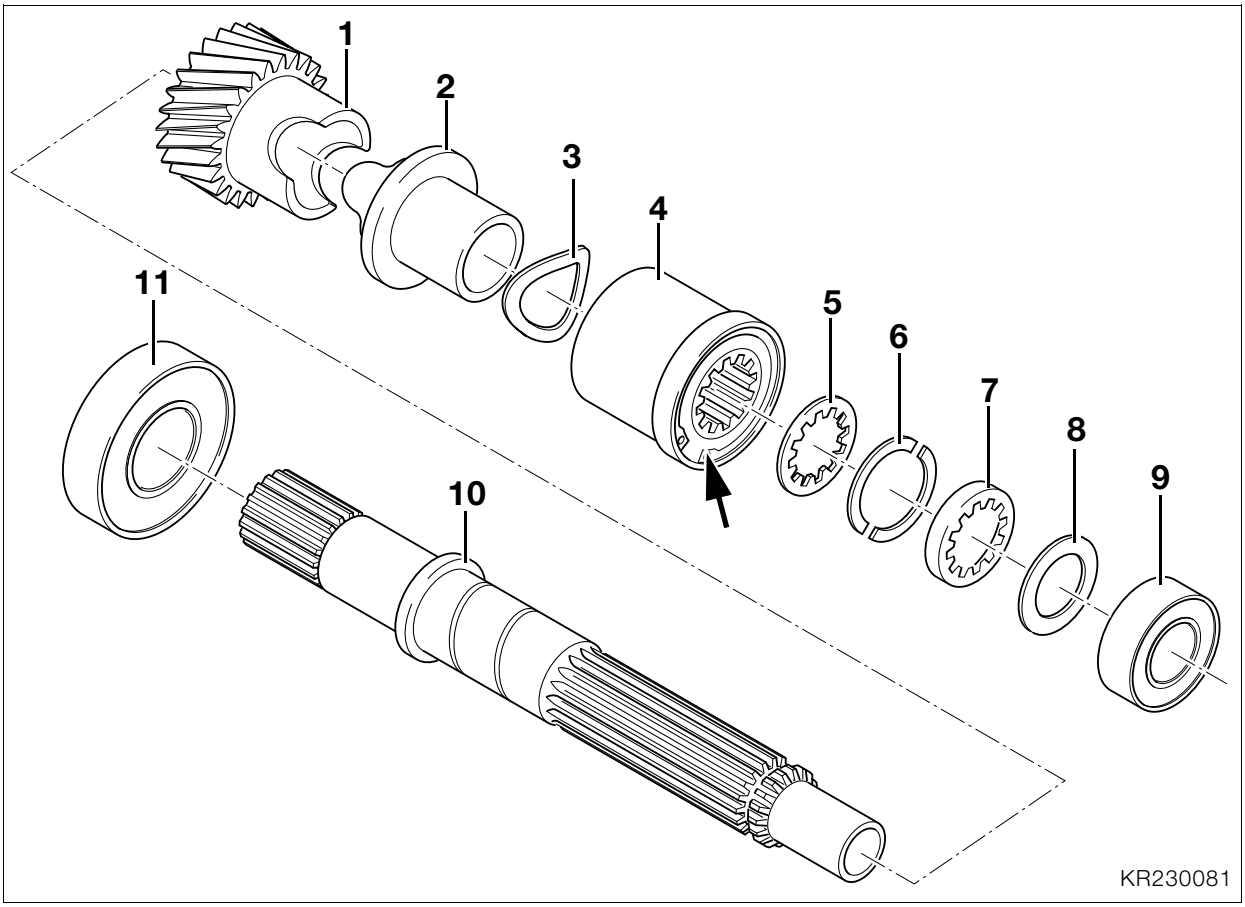


Disassembling/assembling input shaft

Disassembling input shaft



- Clamp the input shaft into a vise with soft jaws.
- Use universal puller, **BMW No. 00 7 500**, and pressure head (arrow) to pull off grooved ball bearing (9) with spacing washer (8).
- Note the thickness of spacing washer (8).
- Remove guide ring (7).
- Compress spring cluster (4) and remove split segment washer (6).
- Remove backup washer (5), spring cluster (4), anti-rattle disc (3), thrust block (2) and constant-speed gear (1).
- Clamp input shaft (10) other way round in vise.
- Use universal puller, **BMW No. 00 7 500**, and pressure head (arrow) to pull off grooved ball bearing (11).

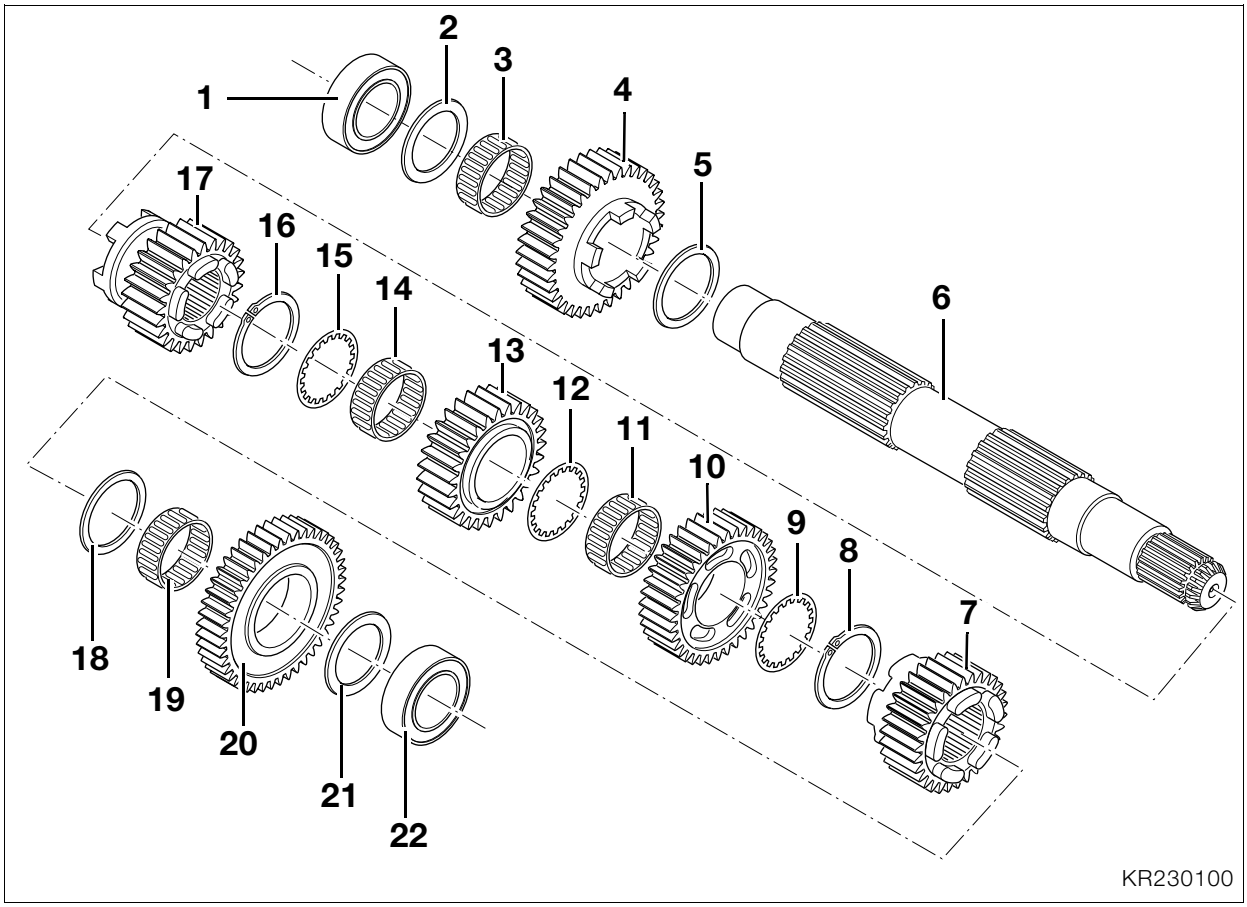


Assembling input shaft

- Lightly oil the bearing surface for constant-speed gear (1) on input shaft (10), and install the constant-speed gear.
- Lightly oil the splines in thrust block (2) and install it.
- Place anti-rattle disc (3) on thrust block (2).
- Mount spring cluster (4) with locating ring (arrow) facing upwards on anti-rattle disc (3).
- Install backup washer (5) of the same thickness as the original washer.
- Compress spring cluster (4) and insert the split segment washer (6) in the ring groove.
- Install guide ring (7) with collar toward split-segment washer (6).
- Check fully assembled length and adjust if necessary (➠ 23.19).
- Install spacing washer (8) of calculated thickness, and press on grooved ball bearing (9).
- Check endplay of spring cluster (4).

Note:
Excessive endplay could be due to wear or incorrect assembly.

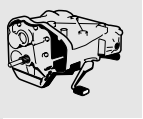
Endplay:
Spring cluster
on shaft ..... 0.4...0.6 mm (0.016...0.024 in)

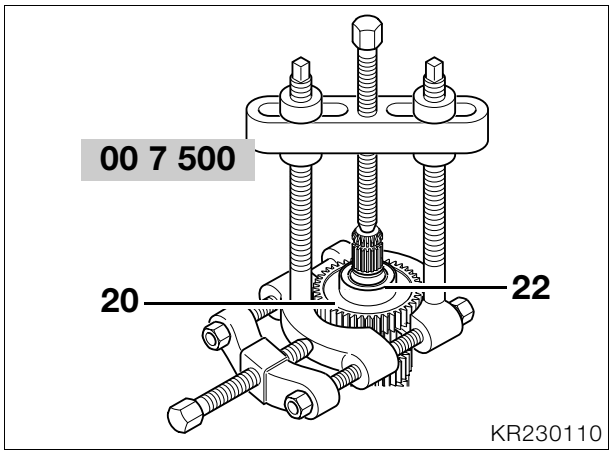


Disassembling/assembling output shaft

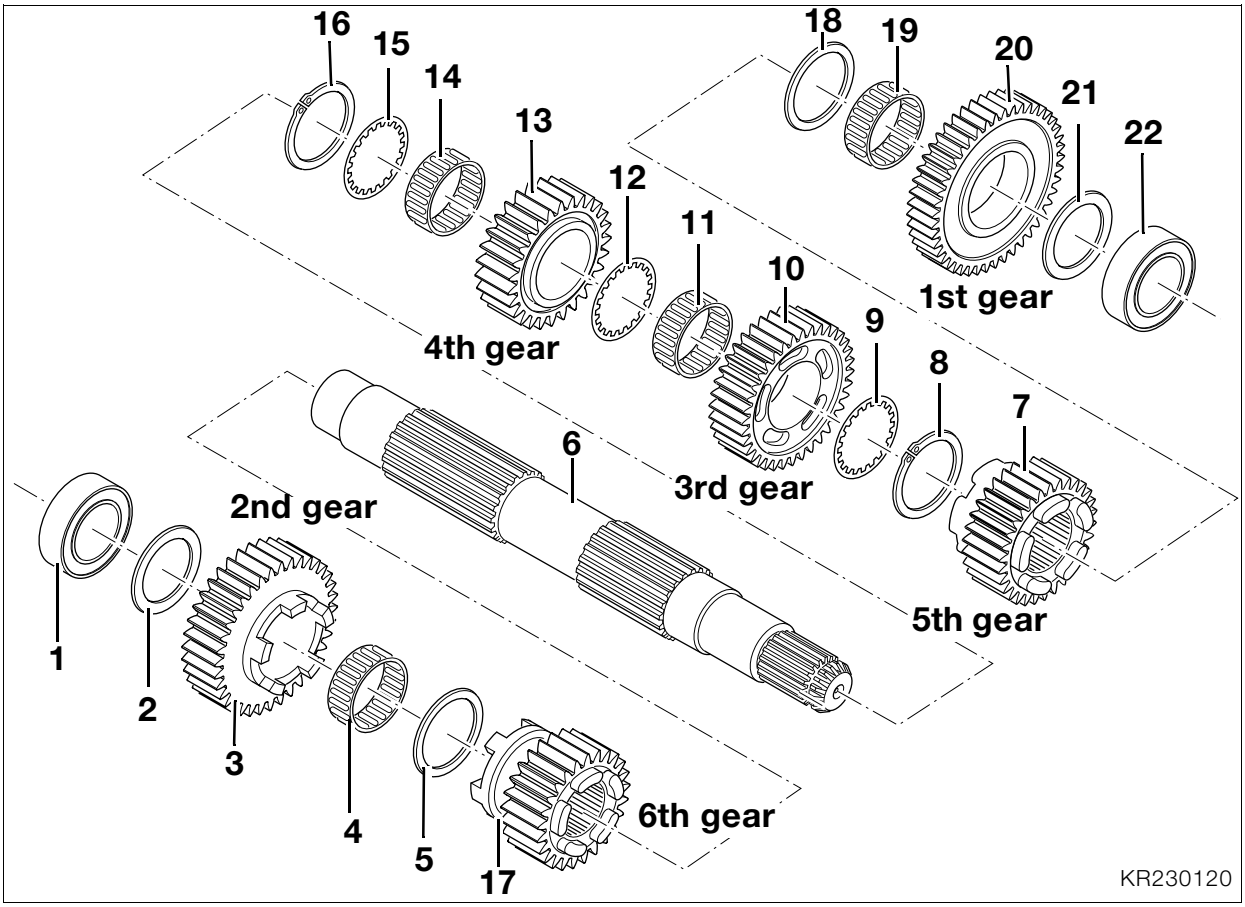
Disassembling output shaft

Caution:
To avoid damaging the needle roller bearing on the splines, spread it carefully at the end face when removing.



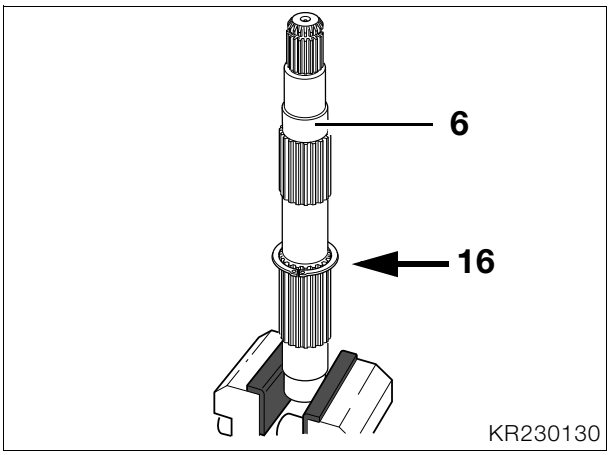


- Using universal puller, **BMW No. 00 7 500**, pull off grooved ball bearing (22) together with 1st gear wheel (20).
- Remove spacing washer (21), shift gear wheel for 1st gear (20), needle roller bearing (19) and spacing washer (18).
- Remove sliding gearwheel (7).
- Remove circlip (8), backup washer (9), shift gearwheel for 3rd gear (10) and needle roller bearing (11).
- Remove backup washer (12), 4th gear shift wheel (13), needle roller bearing (14) and backup washer (15).
- Remove circlip (16) and sliding gearwheel for 5th gear (17).
- Turn output shaft (6) other way round and clamp into the vise with soft jaws.
- Using universal puller, **BMW No. 00 7 500**, pull off deep-groove ball bearing (1) together with shift gearwheel for 2nd gear (4).
- Remove shim washer (2), needle roller bearing (3), shift gearwheel for 2nd gear (4) and thrust washer (5).



Assembling output shaft

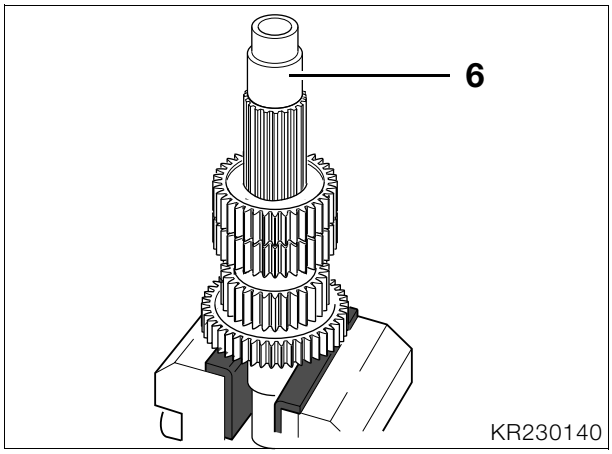
Note:
Assembly starts at the shift gearwheel for 4th gear. Before assembly, oil all running surfaces lightly with gear oil.

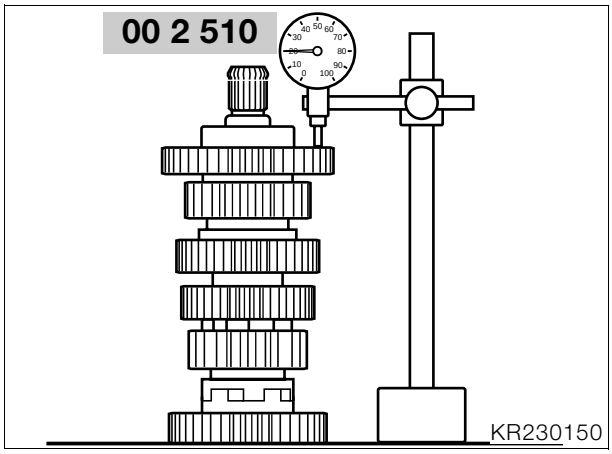


- Clamp the output shaft into the vise with soft jaws and with the splines facing upwards.
- Install circlip (16/arrow).
- Install backup washer (15).
- Install needle roller bearing (14).

Caution:
To avoid damaging the needle roller bearing on the splines, spread it carefully at the end face when installing.

- Install shift wheel for 4th gear (13) with the pockets facing circlip (16).
- Install backup washer (12) and needle roller (11).
- Install shift wheel for 3rd gear (10) with pockets facing away from the 4th gear shift wheel (13).
- Install backup washer (9) and circlip (8).
- After installing the 3rd and 4th shift wheels, measure endplay (➟ 23.16).
- Install shift wheel for 5th gear (7) with recess for shift fork facing towards the 3rd gear shift wheel (10).
- Install backup washer (18) and needle roller bearing (19).
- Install the shift gearwheel for 1st gear (20) with the pockets facing sliding gearwheel (7).
- Install spacing washer (21) and grooved ball bearing (22).
- After installing, check endplay at the shift gearwheel for 1st gear (➟ 23.16).





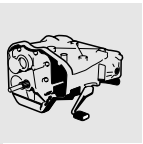
- Reverse position of output shaft (6) in vise.
- Install sliding gearwheel for 6th gear (17) with the recess for the selector fork facing the 2nd gear shift wheel (3).
- Install backup washer (5) and needle roller bearing (4).
- Install the shift wheel for 2nd gear (3) with the dogs facing the 6th gear sliding gearwheel (17).
- Check/adjust the fully assembled length (➠ 23.19).
- Install spacing washer (2) of the calculated thickness, and press on grooved ball bearing (1).
- Check 2nd gear endplay.

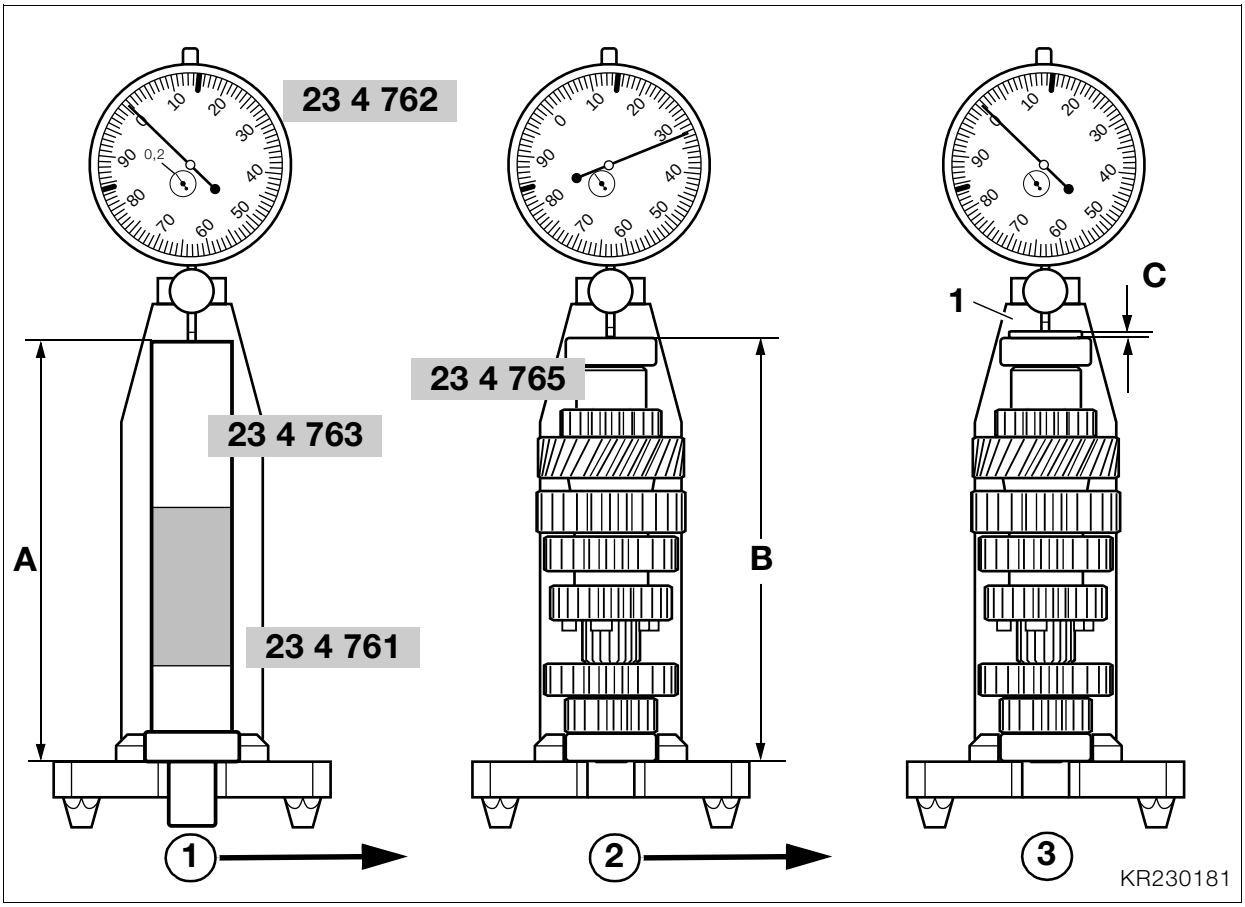
Checking endplay

- Secure dial gauge, **BMW No. 00 2 510**, to dial gauge stand.
- Position dial-gauge stylus on edge of the gearwheel and check endplay.

⚠ Caution:
Excessive endplay is due to incorrect assembly or worn needle roller bearings, backup washers or spacing washers, or the shift gear.
Check and replace as necessary.

Endplay values:
Endplay, 1st gear
..... 0.1...0.33 mm (0.0039...0.0123 in)
Endplay, 2nd gear
..... 0.1...0.33 mm (0.0039...0.0123 in)
Endplay, 3rd/4th gear
(total play) ..... 0.1...0.67 mm (0.0039...0.0264 in)





Checking/adjusting fully assembled length of gearbox shafts and selector drum

Checking/adjusting fully assembled length of intermediate shaft

Caution:
Check and adjust the fully assembled length as described below and install a spacing washer of the correct thickness.
Before measuring, always make sure that the grooved ball bearings are pressed fully home, even if the shaft has not been disassembled and reassembled.

- Secure dial gauge, **BMW No. 23 4 762**, in rear mounting hole of measuring stand, **BMW No. 23 4 761**, and set to 0.2 mm (0.008 in) preload.
- Using dial gauge, zero to dimension **"A"** of the zero gauge, **BMW No. 23 4 763**.
- Pull off the input-side grooved ball bearing with universal puller, **BMW No. 00 7 500**.
- Remove the spacing washer.
- Place reference washer, **BMW No. 23 4 765**, on the intermediate shaft.
- Place the grooved ball bearing on the reference washer.
- Insert intermediate shaft in measuring stand.
- Using dial gauge, measure deviation from zero of dimension **"B"** at inner bearing race.

Deviation from zero is equivalent to the thickness **"C"** of spacing washer (1).

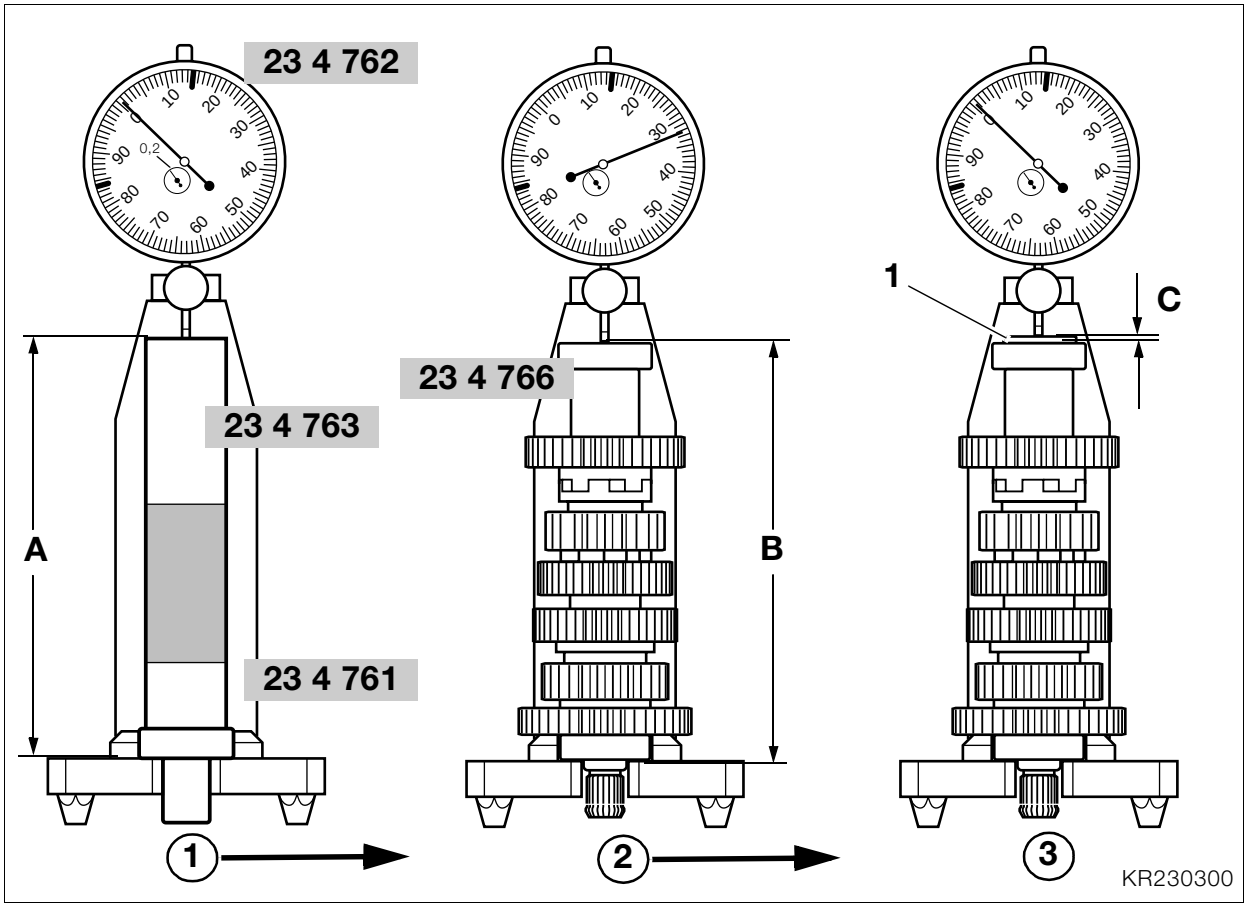
- Place a spacing washer (1) of the correct thickness on the inner bearing race and check deviation from zero.

A = B + C

Caution:
The maximum deviation from zero must not be exceeded.

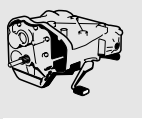
- Remove the intermediate shaft from the measuring fixture.
- Take off spacing washer, grooved ball bearing and reference washer.
- Place a spacing washer (1) of the correct thickness on the intermediate shaft and press on the grooved ball bearing.

Reference dimension for intermediate shaft:
Maximum deviation
from zero ..... -0.05…0 mm (-0.002...0.00 in)



Checking/adjusting fully assembled length of output shaft

⚠ Caution:
Check and adjust the fully assembled length as described below and install a spacing washer of the correct thickness.
Before measuring, always make sure that the grooved ball bearings are pressed fully home, even if the shaft has not been disassembled and reassembled.



- Secure dial gauge, **BMW No. 23 4 762**, in rear mounting hole of measuring stand, **BMW No. 23 4 761**, and set to 0.2 mm (0.008 in) preload.
- Using dial gauge, zero to dimension **"A"** of the zero gauge, **BMW No. 23 4 763**.
- Pull off the input-side grooved ball bearing with universal puller, **BMW No. 00 7 500**.
- Remove the spacing washer.
- Place reference washer, **BMW No. 23 4 766**, on the output shaft.
- Place the grooved ball bearing on the reference washer.
- Insert the output shaft into the measuring stand.
- Using the dial gauge, measure the deviation from zero of dimension **"B"** at the inner bearing race.

Deviation from zero is equivalent to the thickness **"C"** of spacing washer (1).

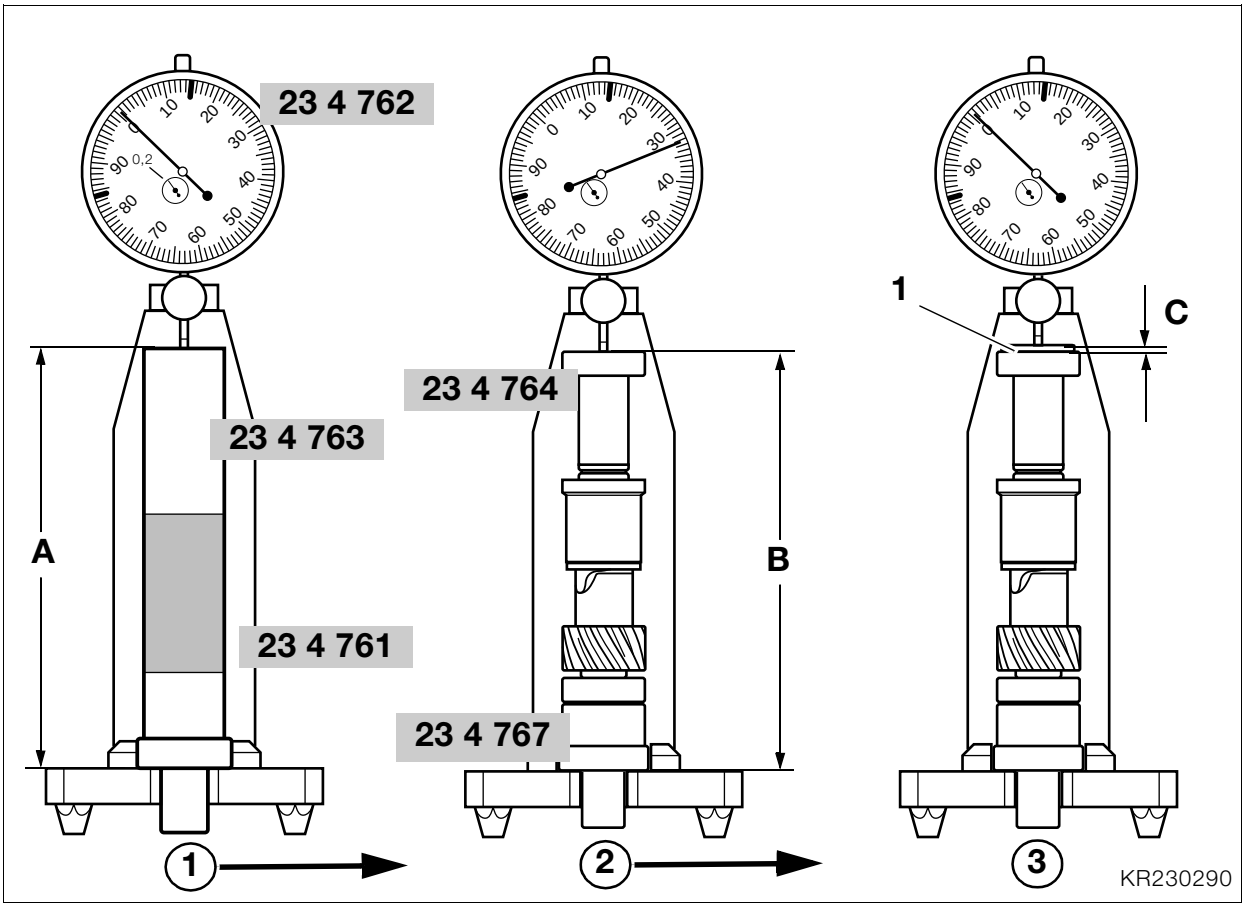
- Place a spacing washer (1) of the correct thickness on the inner bearing race and check the deviation from zero.

A = B + C

⚠ Caution:
The maximum deviation from zero must not be exceeded.

- Take off spacing washer, grooved ball bearing and reference washer.
- Place a spacing washer (1) of the correct thickness on the output shaft and press on the grooved ball bearing.

Reference dimension for input shaft:
Maximum deviation
from zero ..... -0.05...0 mm (-0.002...0.00 in)



Checking/adjusting fully assembled length of input shaft

⚠ Caution:
Check and adjust the fully assembled length as described below and install a spacing washer of the correct thickness.
Before measuring, always make sure that the grooved ball bearings are pressed fully home, even if the shaft has not been disassembled and reassembled.

- Secure dial gauge, **BMW No. 23 4 762**, in front mounting hole of measuring stand, **BMW No. 23 4 761**, and set to 0.2 mm (0.008 in) preload.
- Using dial gauge, zero to dimension **"A"** of the zero gauge, **BMW No. 23 4 763**.
- Pull off the output-side grooved ball bearing with universal puller, **BMW No. 00 7 500**.
- Remove the spacing washer.
- Mount reference washer, **BMW No. 23 4 764**, on the input shaft.
- Place the grooved ball bearing on the reference washer.
- Insert input shaft with adapter disc, **BMW No. 23 4 767**, in measuring stand.
- Using the dial gauge, measure deviation from zero of dimension **"B"** at the inner bearing race.

Deviation from zero is equivalent to the thickness **"C"** of spacing washer (1).

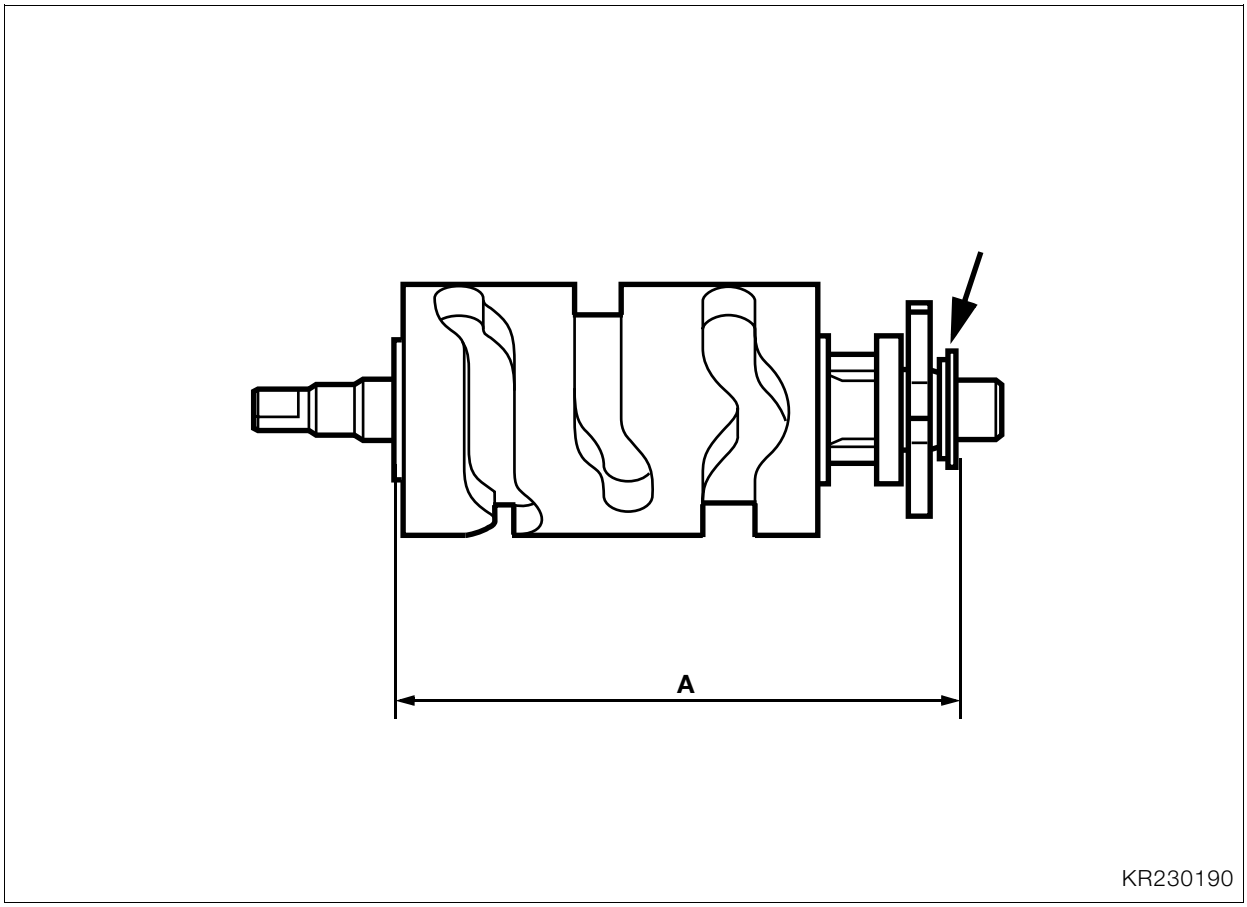
- Place a spacing washer (1) of the correct thickness on the inner bearing race and check the deviation from zero.

A = B + C

⚠ Caution:
The maximum deviation from zero must not be exceeded.

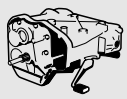
- Take the input shaft out of the measuring fixture.
- Remove the adapter disc, spacing washer, grooved ball bearing and reference washer.
- Place a spacing washer (1) of the correct thickness in position and press the grooved ball bearing on to the input shaft.

Reference dimension for drive shaft:
Maximum deviation
from zero .....-0.05...0 mm (-0.002...0.00 in)



Checking/adjusting fully assembled length of selector drum

- Place spacing washer and both thrust washers on the selector drum.
- Using slide gauge, determine fully assembled length **“A”**.
- If necessary, adjust fully assembled length **“A”** with a shim washer (arrow).

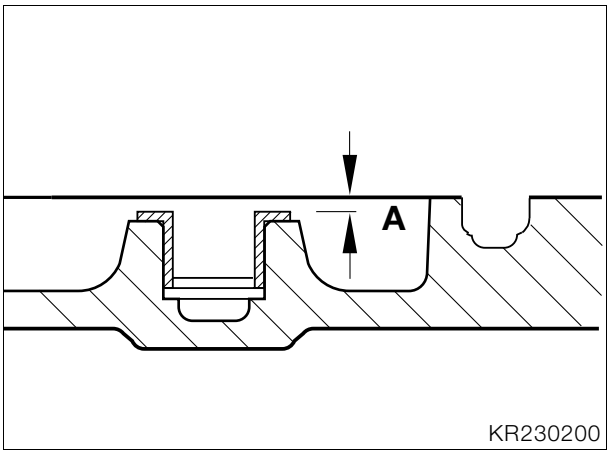


Fully assembled length:

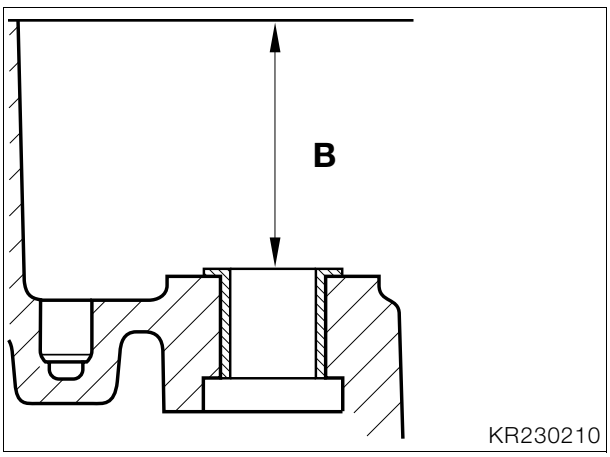
Selector drum .....111.80…111.90 mm (4.402…4.406 in)

Shimming selector shaft

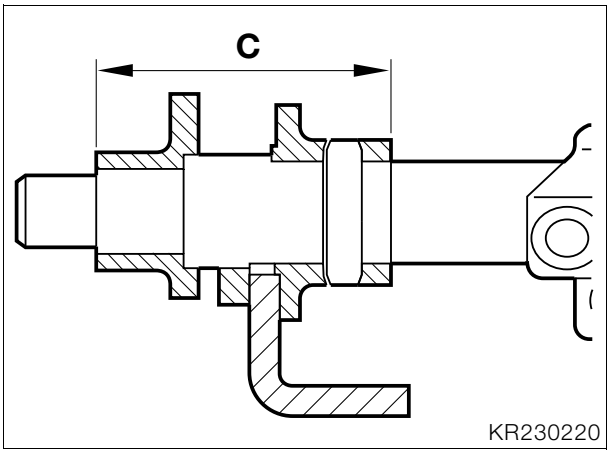
⚠ Caution:
If the housing or the complete selector shaft is replaced, the selector shaft must be measured and shimmed.



- Measure dimension **“A”** from shouldered bushing to cover mating face.



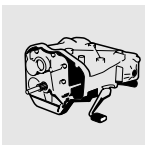
- Measure dimension **“B”** from shouldered bushing to housing mating face.

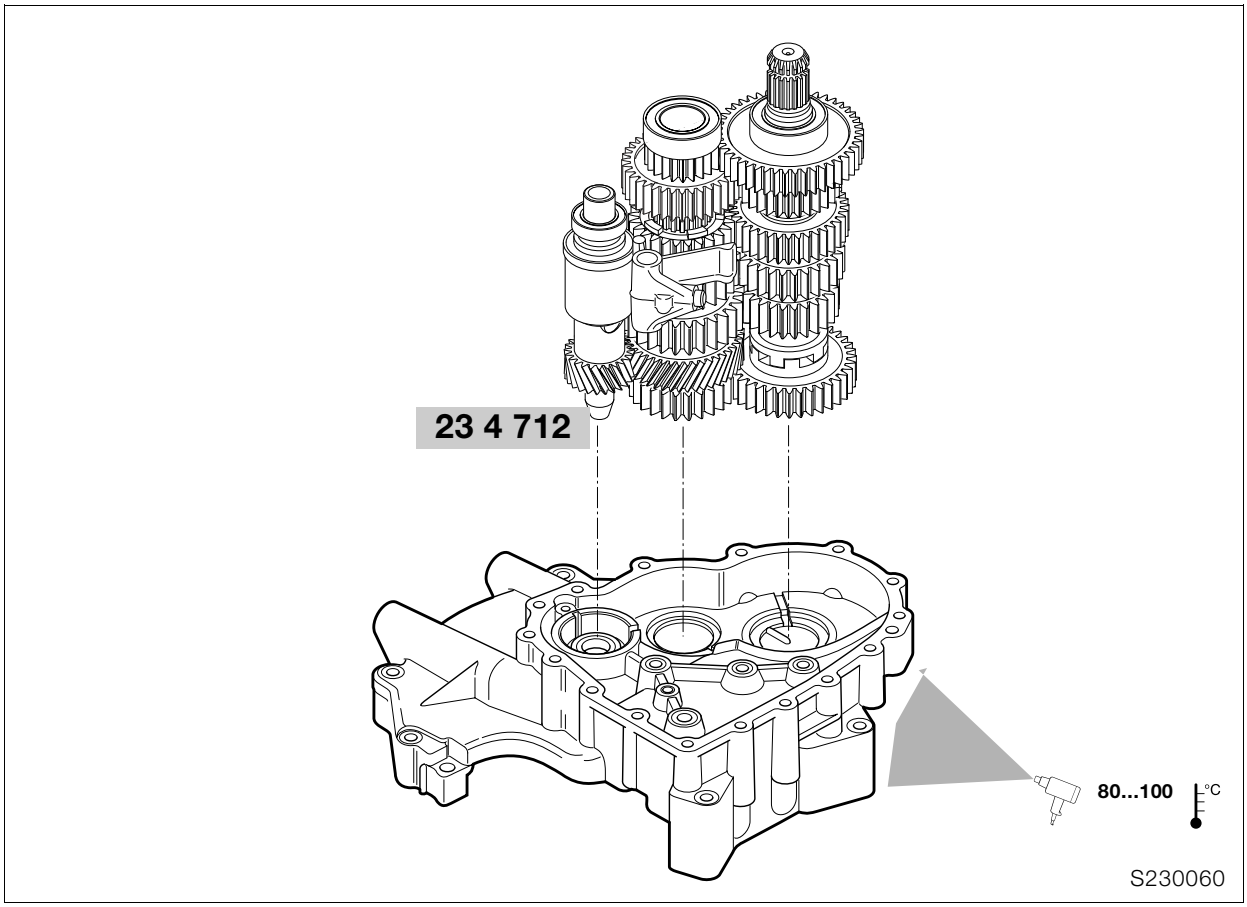


- Measure dimension **“C”** from the shoulder on the selector shaft to the back of the sleeve.
- Calculate endplay as follows:

Dimensions **“A” + “B” = “D”**
Dimensions **“D” - “C” = “E”**
Dimensions **“E”** - thickness of spacing washer = endplay.

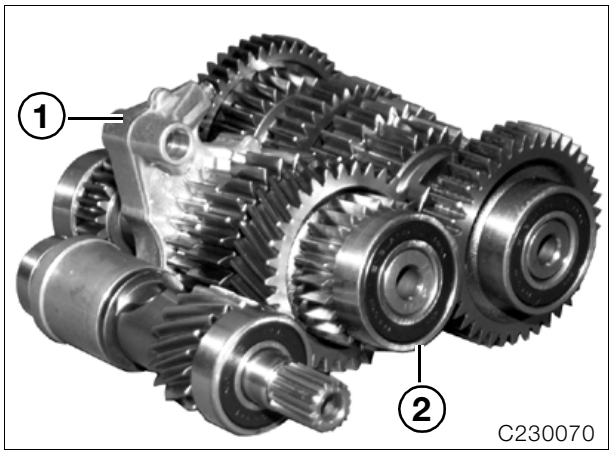
Endplay:
Selector shaft ..... 0.1…0.3 mm (0.004…0.012 in)





Assembling gearbox

Installing input, output and intermediate shafts



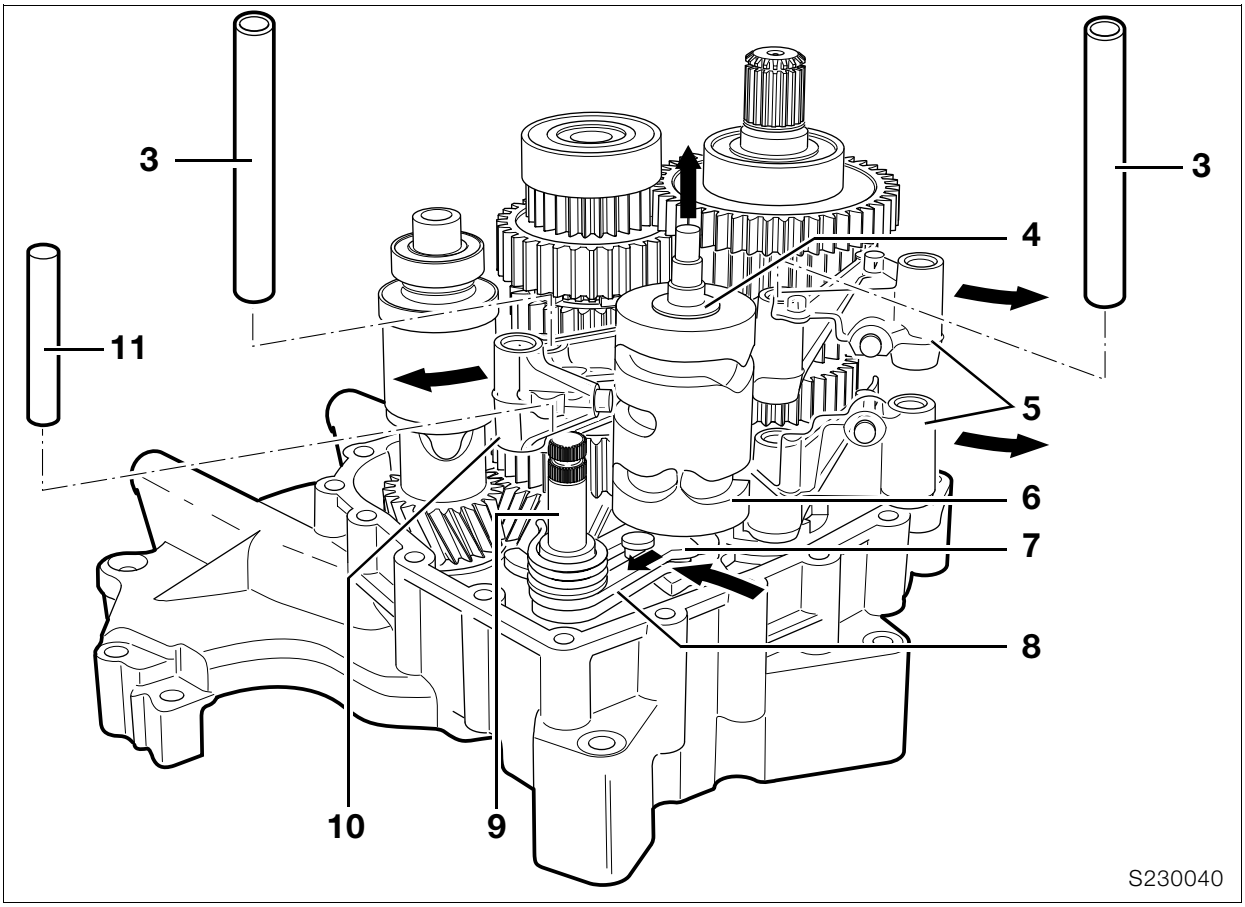
- Insert selector fork (1) into intermediate shaft (2).
- Align input, output and intermediate shafts so that their gear teeth mesh and the selector fork is in the position illustrated.
- Push assembly sleeve, **BMW No. 23 4 712**, on to the input shaft splines.

Note:
This is necessary only if the shaft sealing ring is installed.

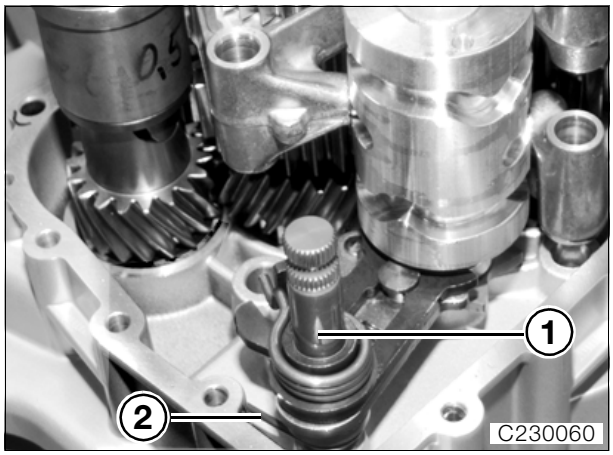
- Heat the bearing points in the cover to 80 ... 100 °C (176...212 °F).
- Insert the input, output and intermediate shafts together.

Caution:
Check that the gearbox shafts are correctly seated.

- Install the 1st/3rd and 2nd/4th shift forks.



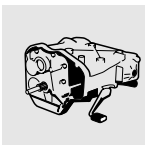
Installing selector shaft

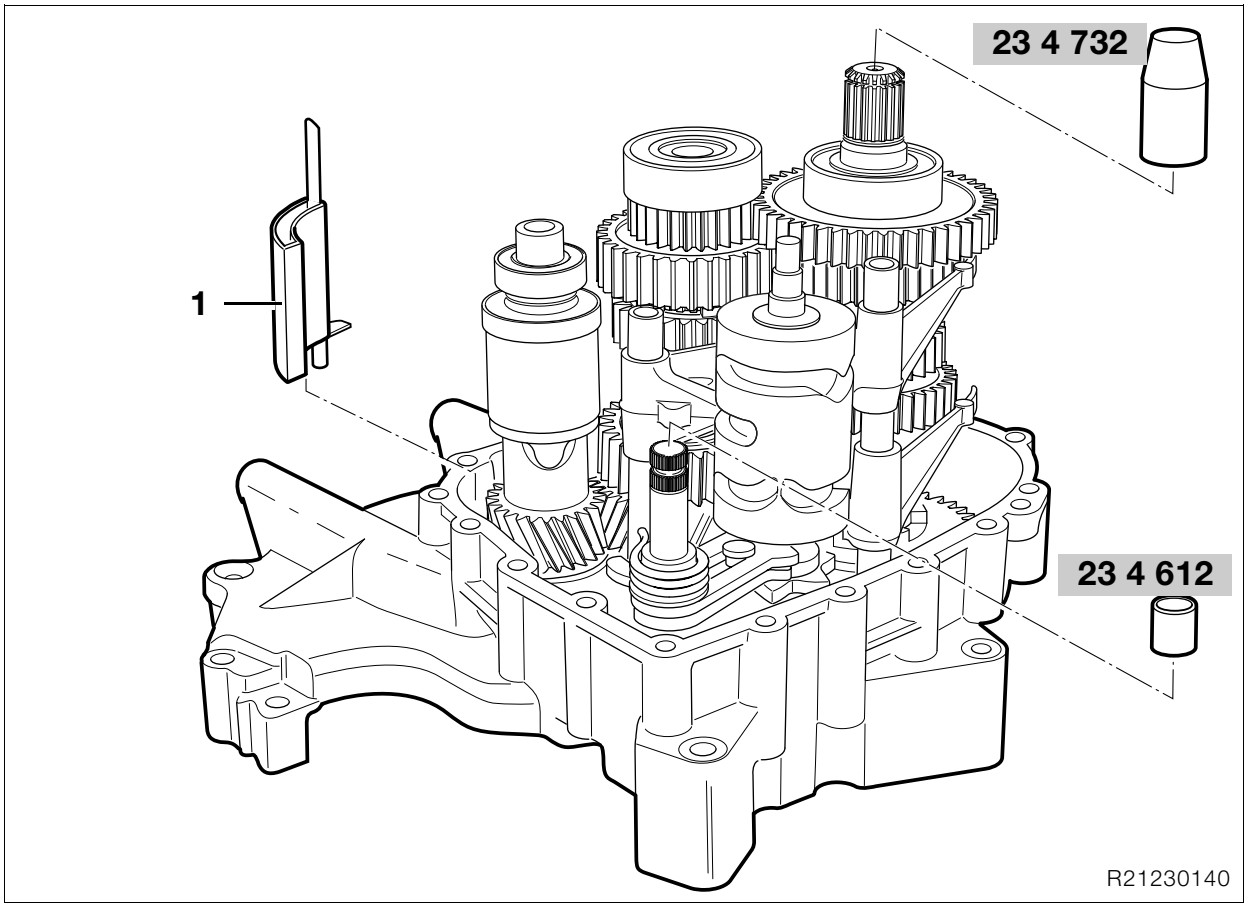


- Place a spacing washer of the correct thickness in position and install selector shaft (1).
- Engage torsion spring (2) in the housing.

Installing selector drum

- Place a spacing washer of the correct thickness and the input-side thrust washer on selector drum (6) and secure with a small amount of grease.
- Swing locking lever (8) toward the drive shaft and install the selector drum.
- Swing locking lever (8) towards selector drum (6) and engage it in position together with guide plate (7).
- Place shift forks (5, 10) in the guide tracks.
- Install selector shafts (3).
- Install locking pin (11).
- Place thrust washer (4) on the selector drum.

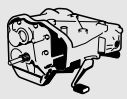




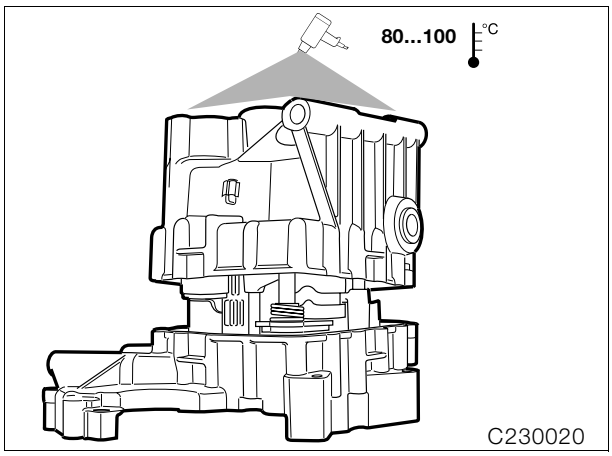
Installing gearbox housing

- Install dowel pins in cover.
- Install breather tube (1) in housing cover.

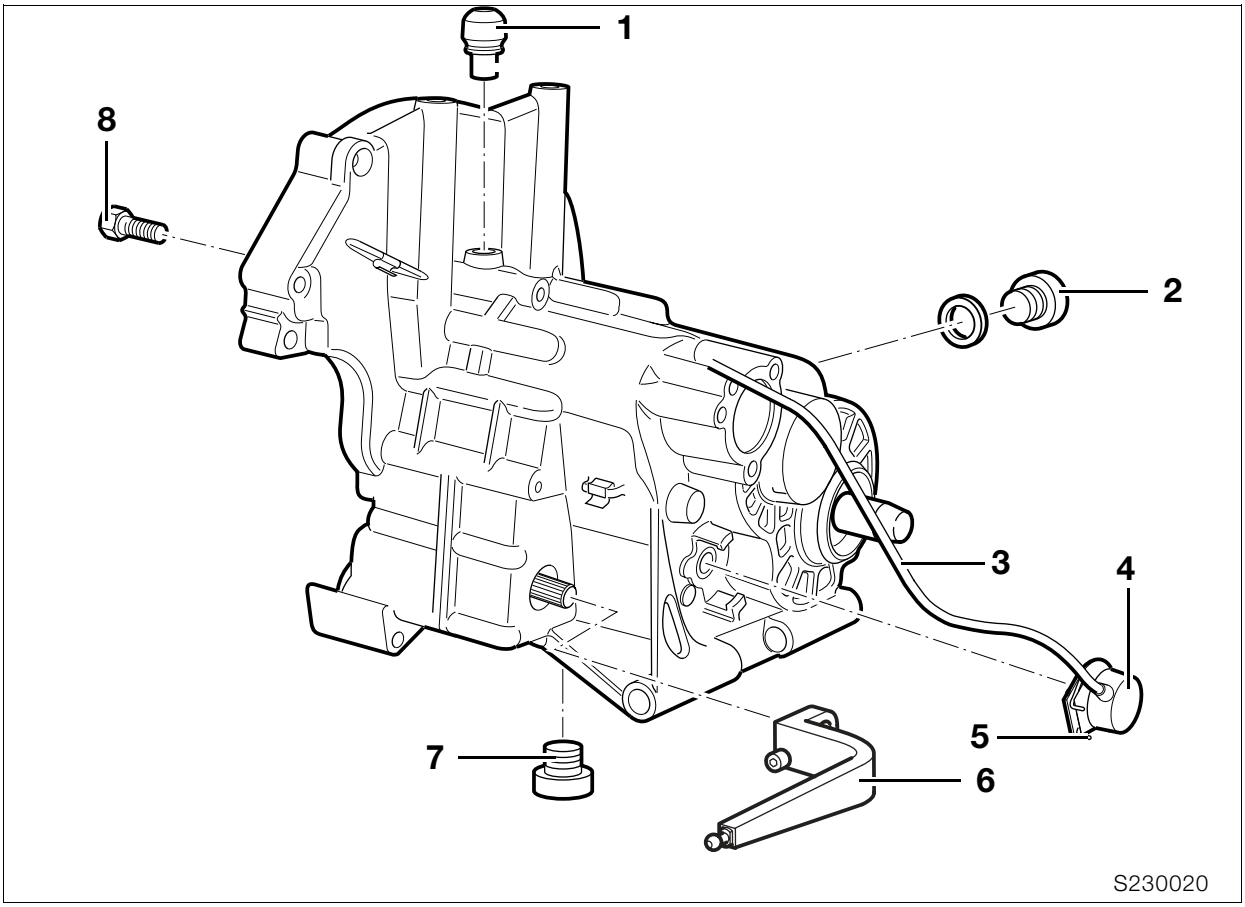
Caution:
Clean and de-grease the sealing faces.
The sealing compound sets within 30 minutes; within this time, place the housing in position and screw it down.



- Apply **Loctite 574** sealing compound to the mating face of the cover.
- Place assembly sleeve, **BMW No. 23 4 732**, on the output shaft.
- Place assembly sleeve, **BMW No. 23 4 712**, on the input shaft.
- Place assembly sleeve, **BMW No. 23 4 612**, on the selector shaft.



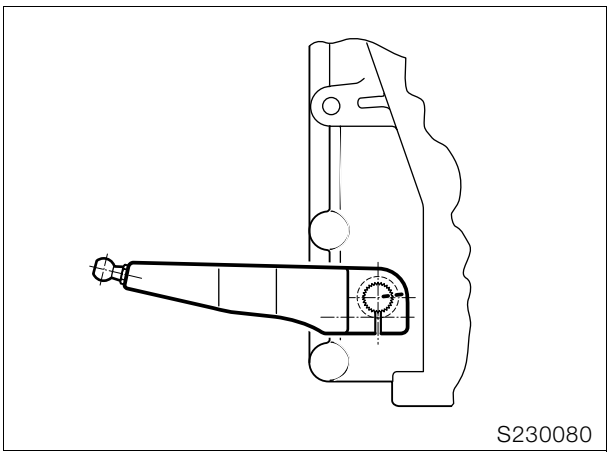
- Heat the bearing seats in the housing to 80 ... 100 °C (176...212 °F) and place the housing on the cover.



- Insert screws (8) and tighten in diagonally opposite sequence.
- Install neutral indicator (4) and clip wire (3) into position.
- Install breather (1).

Caution:
Clean metal particles off the magnet in drain plug (7).

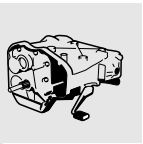
- Install oil drain plug (7).
- Install oil-check and oil filler plug (2) with new sealing ring.



- Install shift lever in correct position.

Note:
The shift lever is in the correct position when the mark is aligned with the corresponding mark on the selector shaft.
After assembling the gearbox, perform a functional check.

Tightening torque:
Selector lever to selector shaft ..... 9 Nm



31 Front fork

Contents

Page

Technical Data 3

Removing and installing telescopic fork 5

Removing and installing telescopic fork 5
- Removing and installing ball joint in slider tube bridge 6
- Removing and installing ball joint in fork bridge 6

Disassembling/assembling telescopic fork 7

Disassembling telescopic fork 7

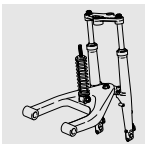
Assembling telescopic fork 7

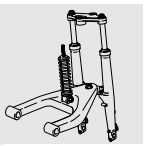
Measuring telescopic fork 8
- Examining slider tube bridge and fork bridge 8
- Checking runout of fixed tube 8
- Checking runout of slider tube 8

Removing and installing leading link 9

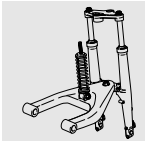
Disassembling/assembling leading link 9

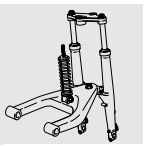
Removing and installing front suspension strut 10

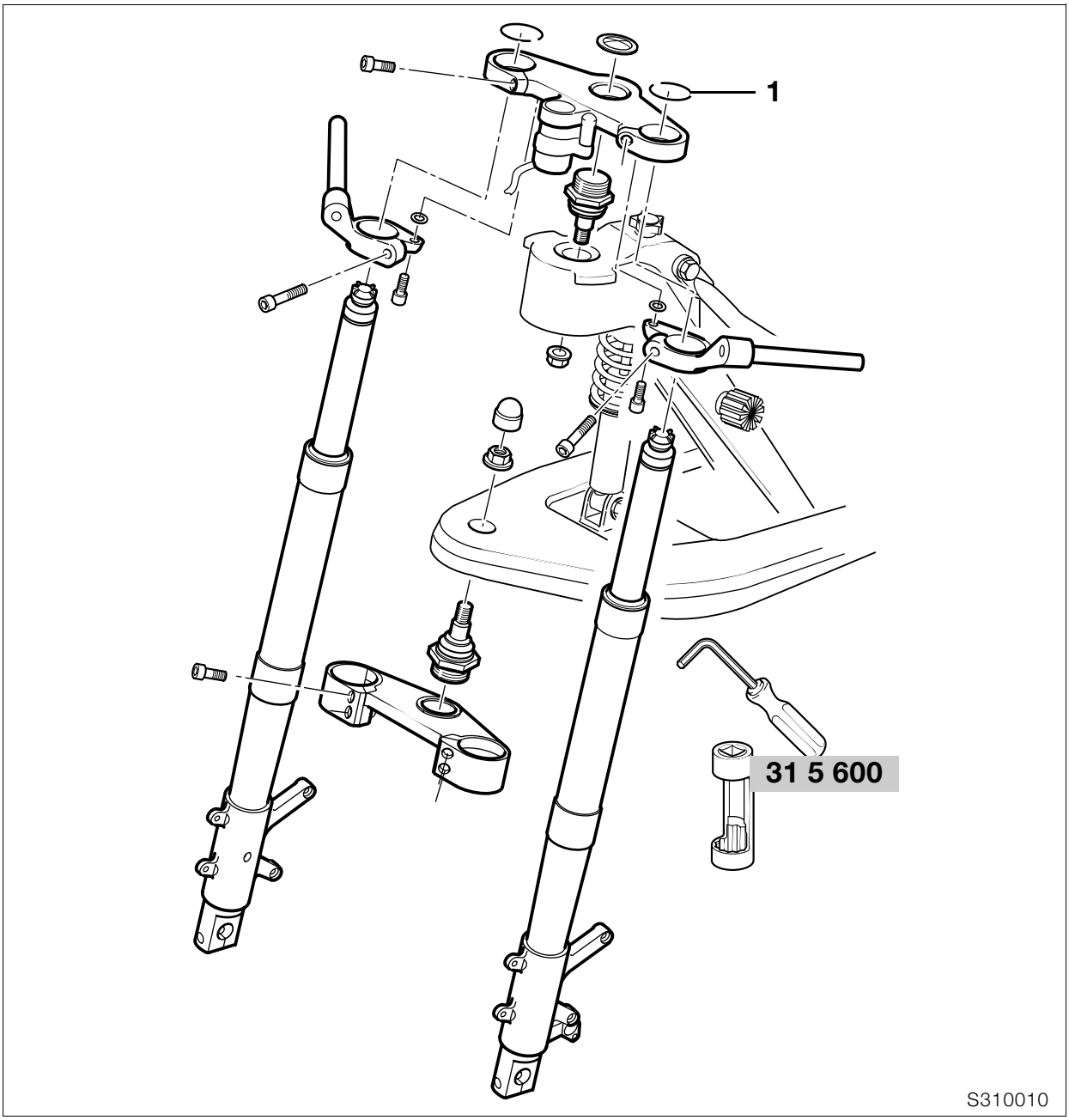




Technical Data		R 1100 S
Front suspension		
Type		BMW Telelever with external suspension strut
Telescopic fork		
Front wheel caster in normal-load position	mm (in)	100 (3.9)
Steering lock angle	°	2 x 31
Total suspension travel	mm (in)	110 (4.3)
Fixed tube surface		Hard chrome plated
Extl. dia. of fixed fork tubes	mm (in)	35.0 (1.38)
Maximum permissible runout of fixed fork tube	mm (in)	0.4 (0.02)
Telescopic fork oil – approved grades		BMW telescopic fork oil
Capacity per fork leg	l (Imp. pint/ US quart)	0.17 (0.299/0.180)
Suspension strut		
Type		Suspension strut with coil spring and single-tube gas-filled shock absorber: Extension-stage damping steplessly adjustable







Removing and installing telescopic fork

Removing and installing telescopic fork

- Secure stand, **BMW No. 00 1 520**, to motorcycle.
- Remove front wheel.
- Remove mudguard.
- **[ABS]** Remove sensor.
- Remove brake line retainer.
- Heat leading link mount at front to max. 120 °C (248 °F) and unscrew.
- Release clamp securing fixed tube to upper fork bridge.
- Remove retaining ring (1) from upper fork bridge.
- Release clamp securing handlebars.
- Remove handlebar from fork bridge.
- Pull telescopic fork down and remove.
- Disconnect plug of ignition lock.
- Heat screw securing ball joint to frame to max. 120 °C (248 °F) and remove, using socket and internal hexagon socket, **BMW No. 31 5 600**.
- Remove fork bridge.
- Remove ignition/steering lock.

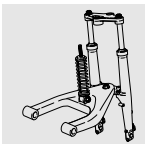
➡ ..... Group 51

- Installation is the reverse of the removal procedure.
- Tighten the ball joint with the socket and hex socket, **BMW No. 31 5 600**.

⚠ Caution:
To prevent grease from escaping and the ingress of dirt, ensure that sleeve is correctly located on ball joint.

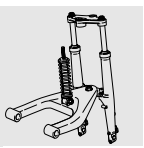
- **[ABS]** Check sensor gap and adjust if necessary.

ABS –
sensor gap: ..... 0.45...0.55 mm (0.018...0.022 in)

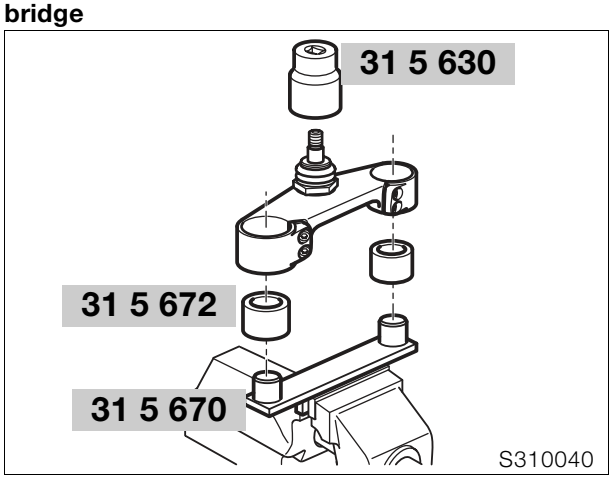


Tightening torque:

Screw connection between fork bridge and frame
(use new nut or
(clean thread + Loctite 2701)..... 130 Nm
Clamp, fork fixed tube to fork bridge
(free from oil and grease)..... 22 Nm
Sliding-fork bridge to leading link
(use new nut or
clean thread + Loctite 2701)..... 130 Nm



Removing and installing ball joint in slider tube bridge

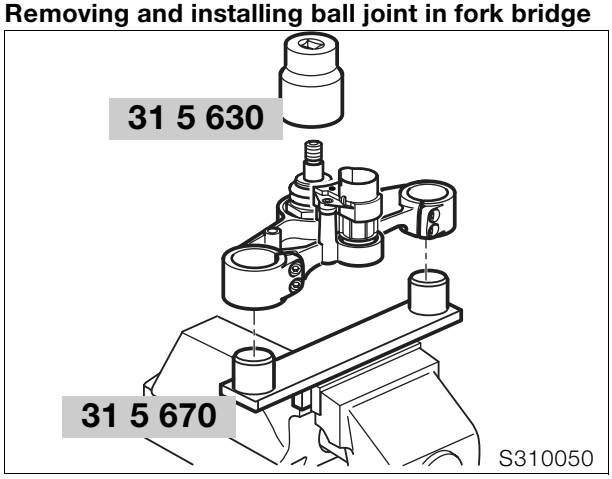


- Mount the slider tube bridge in retaining fixture, **BMW No. 31 5 670/672**.
- Use w/f 46 socket, **BMW No. 31 5 630**, to release and tighten ball joint.

Tightening torque:

Ball joint to slider tube bridge
(apply Never Seez to thread) ..... 230 Nm

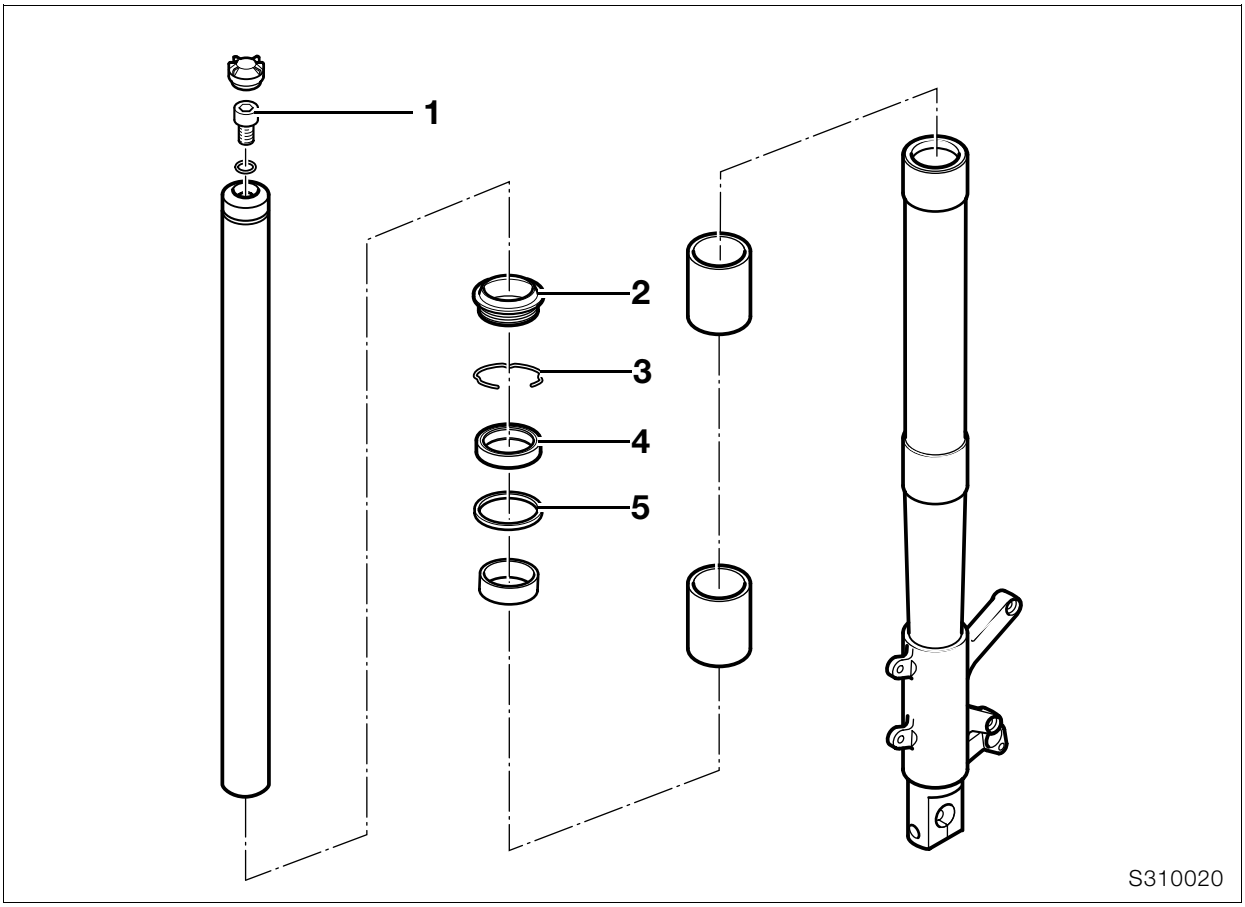
Removing and installing ball joint in fork bridge



- Secure fork bridge in retaining fixture, **BMW No. 31 5 670**.
- Use w/f 46 socket, **BMW No. 31 5 630**, to release and tighten ball joint.

Tightening torque:

Ball joint to fork bridge
(apply Never Seez to thread) ..... 230 Nm



Disassembling/assembling telescopic fork

Disassembling telescopic fork

- Remove securing screws and pull slider tube bridge off slider tubes.
- Remove bleed screw (1).
- Pull out fixed tube/drain oil.
- Lever out the dust wiper (2).

Caution:
Do not damage fork slider tube.

- Remove retaining ring (3).
- Lever out shaft seal (4).
- Remove washer (5).

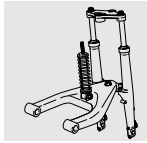
Assembling telescopic fork

- Fill with oil.

Quantity per fixed tube .....0.17 l (0.30 Imp. pint/0.18 US quart)

Oil grade in telescopic fork: .....BMW telescopic fork oil

Note:
No oil changes required during services: unit is maintenance-free.



- Install fixed tube.
- Install washer (5).
- Oil the shaft seal slightly and push it on as far as possible (to stop on slider tube) by striking it lightly with drift, **BMW No. 31 5 610**, and reducing adapter, **BMW No. 31 5 613**.
- Install retaining ring and dust wiper.
- Insert bleed screw (1).
- Push slider tube bridge home on slider tubes and tighten securing screws.
- Bleed telescopic forks under zero load.

Tightening torque:
Bridge to slider tube
(clean thread + Loctite 243)..... 25 Nm

Measuring telescopic fork

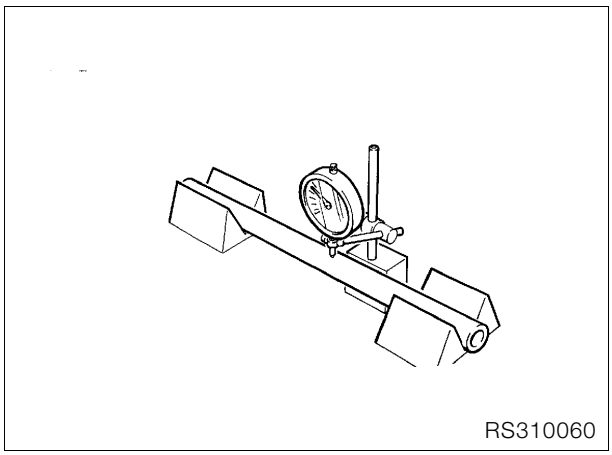
Caution:
After an accident, always examine the telescopic fork for cracks and signs of damage.

Examining slider tube bridge and fork bridge

- Check slider tube bridge and fork bridge for surface irregularities.

Caution:
Replace slider tube bridge/fork bridge if deformed.

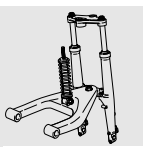
Checking runout of fixed tube



- Place both ends of fixed tube in V-blocks.
- Rotate fixed tube slowly and check with dial gauge.

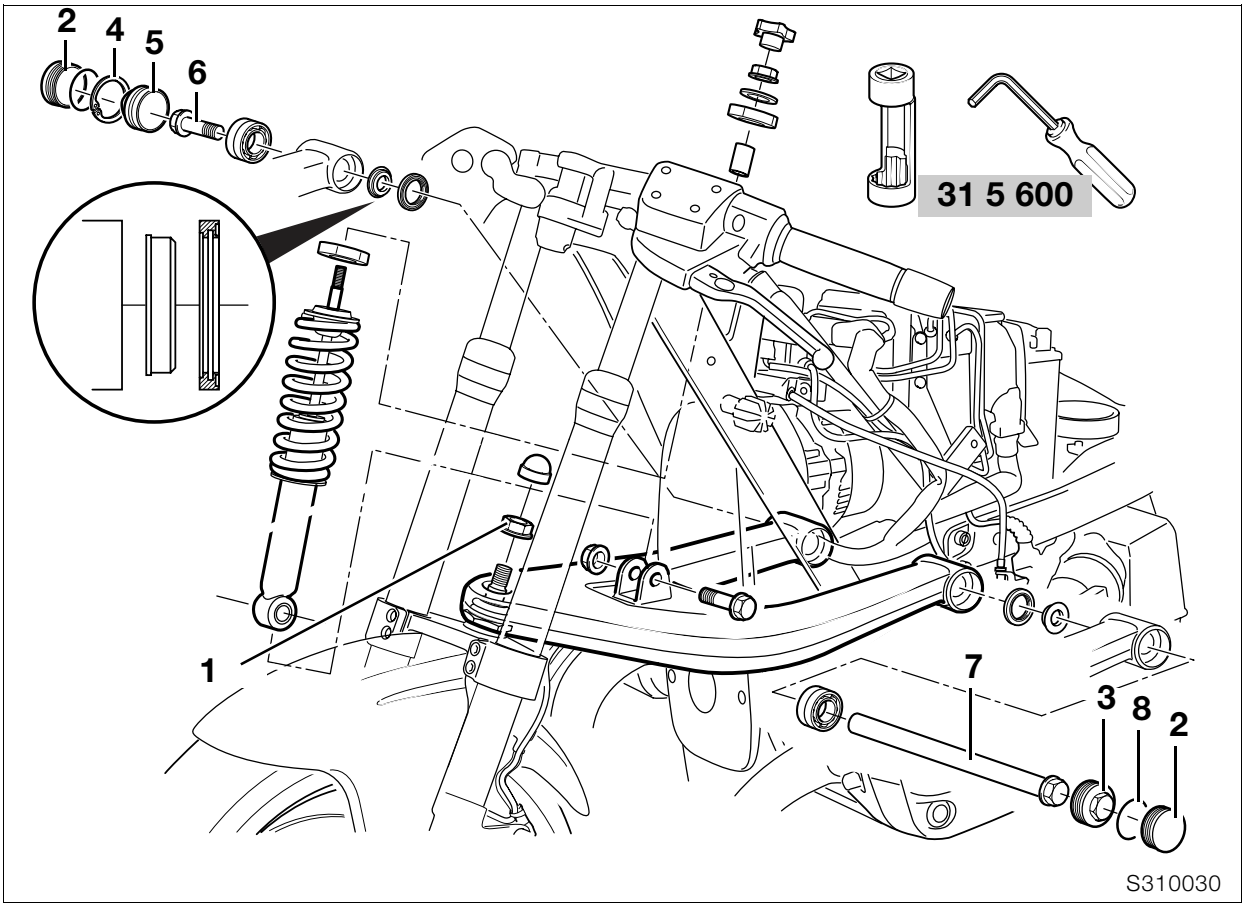
Caution:
Do not straighten distorted fixed tubes: always replace them.

Permissible runout: ..... 0.4 mm (0.016 in)



Checking runout of slider tube

- New fixed tube must slide freely into slider tube without catching.



Removing and installing leading link

- Disengage suspension strut at bottom.
- Heat ball joint mount (1) at leading link to max. 120 °C (248 °F) and remove it.
- Remove covers (2) from leading link pivots.
- Remove left screw cap (3).
- Remove right retaining ring (4) and retaining cap (5).
- Disconnect the left air intake pipe from the cylinder head.
- Remove right screw (6) and remove shaft (7) by pulling to the left.
- Pull telescopic fork forwards and carefully remove leading link by pulling forwards.

Caution:
Protect parts against scratching; mask off if necessary.

- Installation is the reverse of the removal procedure.
- Apply a light coating of grease to the shaft before installing.
- Tighten the ball joint at the leading link with the socket wrench insert and internal hexagon, **BMW No. 31 5 600**.

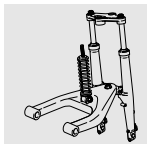
Tightening torque:

Leading link to engine on right	73 Nm
Left screw cap (coat thread lightly with Never Seez)	42 Nm
Leading link to ball joint (use a new nut or clean thread + Loctite 2701)	130 Nm
Suspension strut to leading link	50 Nm

Disassembling/assembling leading link

- Press the bearing out/in with a suitable drift.

Caution:
Always install bearing by applying pressure to outer race.

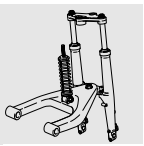


Removing and installing front suspension strut

- Disengage and pull back the fuel tank.
- Remove the horn.
- Turn the knob for adjusting suspension-strut damping all the way counter-clockwise = SOFT direction.
- Remove the knob for adjusting suspension-strut damping.
- Detach suspension strut at top and bottom and remove.
- Installation is the reverse of the removal procedure: always check that suspension-strut damping is set to minimum (knob turned counter-clockwise as far as it will go) before starting work.
- Basic setting for one-up riding: turn knob for adjusting suspension-strut damping clockwise as far as it will go = toward HARD, then back off six clicks.

Caution:
Protect parts against scratching; mask off if necessary.

Tightening torque:
Suspension strut to frame ..... 43 Nm
Suspension strut to leading link ..... 50 Nm



32 Steering

Contents

Page

Technical Data 3

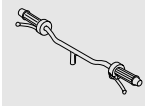
Removing and installing left handlebar fitting 5

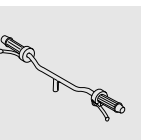
Removing and installing right handlebar fitting 6

Removing and installing handlebar 7

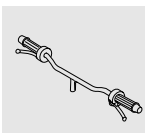
Removing and installing Bowden-cable divider, Bowden cable for throttle actuation and starting-speed increase 8

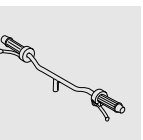
Disassembling Bowden-cable divider 9

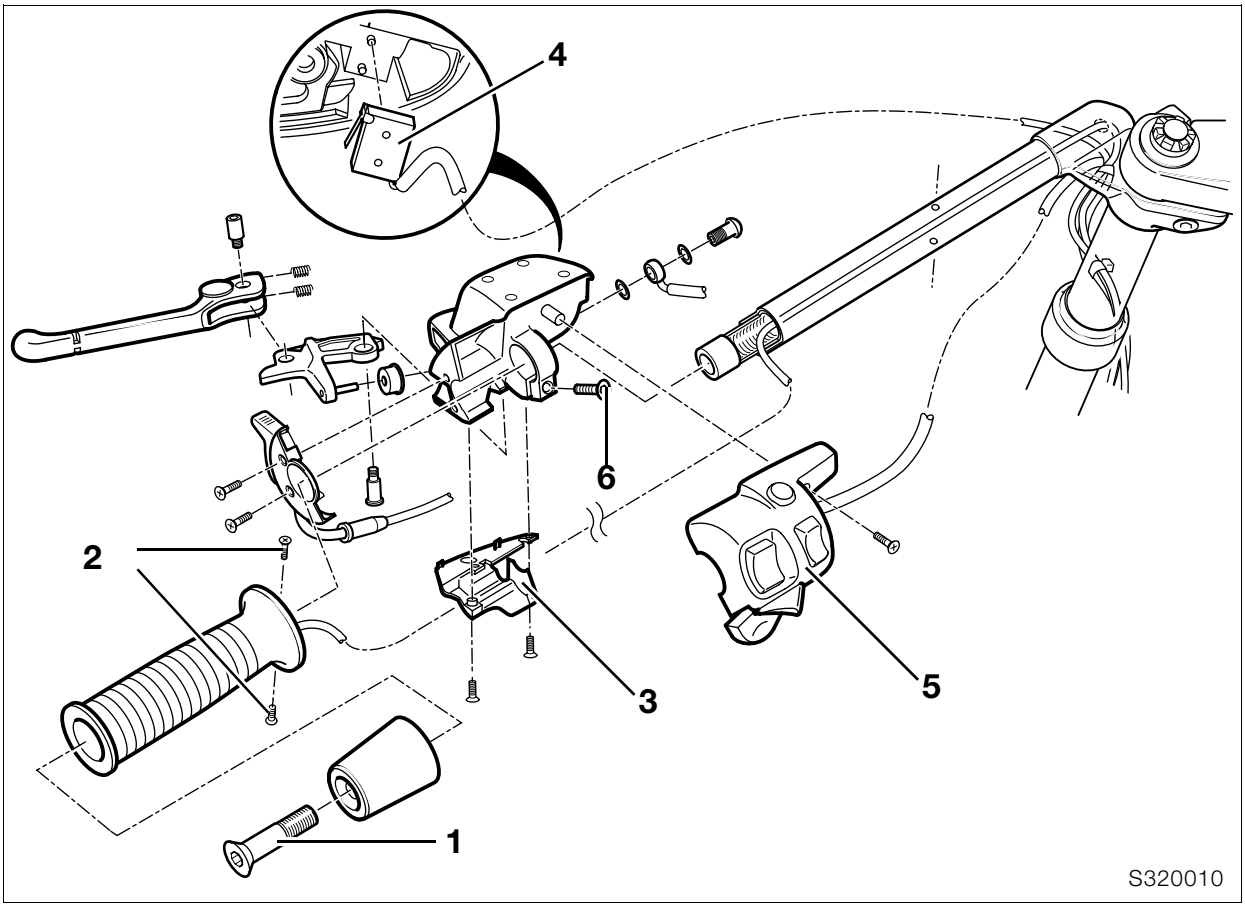




Technical Data		R 1100 S
Steering lock angle	°	2 x 31
Steering tube diameter	mm (in)	22 (0.9)
Width across mirrors	mm (in)	880 (34.6)







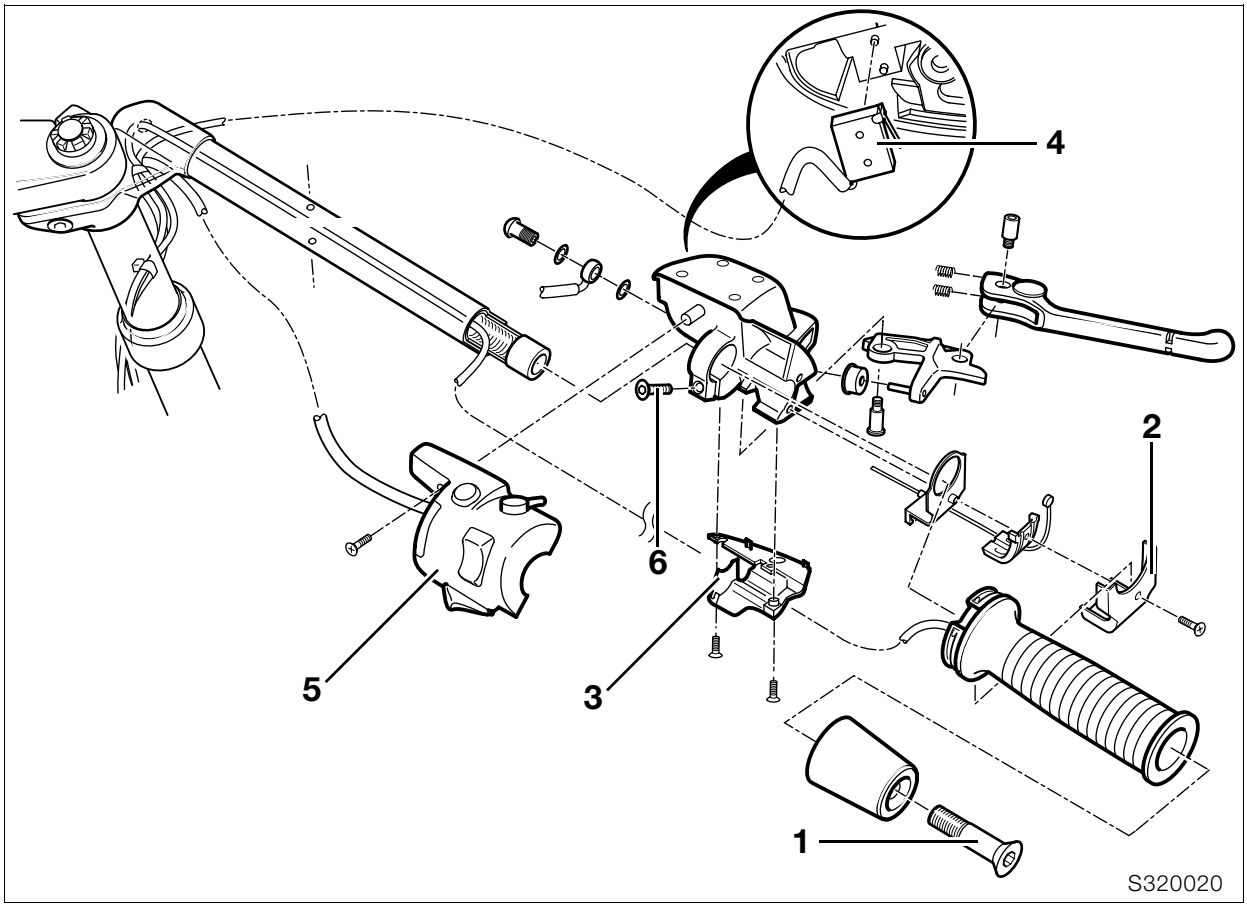
Removing and installing left handlebar fitting

- Remove securing screw (1) and remove handlebar weight.
- Remove securing screws (2) of handlebar grip and remove grip.
- Detach lower section (3) of handlebar fitting.
- Pull off clutch switch (4).
- Remove the combination switch (5).
- Drain the clutch operating system.

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

- Disconnect the clutch line.
- Loosen the retaining screw (6) for the clutch fitting and remove the fitting.
- Disconnect plug for combination switch, if necessary.
- Disconnect plug for clutch switch, if necessary.
- Installation is the reverse of the removal procedure.
- Align the clamp joint line with the punch mark on the handlebar.
- Fill and bleed the clutch operating system.

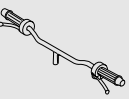
Tightening torques:
Clutch line to clutch lever fitting ..... 18 Nm



Removing and installing right handlebar fitting

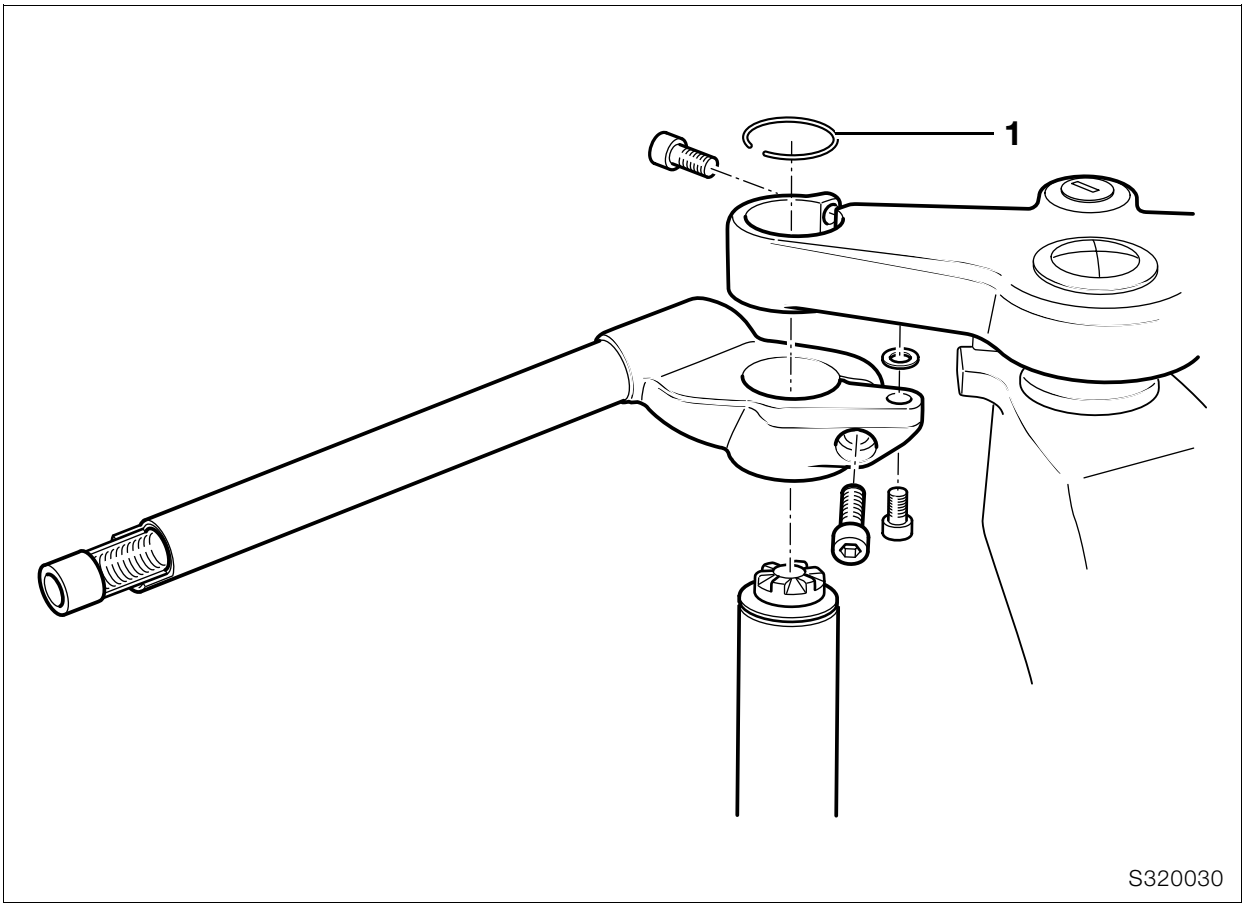
- Remove securing screw (1) and remove handlebar weight.
- Remove throttle twistgrip cover (2).
- Back off the adjuster screw for the throttle cable and disengage the Bowden cable.
- Pull off the throttle twistgrip.
- Remove the lower section (3) of the brake lever fitting.
- Pull off the brake light switch (4).
- Remove the combination switch (5).
- Drain fluid from brake system.

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.



- Disconnect the brake line.
- Loosen the retaining screw for the brake lever fitting (6) and remove the fitting.
- Disconnect plug for combination switch, if necessary.
- Disconnect plug for brake-light switch, if necessary.
- Installation is the reverse of the removal procedure.
- Align the clamp joint line with the punch mark on the handlebar.
- Fill and bleed the brake system.

Tightening torques:
Brake hose to brake lever fitting..... 18 Nm



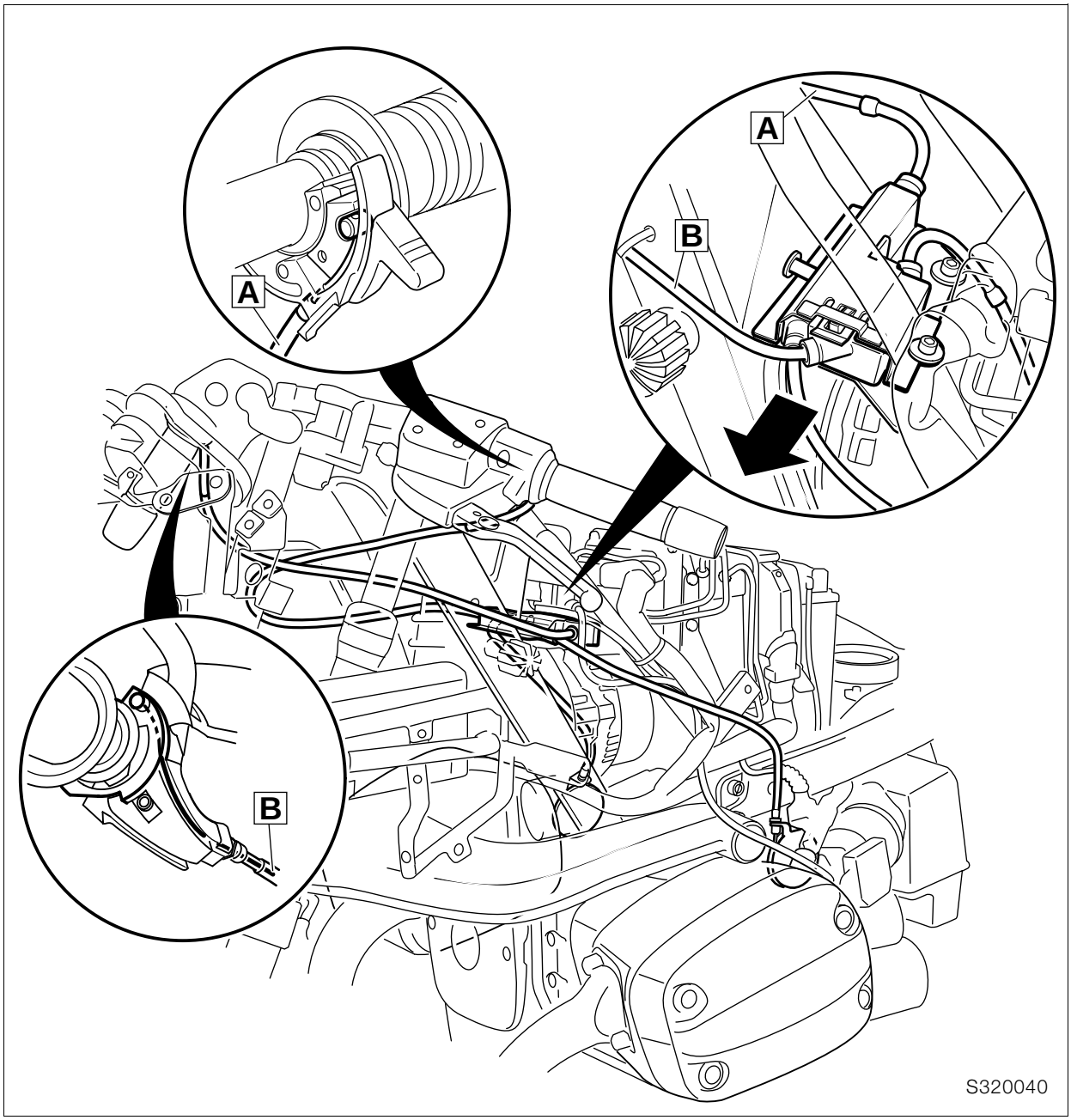
Removing and installing handlebar

- Remove left and right handlebar fittings.
- Release clamp securing fixed tube to upper fork bridge.
- Release clamp securing handlebar.
- Remove screws securing handlebars to fork bridge.
- Remove retaining ring (1) from upper fork bridge.
- Pull the fixed tube down.
- Remove handlebar.
- Installation is the reverse of the removal procedure.

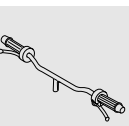
Caution:
Make sure that brake hose is correctly located.

Tightening torques:

Handlebar to fixed tube	21 Nm
Handlebar to fork bridge (clean thread + Loctite 243)	9 Nm



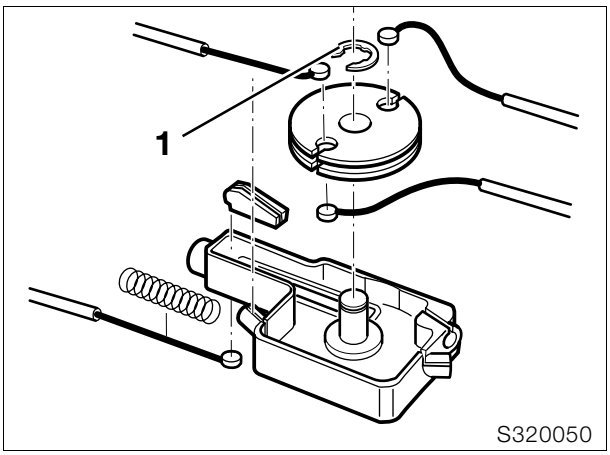
Removing and installing Bowden-cable divider, Bowden cable for throttle actuation and starting-speed increase



- Disengage fuel tank and pull to the rear.
- Remove Bowden-cable cover from fitting for starting-speed increase and disengage Bowden cable (A).
- Remove Bowden-cable cover from fitting for throttle actuation and disengage Bowden cable (B).
- Disengage throttle cables from right and left throttle flap stubs.
- Press in keeper spring and disengage Bowden cable.
- Remove cable ties securing Bowden cables.
- Remove Bowden-cable divider (arrow).

Disassembling Bowden-cable divider

.

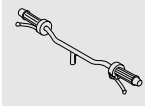


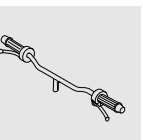
- Remove retainers securing Bowden cables.
- Remove Bowden cable for starting-speed increase.
- Remove retainer (1) for roller of Bowden-cable divider.
- Remove Bowden cables.
- Installation is the reverse of the removal procedure.

Caution:
Make sure that Bowden cables are free of kinks.

- Adjust Bowden cables.

➠ .....See Group 00





33 Rear wheel drive

Contents

Page

Technical data 3

Removing, disassembling, reassembling and installing rear wheel drive 5

Removing rear wheel drive 5

Removing input bevel pinion 5

Disassembling input bevel pinion 7
- Removing needle roller bearing for input bevel pinion 7
- Installing needle roller bearing for input bevel pinion 7

Assembling input bevel pinion 8

Installing input bevel pinion 9

Removing and disassembling crown wheel 10

Assembling/installing crown wheel 11

Checking/adjusting backlash 12

Checking tooth contact pattern 13

Shimming housing cover 14

Installing housing cover 14

Installing sliding element 14

Removing and installing rear swinging arm 15

Removing rear swinging arm 15

Removing and installing taper roller bearing 16

Removing and installing flexible gaiter 16

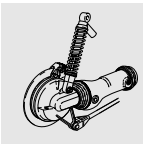
Removing drive shaft 16
- Checking universal joint for wear 16

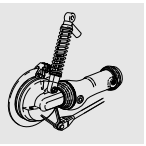
Installing drive shaft 16

Installing rear swinging arm 17

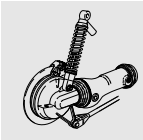
Installing rear wheel drive 18

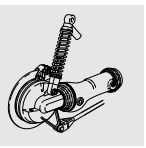
Removing and installing suspension strut 19

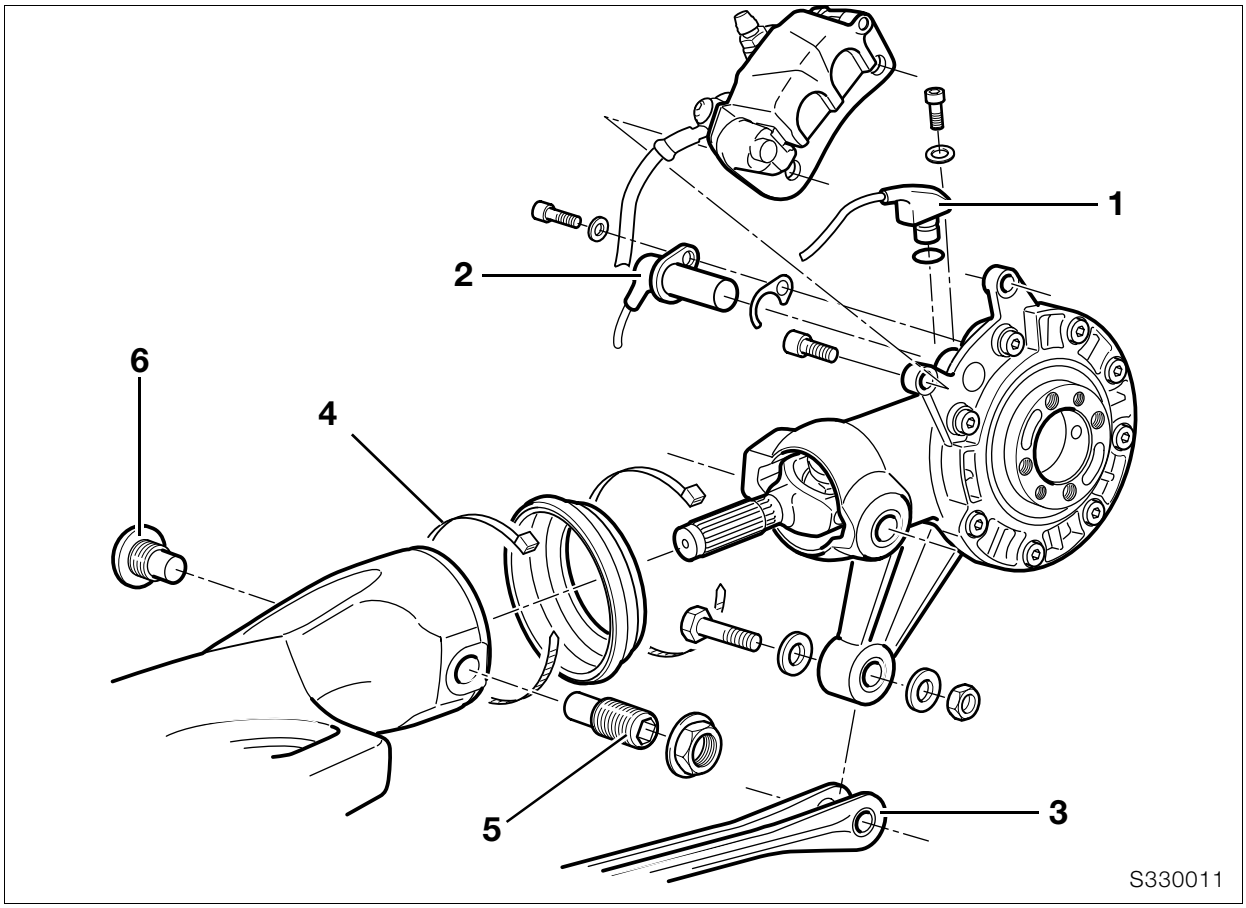




Technical data		R 1100 S
Rear wheel drive		
Gear tooth pattern		Klingelnberg-Palloid spiral bevel
Gear ratio		2.75 : 1
	Number of teeth	33 : 12
Backlash	mm (in)	0.07...0.16 (0.0027...0.0063)
Taper roller bearing preload	mm (in)	0.05...0.1 (0.0020...0.0039)
Oil grades		Brand-name hypoid gear oil, SAE 90 GL 5
Capacity		Initial filling/oil changes
	l (Imp. pint/ US quart)	up to lower edge of thread in oil filler hole approx. 0.25 (0.44/0.26)
Drive shaft		
Layout		Two-piece shaft with universal joints at each end, central sliding joint and integral torsional vibration damper, enclosed in swinging arm.
Swinging arm		
Swinging arm length	mm (in)	355 (14.0), total length (including rear-axle housing) 520 (20.5)
Rear suspension		
Suspension strut		Suspension strut with single-tube damper Spring preload hydraulically adjustable Extension-stage damping steplessly adjustable
Suspension travel	mm (in)	130 (5.1)







Removing, disassembling, reassembling and installing rear wheel drive

Removing rear wheel drive

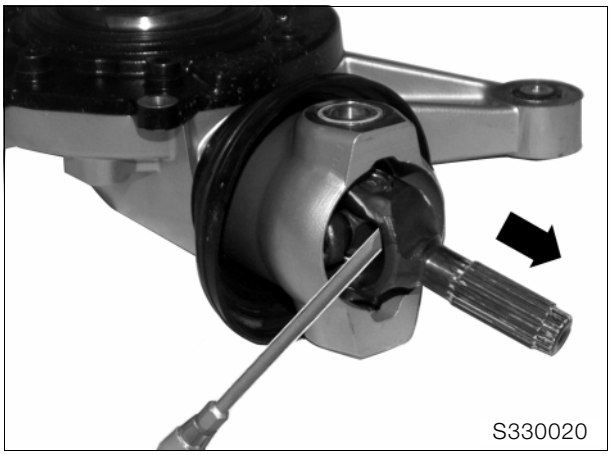
- Raise the motorcycle with the auxiliary stand, **BMW No. 00 1 560**.
- Drain the oil.
- Remove the brake caliper and secure it to the rear frame with a cable strap.
- Remove sensor (1) for the speedometer signal.
- **[ABS]** Remove sensor (2).
- Remove rear wheel.
- Loosen reaction link (3) at the rear wheel drive.
- Remove retainer (4).
- Swinging-arm bearing studs are secured with Loctite: heat to max. 120 °C (248 ° F) to release.
- Loosen floating bearing stud bolt (5).
- Loosen fixed bearing stud bolt (6).
- Disengage reaction link from rear wheel drive.
- Remove floating bearing/fixed bearing stud bolts.

Note:
Note inner races of needle bearings.

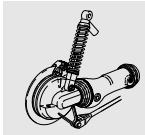
- Remove rear-wheel drive from universal shaft.

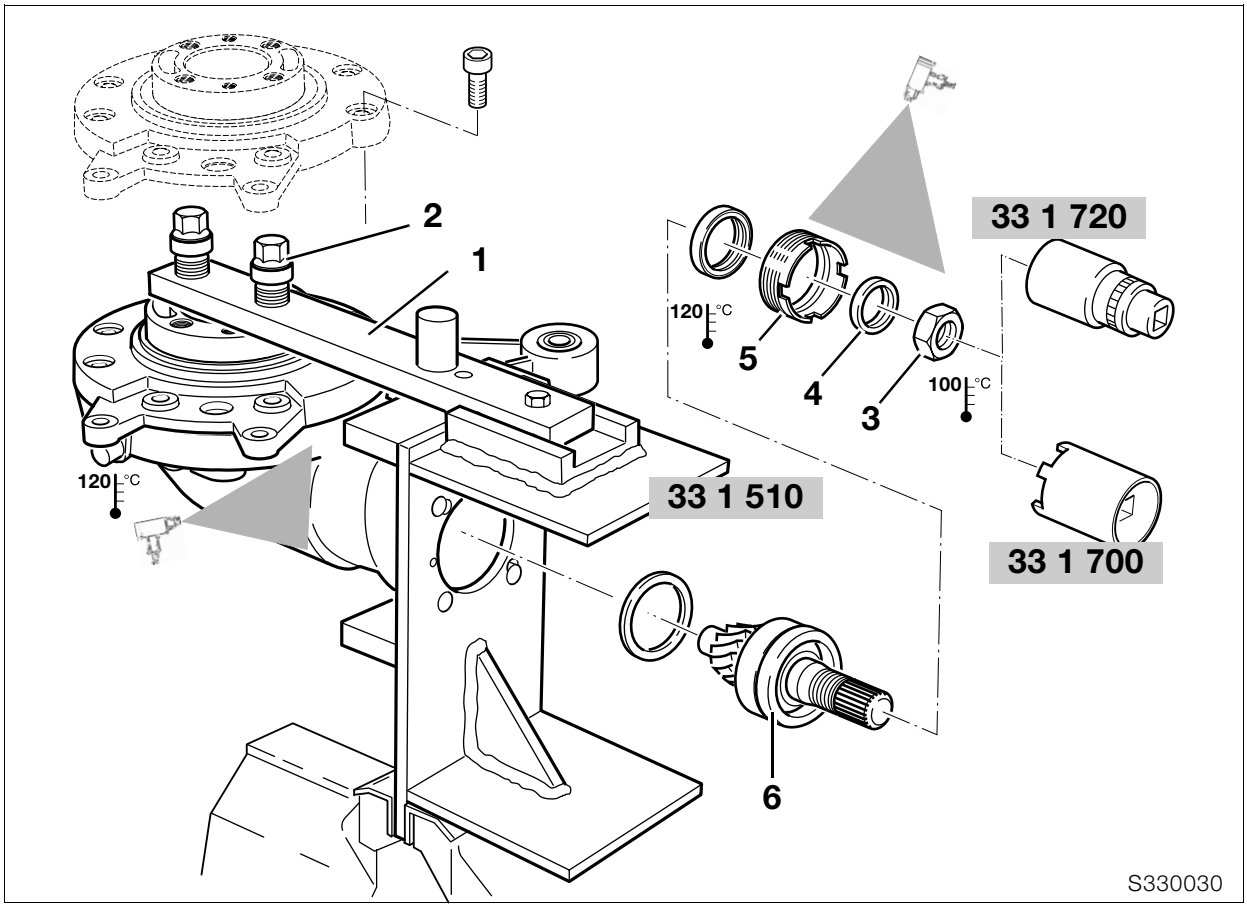
Note:
Do not lay oil-filled rear-wheel drive on its side prior to installation, as this will cause oil to escape when the motorcycle is on the road (suction effect).

Removing input bevel pinion



- Press out splined section of shaft.
- If necessary, remove/install circlip.





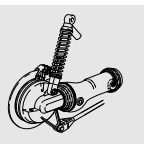
- Bolt the rear wheel drive to the retaining fixture, **BMW No. 33 1 510/511**.
- Bolt the locking arm (1) to the retaining fixture.
- Screw threaded bushings (2) down on to the rear wheel drive and secure them with the wheel studs.
- Heat hex nut (3) at the input bevel pinion to 100 °C (212 °F) and unscrew with w/f 36 socket wrench insert and reduction adapter, **BMW No. 33 1 720**.

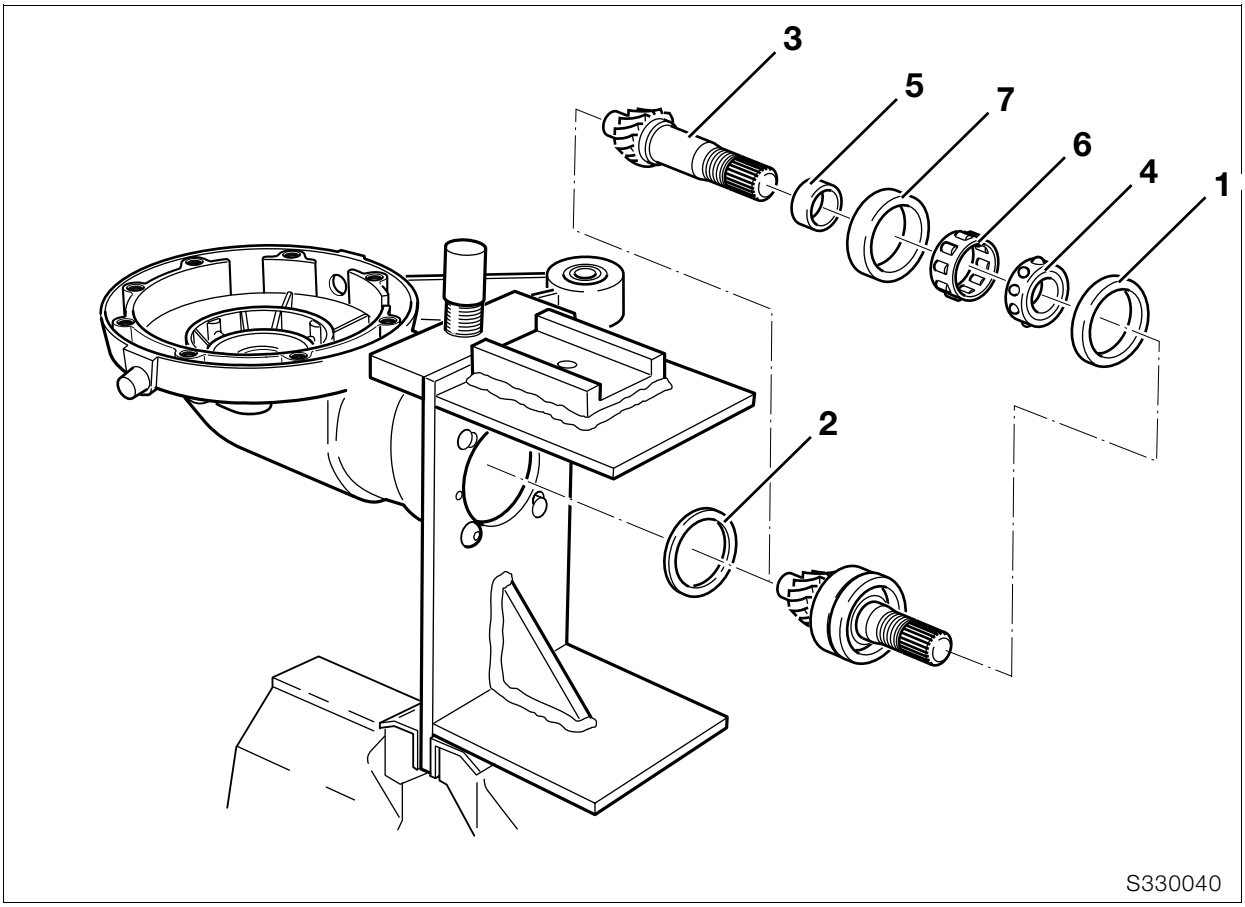
Note:
If necessary, use cross-handle with two tubular extensions.

- Pull off thrust ring (4).
- Heat the housing to max. 120 °C (248 °F) and unscrew threaded ring (5) with pin wrench, **BMW No. 33 1 700**.
- To remove the input bevel pinion (6), remove the crown wheel.

➠ .....See “Removing crown wheel”

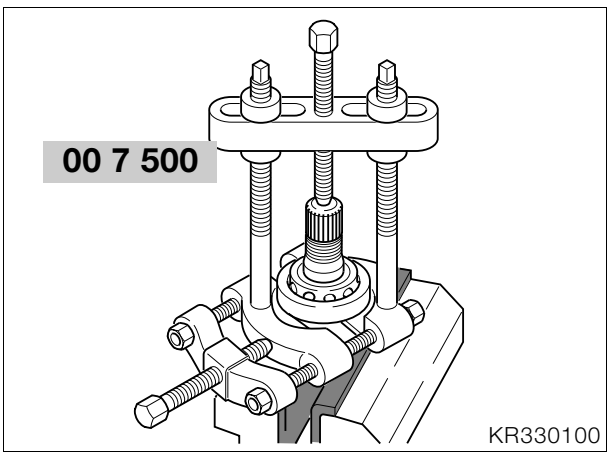
- Heat the bearing seat to max. 120 °C (248 °F).
- Using an aluminium drift, carefully force the input bevel pinion outwards and remove it.





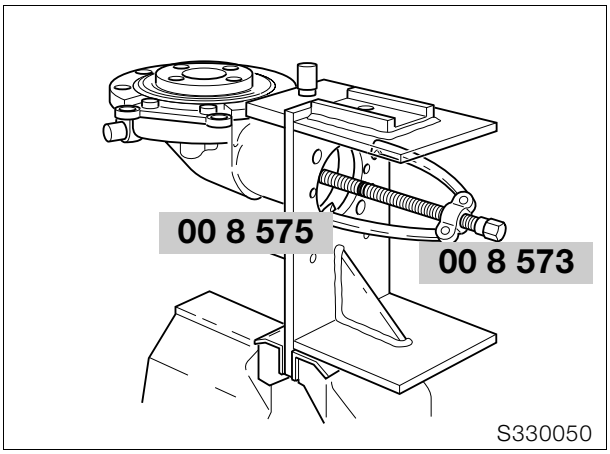
Disassembling input bevel pinion

- Remove outer bearing race (1).
- Pull spacer ring (2) out of housing.
- Clamp input bevel pinion (3) into vise with protective jaws (splines facing upwards).



- Using puller, **BMW No. 00 7 500**, pull off both bearings at the same time.
- Remove ball thrust bearing (4), inner race (5), roller bearing cage (6) and outer race (7).

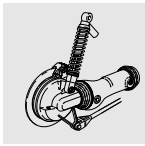
Removing needle roller bearing for input bevel pinion

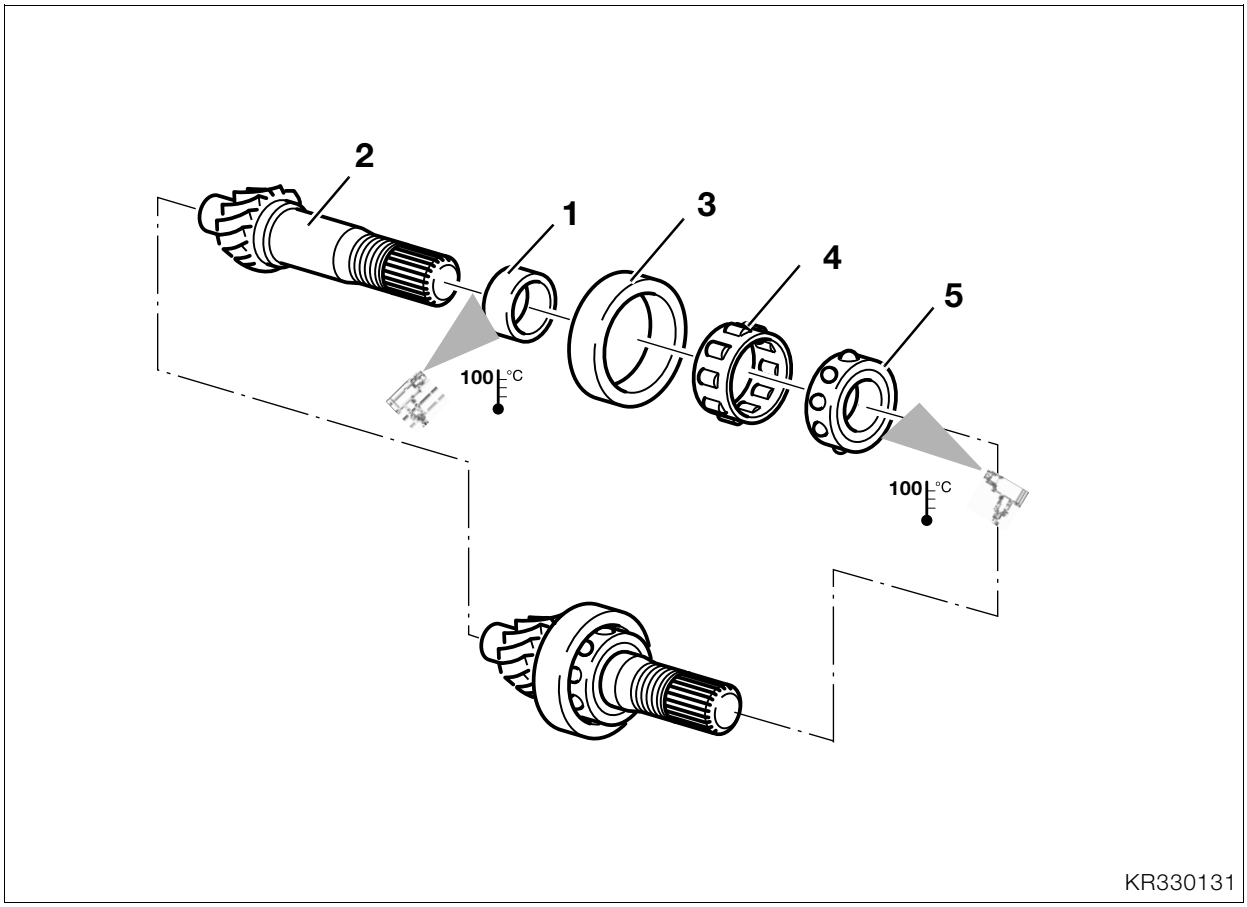


- Heat the housing to 120 °C (248 °F).
- Pull out the outer race of the needle roller bearing with puller, **BMW No. 00 8 573**, and threaded spindle extension, **BMW No. 00 8 575**.

Installing needle roller bearing for input bevel pinion

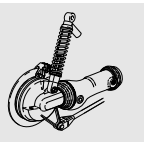
- Heat the needle roller bearing seat to 100 °C (212 °F).
- Press in needle roller bearing using drift or the input bevel pinion.

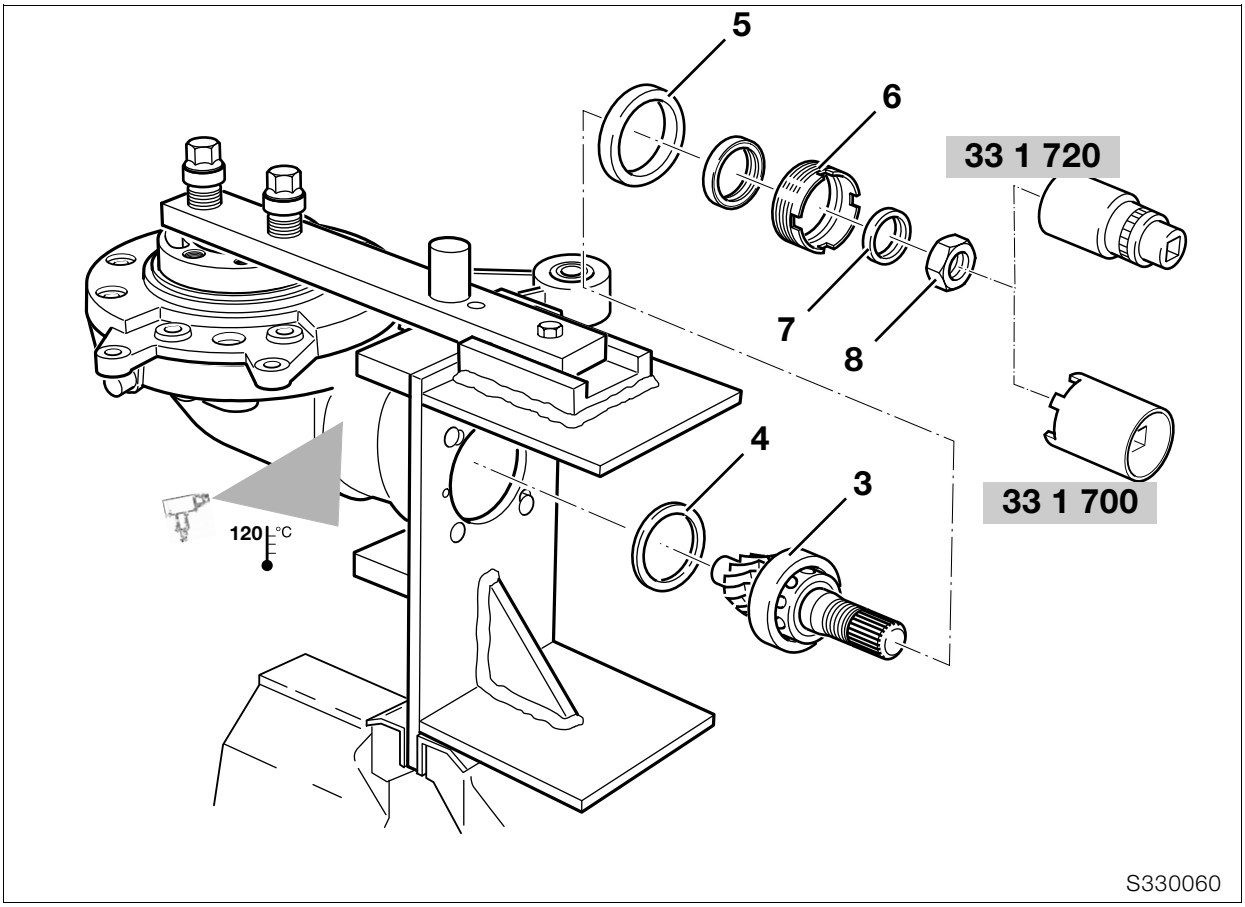




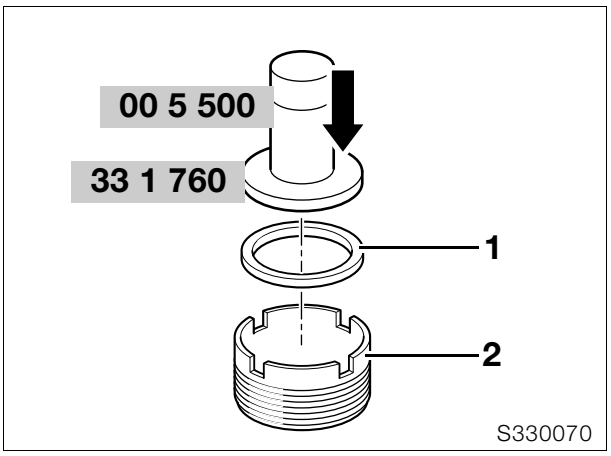
Assembling input bevel pinion

- Heat the inner race (1) to 100 °C (212 °F) and push onto input bevel pinion (2) as far as the stop.
- Push the outer race (3) together with the roller cage (4) on to the inner race.
- Heat ball thrust bearing (5) to 100 °C (212 °F) and push fully on to input bevel pinion.
- Allow input bevel pinion to cool down.





Installing input bevel pinion



- Lightly oil the sealing ring at the sealing lip and round the outer edge.
- Press/drive sealing ring (1) with drift, **BMW No. 33 1 760**, and handle, **BMW No. 00 5 500**, into threaded ring (2).
- Stand housing with drive-side protrusion upright and heat to 120 °C (248 °F).
- Working from above, insert input bevel pinion (3) complete with spacer (4).

Note:
If necessary, chill input bevel pinion prior to installation in refrigerator/freezer, or similar.

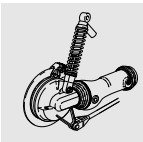
- Insert outer race (5).
- Coat threaded ring (6) with **Hylomar SQ 32 M**.
- Tighten threaded ring with pin wrench, **BMW No. 33 1 700**.
- Install thrust ring (7).

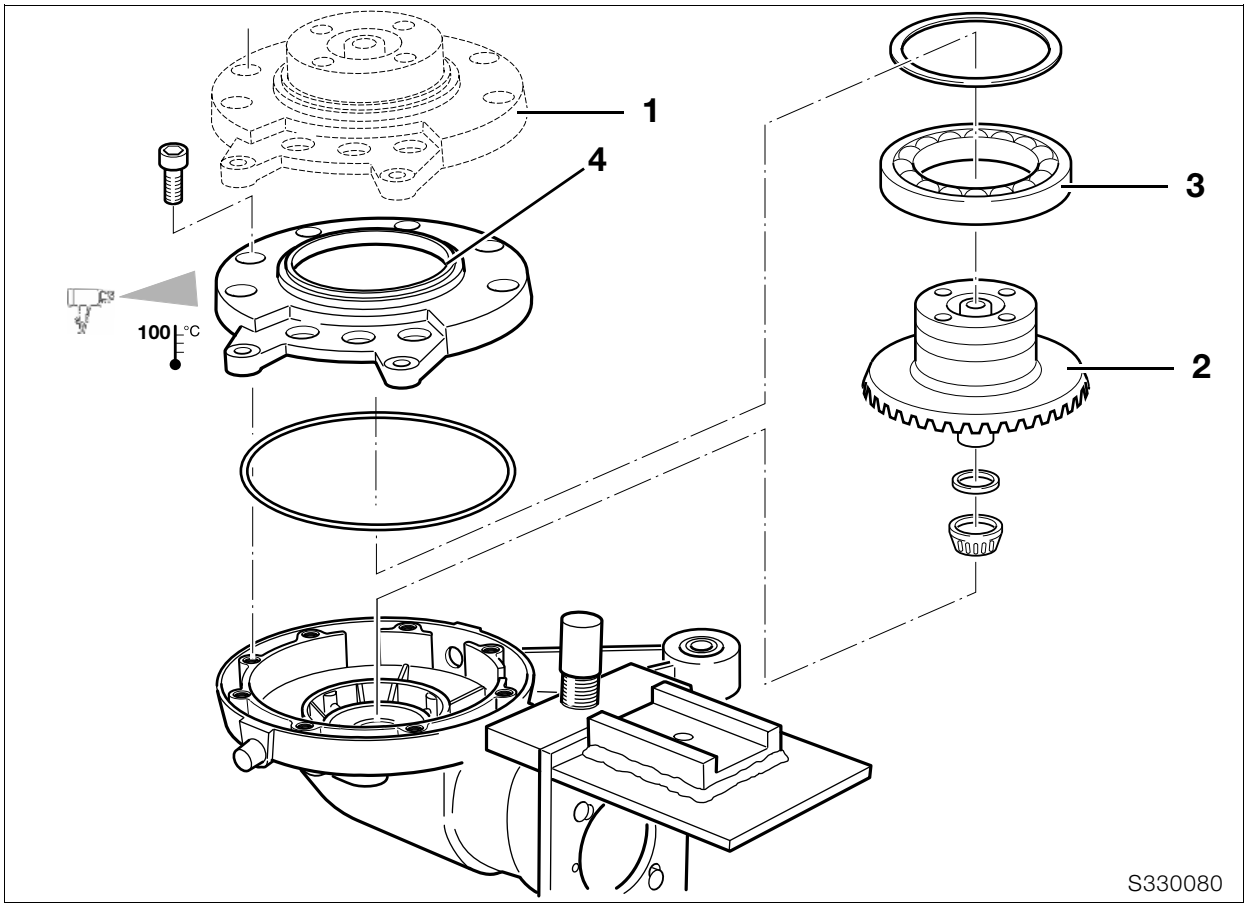
Note:
Make sure that the lip of the shaft seal is seated correctly on the thrust ring.

- Tighten hex nut (8) with w/f 36 socket wrench insert and reduction adapter, **BMW No. 33 1 720**.

Caution:
Make sure that the nut does not damage the shaft sealing ring.

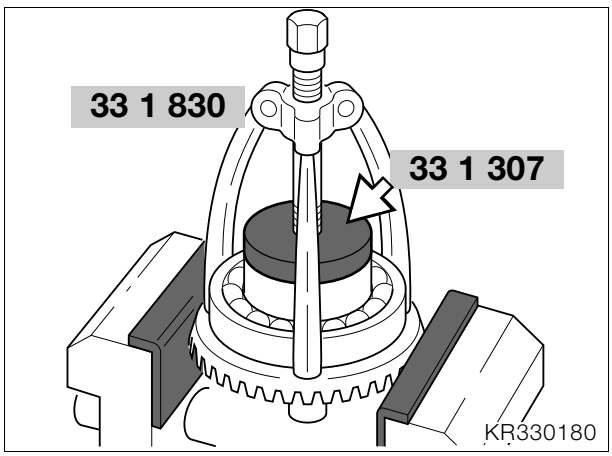
Tightening torques:
Threaded ring
(thread cleaned + Hylomar SQ 32 M) ..... 118 Nm
Nut for input bevel pinion
(thread cleaned + Loctite 2701)..... 200 Nm

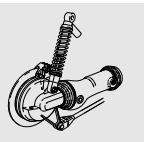




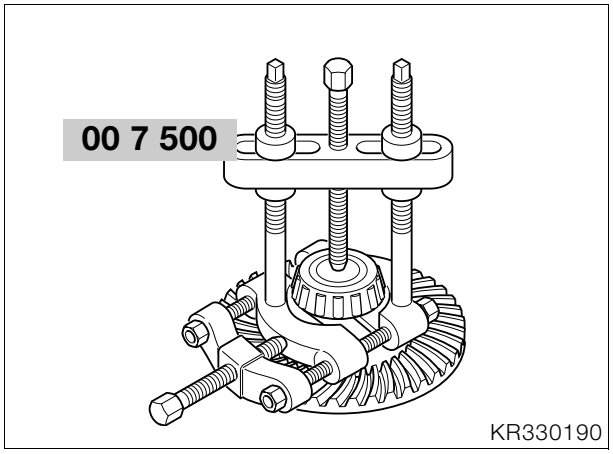
Removing and disassembling crown wheel

- Remove housing cover (1) with crown wheel (2) and bearing (3).
- Heat housing cover to 100 °C (212 °F) and pull it off.
- Force shaft seal (4) out of housing cover with drift.

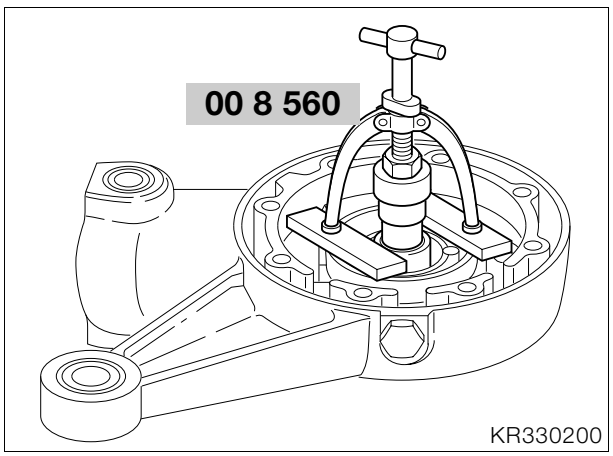




- Clamp crown wheel in vise with protective jaws.
- Insert thrust block (arrow), **BMW No. 33 1 307**.
- Use puller, **BMW No. 33 1 830**, to pull off the grooved ball bearing.

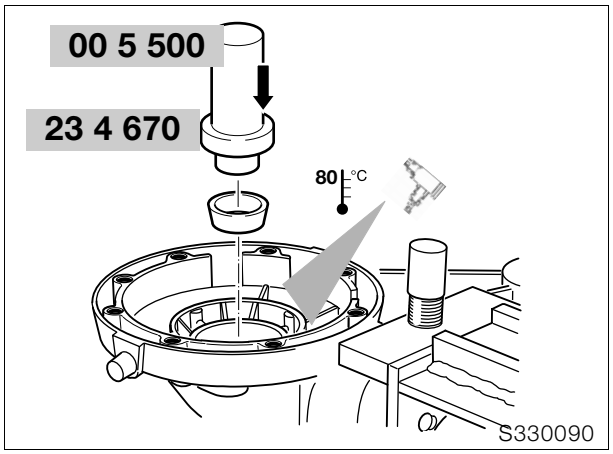


- Using puller, **BMW No. 00 7 500**, pull taper roller bearing off crown wheel.



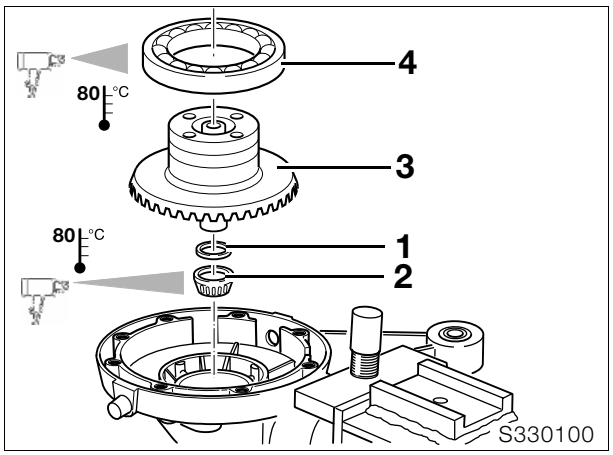
- Pull out the outer race using internal puller, **BMW No. 00 8 560**.

Assembling/installing crown wheel

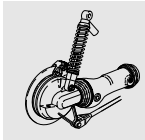


- Heat the housing to 80 °C (176 °F).
- Insert the outer race in the bearing seat with drift, **BMW No. 23 4 670**, and handle, **BMW No. 00 5 500**.
- Check that outer race is correctly seated by tapping gently.

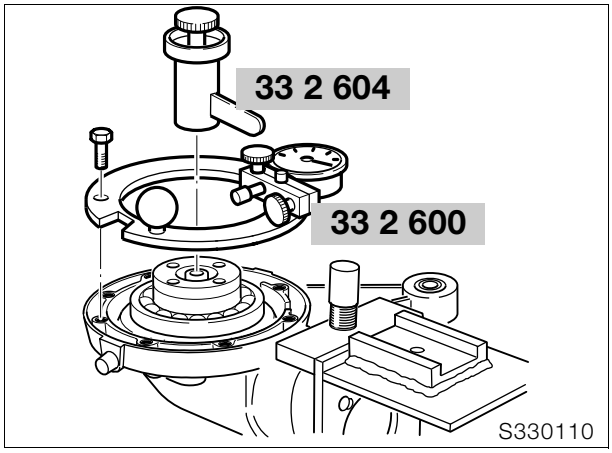
Note:
If new parts are installed (e.g. taper roller bearing), check tooth backlash and adjust if necessary.



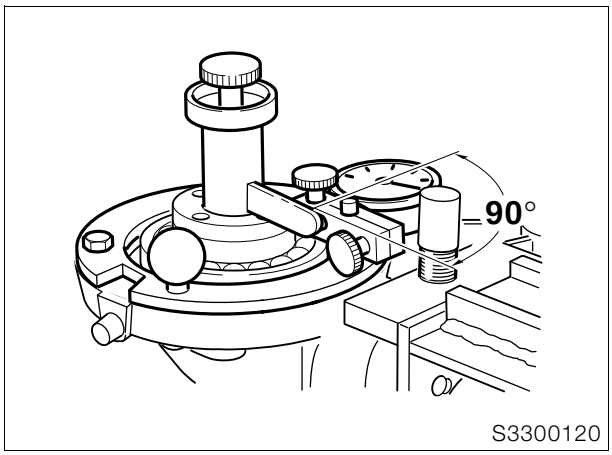
- Place the original spacer ring (1) on the crown wheel.
- Heat taper roller bearing (2) to 80 °C (176 °F) and push it on.
- Install crown wheel (3).
- Heat grooved ball bearing (4) to 80 °C (176 °F) and place it in position.



Checking/adjusting backlash

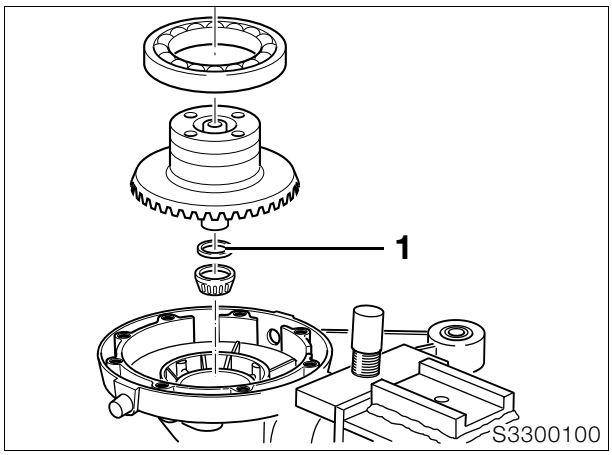


- Secure measuring device, **BMW No. 33 2 600**, with dial gauge to crown wheel and secure to housing with the knurled screw.
- Secure measuring arm, **BMW No. 33 2 604**, centrally to crown wheel.



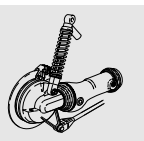
- Using the balls of your hands, press the crown wheel into the housing and turn it to and fro to check tooth backlash.

Note:
Check tooth backlash at three points 120 degrees apart; turn the bevel pinion with the crown wheel.



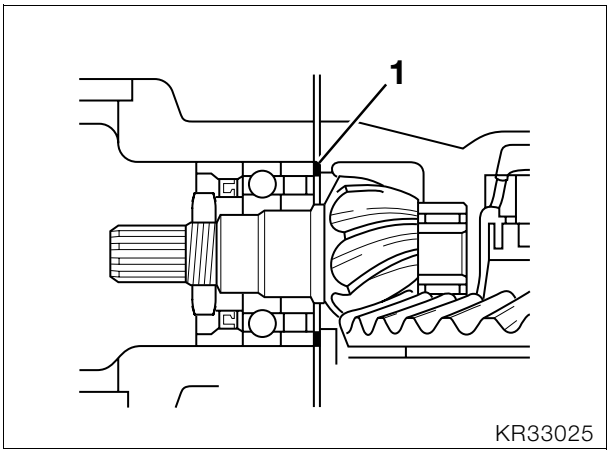
- Compensate for excessive backlash by inserting a thinner shim washer, and for insufficient backlash by inserting a thicker shim washer (1).

Backlash:
(adjust without oil)
..... 0.07...0.16 mm (0.0027...0.0063 in)



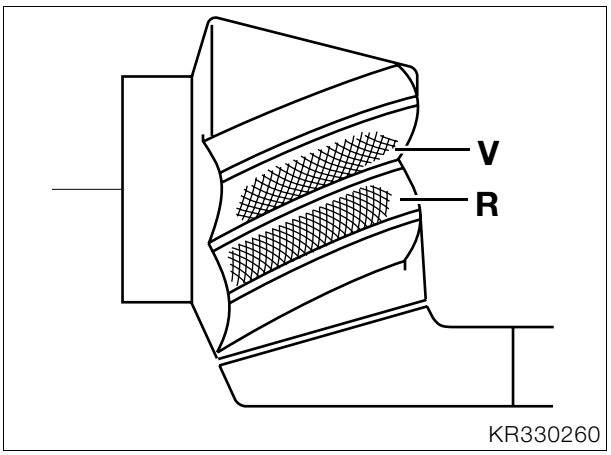
Checking tooth contact pattern

- The tooth contact pattern must be checked if the gear set, housing or input bevel pinion bearing have been replaced.



Note:
The contact pattern is adjusted by means of the shim washer (1) on the input bevel pinion.

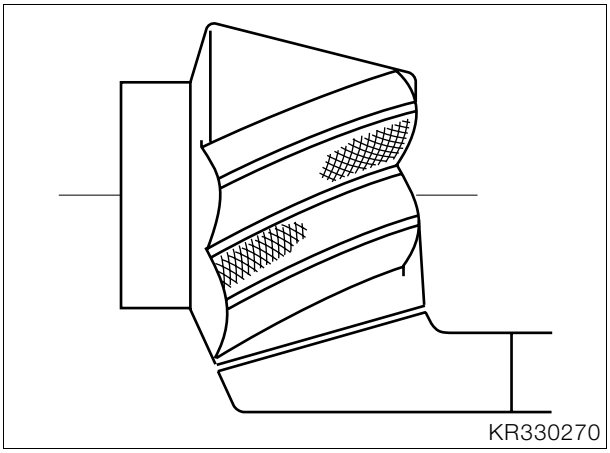
- Clean and degrease tooth flanks of crown wheel and bevel gear and coat with **marking ink**.
- Install measuring fixture, **BMW No. 33 2 600**, centre crown wheel and use the balls of your hands to press it into the housing and turn it back and forth a few times.



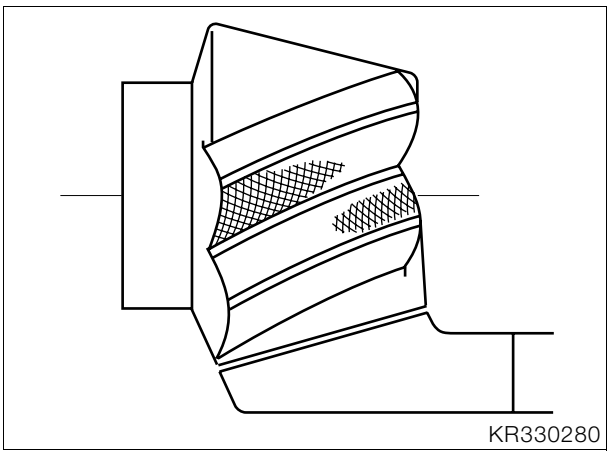
- If the correct shim is installed, the following contact pattern appears with no load applied.

Note:
The contact point is centered on leading flank V. The contact point is closer to the larger diameter on trailing flank R.

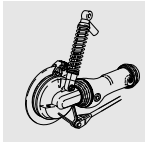
Caution:
Make sure that teeth are not in contact at the smaller diameter.



- Install a thinner shim if the contact pattern looks like this.

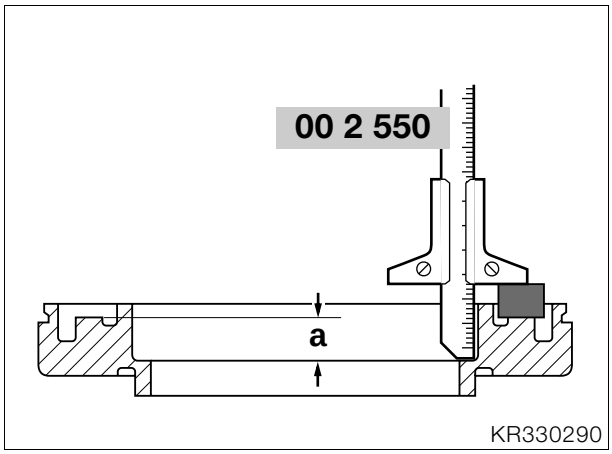


- Install a thicker shim if the contact pattern looks like this.

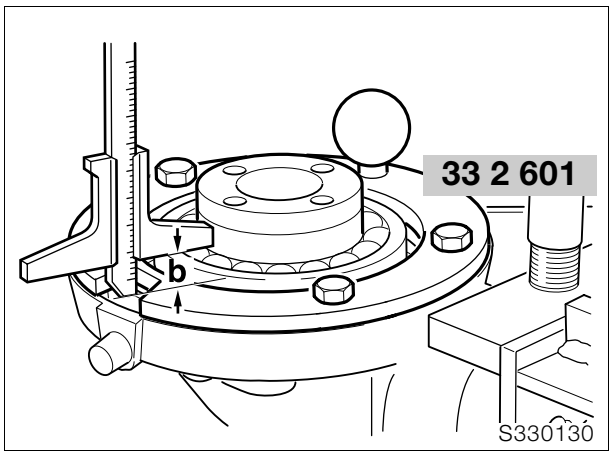


Shimming housing cover

- To obtain the correct roller bearing preload, the housing cover must be shimmed.



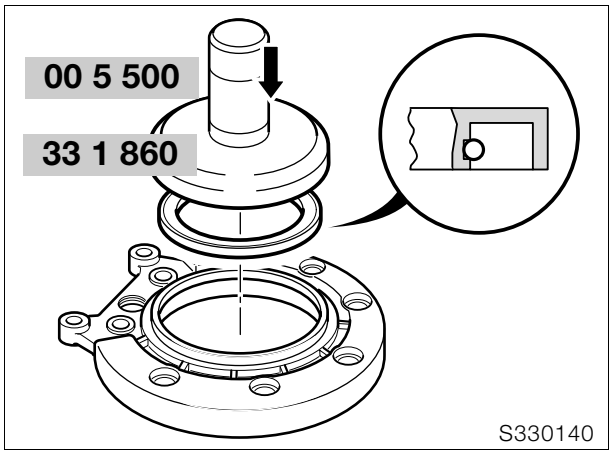
- Using depth gauge, **BMW No. 00 2 550**, measure distance a.



- Place measuring ring, **BMW No. 33 2 601**, in position and secure it.
- Measure from the outer ball bearing race through the cutout in the measuring ring to the housing mating face and calculate distance b.
- Distance a – distance b = shim thickness (without preload).
- Apply a light coat of grease to the selected shim washer, and install it.

Preload:..... 0.05...0.1 mm (0.0020...0.0039 in)

Installing housing cover



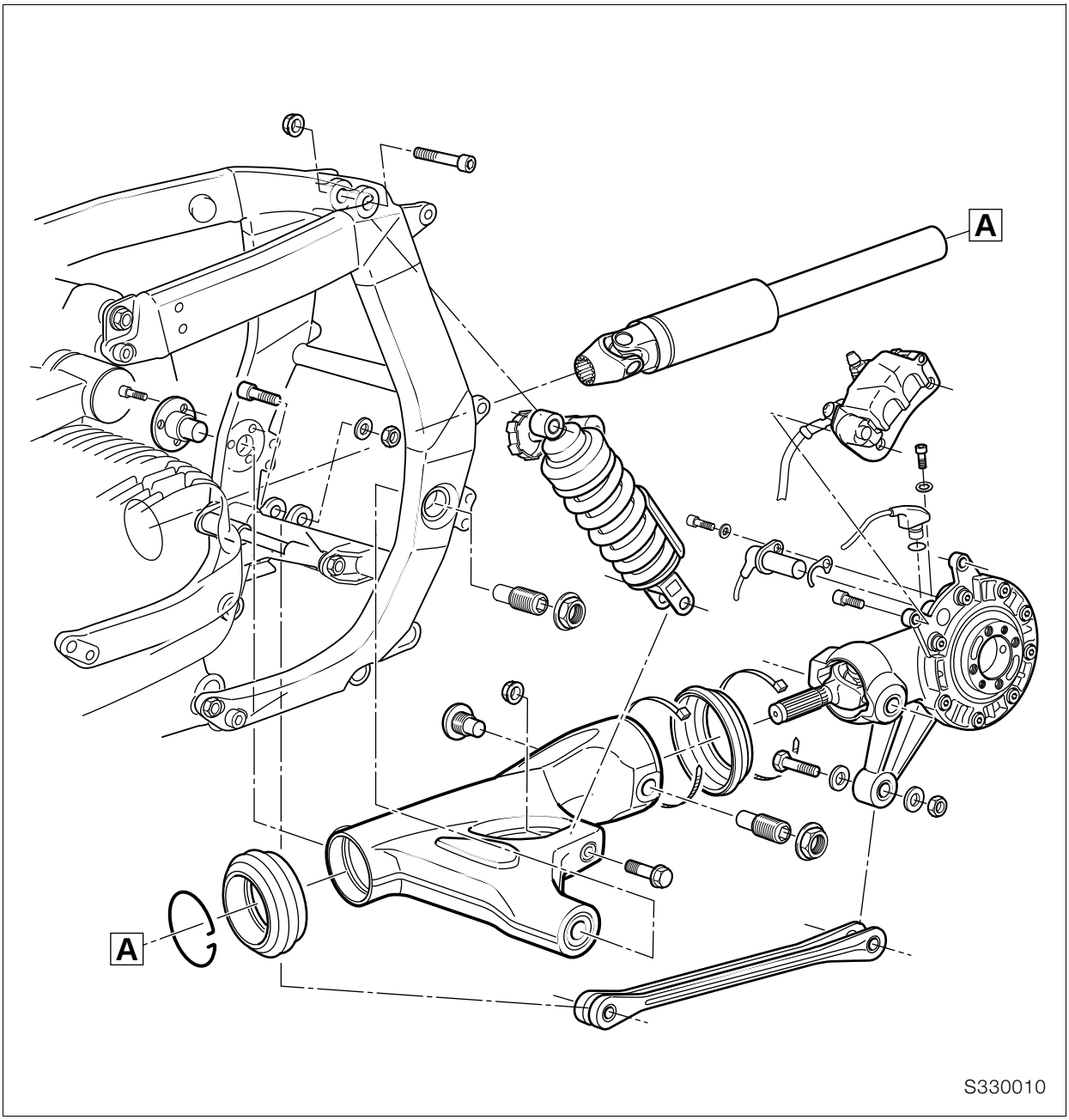
- Lightly oil the lip and outer edge of the sealing ring.
- Using drift, **BMW No. 33 1 860**, and handle, **BMW No. 00 5 500**, drive in the sealing ring.
- Heat housing cover to 80 °C (176 °F) and install.
- Tighten securing screws in diagonally opposite sequence.

Tightening torques:

Housing cover..... 35 Nm

Installing sliding element

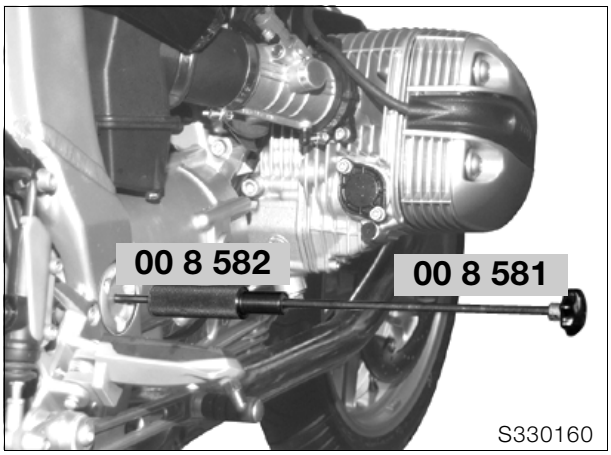
- Coat splines on input pinion with **Staburags NBU 30 PTM**.
- Fit sliding element to drive pinion.
- Locate retaining ring with gentle blows (plastic hammer).



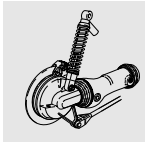
Removing and installing rear swinging arm

Removing rear swinging arm

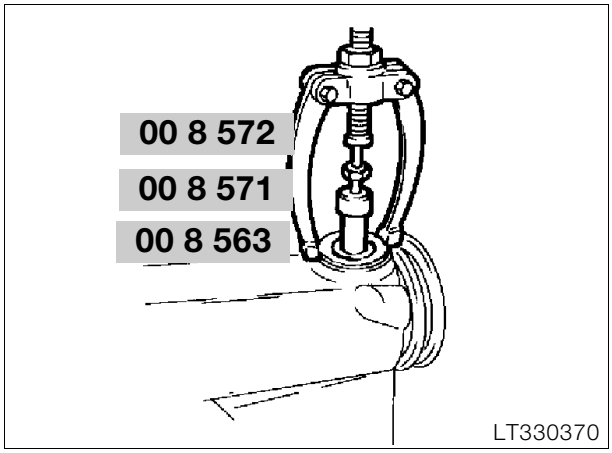
- Release suspension strut at bottom.
- Loosen the swinging arm floating bearing stud bolt.



- Remove the swinging arm fixed bearing stud bolt.
- Using pull rod, **BMW No. 00 8 581**, and impact weight, **BMW No. 00 8 582**, pull out the swinging arm fixed bearing stud bolt.
- Remove the swinging arm bearing stud bolt.

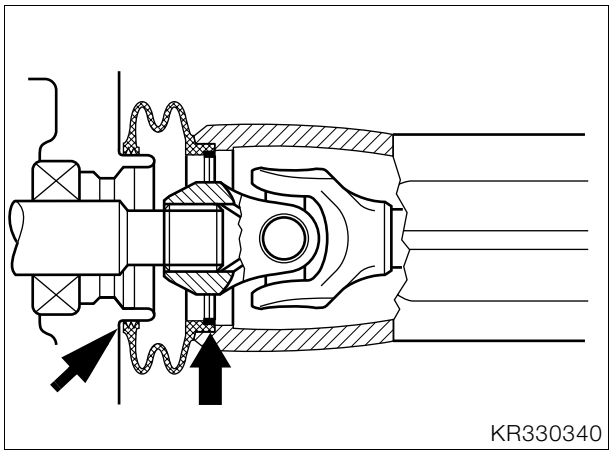


Removing and installing taper roller bearing



- Pull the taper roller bearing out with counter-support, **BMW No. 00 8 572**, and internal puller 21/2, **BMW No. 00 8 571**.
- Pull out outer race with internal puller 21/5, **BMW No. 00 8 563**.
- To install the bearing, heat the swinging arm to 80 °C (176 °F).
- Drive in bearing with drift, **BMW No. 33 5 700**.

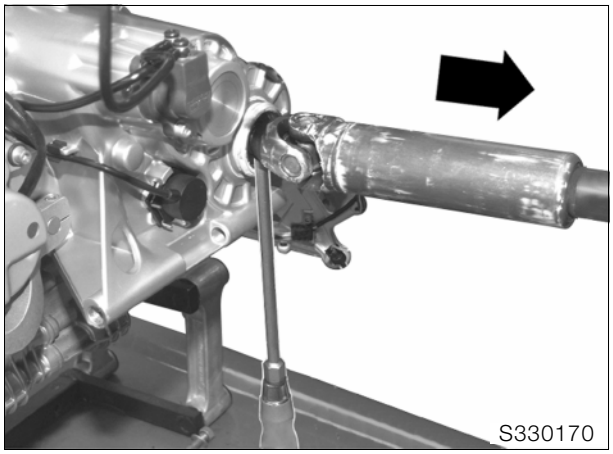
Removing and installing flexible gaiter



- Pull flexible gaiter with circlip out of swinging arm.
- When installing, coat inner and outer sealing lips (arrows) with **Staburags NBU 30 PTM**.

Caution:
Drive shaft clearance when suspension is compressed: gap of retaining ring must be in the horizontal plane.

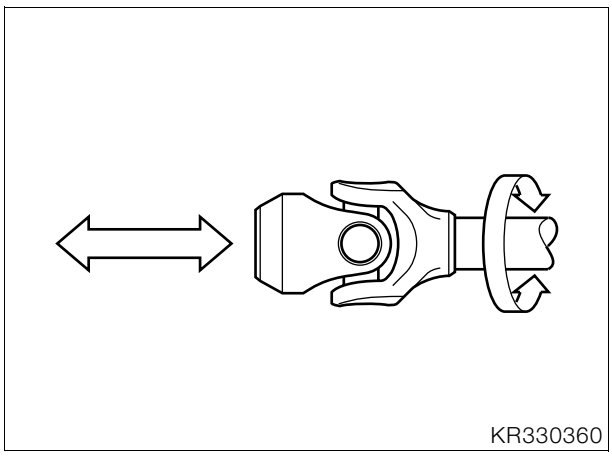
Removing drive shaft



- Press off drive shaft.

Caution:
Avoid scratching painted parts; use an underlay if necessary.

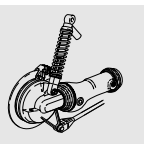
Checking universal joint for wear

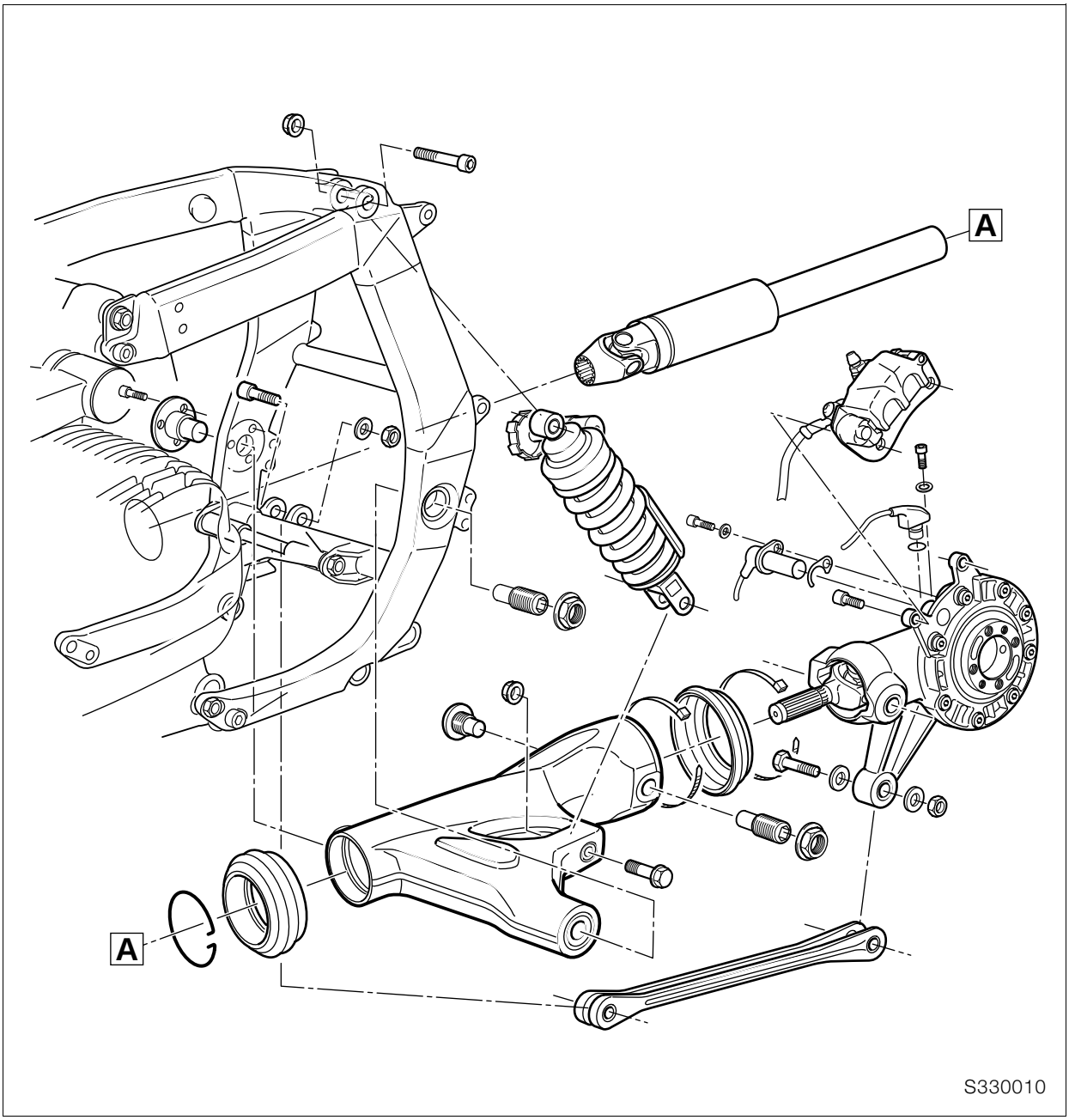


- Measure axial and radial play.

Installing drive shaft

- Coat the splines on the output shaft with **Staburags NBU 30 PTM**.
- Fit drive shaft to output shaft.
- Engage the snap ring with gentle blows (plastic hammer).



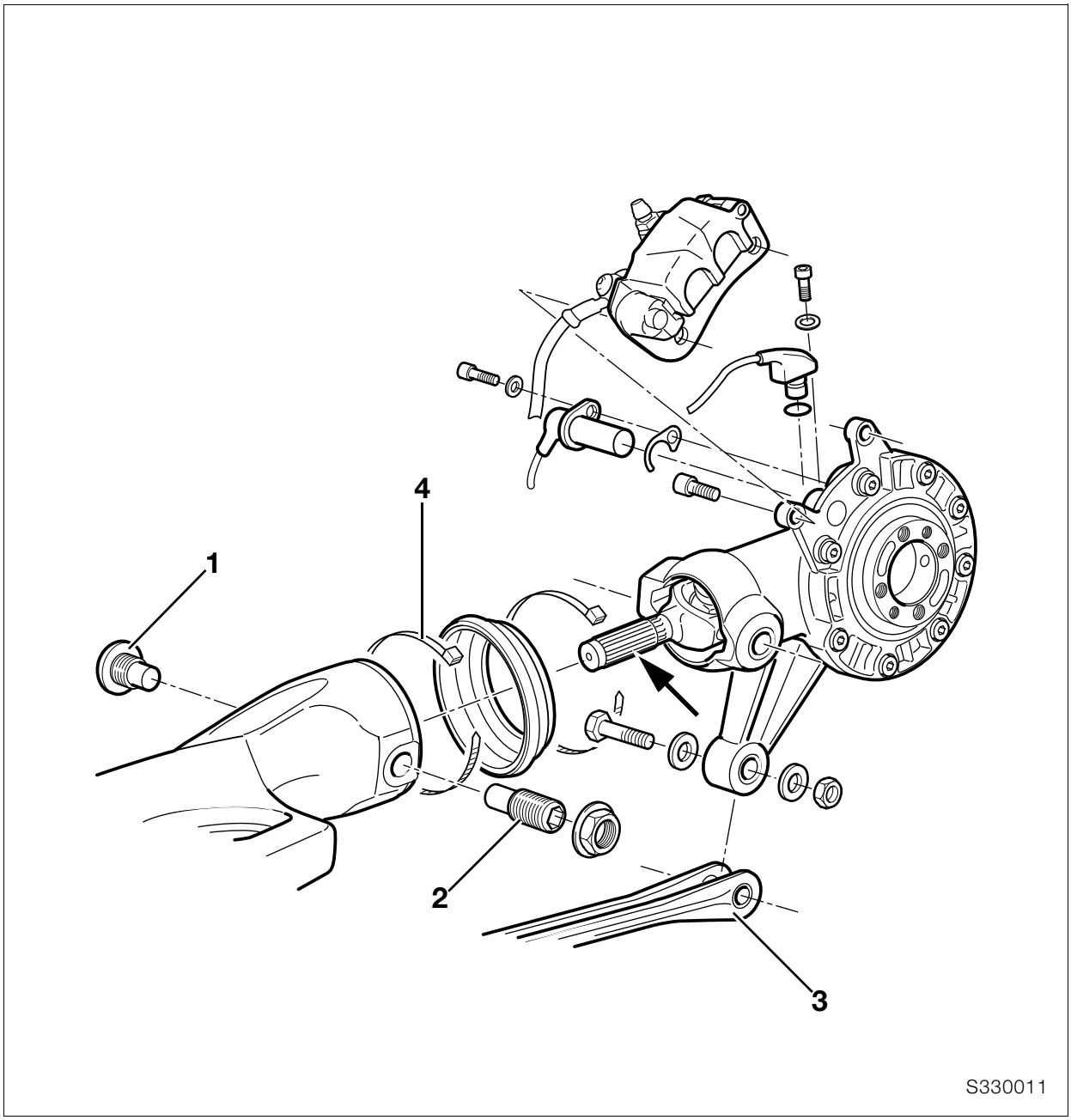


Installing rear swinging arm

- Slide swinging arm over drive shaft as far as possible until rubber gaiter connects on housing neck.
- Install fixed bearing stud bolt (1).
- Install floating-bearing stud bolt (2) with **Loctite**.
- Tighten fixed bearing stud bolt.
- Tighten floating bearing stud bolt.
- Tighten locknut (3).
- Secure suspension strut (1).

Tightening torques:

Swinging-arm fixed bearing stud bolt
to rear frame ..... 9 Nm
Swinging-arm floating-bearing stud bolt
to rear frame (clean thread + Loctite 2701)..... 7 Nm
Locknut..... 160 Nm
Suspension strut to swinging arm ..... 50 Nm



Installing rear wheel drive

- Coat splines of sliding element (arrow) with **Staburags NBU 30 PTM**.
- Apply grease to inner race of left needle roller bearing and install.
- Place rear-wheel drive with flexible gaiter in position and introduce sliding element into universal shaft.

Caution:
Support the rear wheel drive.

- Install fixed-bearing stud bolt (1) with **Loctite**.

Caution:
Make sure that the inner race never presses against the ends of the needles.

- Install floating-bearing stud bolt (2) with **Loctite**.
- Tighten the fixed swinging arm bearing.

Tightening torques:
Fixed bearing stud bolt
(thread cleaned + Loctite 2701)..... 160 Nm

Caution:
When tightening threaded fasteners coated with Loctite 2701, always apply final torque without delay.
Allow at least 3 hours for the Loctite to cure.

Note:
Use an acetone-based cleansing agent when cleaning, for example
Loctite Fastclean 706
Loctite order number 70636-AC

- Tighten the floating swinging arm bearing.

Tightening torques:
Floating-bearing stud bolt
(clean thread + Loctite 2701)..... 7 Nm
Locknut..... 160 Nm

- Load approx. 85 kg (187 lbs) onto motorcycle and tighten loose reaction link (3).

Tightening torques:
Reaction link to rear wheel drive..... 43 Nm

- Tighten clamping strap (4) on gaiter.
- If necessary, fill with oil.

Quantity:
Initial filling/oil changes
.....approx. 0.25 l (0.44 Imp. pint/0.26 US quart)

Oil grade:
Brand-name hypoid gear oil, SAE 90, API class GL 5

- Install the rear wheel.
- Install brake caliper.

Caution:
Do not damage brake pads; keep the brake caliper parallel to the brake disc when installing.

- Install the rear wheel.
- Install brake caliper.

Caution:
Do not damage brake pads; keep the brake caliper parallel to the brake disc when installing.

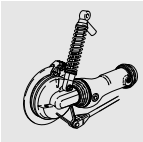
- Install speedometer signal transmitter.
- **[ABS]** Install sensor.
- **[ABS]** Check that sensor gap is correct.

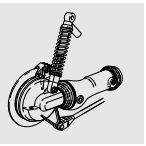
ABS rear
sensor gap: ..... 0.45...0.55 mm (0.018...0.022 in)

Removing and installing suspension strut

Note:
To remove the suspension strut, support the rear axle.

Tightening torque:
Suspension strut to swinging arm/rear frame..... 50 Nm

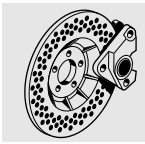




34 Brakes

Contents

Page



Technical Data 3

Removing and installing front brake caliper 5

Disassembling and assembling front brake caliper 6

Disassembling front brake caliper 6

Assembling front brake caliper 6

Removing and installing rear brake caliper 7

Disassembling and assembling rear brake caliper 8

Disassembling rear brake caliper 8

Assembling rear brake caliper 8

Removing and installing front brake disc 9

Removing and installing rear brake disc 10

Removing and installing front ABS sensor 11

Adjusting front ABS sensor gap 12

Marking sensor wheel 12

Checking and adjusting sensor gap 12

Removing and installing rear ABS sensor 13

Adjusting rear ABS sensor gap 14

Marking sensor wheel 14

Checking and adjusting sensor gap 14

Removing and installing rear brake master cylinder 15

Checking and adjusting play of piston rod 15

Removing and installing footbrake lever 16

Removing and installing ABS unit 17

Removing the ABS unit 17

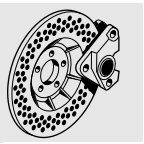
Installing the ABS unit 18

Contents

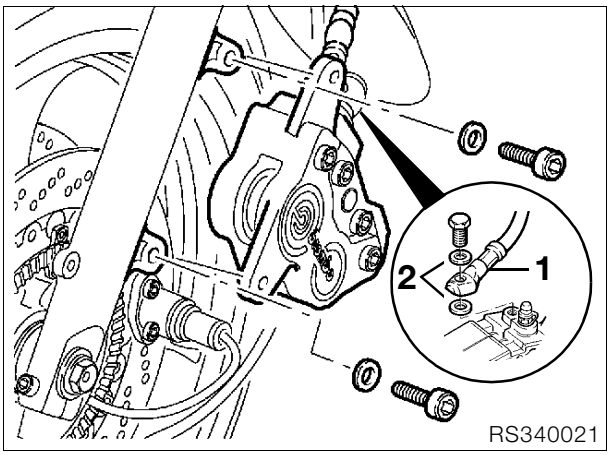
Page

Removing and installing ABS relay and relay socket 19
Removing ABS relay 19
Installing the ABS relay 19
Removing ABS relay socket 20
Installing the ABS relay base 20
Removing and installing brake line 21
Removing and installing front brake line 21
Removing and installing rear brake line 22

Technical Data		R 1100 S
Brake fluid		DOT 4
Minimum lining thickness, front	mm (in)	1.0 (0.04)
Minimum lining thickness, rear		If the brake disc is visible through the bore in the wheel-side brake pad, the brake lining is worn to its minimum permissible thickness.
Front wheel		
Brake disc dia.	mm (in)	305 (12.0)
Brake disc thickness	mm (in)	4.5 (0.18)
Minimum thickness	mm (in)	4.0 (0.16)
Brake pad surface area	cm^2 (sq in)	100 (15.5)
Piston dia. in brake caliper	mm (in)	32/34 (1.26/1.34)
Piston diameter in handlebar lever cylinder	mm (in)	16 (0.6)
Sensor gap, front	mm (in)	0.45...0.55 (0.018...0.022)
Brake pad lining		Sintered metal
Rear wheel		
Brake disc dia.	mm (in)	276 (10.87)
Brake disc thickness	mm (in)	5.0 (0.20)
Minimum thickness	mm (in)	4.5 (0.18)
Brake pad surface area	cm^2 (sq in)	34 (5.27)
Piston dia. in brake caliper	mm (in)	26/28 (1.02/1.10) with insulating piston
Piston dia. in foot brake cylinder	mm (in)	13 (0.5)
Sensor gap, rear	mm (in)	0.45...0.55 (0.018...0.022)
Brake pad lining		Semi-metallic



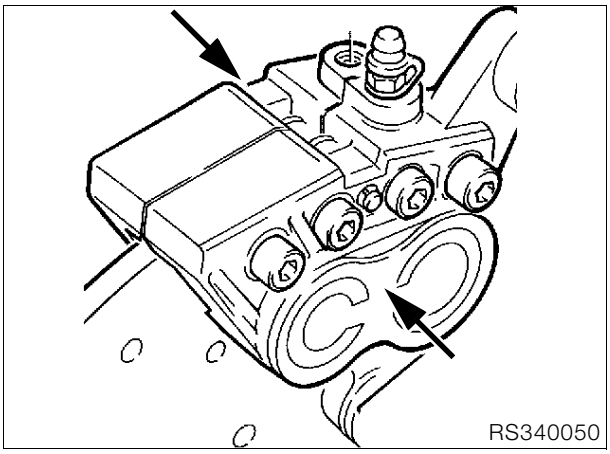
Removing and installing front brake caliper



- Drain the brake system.
- Disconnect brake line (1).

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

- Remove screws securing the brake caliper.



- Force back the brake pads and pistons (arrows).
- Carefully remove the brake caliper.

Caution:
Do not damage brake pads.

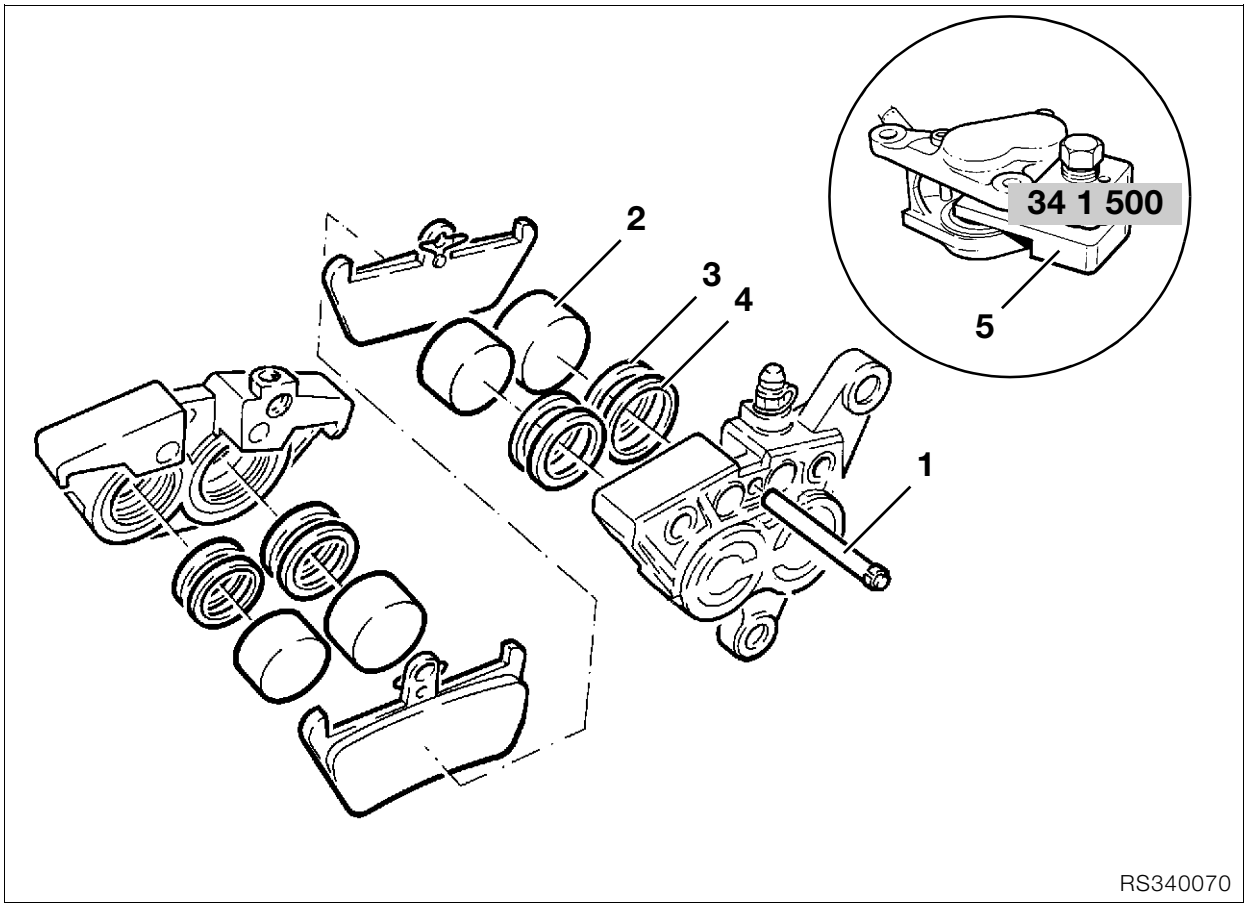
- Installation is the reverse of the removal procedure.
- Force back the brake pads and pistons.
- Fill and bleed the brake system.

➠ ..... see Group 00

Caution:
Use new sealing rings (2).
Do not damage brake pads.

Tightening torque:

Brake caliper to fork slider tube	40 Nm
Brake hose to brake caliper	18 Nm
Bleed screw to brake caliper	14 Nm



Disassembling and assembling front brake caliper

Caution:
Do **not separate** the brake caliper halves.

Disassembling front brake caliper

- Remove the brake caliper.
- Remove keeper from retaining pin (1).
- Drive out the retaining pin (1) from the wheel side.
- Pull the brake pads down to remove.
- Close the bleed screw.

Tightening torque:
Bleed screw in brake caliper ..... 14 Nm

- Hold a cloth over the brake caliper.
- **Carefully** press out brake pistons (2), using a compressed air gun at the brake line connection.

Caution:
Do not insert your fingers between the pistons; risk of injury.

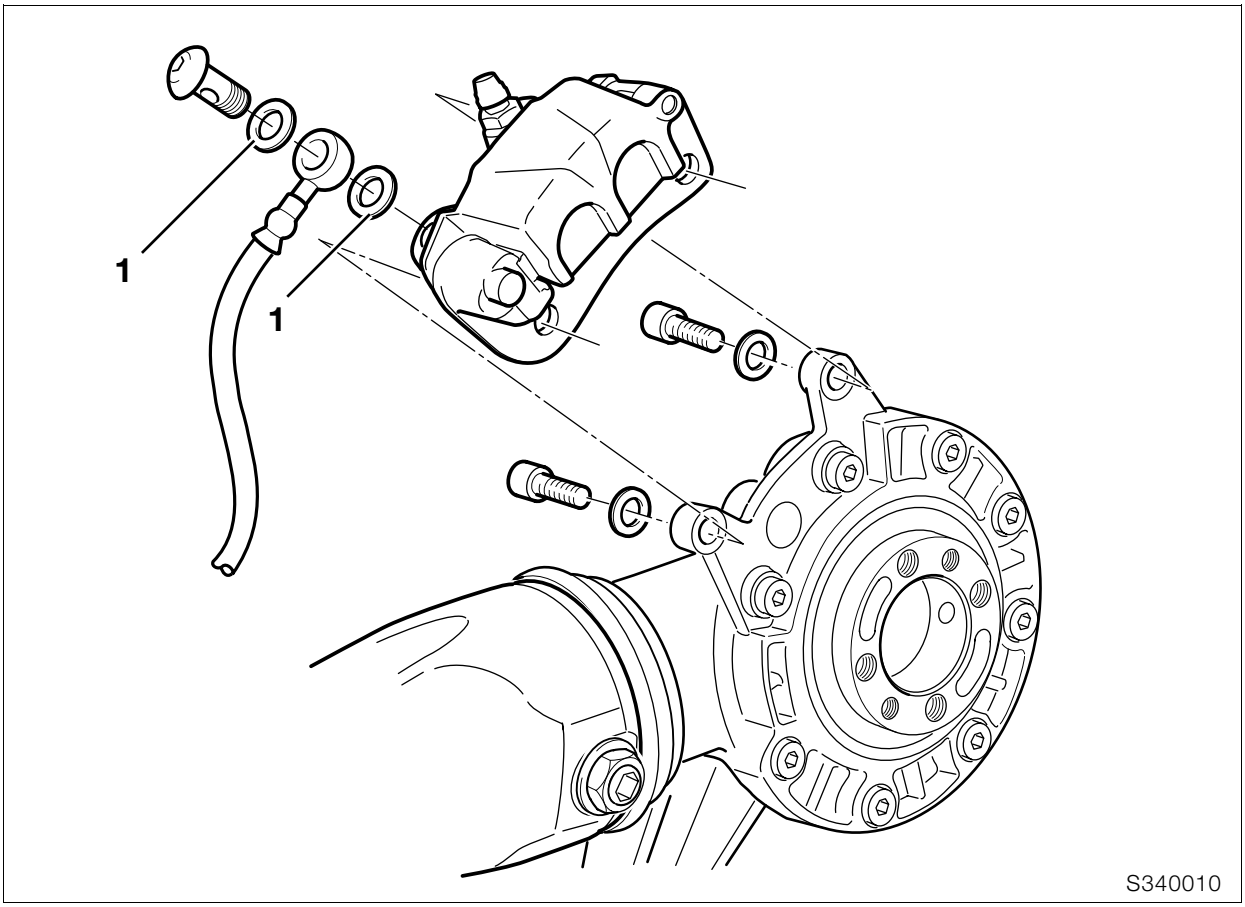
- Remove the two sealing rings (3,4) from the left and right brake cylinder bores.
- Examine the brake caliper pistons for damage.

Assembling front brake caliper

- Coat new sealing rings (3,4) with brake fluid and install.
- Coat brake caliper pistons (2) with brake fluid and insert.

Caution:
Keep the brake pistons parallel with their bores when installing.

- Using piston compressor (5), **BMW No. 34 1 500**, if necessary press the pistons fully back.
- Install the brake pads.



Removing and installing rear brake caliper

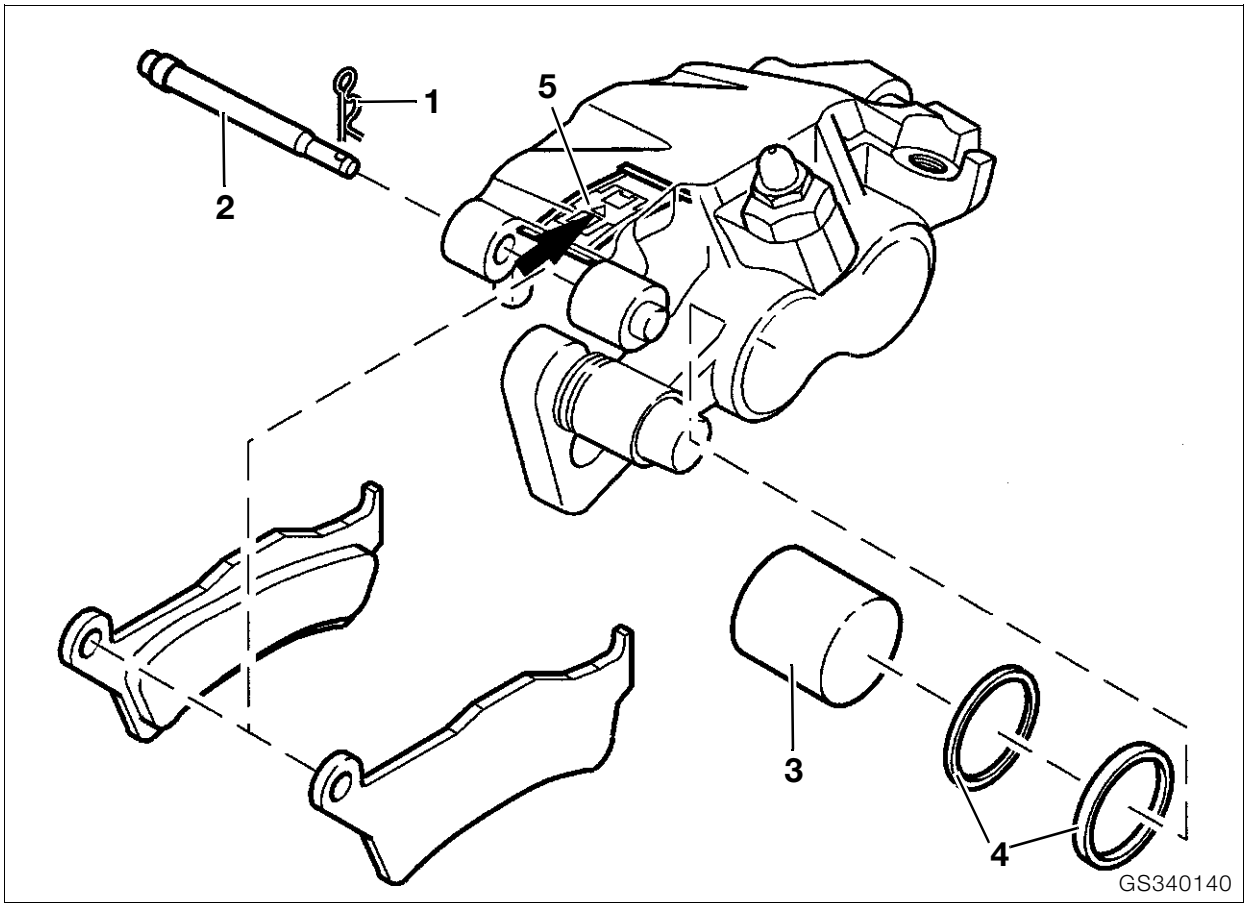
- Drain the brake system.

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

- Disconnect the brake line from the brake caliper.
- Remove screws securing the brake caliper.
- Installation is the reverse of the removal procedure.
- Force back the brake pads and pistons.
- Fill and bleed the brake system.
- To bleed, release the brake caliper and position it with the bleed nipple at the highest point.

Caution:
Replace the sealing rings (1) in the brake line.
Do not damage brake pads.

Tightening torque:
Brake caliper to rear wheel drive ..... 40 Nm
Brake hose to brake caliper ..... 18 Nm
Bleed screw in brake caliper ..... 6 Nm



Disassembling and assembling rear brake caliper

Disassembling rear brake caliper

- Remove keeper (1).
- Drive out retaining pin (2).
- Remove brake pads.
- Close the bleed screw.

Tightening torque:
Bleed screw in brake caliper ..... 6 Nm

- Hold a cloth over the brake caliper piston.
- **Carefully** press out brake piston (3) with a compressed air gun applied to the connecting bore; work at low air pressure.

Caution:
Keep fingers away from gap between piston and side contact face of brake pads; risk of injury.

- Remove sealing rings (4) from left and right bores.
- Inspect the brake caliper piston for hairline cracks, score-marks and other damage.

Assembling rear brake caliper

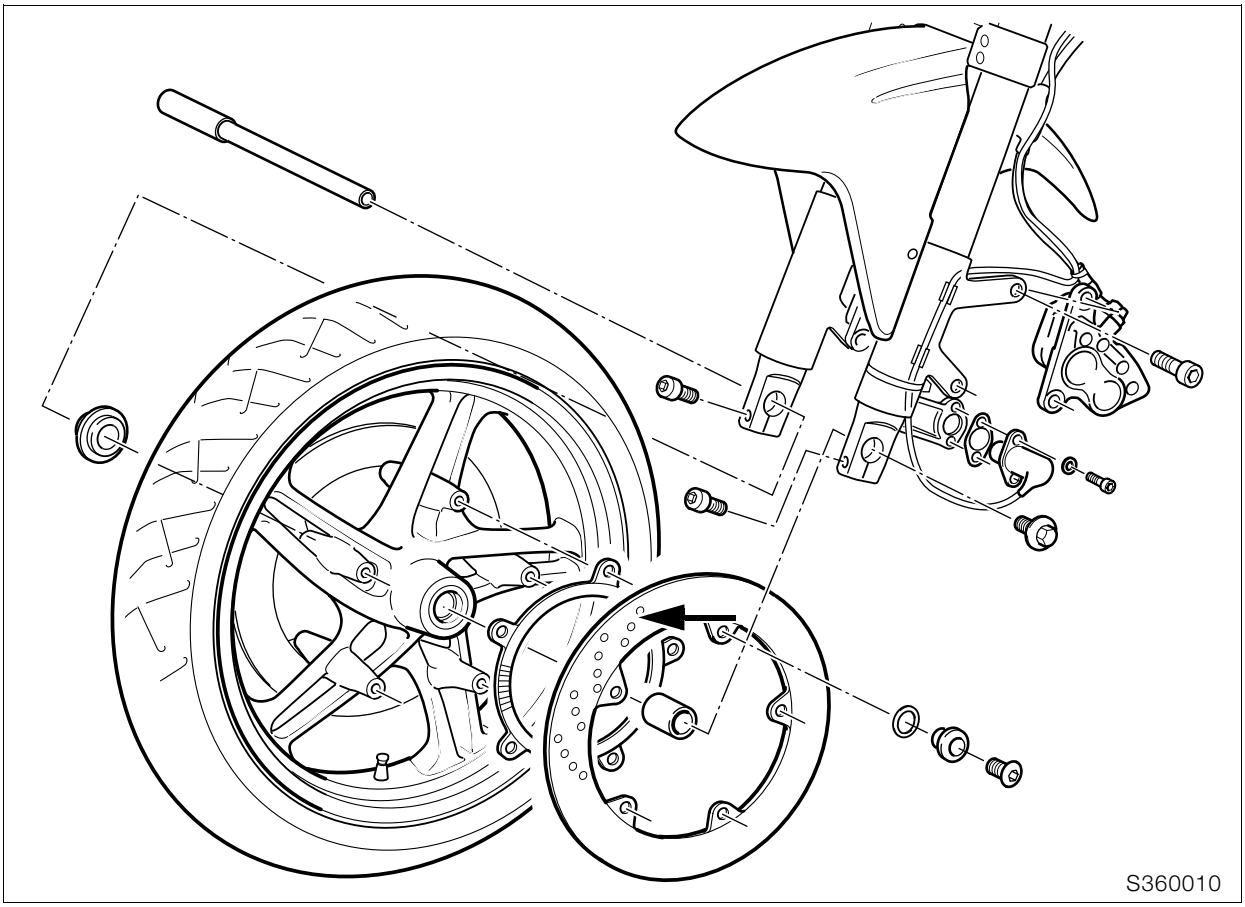
- Coat the new sealing rings with brake fluid and insert them into the left and right brake caliper bores.
- Coat both brake caliper pistons with brake fluid and install them.

Caution:
Keep the brake pistons parallel to their bores when installing.

- Coat the adapter plate locating pins with **Shell Retinax A** and install the adapter plate.
- Insert locating plate (5) into brake caliper.

Note:
The installed position must be correct (arrow pointing in forward-travel direction).

- Insert brake pads and secure with retainers.



Removing and installing front brake disc

- Degrease brake discs before installing.

Note:
Make sure the brake discs are installed the right way round (holes: see arrow).

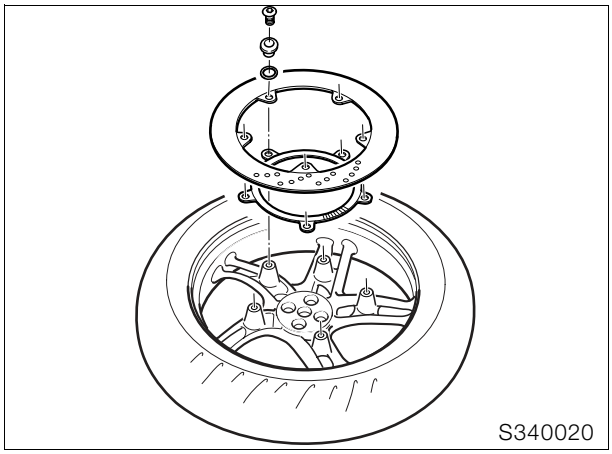
Tightening torque:
(clean thread + Loctite 2701)..... 21 Nm

Caution:
Check and adjust the sensor gap.

Sensor gap:..... 0.45...0.55 mm (0.018...0.022 in)

Removing and installing rear brake disc

- Remove the brake caliper.
- Remove rear wheel.

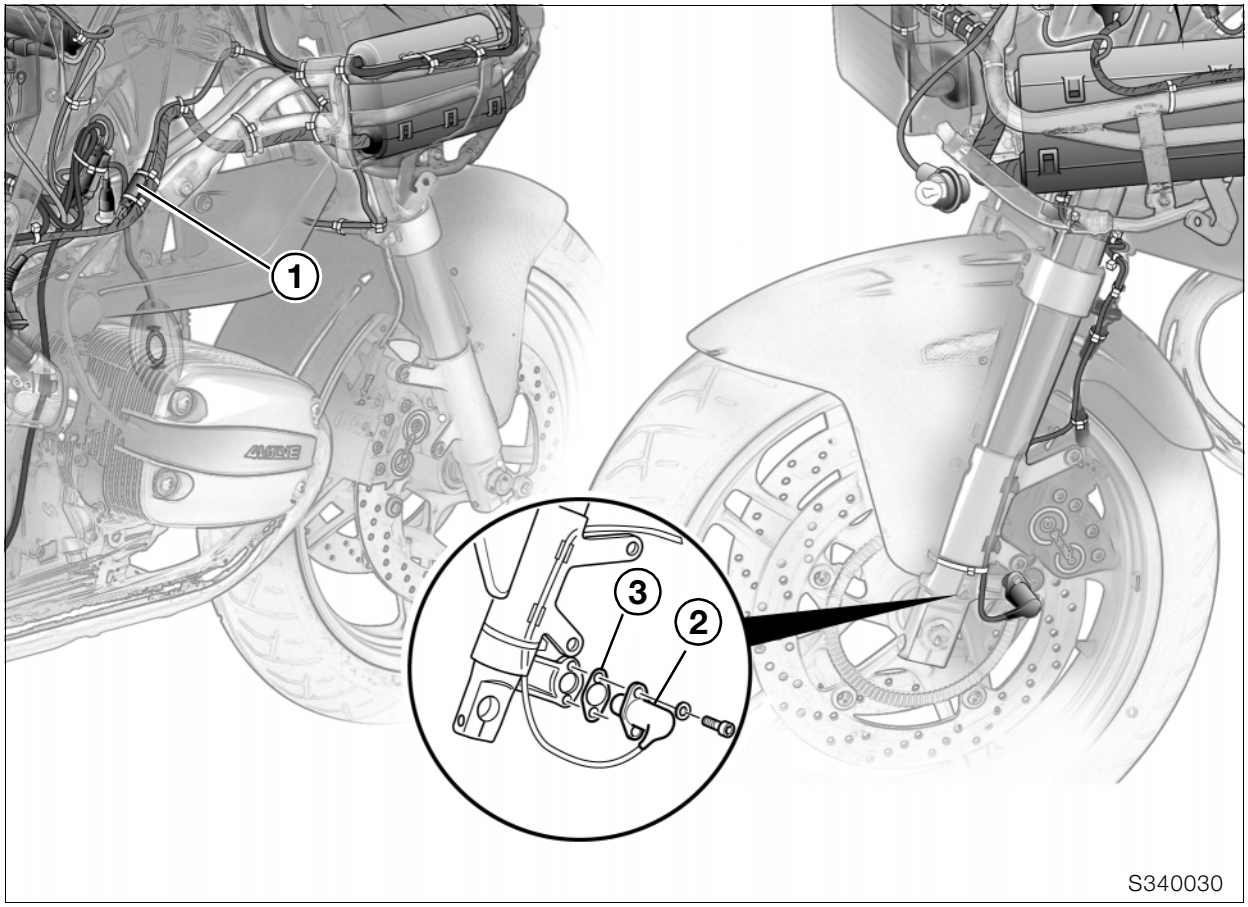


- Remove brake disc.
- Installation is the reverse of the removal procedure.
- Degrease the brake disc before installing.

Caution:
[ABS] Check sensor gap and adjust with shims if necessary.

Sensor gap:..... 0.45...0.55 mm (0.018...0.022 in)

Tightening torque:
Brake disc to rear wheel drive
(clean thread + Loctite 2701)..... 21 Nm



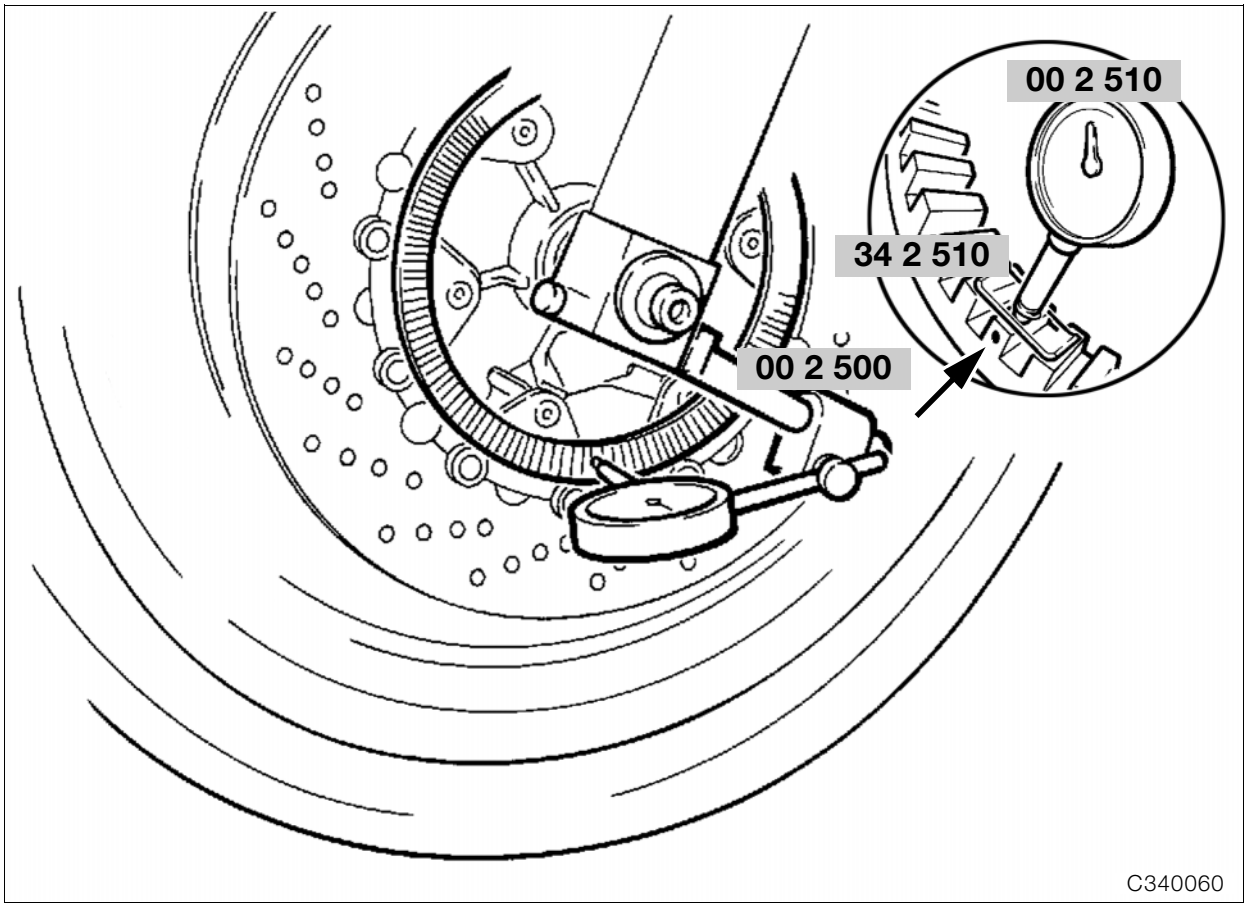
Removing and installing front ABS sensor

- Disengage and pull back the fuel tank.
- Disconnect plug (1) of sensor cable.
- Remove sensor (2) with **Torx T 25**.
- Installation is the reverse of the removal procedure.

Caution:
Route the sensor cable correctly.
Check sensor gap and adjust if necessary with shim (3).

Sensor gap:..... 0.45...0.55 mm (0.018...0.022 in)

Tightening torque:
Sensor .....handtight, 4 Nm



Adjusting front ABS sensor gap

Marking sensor wheel

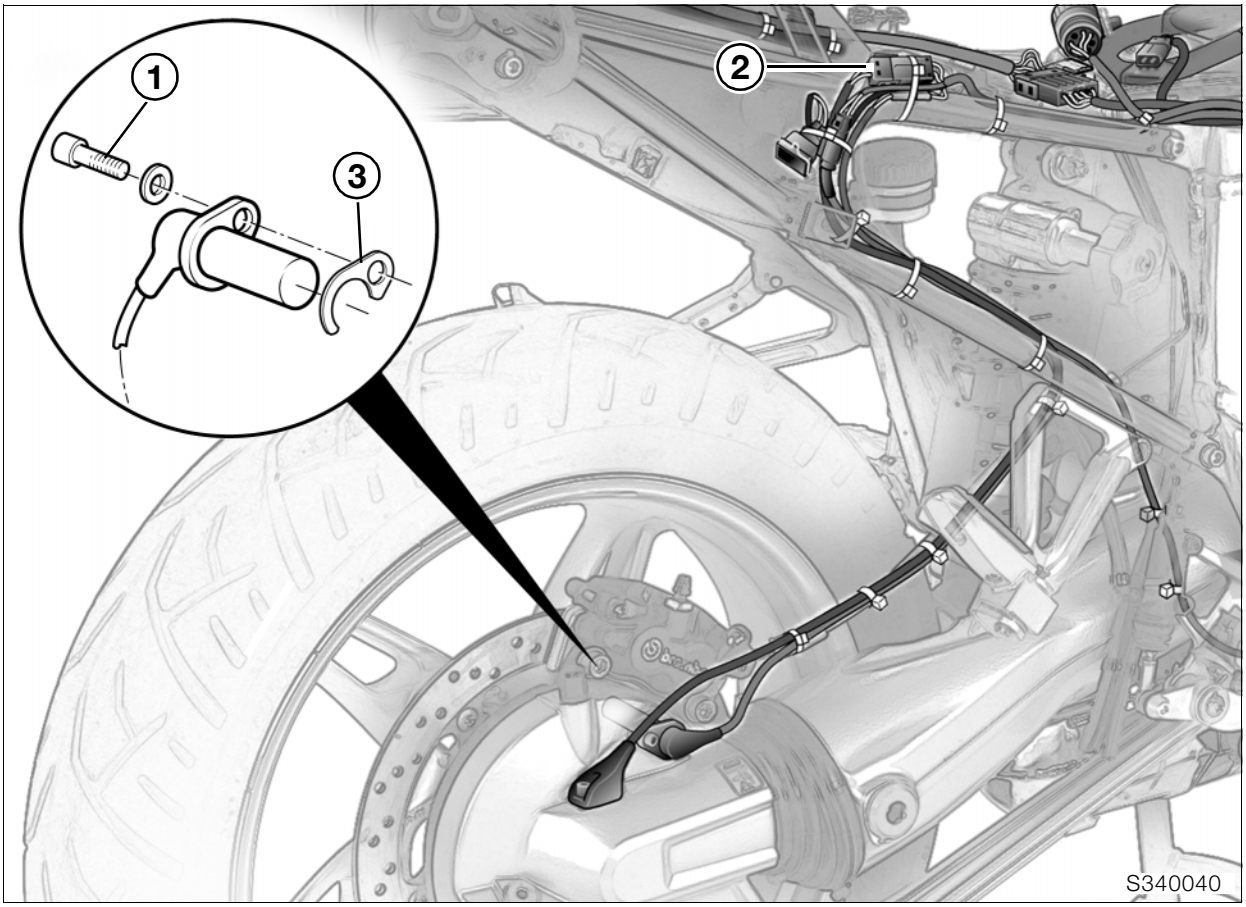
- Take load off front wheel/lift clear of ground.
- Secure the dial gauge holder,
  BMW No. 00 2 500, with dial gauge,
  BMW No. 00 2 510, and measuring shoe,
  BMW No. 34 2 510, to slider.
- Zero the dial gauge.
- Measure axial runout over the entire circumference.
- Using a touch-up marker, indelibly mark the point where the sensor is farthest away from the sensor ring (arrow).

Checking and adjusting sensor gap

- Check/adjust at the marked point.
- If necessary, remove/install sensor with
  Torx T 25 and adjust sensor gap with shims.

Sensor gap:..... 0.45...0.55 mm (0.018...0.022 in)

Caution:
After adjusting, rotate the wheel and check that the sensor is clear at all times.



Removing and installing rear ABS sensor

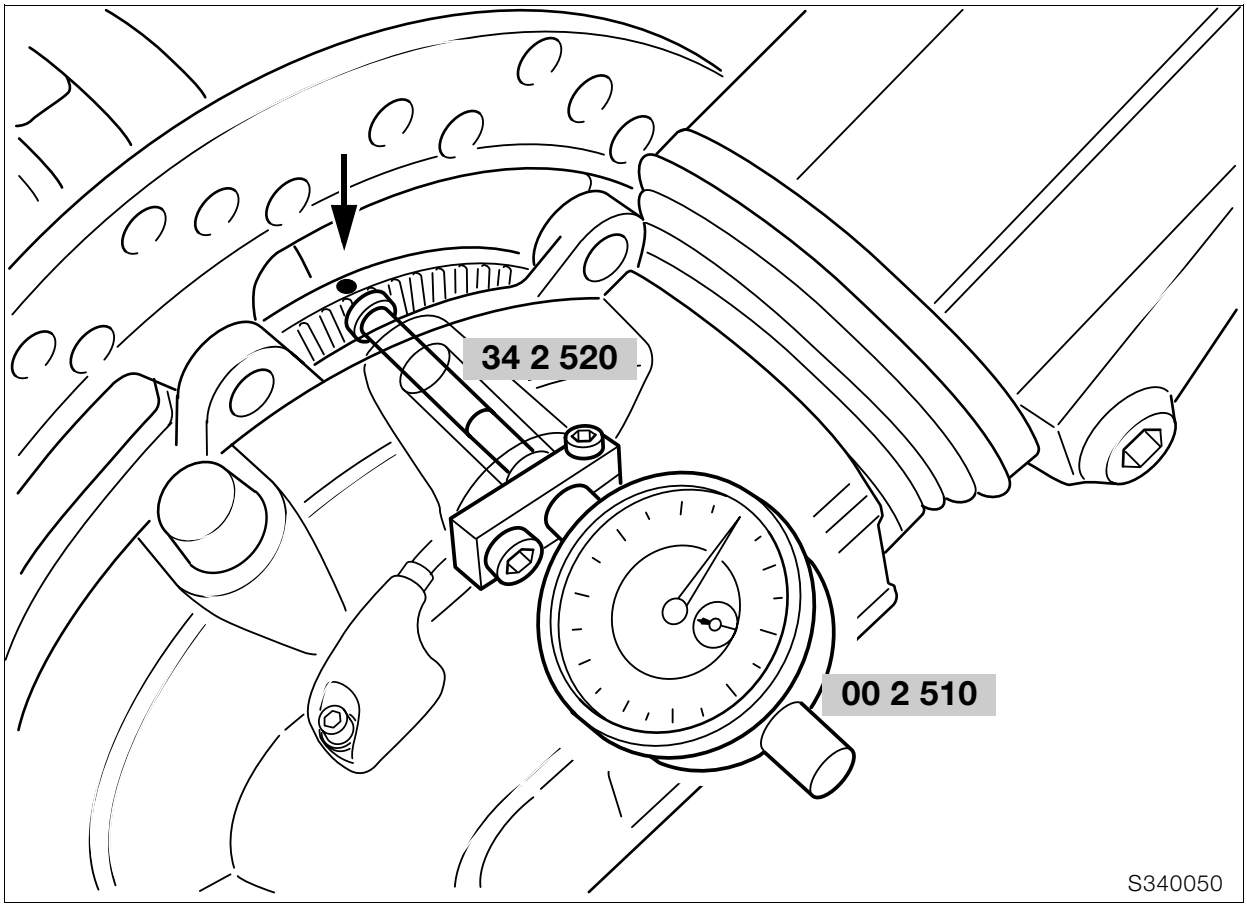
Note:
When installing shims pull the sensor out only very slightly and pull the shims up and out.

- Before removing/installing, clean the sensor bore.
- Using **Torx T 25**, slacken sensor (1).
- Disconnect plug (2) of sensor cable.
- Installation is the reverse of the removal procedure.
- Coat O-rings with oil before installing.

Caution:
Route the sensor cable correctly.
Check sensor gap and adjust if necessary with shims (3).

Sensor gap:..... 0.45...0.55 mm (0.018...0.022 in)

Tightening torque:
Sensor .....handtight, 4 Nm



Adjusting rear ABS sensor gap

Marking sensor wheel

- Before removing/installing, clean the sensor bore.
- Using **Torx T 25**, remove the sensor.
- Screw dial gauge holder with measuring shoe and extension, **BMW No. 34 2 520**, with dial gauge, **BMW No. 00 2 510**, firmly to the sensor mount.
- Zero the dial gauge.
- Measure axial runout over the entire circumference.
- Using a touch-up marker, indelibly mark the point where the sensor is farthest away from the sensor ring.

Caution:
If parts are replaced (brake disc etc.) and a used or previously marked sensor ring is installed, the sensor ring must be measured and marked again. Remove the old marking.

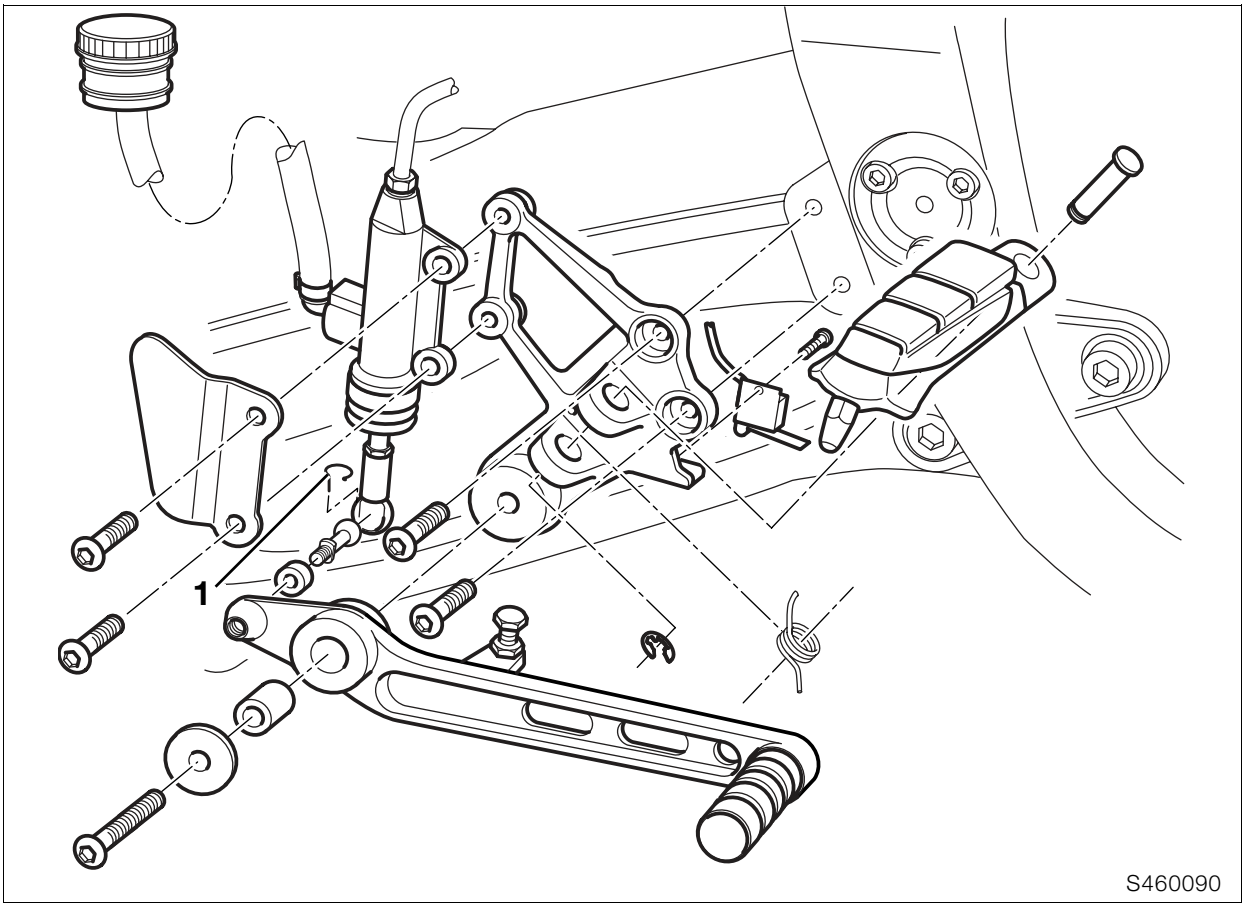
Checking and adjusting sensor gap

- Check/adjust at the marked point.
- If necessary, remove/install sensor with **Torx T 25** and adjust sensor gap with shims.

Caution:
After adjusting, rotate the wheel and check that the sensor is clear at all times.

Sensor gap:..... 0.45...0.55 mm (0.018...0.022 in)

Tightening torque:
Sensor .....handtight, 4 Nm



Removing and installing rear brake master cylinder

- Drain the brake system.

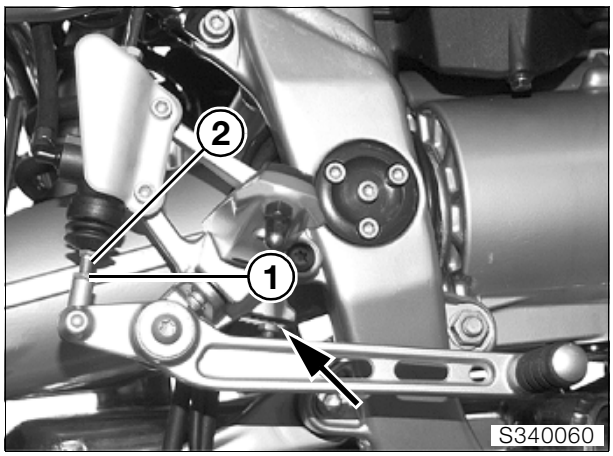
Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

- Disconnect the brake line and hose.
- Remove retainer (1) from ball socket/linkage.
- Force ball socket off ball head.
- Remove brake master cylinder.
- Installation is the reverse of the removal procedure.
- Secure non-reusable hose clip with pliers, **BMW No. 13 1 500**.

Caution:
Bleed the brake system carefully.
Check/adjust piston rod play.

Tightening torque:
Master cylinder to footrest plate ..... 8 Nm

Checking and adjusting play of piston rod



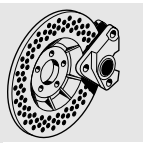
- Insert a feeler gauge of the correct thickness between the adjusting screw/brake lever and the stop (arrow).

Feeler gauge thickness:..... 0.2 mm (0.008 in)

- Slacken locknut (1).
- Turn piston rod (2) clockwise to obtain play.
- Carefully back off piston rod to take up play and tighten locknut.
- Tighten locknut and recheck play.

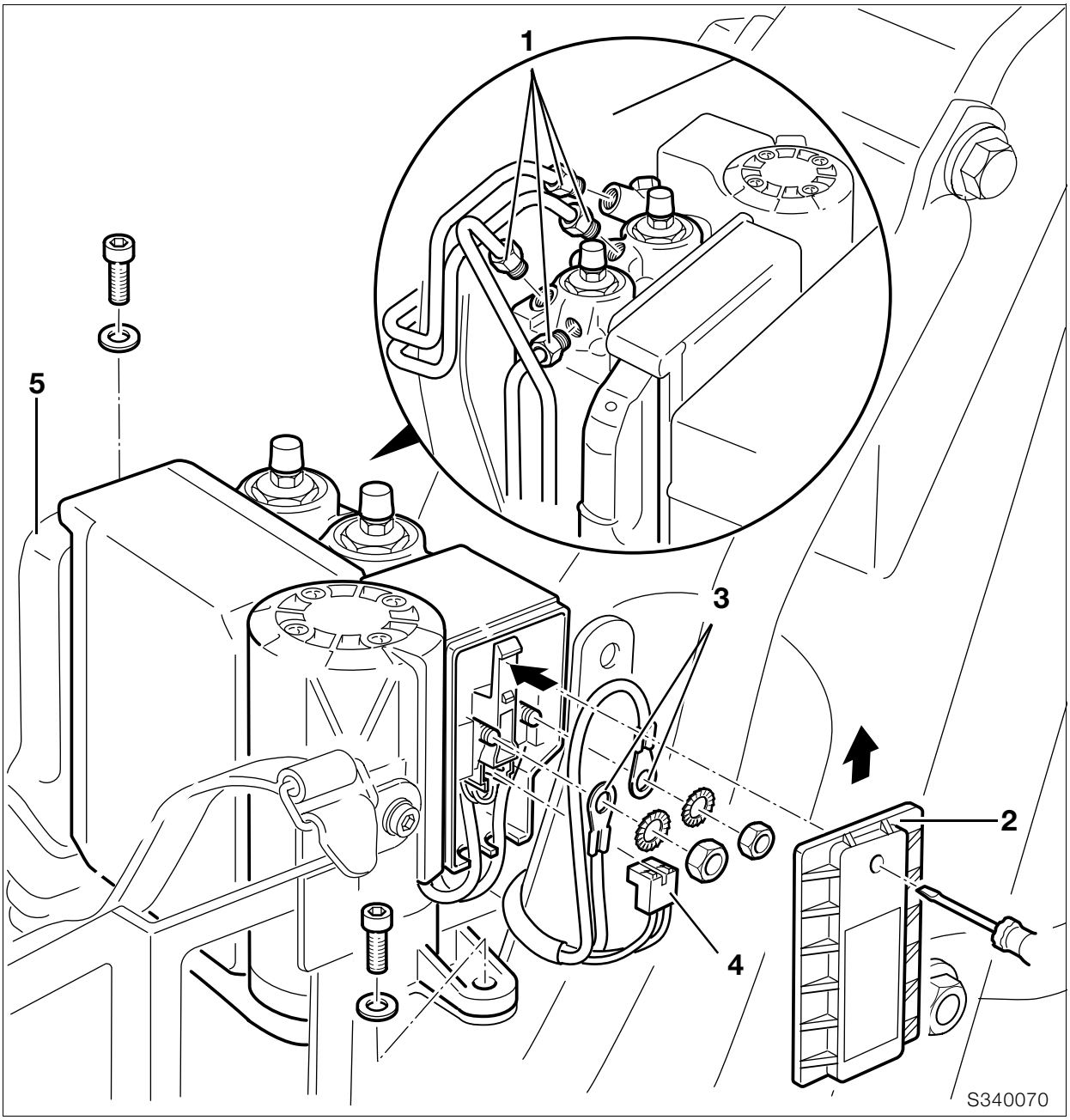
Removing and installing footbrake lever

- Lubricate pivot bushing with **Shell Retinax A**.



Caution:
Check/adjust piston rod play.
See removal and installation of brake master cylinder.
The brake light must come on as soon as the rear brake begins to take effect.

Tightening torque:
Footbrake lever to footrest assembly
(clean thread + Loctite 2701)..... 21 Nm



Removing and installing ABS unit

Caution:
Work on the ABS unit must be performed by an authorised BMW workshop.

Removing the ABS unit

- Remove fuel tank.
- Remove Motronic control unit.
- Disconnect ABS brake lines (1) from ABS unit.

Caution:
If brake fluid escapes, it may damage paint.
Line connections **must** be protected against dirt penetration; seal or cover ends of lines and ports.

- Hold the front brake lever against the handlebar grip with a rubber band (to close the brake fluid feed bore).

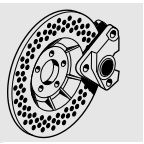
Caution:
Switch off ignition, disconnect and insulate the ground (earth) strap.

- Remove cover (2) from ABS control unit, press the lock in with a screwdriver and pull the cover up.
- Disconnect wires (3).
- Pull off 2-pin plug (4).
- Pull off the central plug (5).
- Remove the ABS unit.

Installing the ABS unit

- Install the ABS unit.
- Connect the central plug (5).

Caution:
Make sure the cable is not at an angle, or its insulation may be damaged.



- Reconnect the 2-pin plug in the correct position, pushing the two halves fully together, and press the two wires into the center (smaller) cable entries.
- Push the two plugs for the connecting cable/wiring harness onto the threaded pins with the crimp at the front.
- Press the two cables into the remaining free cable entries.
- Tighten the nuts.

Caution:
Always use new self-locking nuts.

Tightening torque:

Battery –/M5	3.5 Nm
Battery +/M4	3 Nm

- Install a new cover.

Caution:
When sliding the cover on, make sure that all cables are correctly located in their cable entries. **Scrap** the old cover.

- Screw ABS brake lines (1) to ABS unit.
- Fill and bleed the brake system.
- Install the fuel tank.

Tightening torque:

ABS unit to holder

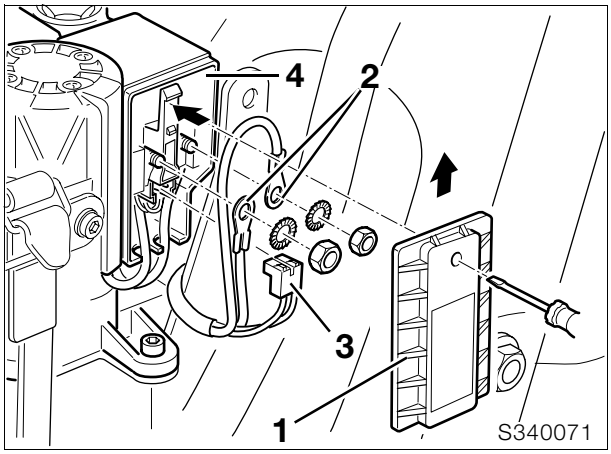
M6 screw	9 Nm
Brake line to ABS unit	18 Nm
Bleed screw on ABS unit	9 Nm

- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

Removing and installing ABS relay and relay socket

Removing ABS relay



Caution:
Switch off ignition, disconnect and insulate the ground (earth) strap.

- Remove cover (1) from ABS control unit, press in the lock with a screwdriver and pull the cover up.
- **Scrap** the old cover (1).
- Disconnect lines (2) and **discard** nuts.

Caution:
Make sure the cable is not at an angle, or its insulation may be damaged.

- Pull off 2-pin plug (3).
- Remove relay socket (4).
- **Back off** screws on relay socket by app. 2 turns with **Torx T20**.
- Pull the relay up to remove.

Installing the ABS relay

- Insert the ABS relay with the FAG logo facing the detent hook.
- Tighten the screws at the relay socket.
- Push the relay socket into the relay housing, at the same time pressing both engine cables into the left cable entries on the relay housing (red at bottom, black at top).
- Secure black engine cable to left threaded pin (M5) with crimp at rear.

Caution:
Make sure the cable is not at an angle, or its insulation may be damaged.

- Reconnect the 2-pin plug in the correct position, pushing the two halves fully together, and press the two wires into the center (smaller) cable entries.
- Push the two plugs for the connecting cable/wiring harness onto the threaded pins with the crimp at the front.
- Press the two cables into the remaining free cable entries.
- Tighten the nuts.

Caution:
Always use new self-locking nuts.

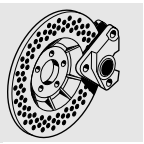
- Install a new cover (1).

Caution:
When sliding the cover on, make sure that all cables are correctly located in their cable entries. **Scrap** the old cover.

- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

Removing ABS relay socket



Caution:
Switch off ignition, disconnect and insulate the ground (earth) strap.

- Remove cover (1) from ABS control unit, press in the lock with a screwdriver and pull the cover up.
- **Scrap** the old cover (1).
- Disconnect lines (2) and **discard** nuts.

Caution:
Make sure the cable is not at an angle, or its insulation may be damaged.

- Pull off 2-pin plug (3).
- Remove relay base (4).
- Remove screws at relay base with **Torx T20**.
- Remove the ABS relay.
- Press the contact interlock out of the relay socket.
- Release the plug from the relay side using special tool, **No. 50000-017-507 from the Grote und Hartmann company**.

Caution:
The contact has a double detent.
When pulling the plug out of the relay socket, avoid applying too much tension to the cable.
If the cable breaks, the complete ABS unit will have to be replaced.

Installing the ABS relay base

- Bend up the contact interlock on the plug.
- Insert the contact into the relay socket.

Caution:
The contact engages with an audible click and must be firmly located.

- Insert the ABS relay with the FAG logo facing the detent hook.
- Insert a Torx screw into the ring shoe of the red engine cable.

Note:
The crimp side is towards the screw head.

Caution:
The same Torx screws must be re-used because of their self-locking effect.
When inserting the screws again, make sure that they pick up with the existing thread in the sheet-metal element.
Failing this, vibration could cause the screws to work loose.

- Place the ring shoe (with two cables) on the bore of the insert at the rear of the relay socket, with the crimp side towards the relay socket, and screw on together with the red engine cable, using the Torx screw.
- Use the second Torx screw to secure the flat plug to the relay.
- Press the contact interlock into the relay socket at the side.
- Push the relay socket into the relay housing, at the same time pressing both engine cables into the left cable entries on the relay housing (red at bottom, black at top).
- Secure black engine cable to left threaded pin (M5) with crimp at back.

Caution:
Make sure the cable is not at an angle, or its insulation may be damaged.

- Reconnect the 2-pin plug in the correct position, pushing the two halves fully together, and press the two wires into the center (smaller) cable entries.
- Push the two plugs for the connecting cable/wiring harness onto the threaded pins with the crimp at the front.
- Press the two cables into the remaining free cable entries.
- Tighten the nuts.

Caution:
Always use new self-locking nuts.

- Install a new cover (1).

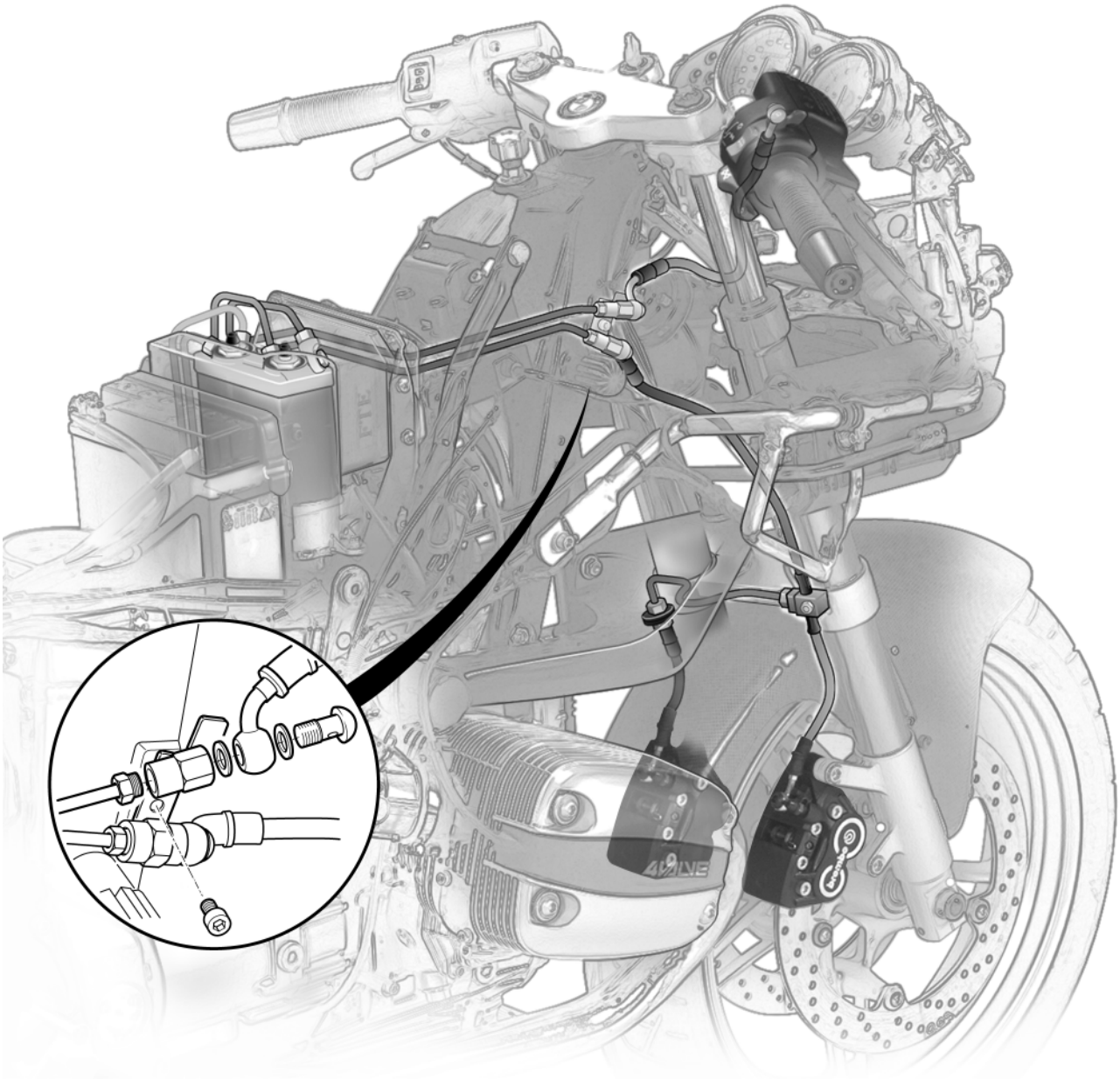
Caution:
When sliding the cover on, make sure that all cables are correctly located in their cable entries.

- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

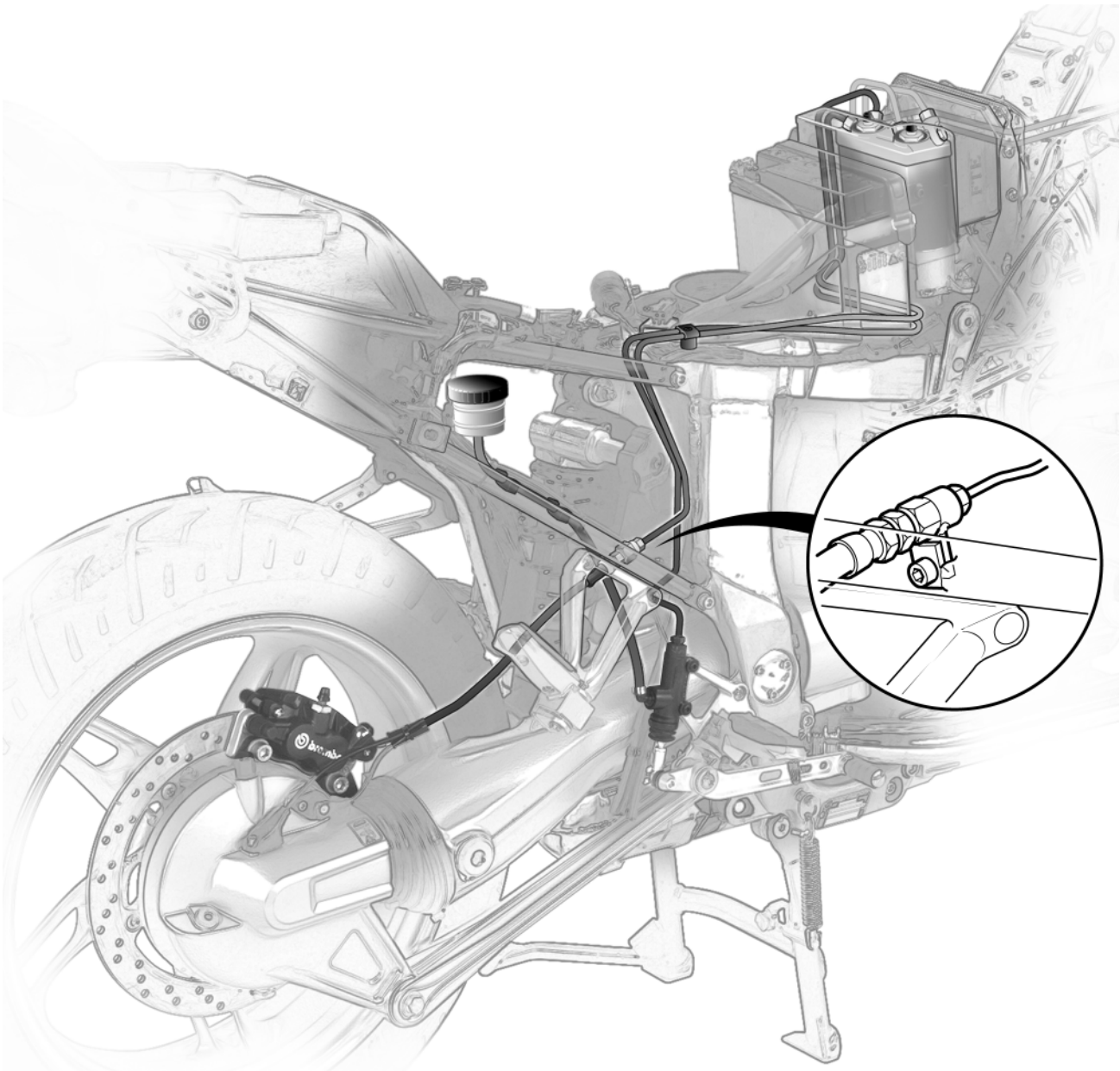
Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

Removing and installing brake line

Removing and installing front brake line



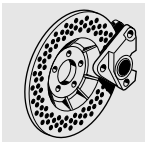
Removing and installing rear brake line



- Drain the brake system.

Caution:
Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

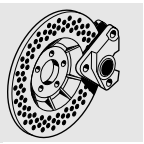
- Remove fuel tank.
- Remove brake lines.
- Installation is the reverse of the removal procedure.



Caution:
Replace sealing rings for brake line.
Secure brake line to master cylinder so that it cannot become kinked or abraded when the handlebar is turned.
Fill and bleed the brake system.

Tightening torque:

Brake hose and brake line	18 Nm
Bleed screws in front brake caliper	14 Nm
Bleed screw in rear brake caliper	6 Nm
Bleed screw in ABS unit	9 Nm



36 Wheels and tyres

Contents

Page

Technical Data 3

Removing and installing front wheel 5

Removing front wheel 5

Installing front wheel 5

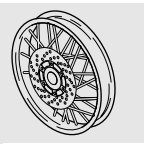
Removing and installing wheel bearings 6

Removing and installing rear wheel 8

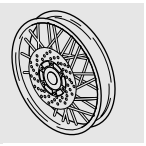
Static balancing of front and rear wheels 9

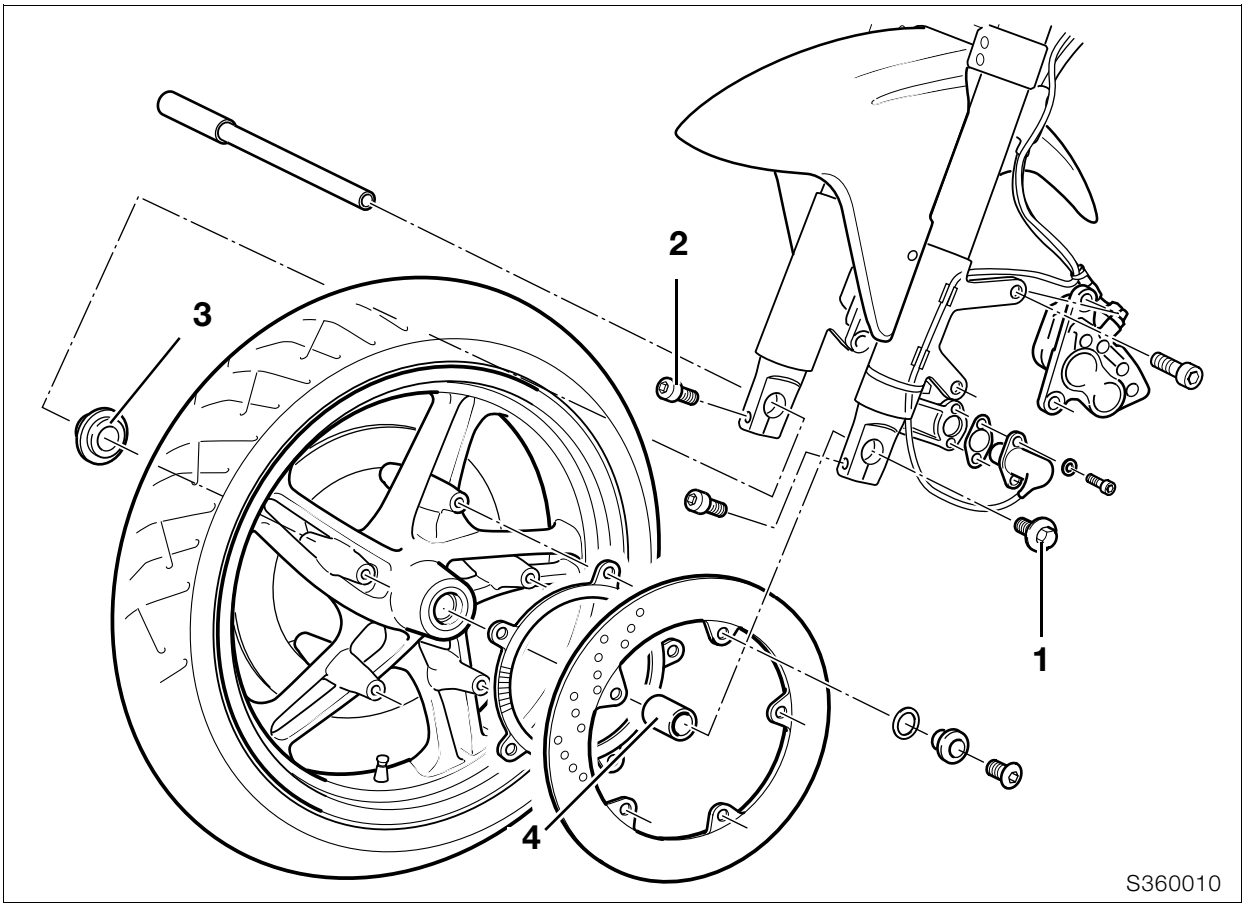
Checking front/rear wheel rim for runout 10





Technical Data			R 1100 S
Rim size			
	Front		3.50 x 17 MT H 2
	Rear		5.00 x 17 MT H 2 Option: 5.50 x 17 MT H 2
Max. radial/lateral runout			
	Front wheel	mm (in)	0.5 (0.02)
	Rear wheel	mm (in)	0.3 (0.01)
Tyre size			
	Front		120/70 x 17 ZR17 tubeless
	Rear		170/60 x 17 ZR17 tubeless Option: 180/55 x 17 ZR17 tubeless
Tyre pressures (cold)			
Solo	Front	bar (psi)	2.2 (31.9)
	Rear	bar (psi)	2.5 (36.3)
Two-up	Front	bar (psi)	2.5 (36.3)
	Rear	bar (psi)	2.7 (42.0)
Two-up with luggage			
	Front	bar (psi)	2.5 (36.3)
	Rear	bar (psi)	2.9 (45.1)





Removing and installing front wheel

Removing front wheel

- Place the motorcycle on the auxiliary stand, **BMW No. 00 1 560**.
- The motorcycle is heavy at the nose; if necessary, use a ratchet-lock belt to pull the motorcycle down at the rear on the lifting platform.
- Remove brake calipers.

Note:
Do not apply handbrake lever with brake calipers removed or front wheel removed.

- Remove retaining screw (1).
- Loosen clamping screws (2).
- Remove quick-release axle.
- Remove spacing bushing (3/4) and front wheel.

Installing front wheel

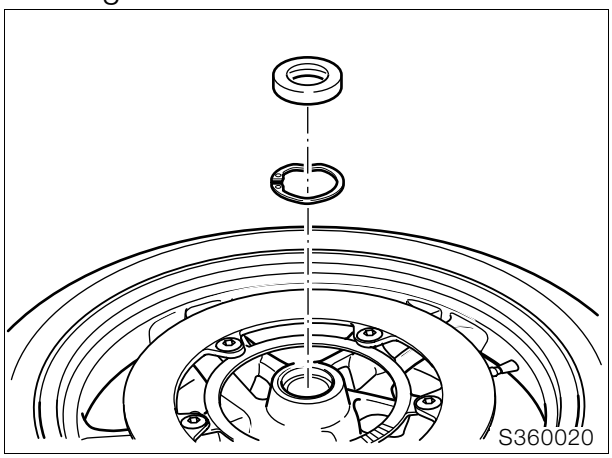
- Install front wheel and spacing bushings.
- Apply a light coating of **Molykote paste** to the quick-release axle and install.
- Tighten the retaining screw (1).
- Install the brake calipers.
- Compress the front fork firmly several times.
- Tighten the clamp screws (2).
- **[ABS]** Check sensor gap and adjust if necessary.

ABS sensor gap:
..... 0.45...0.55 mm (0.018...0.022 in)

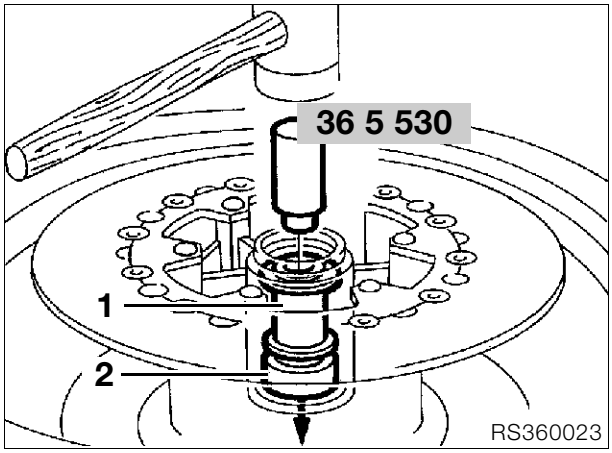
Tightening torques:

Quick-release axle screw	30 Nm
Quick-release axle clamp screws	22 Nm
Brake caliper to fork slider tube	40 Nm

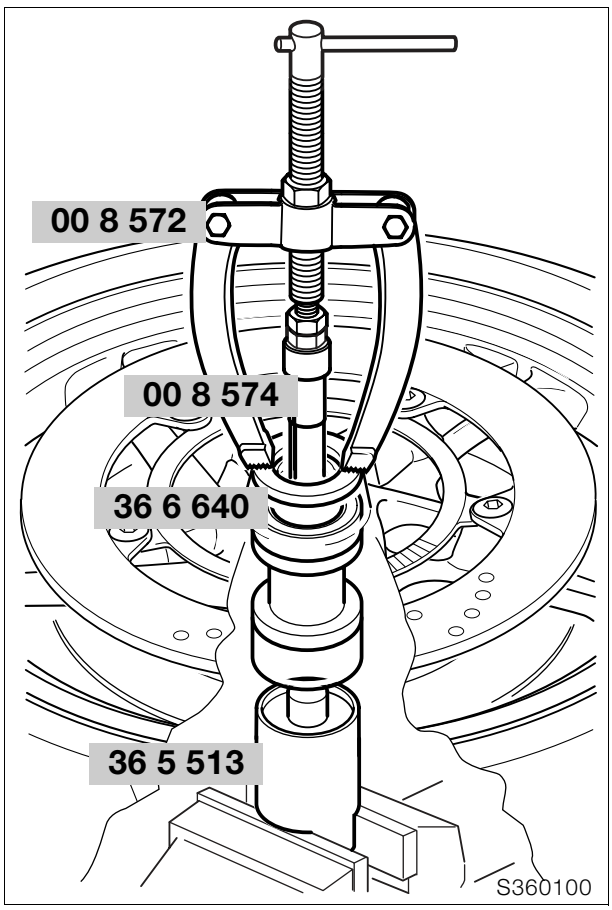
Removing and installing wheel bearings



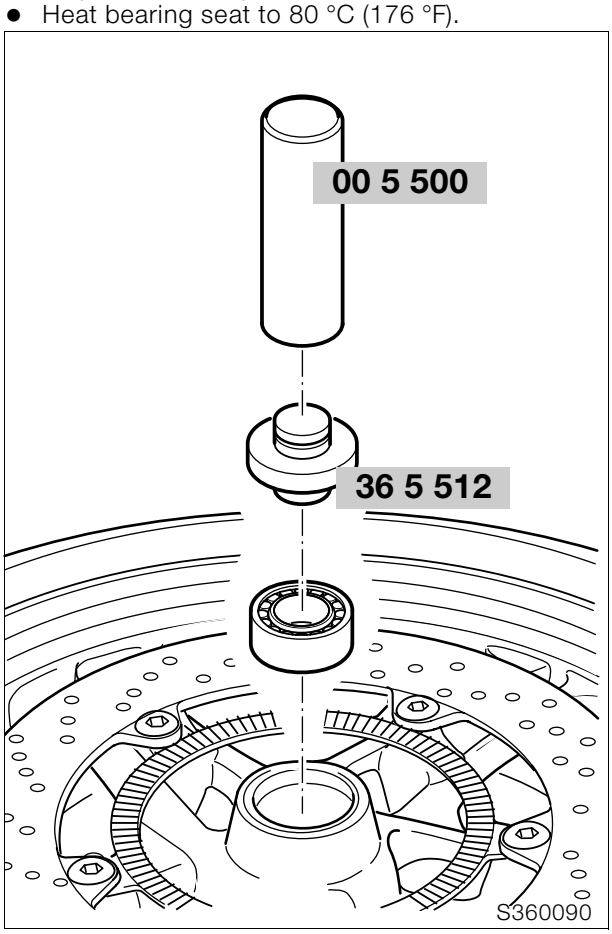
- Carefully lever out the shaft sealing ring with a screwdriver.
- Remove the circlip.



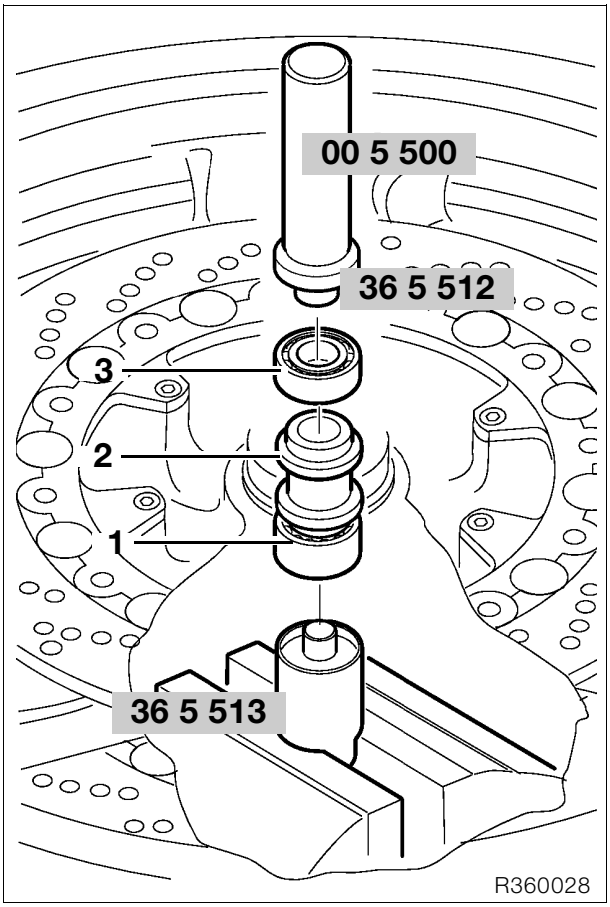
- Remove spacer bushing (1).
- Heat bearing seat to 80 °C (176 °F).
- Press out wheel bearing (2) with drift, **BMW No. 36 5 530**.
- Degrease bearing seats.
- Heat bearing seat to 80 °C (176 °F).



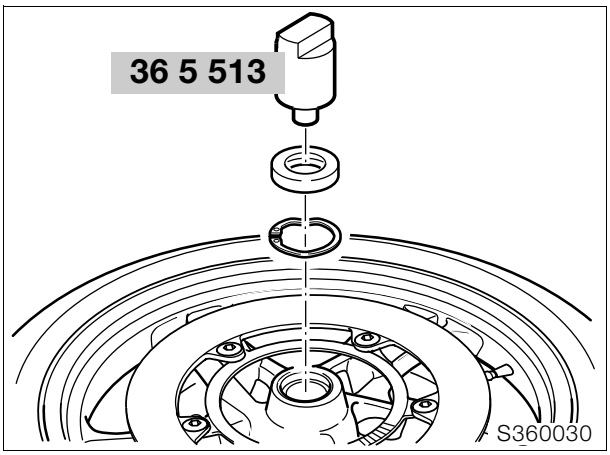
- Clamp a drift, **BMW No. 36 5 513**, into the vise and place the wheel on it with the wide bearing down.
- Place a spacing ring, **BMW No. 36 6 640**, between the wheel hub on the right and the claws of the internal puller.
- Heat bearing seat to 80 °C (176 °F).
- Pull out the wheel bearing with counter-support 22/1, **BMW No. 00 8 572**, and internal puller 21/3, **BMW No. 00 8 574**.



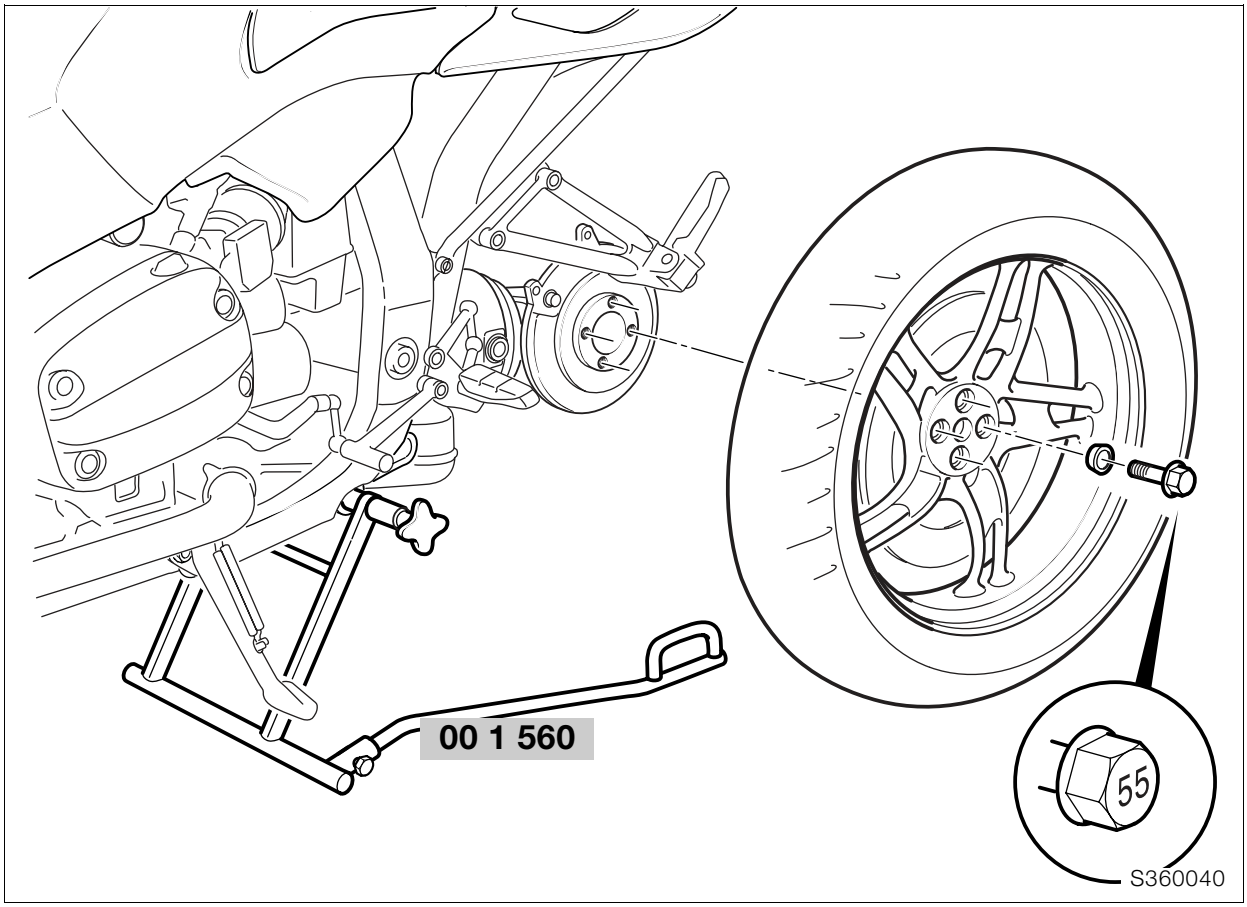
- **First** insert wide bearing using drift, **BMW No. 36 5 512**, and handle, **BMW No. 00 5 500**.



- Clamp a drift, **BMW No. 36 5 513**, into the vise and place the wheel on it with the wide bearing (1) down.
- Install spacer tube (2).
- Bearing seat temperature 80 °C (176 °F).
- Insert narrow bearing (3) with drift, **BMW No. 36 5 512**, and handle, **BMW No. 00 5 500**.



- Install circlip with convex side facing down.
- Drive in shaft sealing ring with drift, **BMW No. 36 5 513**.

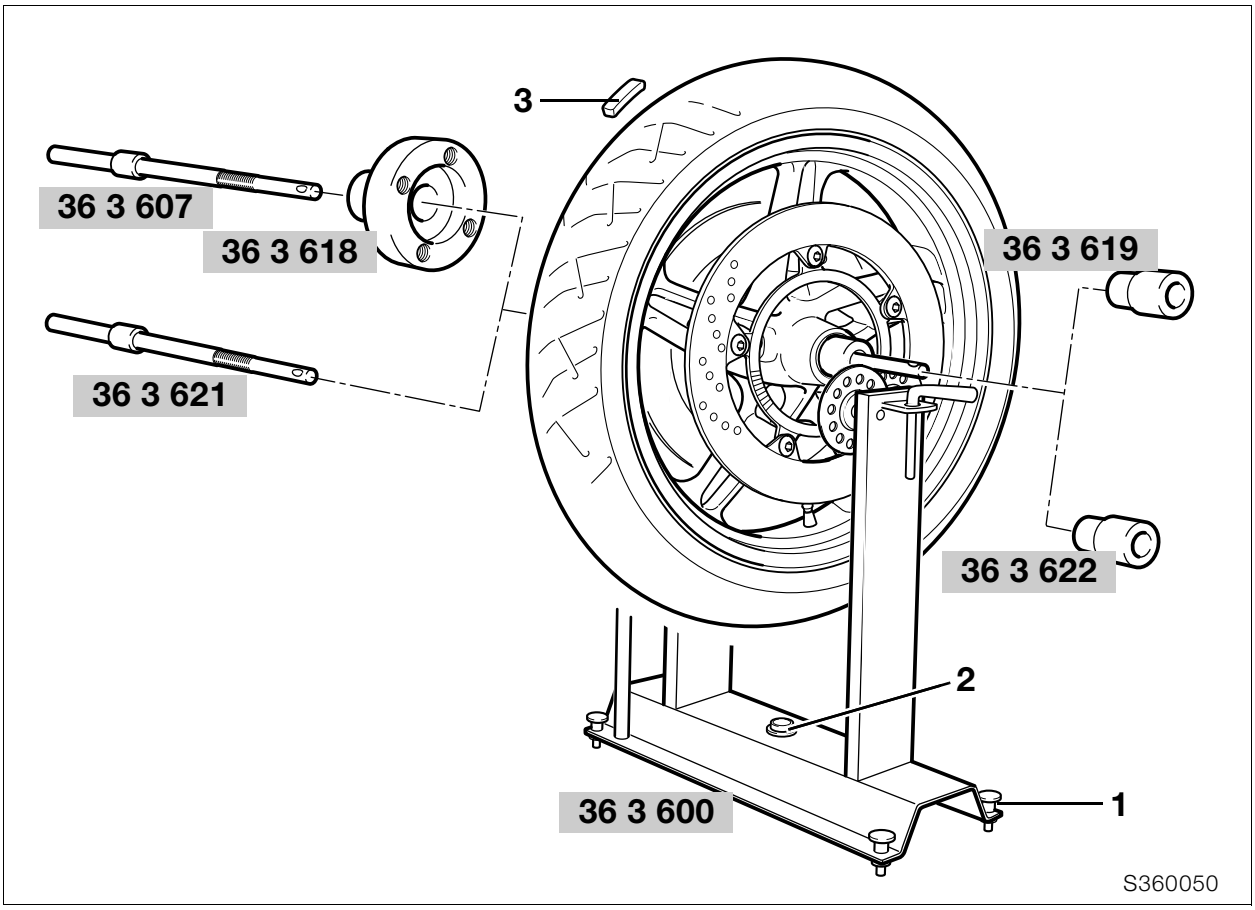


Removing and installing rear wheel

- Place the motorcycle on the auxiliary stand, **BMW No. 00 1 560**.
- Remove rear brake caliper.

Caution:
Use only wheel studs with length code 55.
Do not oil or grease wheel studs.
Contact faces on rear wheel drive and hub must be clean and free of grease.

Tightening torques:
Screw in wheel studs handtight, then
tighten in diagonally opposite sequence
Initial tightening ..... 50 Nm
Final tightening ..... 105 Nm

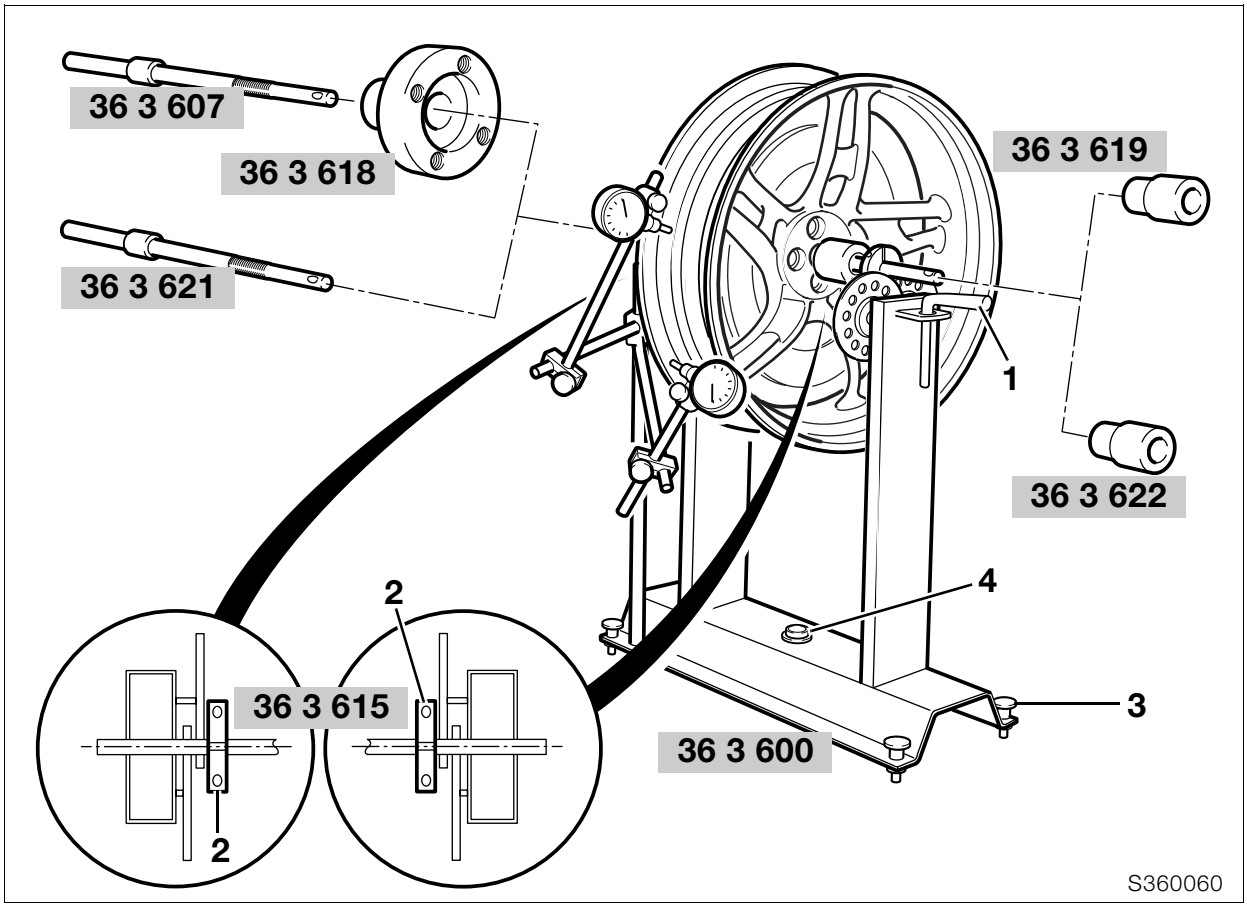


Static balancing of front and rear wheels

- Install balancing shaft, **BMW No. 36 3 621**, and nut, **BMW No. 36 3 622**, in front-wheel bearing.
- Tighten nut to slightly preload bearing.
- Rear wheel: mount adapter, **BMW No. 36 3 618**, on centring collar side with balancing shaft, **BMW No. 36 3 607**, and nut, **BMW No. 36 3 619**.
- Level balancing stand, **BMW No. 36 3 600**, using knurled-head screws and bubble gauge (1/2).
- Allow wheel to settle.
- Clean the attachment points for the adhesive weights.
- Affix the adhesive weights (3) uniformly spaced on both sides of the rim opposite the wheel's heaviest point.

Caution:
Maximum balancing weight 60 g (2.12 oz).

- Repeat the balancing procedure as a check.



Checking front/rear wheel rim for runout

- Remove tyre.
- Install balancing shaft, **BMW No. 36 3 621**, and nut, **BMW No. 36 3 622**, in front-wheel bearing.
- Tighten nut to slightly preload bearing.
- Use pin (1) to lock the balancing shaft against the balancing stand to prevent the shaft from turning.
- Rear wheel: mount adapter, **BMW No. 36 3 618**, on centring collar side with balancing shaft, **BMW No. 36 3 607**, and nut, **BMW No. 36 3 619**.
- Clamp locating discs (2), **BMW No. 36 3 615**, to the balancing shaft at left and right in such a way that the shaft cannot wander.
- Level balancing stand, **BMW No. 36 3 600**, using knurled-head screws and bubble gauge (3/4).
- Check radial/axial runout.

⚠ Caution:
Bring the dial gauge stylus into contact only with the machined inner face of the wheel rim.

Max. radial runout/lateral runout
Front wheel ..... 0.5 mm (0.020 in)
Rear wheel ..... 0.3 mm (0.012 in)

46 Frame

Contents

Page

Technical Data 3

Exploded view of fairing sections 5

Removing and installing fairing 6

Removing and installing side panels 6

Removing and installing tank trim 6

Removing and installing fairing 6

Removing and installing rear side panels 7

Removing and installing tail section 7

Removing and installing rear mudguard 8

Removing and installing number-plate carrier 8

Removing and installing front mudguard 9

Removing and installing fairing bracket 10

Removing and installing front frame 11

Removing and installing main frame 13

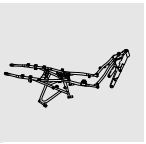
Removing and installing frame tail section 16

Removing and installing side stand 17

Checking running gear 18

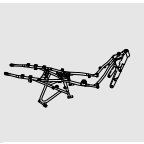
Measuring wheel track offset 18



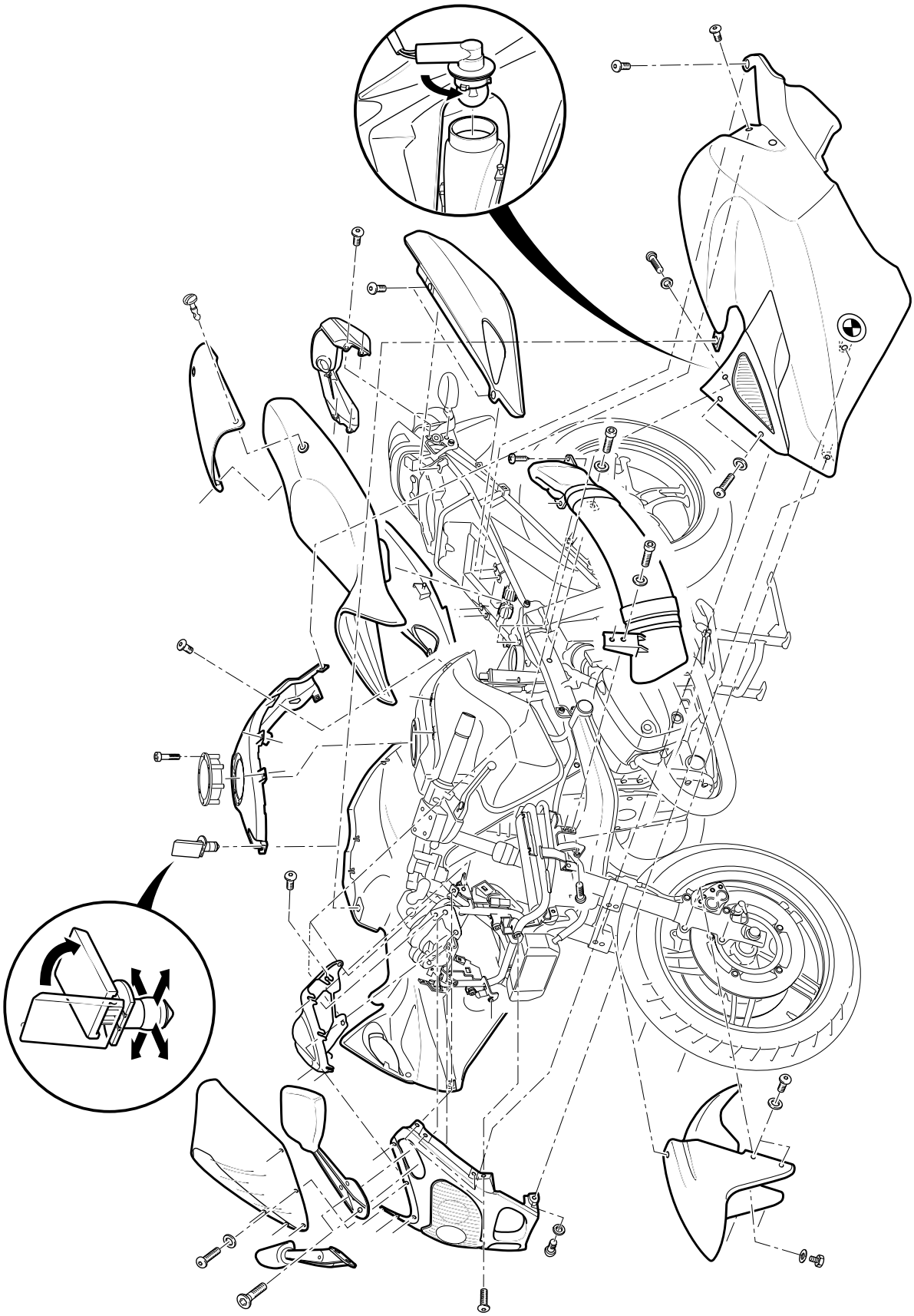


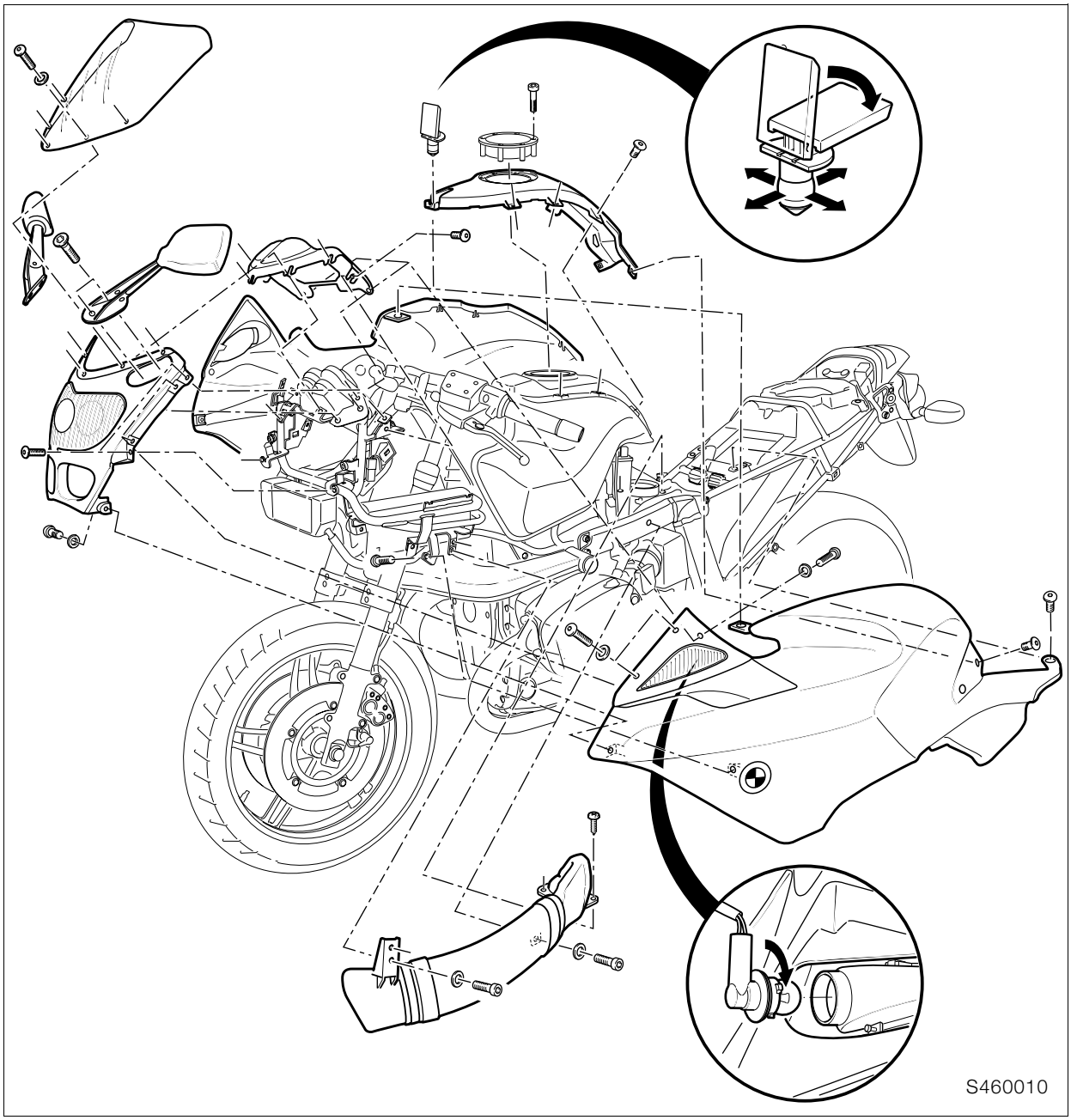
Technical Data		R 1100 S
Location of manufacturer's type plate/frame number		On frame, at right
Length, overall	mm (in)	2180 (85.8)
Max. height without mirrors	mm (in)	1160 (45.7)
Width across mirrors	mm (in)	880 (34.6)
Width across rider's footrests	mm (in)	580 (22.8)
Width across pillion footrests	mm (in)	730 (28.7)
Height of seat at unladen weight	mm (in)	800 (31.5)
Wheelbase in normal-load position	mm (in)	1478 (58.2)
Ground clearance at unladen weight	mm (in)	172 (6.8)
Caster angle in normal-load position	mm (in)	100 (3.9)
Steering head angle in normal-load position	°	65
Wheel track offset		
normal	mm (in)	+ 4.5 mm (0.18 in) (= to right)
max.	mm (in)	± 9 mm (0.35 in) : datum is + 4.5 mm (0.18 in)
Unladen weight, ready for road, full tank	kg (lbs)	229 (505)
Axle load distribution (without rider), front/ rear	%	52/48
Permissible maximum wheel loads		
Front	kg (lbs)	180 (397)
Rear	kg (lbs)	300 (661)
Permitted gross weight	kg (lbs)	450 (992)





Exploded view of fairing sections





Removing and installing fairing

Removing and installing side panels

- Remove seat.
- Remove screws securing the side panels.
- Disengage catch at top of tank.
- Raise side panel clear of guide groove in tank trim.
- Disconnect plug of turn indicator.
- Remove side panel.
- Installation is the reverse of the removal procedure.

Removing and installing tank trim

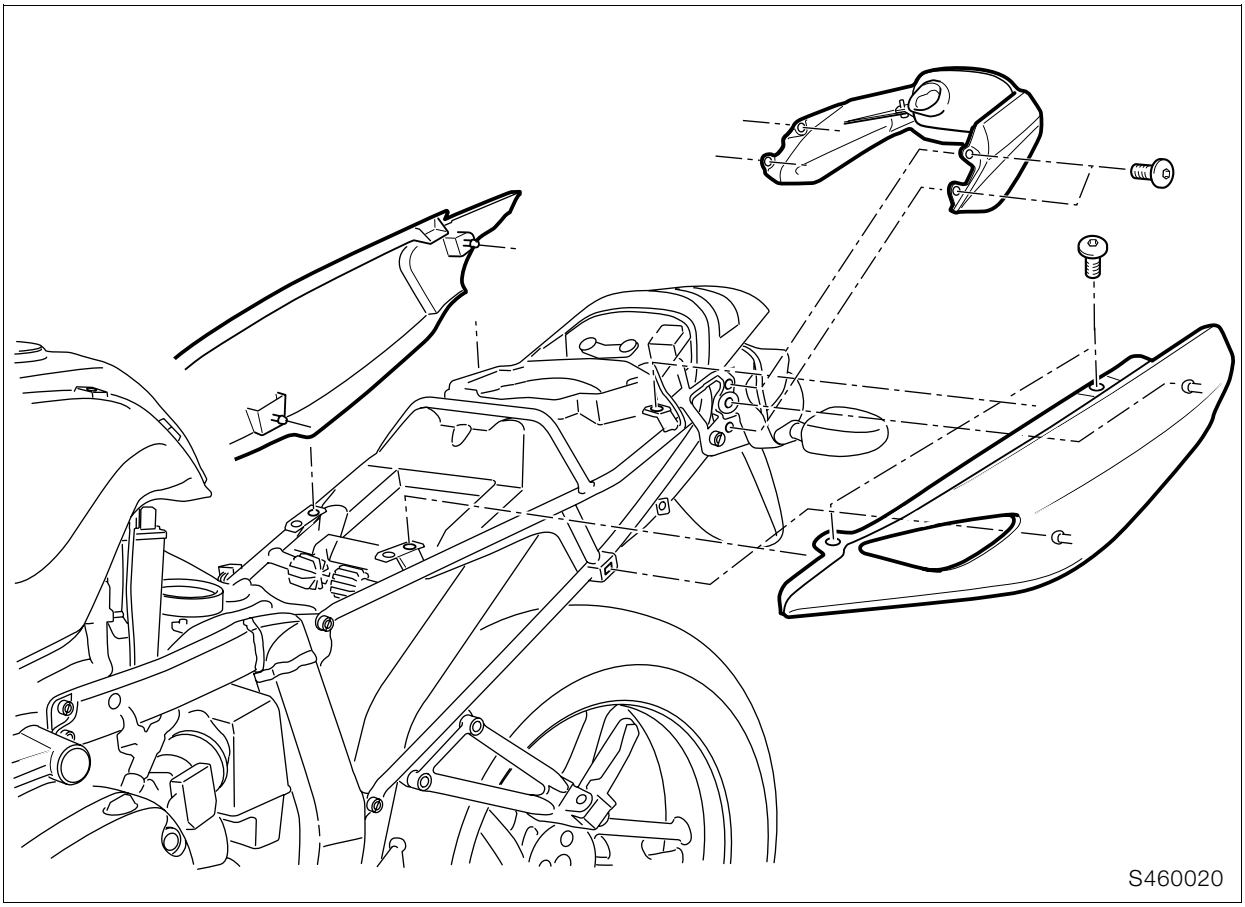
- Remove side panels.
- Remove screws securing fuel filler cap.
- Remove fuel filler cap.
- Remove screws securing the tank trim.
- Remove tank trim.
- Installation is the reverse of the removal procedure.

Removing and installing fairing

- Remove side panels on both sides.
- Remove mirrors.
- Remove the windshield.
- Disconnect headlight plug from socket at front right fairing bracket.
- Remove screws securing the front fairing panel.
- Remove fairing.
- Installation is the reverse of the removal procedure.

Tightening torques:

Mirrors
(clean thread + Loctite 243)..... 10 Nm

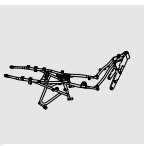


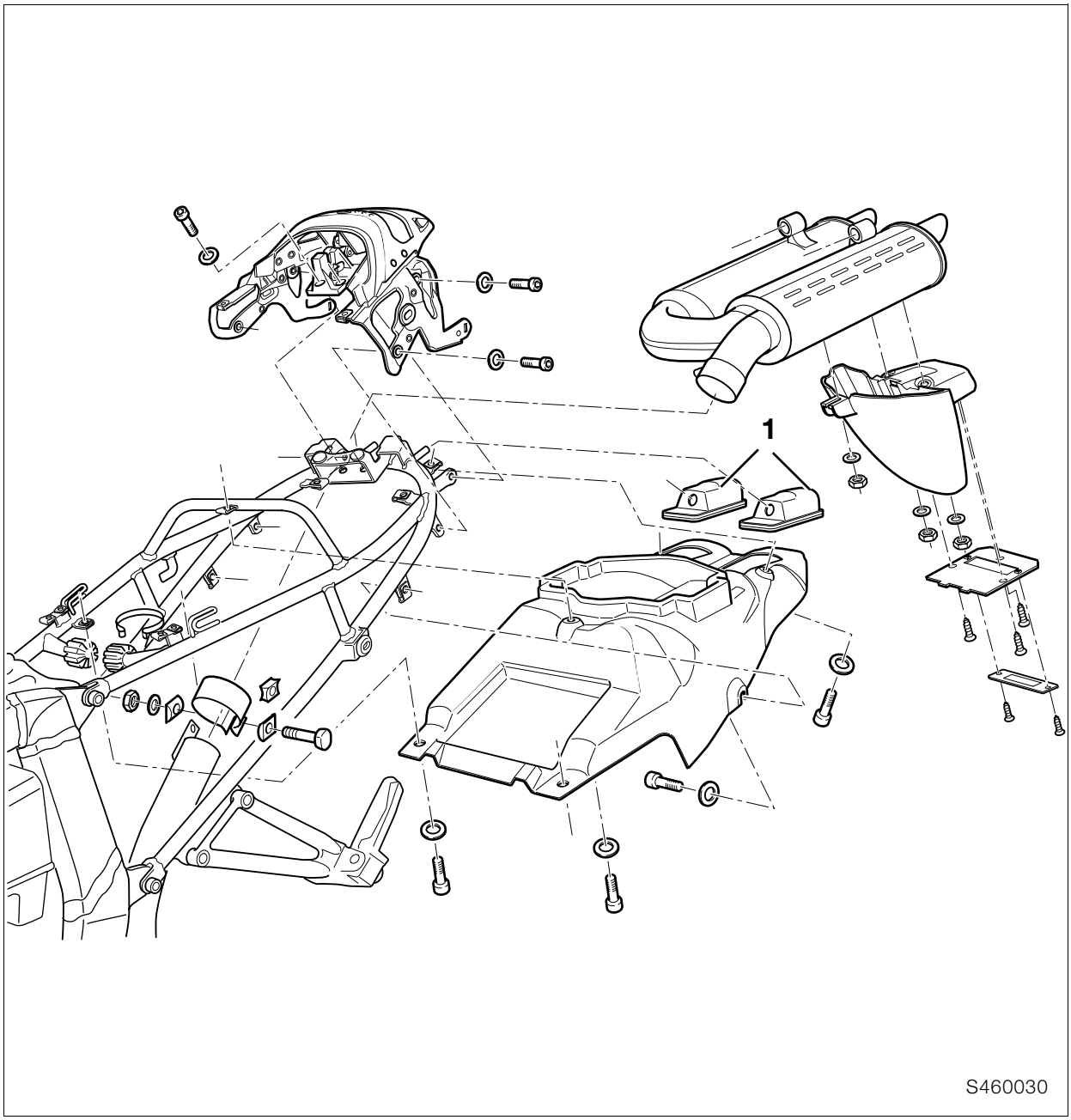
Removing and installing rear side panels

- Remove securing screws at top.
- Release side panel from rubber mounts.
- Installation is the reverse of the removal procedure.

Removing and installing tail section

- Remove rear side panels.
- Remove securing screws.
- Disconnect plugs for rear light and brake light.
- Remove tail section.
- Installation is the reverse of the removal procedure.





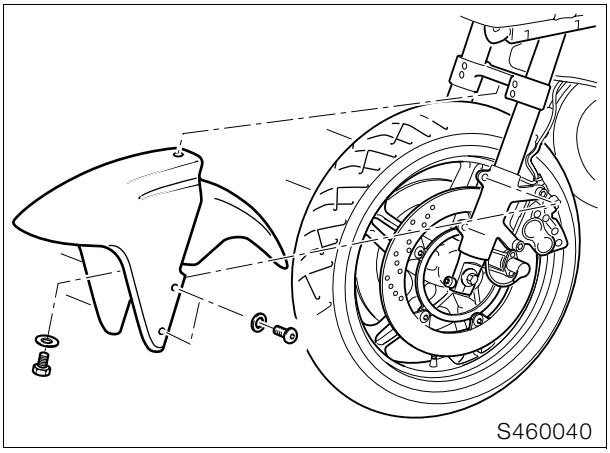
Removing and installing rear mudguard

- The rear silencer has to be removed to permit removal of the rear mudguard.
- Remove securing screws.
- Disconnect plug for number-plate light.
- Remove protective caps (1).
- Remove mudguard.
- Installation is the reverse of the removal procedure.

Removing and installing number-plate carrier

- Remove screws securing number-plate light.
- Disconnect plugs.
- Remove screws securing cover.
- Remove the cover.
- Remove screws securing the rubber mounts.
- Remove number plate carrier.
- Pull out cables.
- Tap in the rubber mounts with a hammer to remove.
- Installation is the reverse of the removal procedure.

Removing and installing front mudguard



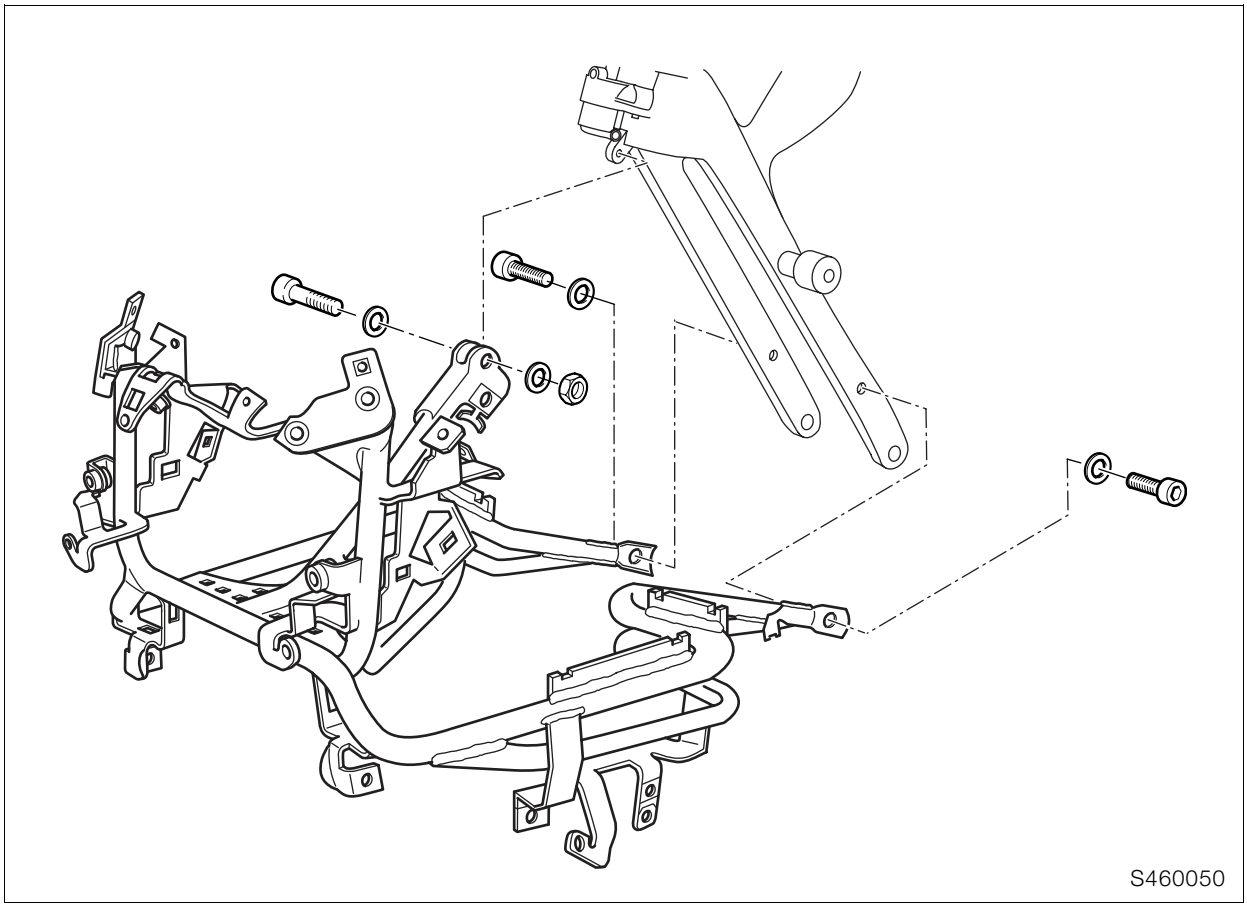


- The front wheel has to be removed to permit removal of the front mudguard.

Tightening torques:

Mudguard to slider tube bridge ..... 8 Nm





S460050

Removing and installing fairing bracket

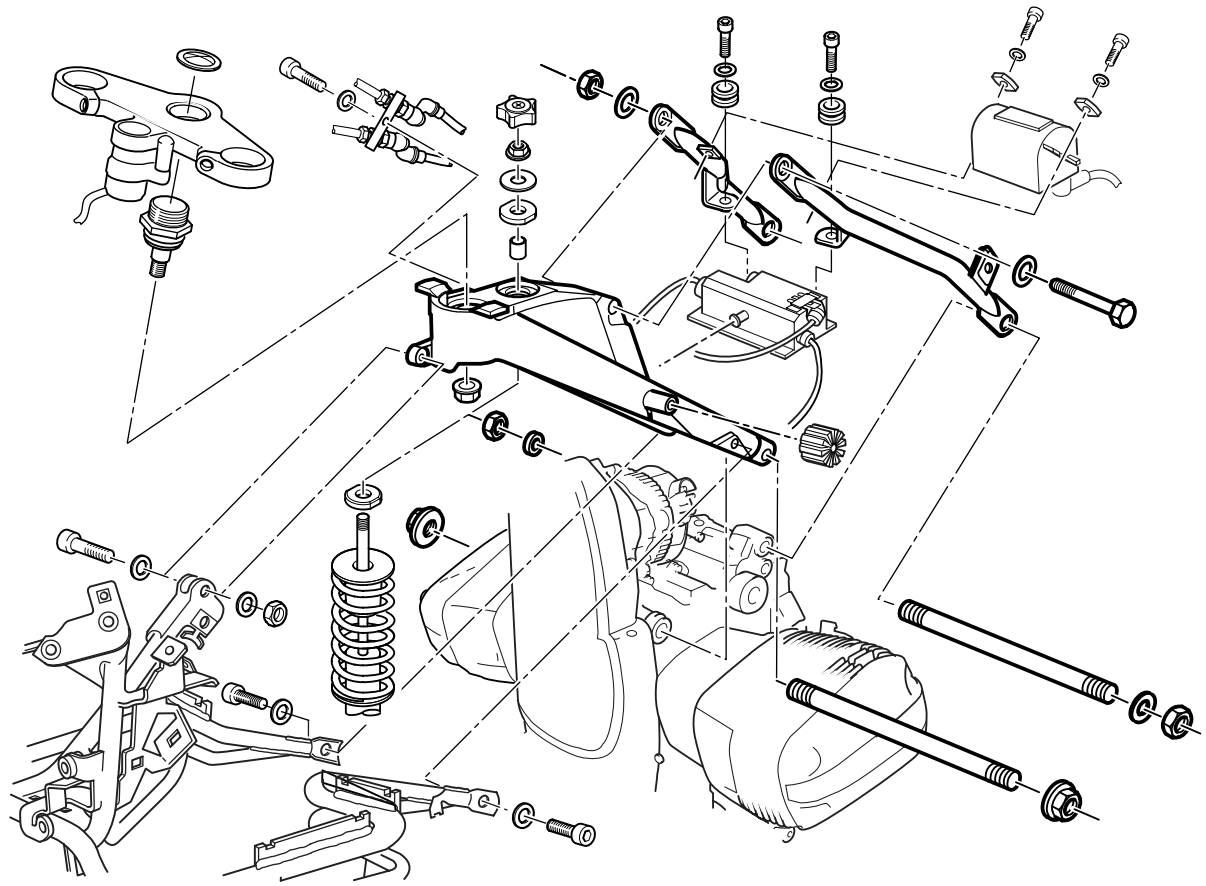
Caution:
Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove seat.
- Remove fairing side sections.
- Remove mirrors.
- Remove windshield.
- Disconnect headlight plug from socket at front right fairing bracket.
- Remove cable ties.
- Remove front fairing panel complete with headlight.
- Disconnect plug of instrument panel.
- Slacken the screws securing the instrument cover.
- Remove retainers at bottom of instrument panel and lift the instrument panel clear of its bearers.
- Remove the instrument cover.
- Remove left and right oil cooler lines from fairing brackets.
- Remove screws securing oil cooler to fairing bracket.
- Remove the horn.
- Remove connector strips, wiring harness and cables from fairing bracket.
- Remove trim support bracket.
- Installation is the reverse of the removal procedure.

Tightening torques:
Fairing bracket to front frame ..... 21 Nm

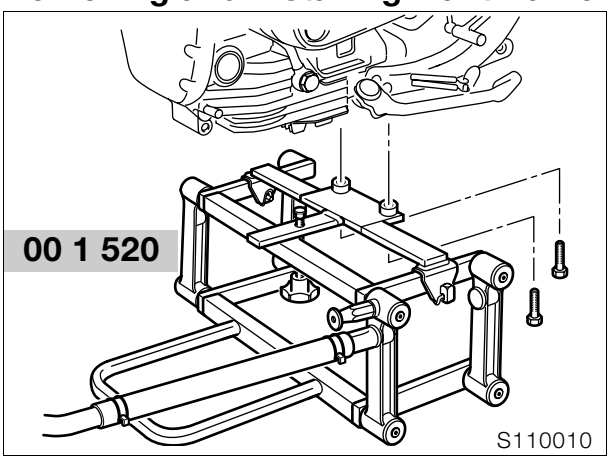
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.



S460060

Removing and installing front frame



S110010

- Secure stand with overlength bushes, **BMW No. 00 1 520/529**, to motorcycle.
- Drain the front brake system.

⚠ Caution:

Do not allow brake fluid to come into contact with painted parts of the motorcycle, because brake fluid attacks paint.

- Remove seat.
- Remove side panels.
- Remove fuel tank.

⚠ Caution:

Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove the horn.
- Remove suspension strut.
- Remove brake line retainer.
- Heat leading link mount at front to max. 120 °C (248 °F) and unscrew.
- Release clamp securing fixed tube to upper fork bridge.

- Remove retaining ring from upper fork bridge.
- Release clamp securing handlebars.
- Remove handlebars from fork bridge.
- Pull telescopic fork down and remove.

Caution:
Avoid scratching the leading link.

- Disconnect plug of ignition lock.
- Heat screw securing ball joint to frame to max. 120 °C (248 °F) and remove, using socket and hexagon socket, **BMW No. 31 5 600**.
- Remove fork bridge.
- Remove the leading link caps.
- Remove the left screw cap.
- Remove the circlip at the right and take off the retaining cap.
- Disconnect the left air intake pipe from the cylinder head.



- Remove the screw at the right and pull the axle out to the left.
- Remove the leading link.
- Remove oil lines from fairing bracket.
- Secure fairing bracket to workshop crane and remove securing screws.
- Remove cable ties.
- Pull fairing bracket forward and lower it slightly with workshop crane.
- Disconnect brake lines and remove brake-line holder.
- Remove screws securing front frame section and carefully pull frame front section forward and up.

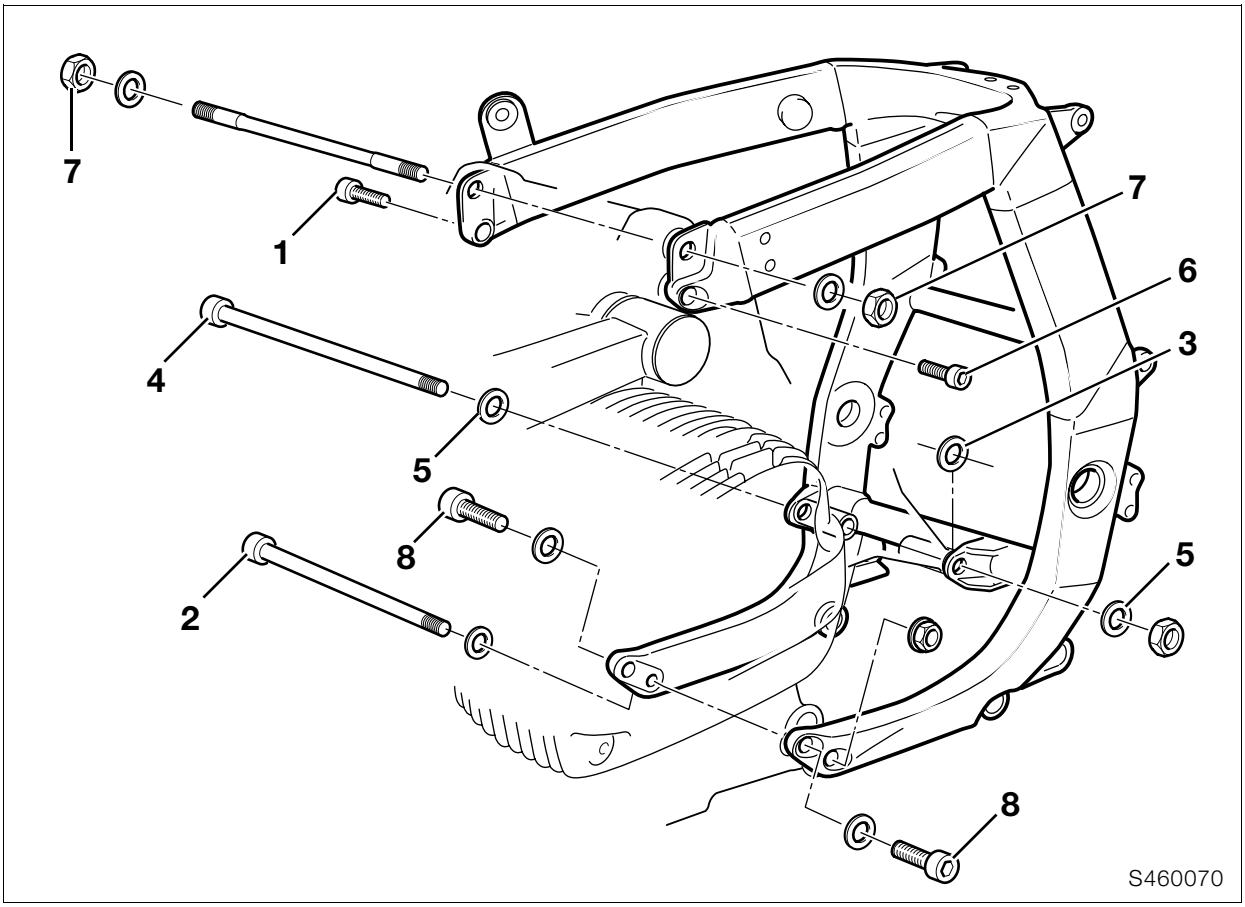
Caution:
Do not scrape the frame.

- Installation is the reverse of the removal procedure.
- Fill and bleed the brake system.
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

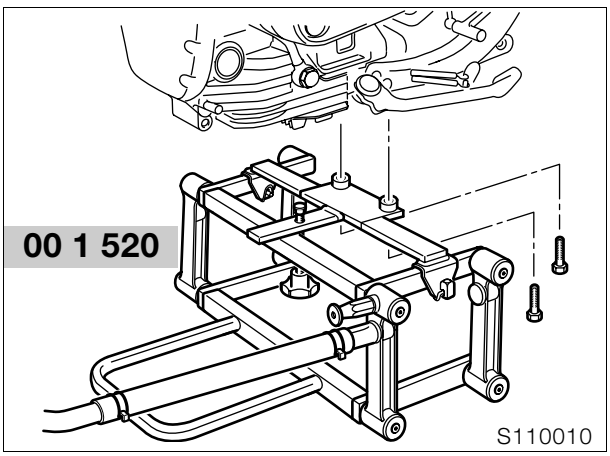
Tightening torques:

Fork bridge to front frame (clean thread + Loctite 2701)	130 Nm
Front frame to engine at front (M 12 bolt)	82 Nm
Struts to engine	50 Nm
Struts to front frame	58 Nm
Front fairing bracket to frame	21 Nm
Suspension strut to front frame	43 Nm



Removing and installing main frame

- **[ABS]** Fully drain the brake system.



- Secure stand with overlength bushes, **BMW No. 00 1 520/529**, to motorcycle.
- Remove seat.
- Remove left side fairing.
- Remove right side trim.
- Remove the intake air pipe.
- Remove the fuel tank.

Caution:
Fuel is flammable and a hazard to health. Observe relevant safety regulations.

- Seal the fuel feed and return lines with hose clips, **BMW No. 13 3 010**, and remove.
- Pull the plug connector off the fuel pump unit.
- Remove fuel tank.
- Remove the battery.

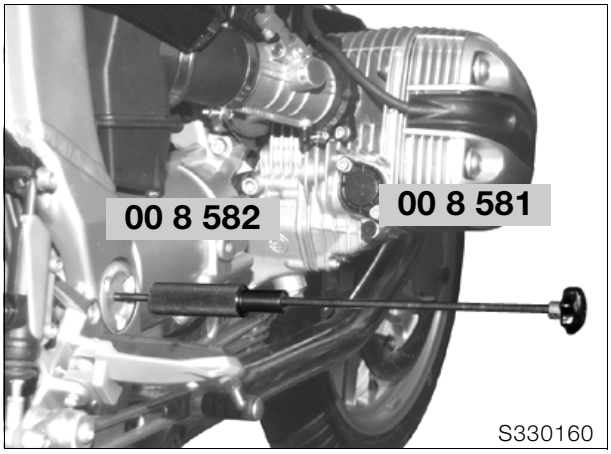
Caution:
Disconnect negative terminal first, then positive terminal.

- Remove rear brake caliper.
- The motorcycle is heavy at the rear; use a ratchet-lock belt to pull the motorcycle down at the nose on the lifting platform.
- Remove rear wheel.
- Remove the carrier plate for the number-plate light.
- Disconnect the cable.
- Remove number plate bracket.
- Remove cable.
- Remove the nut securing the metal tab of the pipe clamp securing the rear silencer and bend back the metal tab.
- Slacken pipe clamp.
- Remove rear silencer.

Note:
Tap gently with a plastic-headed hammer and pull the silencer down and to the rear to remove.

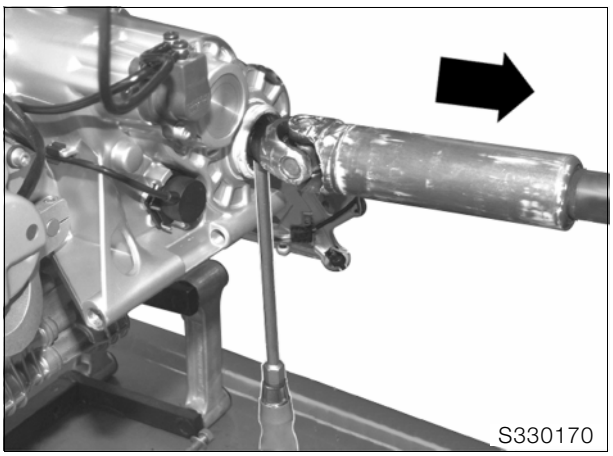
- Remove front silencer.
- Disconnect plug for oxygen sensor.
- Remove retainer from rubber bellows of swinging arm at rear wheel drive.
- Swinging-arm bearing studs are secured with Loctite: heat to max. 120 °C (248 °F) to release.
- Slacken nut of swinging-arm floating bearing.
- Loosen the floating bearing stud bolt.
- Loosen the fixed bearing stud bolt.

- Disengage reaction link from rear wheel drive.
- Remove fixed and floating bearing stud bolts and remove rear wheel drive.
- Remove screw at bottom of suspension strut.
- Loosen floating bearing left, swinging arm to main frame.

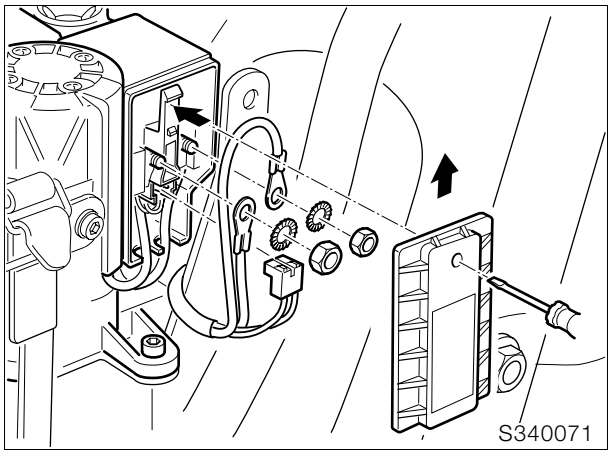




- Loosen fixing bearing right, swinging arm to main frame, if necessary using puller, **BMW No. 26 1 660**, or puller with impact weight, **BMW No. 00 8 580**.
- Remove screw at bottom of suspension strut.
- Remove swinging arm.
- Remove suspension strut.



- Use a screwdriver to press out the universal shaft.
- **[ABS]** Disconnect plug from ABS unit.
- **[ABS]** Disconnect brake lines from ABS unit.
- **[ABS]** Remove cover of ABS unit and disconnect lines.



Caution:
Always follow the instructions in the Repair Manual.
➡ Group 34/Removing ABS unit

- **[ABS]** Remove the ABS unit.
- Remove the rear side panel on the right.
- Disconnect plug for rear wiring harness.
- **[ABS]** Disconnect sensor plug.
- Disconnect plug for brake-light switch.
- Disconnect plug for inductive sensor, speedometer.
- **[ABS]** Remove rear brake lines.
- Disconnect gearshift linkage from ball head.
- Remove footrest assembly.
- Remove rear frame.
- Disconnect main frame and lift main frame.
- Installation is the reverse of the removal procedure, note the correct tightening sequence for installing the main frame:
- Install all screws and bolts except screw (4) securing the frame to the gearbox.
- Tighten screw (1) to initial torque.
- Tighten screw (2).
- Measure clearance between transmission housing and frame lug on left in forward direction of travel and compensate if necessary by installing washer (3) of correct thickness on left.
- Tighten fastener securing frame to gearbox (4), using new washers (5) and a new compression nut.
- Tighten screws (1) and (6).
- Tighten nuts (7).
- Tighten screws (8).
- Fill and bleed the brake system.
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

Clearance between transmission housing and frame lug

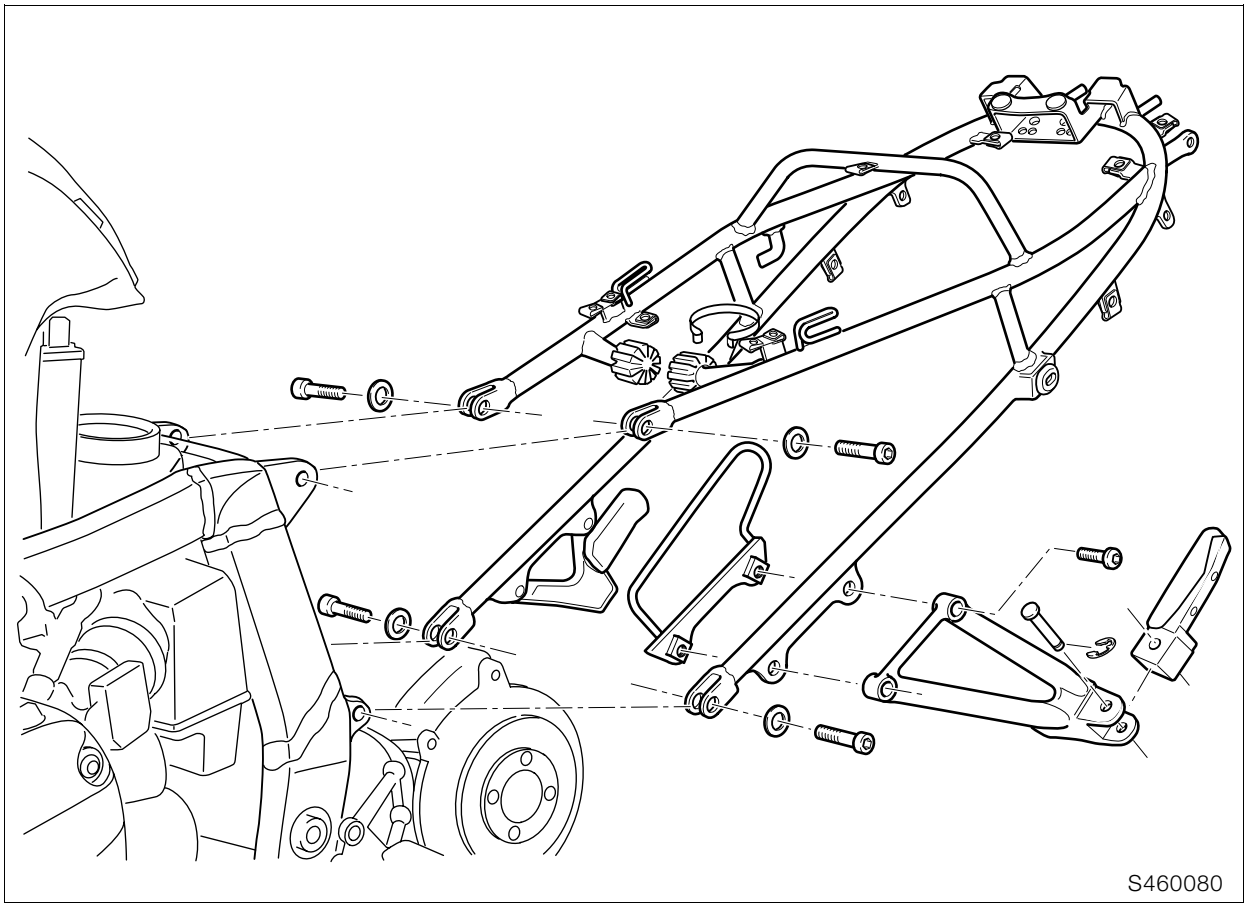
..... less than 0.5 mm (0.02 in)

Tightening torques:

Engine to main frame
M10 screw, top right (1)
Initial tightening ..... 13 Nm
Final tightening ..... 42 Nm
M10 screw, top left (6) ..... 42 Nm
M10 bolts at top (struts to engine) (7) ..... 50 Nm
M10 screw, long, frame to gearbox (4) ..... 55 Nm
M12 screw, bottom (8) ..... 80 Nm
M8 screw, long, bottom (2) ..... 24 Nm
Rear frame to main frame ..... 31 Nm
Centre stand to main frame ..... 42 Nm
Footrest assembly to main frame ..... 21 Nm
Strut to rear wheel drive/main frame
(load 85 kg/187 lbs onto motorcycle and
tighten loose reaction link) ..... 43 Nm
Suspension strut to main frame ..... 50 Nm
Swinging-arm fixed bearing stud bolt
to rear frame ..... 9 Nm
Swinging-arm floating-bearing stud bolt
to rear frame (clean thread + Loctite 2701) ..... 7 Nm
Locknut of swinging-arm floating bearing
stud bolt to main frame ..... 160 Nm







Removing and installing frame tail section

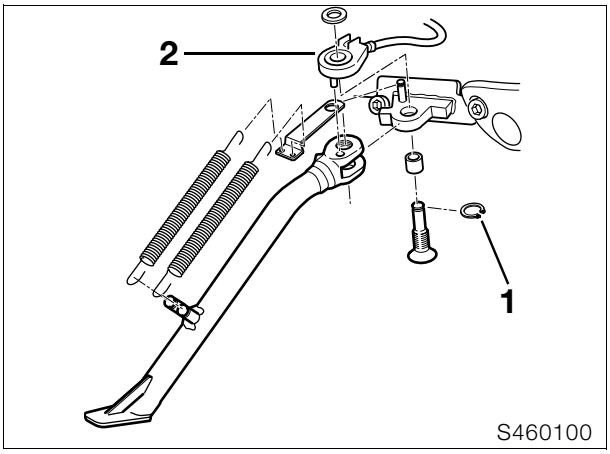
- Remove seat.
- Remove tail-section panels.
- Remove the carrier plate for the number-plate light.
- Disconnect the cable.
- Remove number plate bracket.
- Remove cable.
- Remove the nut securing the metal tab of the pipe clamp securing the rear silencer and bend back the metal tab.
- Slacken pipe clamp.
- Remove rear silencer.

Note:
Tap gently with a plastic-headed hammer and pull the silencer down and to the rear to remove.

- Remove brake fluid reservoir from its holder.
- Disconnect plug for brake light.
- Disconnect plug for speedometer.
- **[ABS]** Disconnect plug of sensor cable.
- Disconnect brake line at adapter in frame tail section.
- Disconnect plug of rear wiring harness.
- Remove rear screws securing the side panel.
- Push the side panel slightly to one side.
- Remove the securing screws and remove the rear frame.
- Remove frame-mounted components, if applicable.
- Installation is the reverse of the removal procedure.

Tightening torques:
Frame tail section to main frame ..... 31 Nm
Pillion footrest holder to rear frame..... 21 Nm

Removing and installing side stand

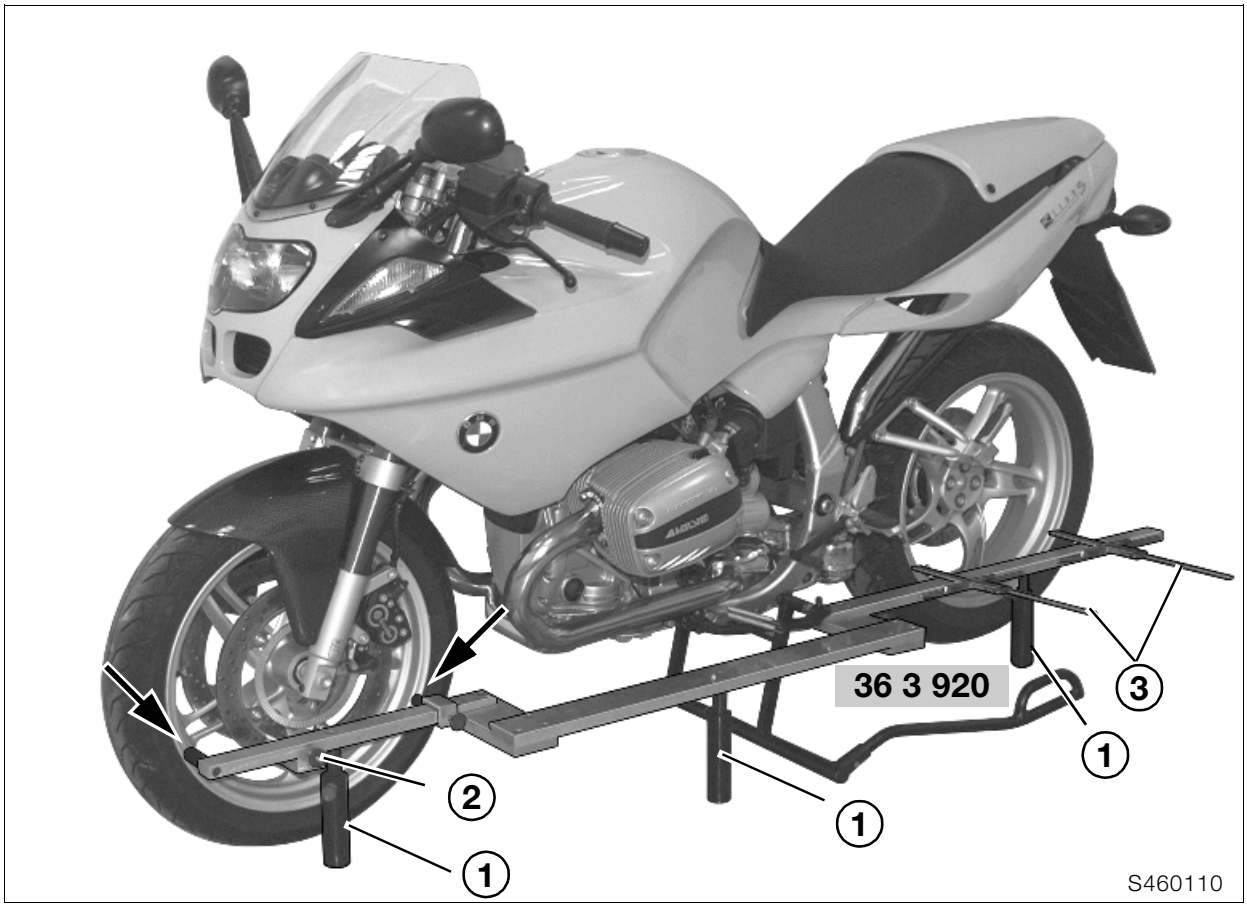


- Remove keeper (1) from side stand switch.
- Pull off side stand switch (2).
- Disconnect tension springs.
- Remove side stand.

Caution:
Note routing of cables.

Lubricant:..... e.g. Staburags NBU 30 PTM

Tightening torques:
Side stand to pivot mount
(thread cleaned + Loctite 243)..... 42 Nm



Checking running gear

Measuring wheel track offset

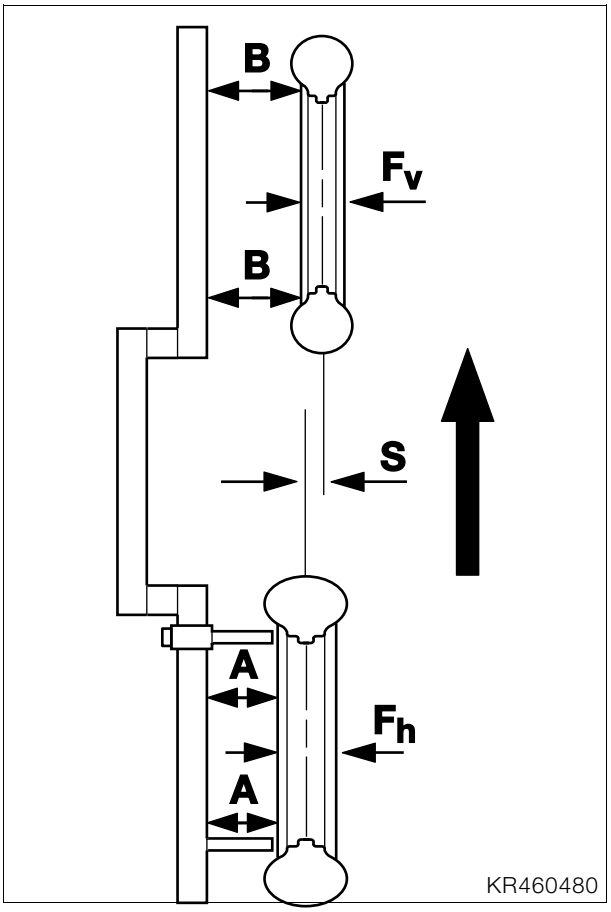
- Place motorcycle on level ground on centre stand.
- Place track alignment gauge, **BMW No. 36 3 920**, against the left or right side of the motorcycle.

Note:
In order to use the track alignment gauge on either the left or right side, simply screw the supports in on the other side.

- Adjust support (1) so that the measuring plane is as close as possible to the wheel centreline. The gauge must slide freely up to the motorcycle.
- Adjust measuring stops (arrows) until they contact the rim – not the tyre.
- Attach hook (2) to wheel spoke to secure the gauge firmly to the wheel.
- Align front wheel parallel with the gauge.
- Measure distance between outer edge of gauge and wheel rim, using depth gauge (3) or ruler, and make a note of the distance.
- Calculate wheel track offset S:
- Wheel track offset S is the distance to left or right between the longitudinal axes of the front and rear wheels.

Track offset (S): .....+ 4.5 mm (0.18 in) (= to right)
Permissible wheel track offset (S):
..... ±9 mm (0.35 in): datum is + 4.5 mm (0.18 in)

Key to measurement result:
Minus sign = track offset to left
Plus sign = track offset to right



EXAMPLE:

Formula: $S = A + \frac{F_h}{2} - \left(B + \frac{F_v}{2}\right)$

Fixed value A
(length of measuring stops)

A = 50.0 mm (1.97 in)

Half of rear wheel rim width

$\frac{F_h}{2}$ = 72.5 mm (2.85 in)

Measured value B
(mean value)

B = 70.0 mm (2.76 in)

Half of front wheel rim width

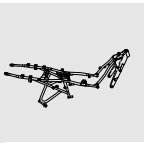
$\frac{F_v}{2}$ = 54.5 mm (2.16 in)

Track offset S

$S = A + \frac{F_h}{2} - \left(B + \frac{F_v}{2}\right)$

S = 122.5 mm – 124.5 mm (4.82 in - 4.92 in)

Track offset S = – 2.0 mm (–0.10 in)



51 Equipment

Contents

Page

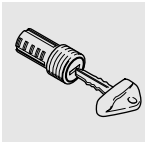
Removing and installing ignition switch/steering lock 3

Removing and installing ignition/light switch 3

Removing and installing lock barrel 3
Drilling out lock barrel 3

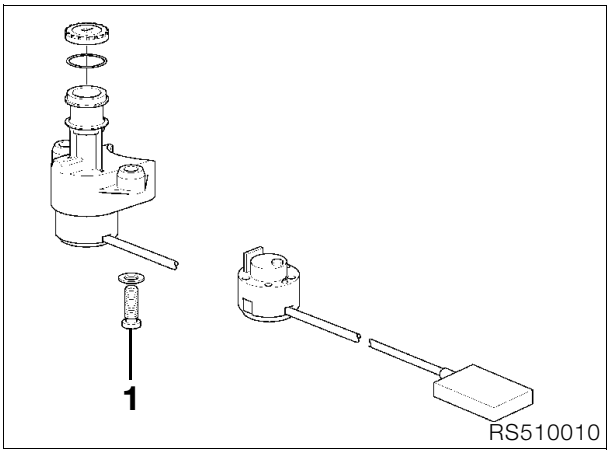
Removing and installing dualseat lock 3

Removing and installing lock barrel for fuel tank filler cap 4
Drilling out lock barrel 4





Removing and installing ignition switch/steering lock

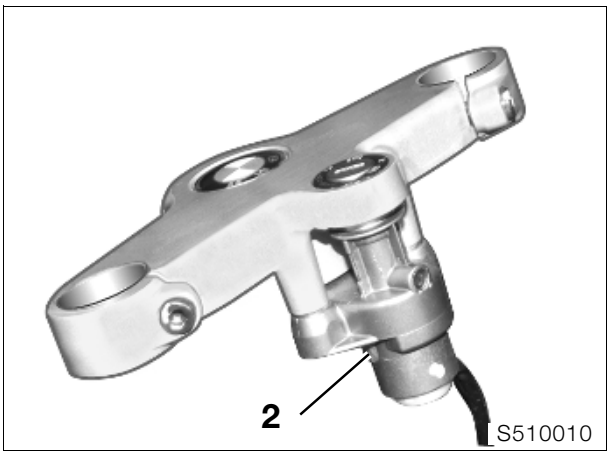


- Remove fork bridge.
- With a 4 mm (0.16 in) dia. drill bit, drill approx. 5 mm (0.20 in) into non-removable screw (1).
- Use an 8 mm (0.31 in) dia. drill bit to drill away the screw head.
- Pull out the ignition switch/steering lock.
- Unscrew and remove remainder of screw with stud bolt extractor.
- Install steering lock with non-removable socket wrench insert, **BMW No. 51 0 531**.

Tightening torques:

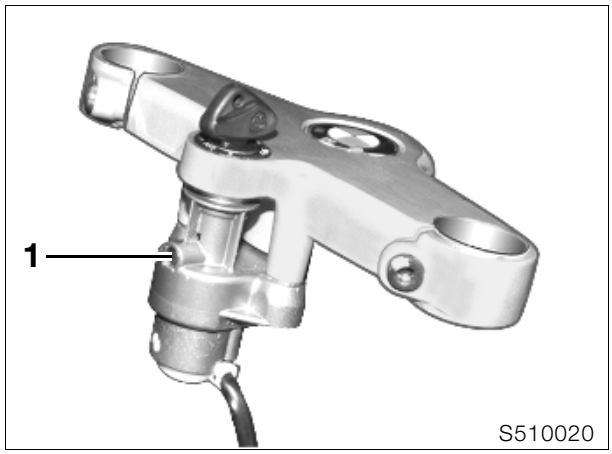
Non-removable screws (microencapsulated) ..... 15 Nm

Removing and installing ignition/light switch

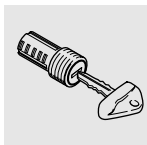


- Remove socket head cap screw (2).

Removing and installing lock barrel



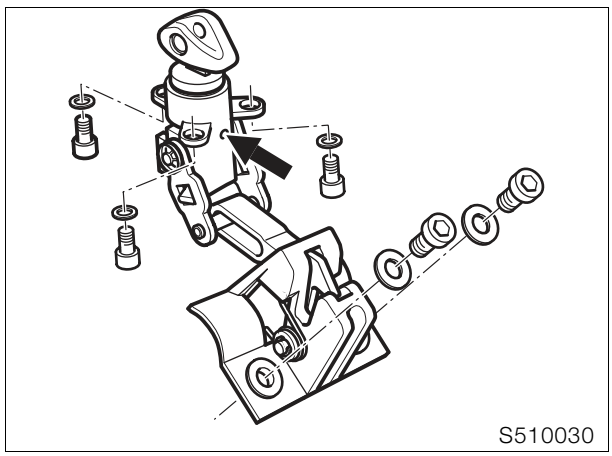
- Key in ON position/press in keeper (1) with a stiff wire or similar.
- Pull out lock barrel with key.
- Lubricate the new lock barrel with **Shell Retinax A**.
- Insert the lock barrel with the key in the ON position.
- Press lock barrel down until keeper engages.



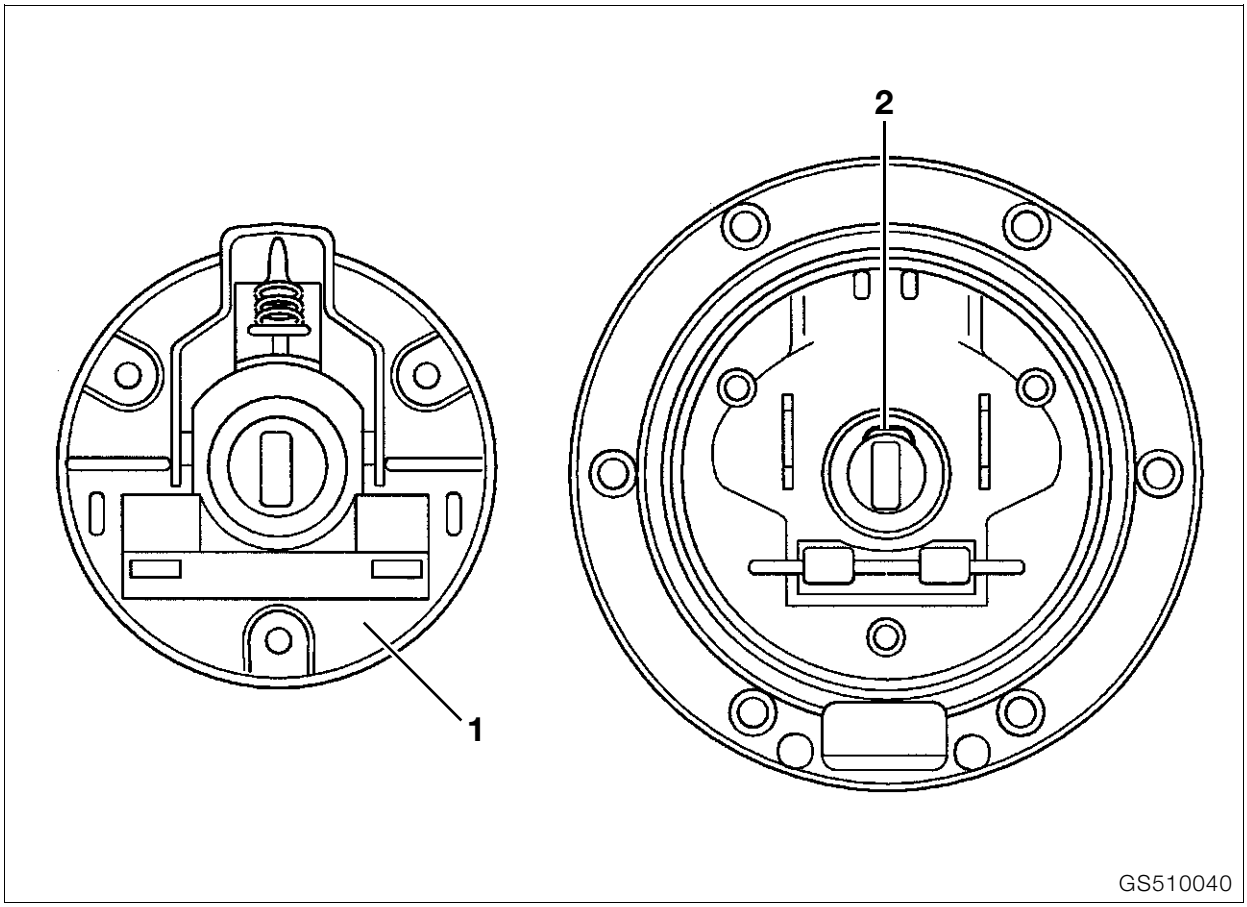
Drilling out lock barrel

- Use a 4-5 mm (0.16-0.20 in) dia. drill bit to drill the full length of the lock barrel.
- Repeat with a drill bit of larger diameter until the lock barrel can be removed.

Removing and installing dualseat lock



- Remove seat.
- Remove dualseat lock
- Press in keeper (arrow) with a length of wire or similar.
- Pull out lock barrel with key.
- Lubricate the new lock barrel with **Shell Retinax A**.
- Press lock barrel in until keeper engages.



Removing and installing lock barrel for fuel tank filler cap

Note:
Make sure that screws do not fall into fuel tank: cover fuel tank filler neck with cloth.

- Open cap and remove lower part of cap (1).
- Insert key in lock barrel and press down on retainer (2).
- Pull out lock barrel with key.
- Lubricate the new lock barrel with **Shell Retinax A**.
- Install lock barrel with key (at a right angle to direction of travel).
- Installation is the reverse of the removal procedure.

Drilling out lock barrel
- Use a 4-5 mm (0.16-0.20 in) dia. drill bit to drill the full length of the lock barrel.
- Repeat with a drill bit of larger diameter until the lock barrel can be removed.

52 Seat

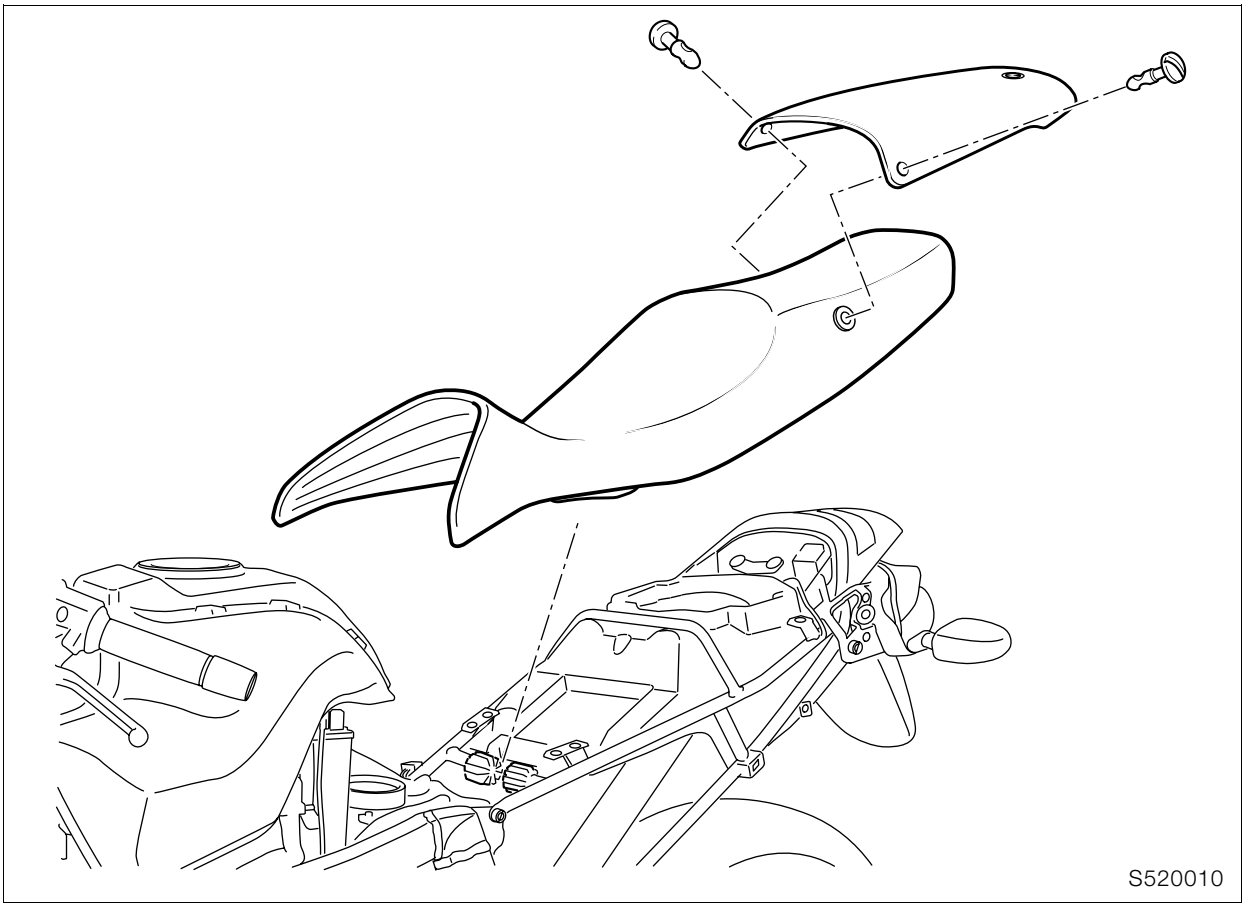
Contents

Page

Removing and installing seat 3







Removing and installing seat



61 General electrical equipment

Contents

Page

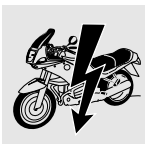
Technical Data 3

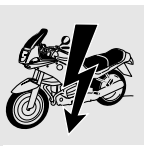
Relay positions (central electrical equipment box) 5
- Fuse assignments 5
- Left fuse box 5
- Right fuse box 5

Frame wiring harness 6

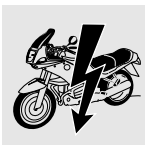
Wiring harness
View from left 7

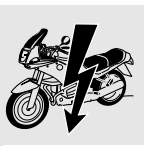
Wiring harness
View from right 11

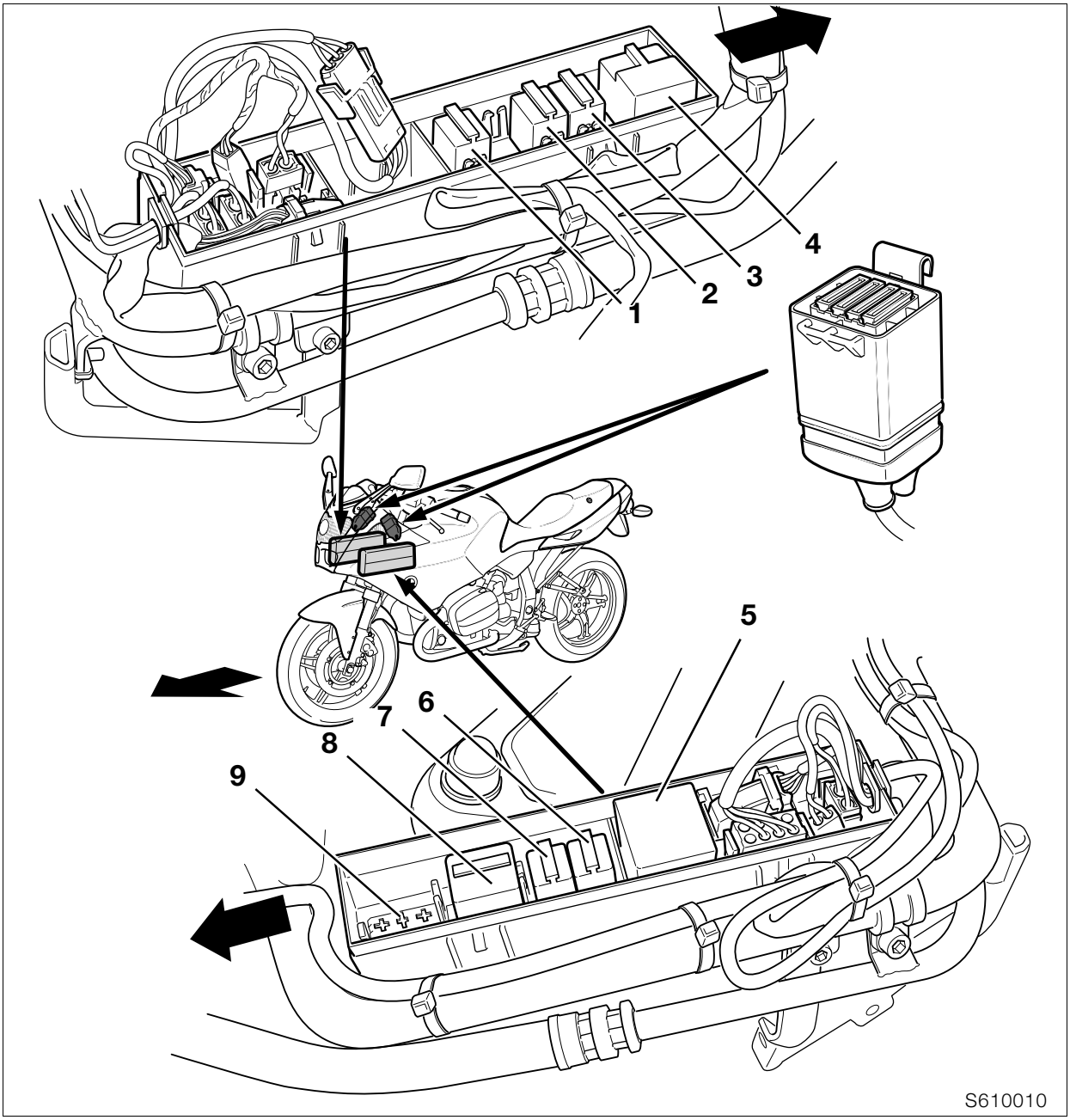




Technical Data		R 1100 S
Battery	A/h A/h	14 Option: 19







Relay positions (central electrical equipment box)

1. ABS warning relay
2. Relief relay
3. Horn relay
4. Indicator damping
5. Flasher unit
6. Fuel pump relay
7. Motronic relay
8. Starter motor relay
9. Coded plug for Motronic

Fuse assignments

Left fuse box
(No. 1 on left, looking forwards)

1. Instrument panel, controller for fuel warning lamp or indicator damping, brake light ..... 4 amps
2. Rear light, parking light, number-plate light ..... 4 amps
3. Instrument panel, horn, power socket .. 15 amps
4. Fuel pump, Motronic ..... 15 amps

Right fuse box
(with options)

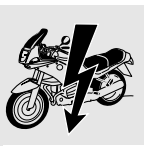
5. Not used
6. Heated handlebar grips..... 4 amps
7. Not used
8. Not used

Frame wiring harness

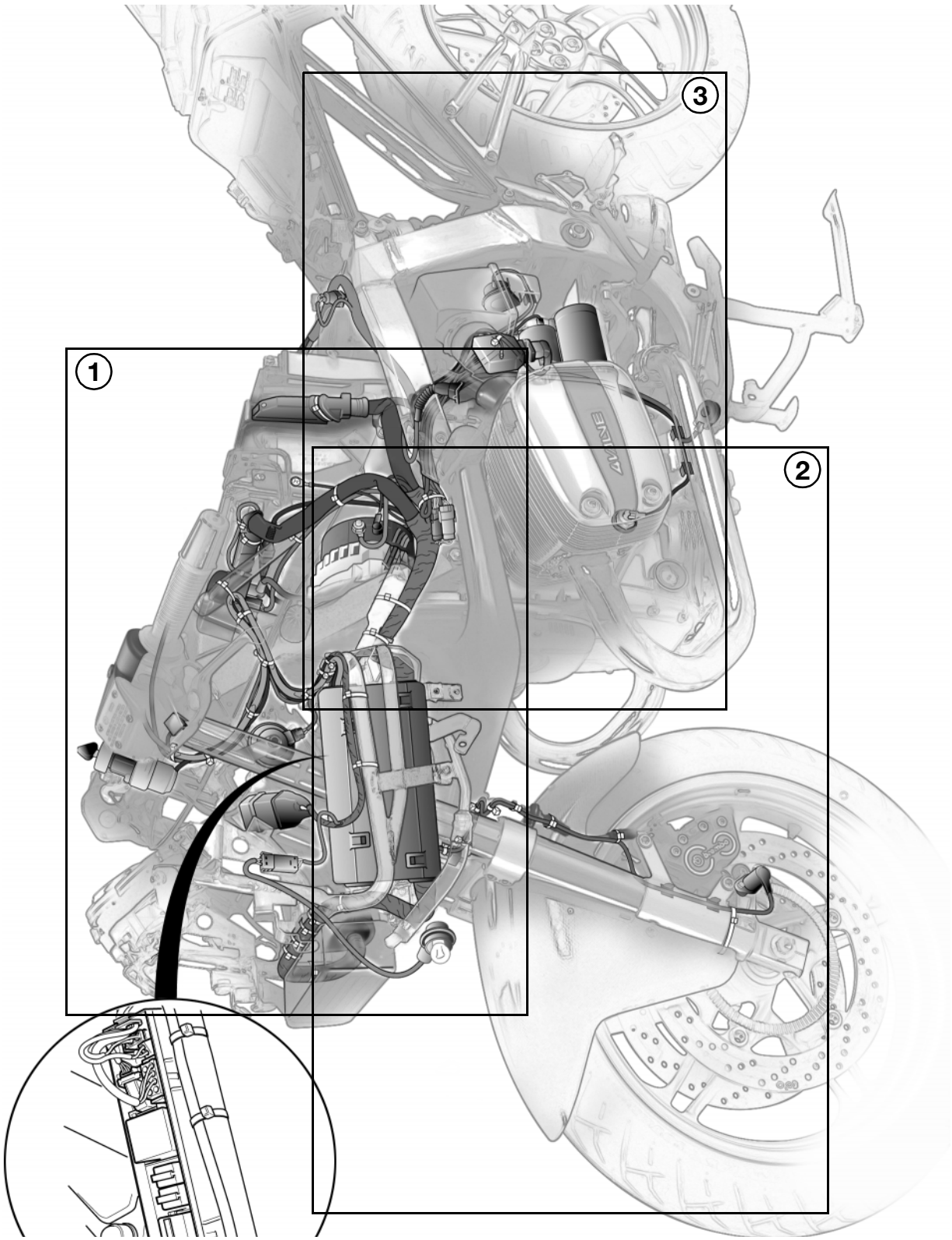
Caution:
Use (yellow) galvanized screws for the ground (earth) connection to the engine.
Screws with unsuitable corrosion proofing can cause the electrical resistance to rise as high as 80 Ω.
Run wiring without kinking and avoid risk of abrasion.
Note the number and position of the cable straps.

- Apply a thin coating of contact grease, e.g. **CENTOPLEX 3 CU** to the central earth (ground) point, which must be cleaned to bright metal first.

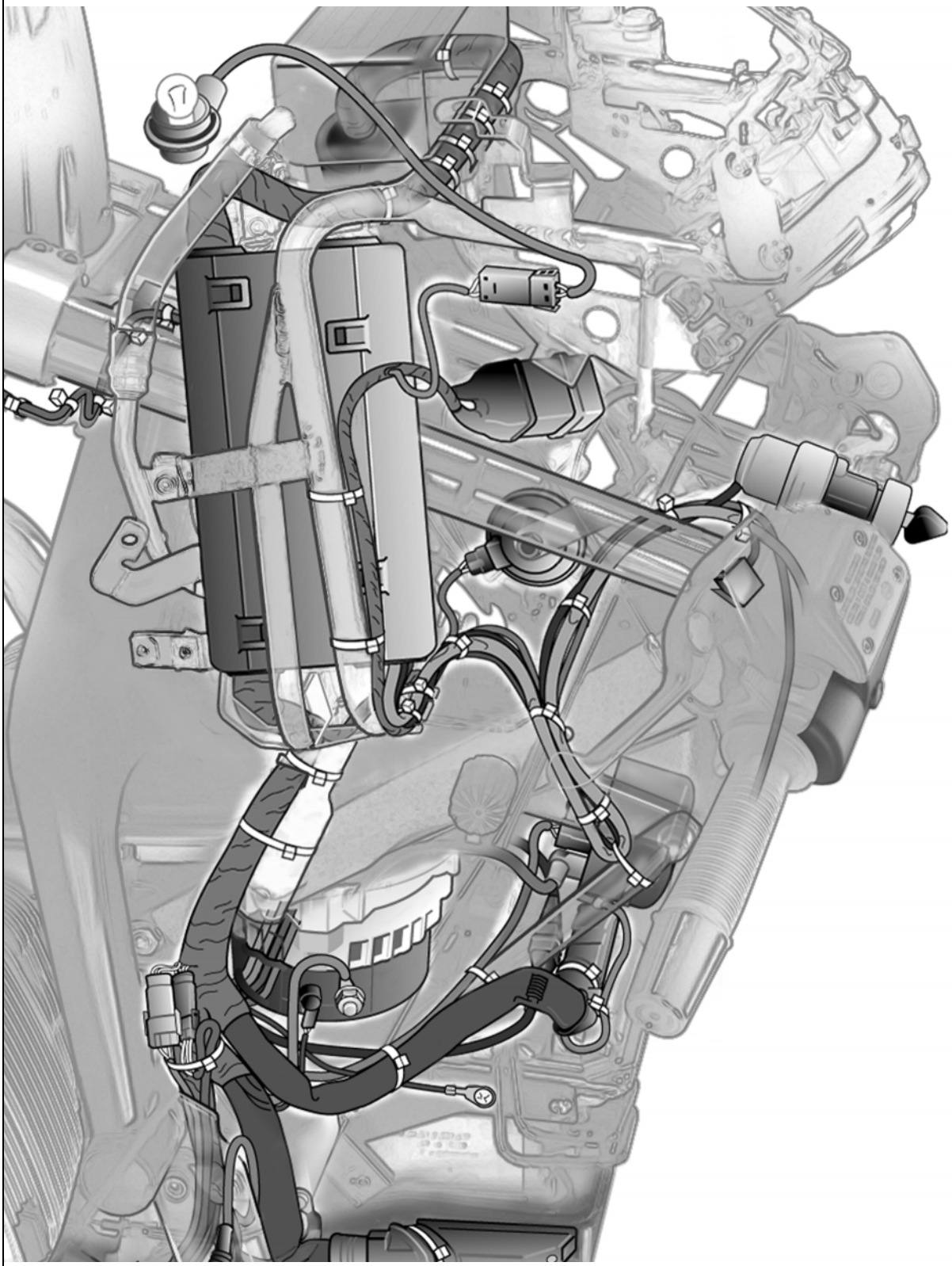
Tightening torques:
Ground (earth) connection to engine ..... 7 Nm



Wiring harness
View from left

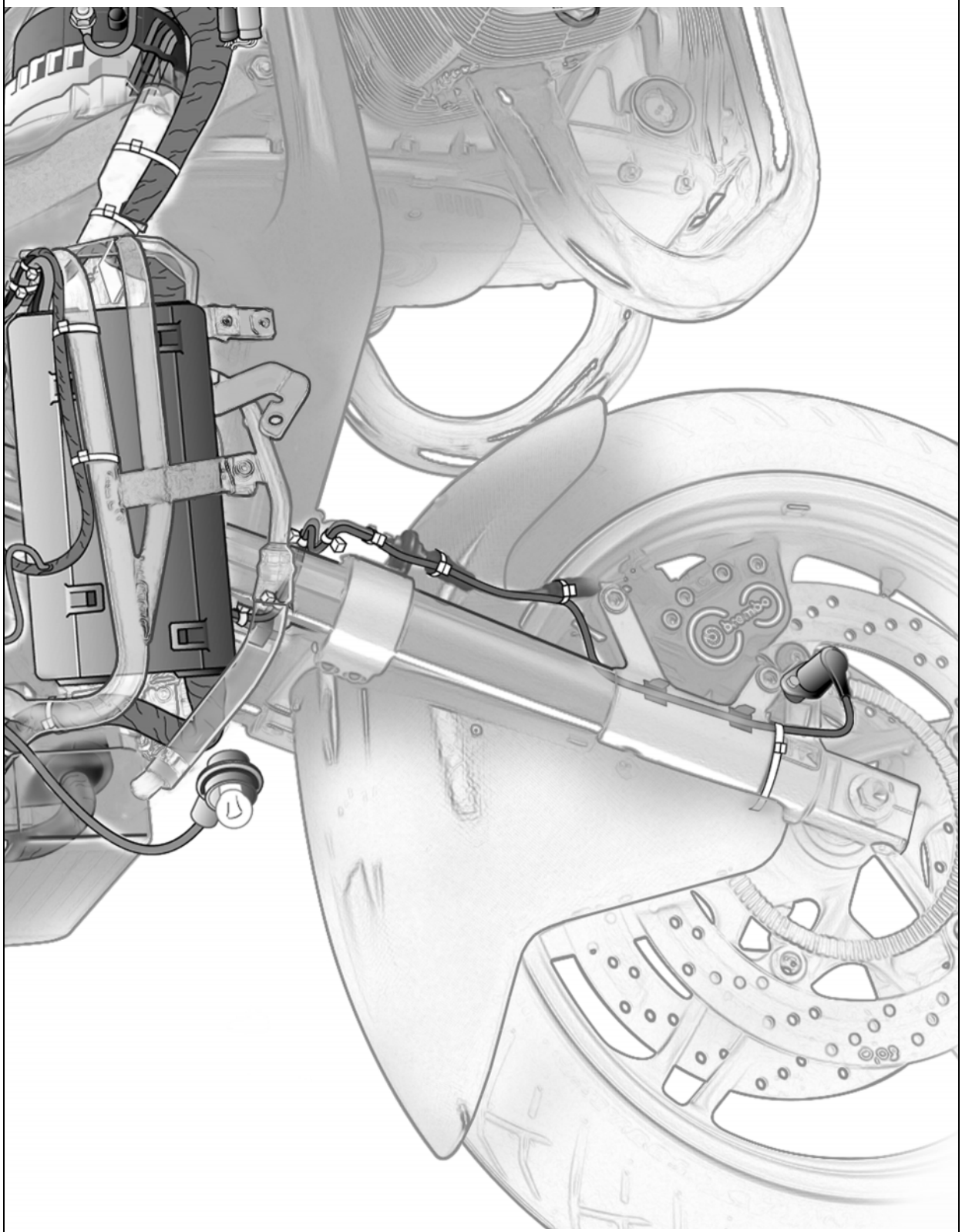


S619010



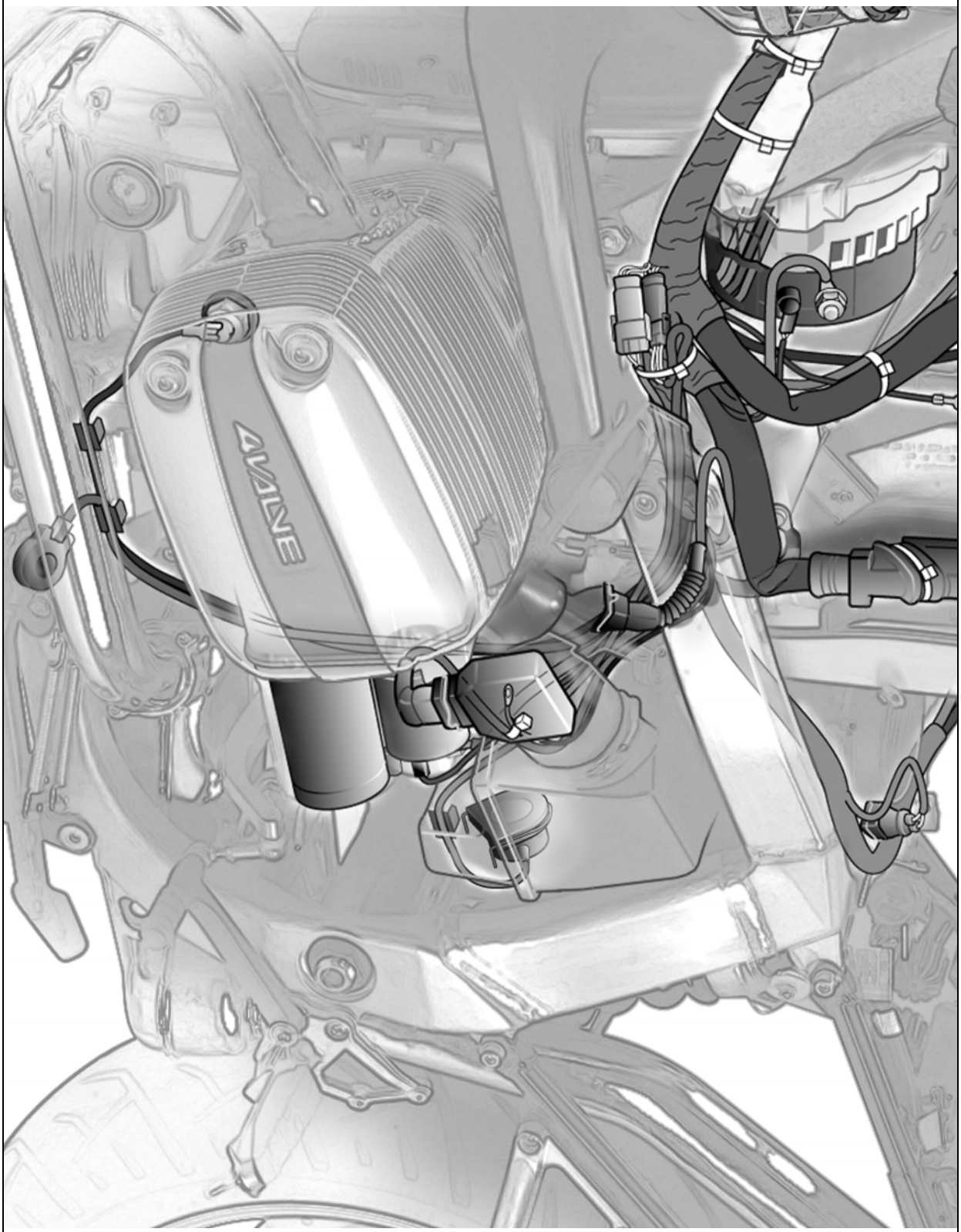
S619011

2



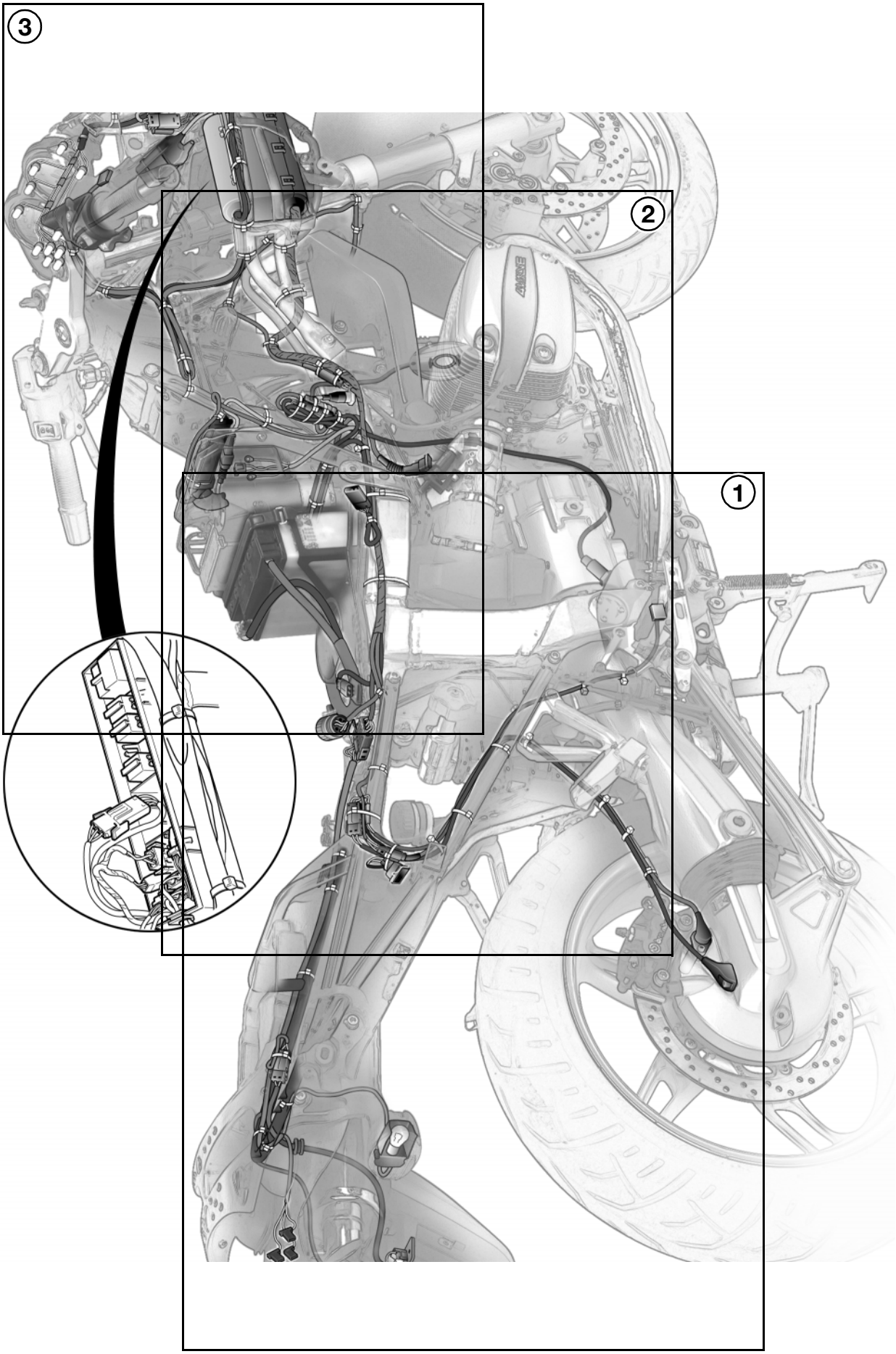
S619012

③

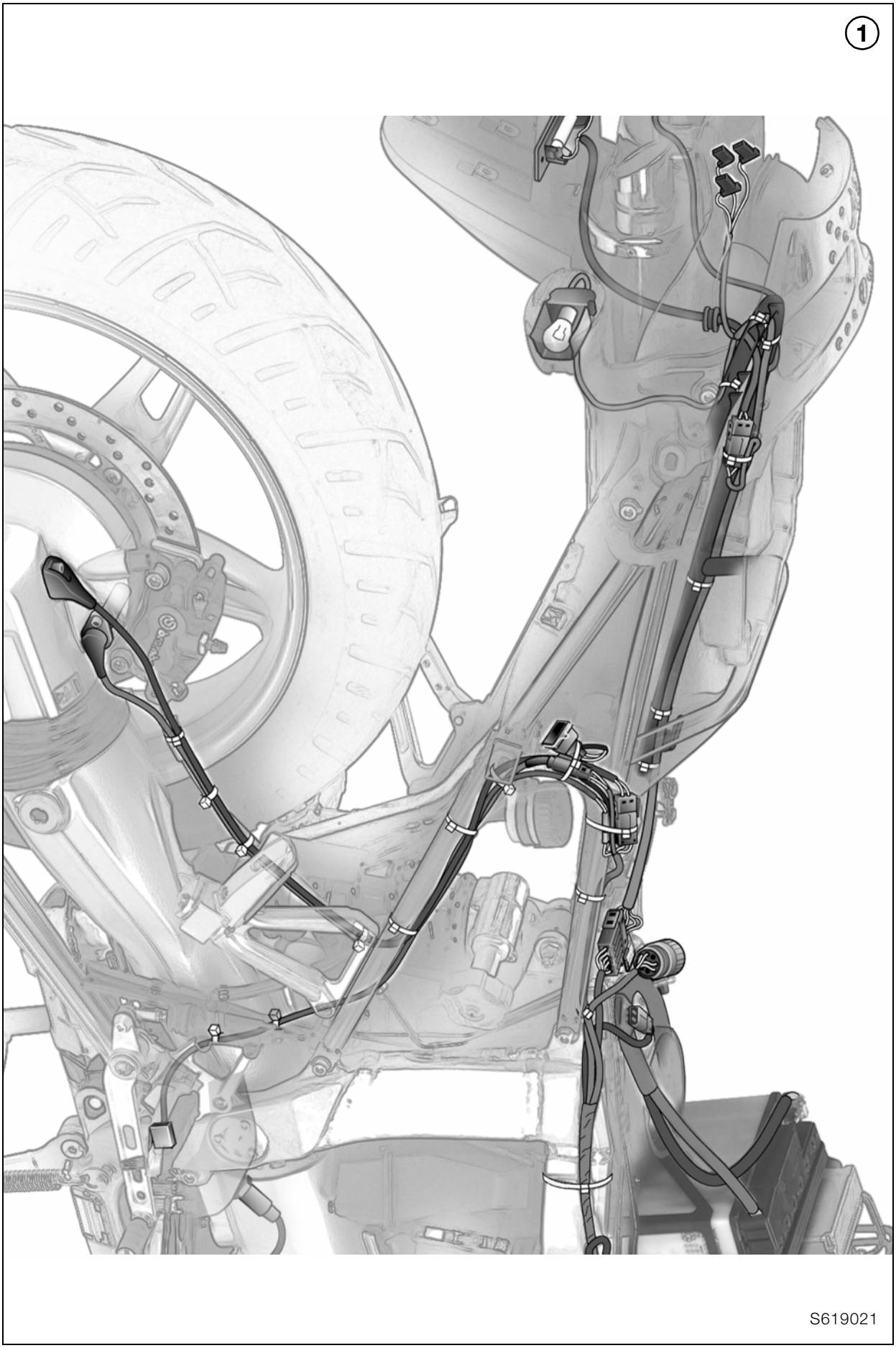


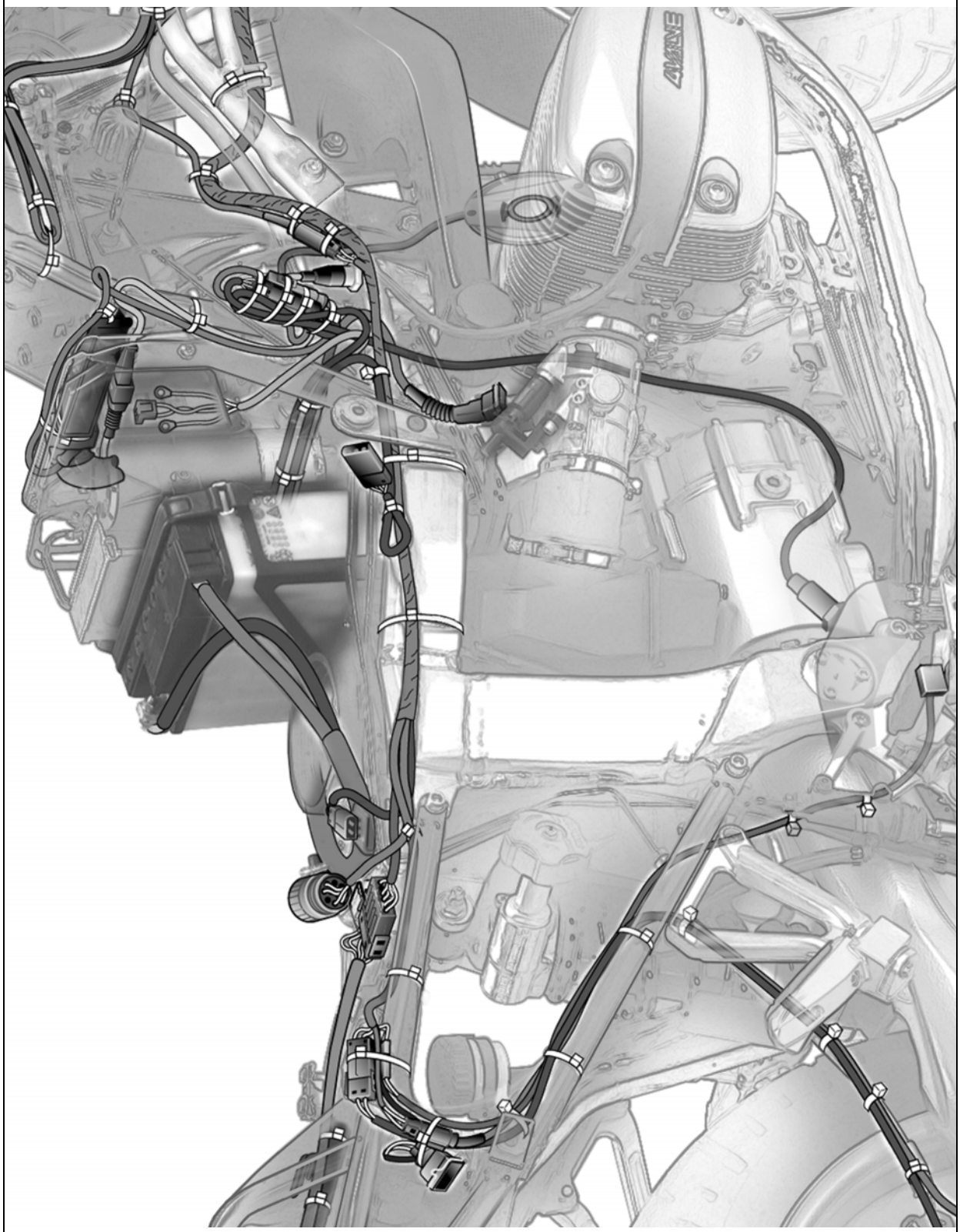
S619013

Wiring harness View from right

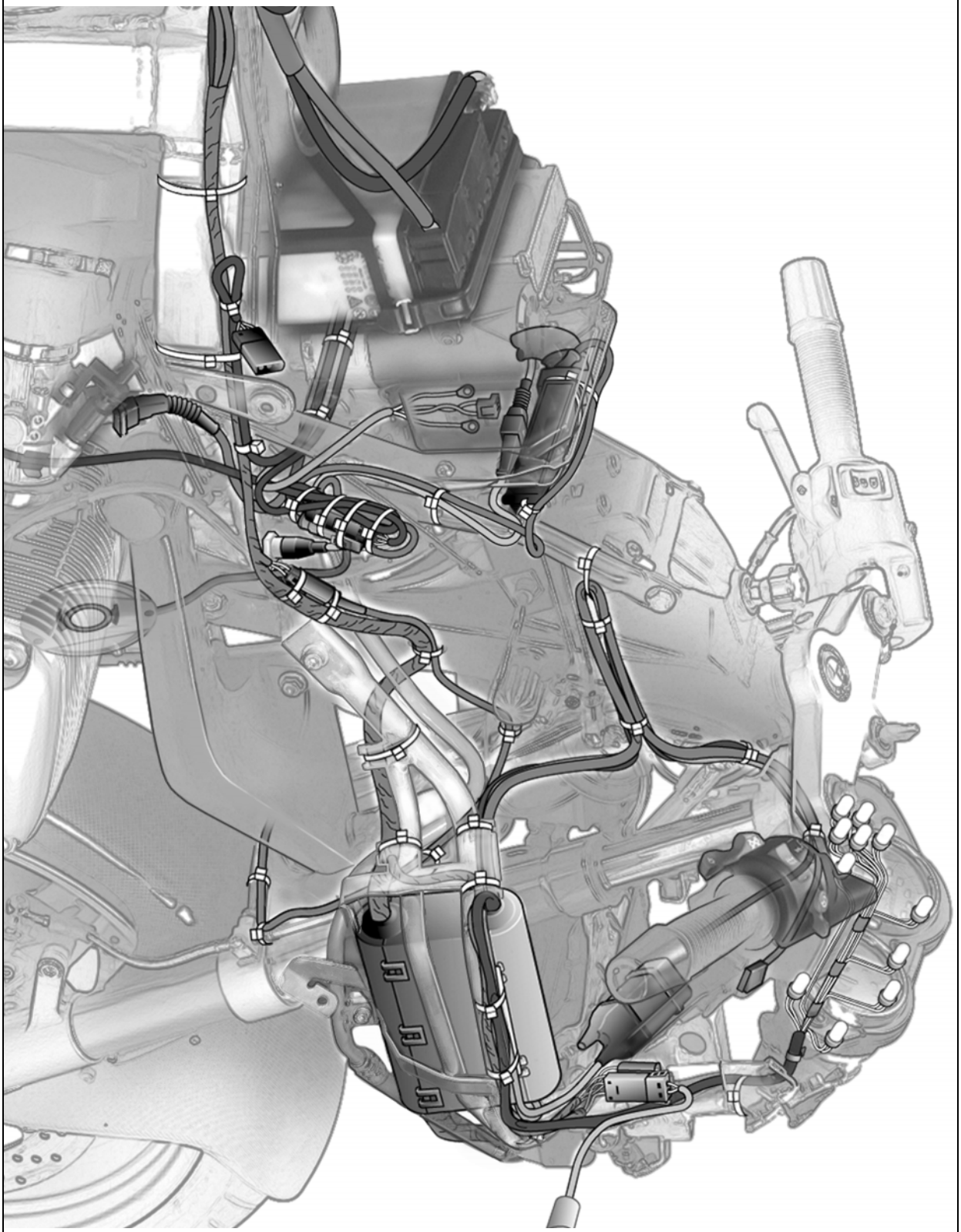


S619020


1
S619021



S619022


3
S619023

62 Instruments

Contents

Page

Technical Data 3

Removing and installing instrument panel 5

Disassembling and assembling instrument panel 5

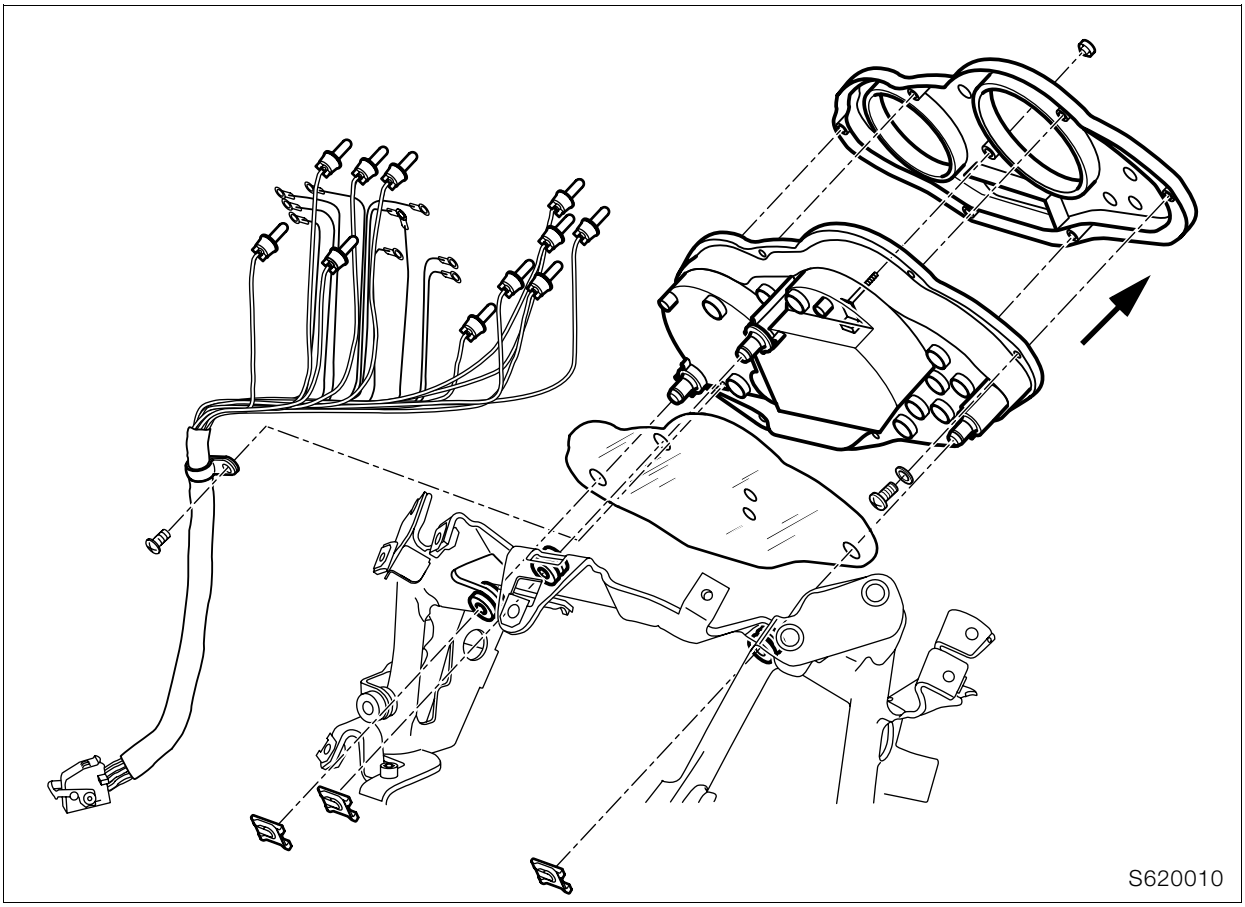




Technical Data	R 1100 S
Instrument cluster	
Instrument lighting	T6.5 12 V 3 W
Telltale and warning lights	T6.5 12 V 1.7 W







Removing and installing instrument panel

- Remove side panels.
- Remove mirrors.
- Remove fairing.
- Open electrics box on right.
- Disconnect plug of instrument panel.
- Remove fuses from instrument panel.
- Remove instrument panel.
- Installation is the reverse of the removal procedure.

Disassembling and assembling instrument panel

- Remove foil.
- Remove screws securing bottom of housing to top.
- Remove cap from reset knob for tripmeter.
- Remove top of housing.
- Remove rev. counter, speedometer and/or clock.
- Remove bulbs.
- Assembly is the reverse of the disassembly procedure.

⚠ Caution:
When reassembling, make sure that gasket is correctly seated.



63 Lights

Contents

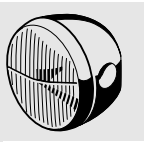
Page

Technical Data 3

Removing and installing headlight 5

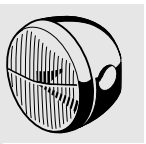
Adjusting headlight 5

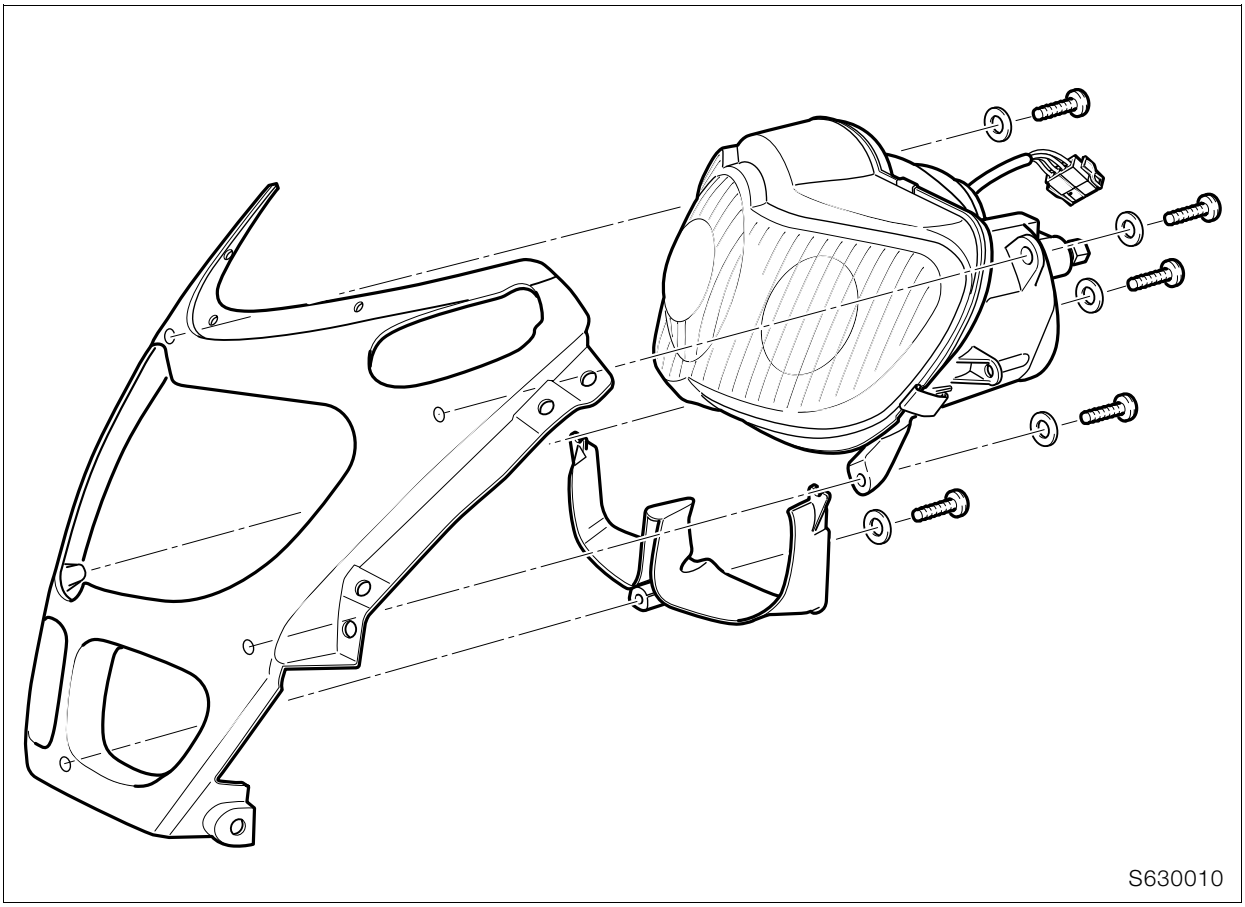




Technical Data	R 1100 S
Headlight	Twin halogen headlights Low (dipped) beam headlight: Projection type High (main) beam headlight: Free-form type
Bulbs	
Low (dipped) beam headlight	H 1 halogen bulb, 12 V 55 W
High (main) beam headlight	H 7 halogen bulb, 12 V 55 W
Parking light	12 V/5 W Standard designation W 5 W
Rear light/brake light	12 V / 5/21 W Standard designation P 21/5 W
Flashing turn indicator	12 V/21 W Standard designation P 21 W
Registration-plate light	12 V/5 W Standard designation C 5 W





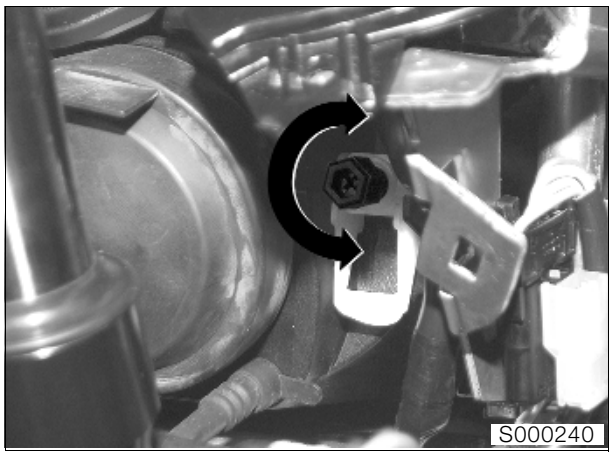


Removing and installing headlight

Caution:
Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.
Do not touch inner surface of reflector or bulbs with bare hands.

- Remove side panels.
- Remove mirrors.
- Remove the windscreen.
- Disconnect headlight plug from socket at front right fairing bracket.
- Remove screws securing the front fairing panel.
- Remove front fairing panel complete with headlight.
- Remove headlight.
- Installation is the reverse of the removal procedure.
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.



Adjusting headlight

- Motorcycle on level surface.
- Rider's weight on motorcycle (approx.80 kg/ 176 lbs).
- Move swivel lever to horizontal position (basic setting).
- Turn the adjusting screw to correct the headlight beam throw.

Lateral adjustment:
..... Adjusting screw on left of headlight.
Vertical adjustment:
.....Adjusting screw on right of headlight.
Turn screw anti-clockwise:..... longer throw
Turn screw clockwise: ..... shorter throw
Setting:
.... -12 cm (-4.7 in) over a distance of 10 m (32.8 ft)

