Repair Manual

R 1150 RT

BMW Motorrad
After Sales

Published by ©BMW Motorrad
After Sales
UX-VS-2

Produced in Germany 07/2001

Introduction

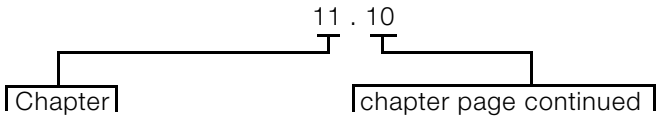
This repair manual will help you to perform all the main maintenance and repair work correctly and efficiently. If it is consulted regularly by workshop personnel it will form a useful addition to the theoretical and practical knowledge acquired at the BMW Training Centre. It is a contribution towards achieving even higher Service quality.

A new issue of this repair manual will be published if amendments or additions (supplements) are needed.

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 complete contents are divided into individual chapters, corresponding to the unified construction groups (U.P.G., referred to here as "Group").



If a reference is needed to a different page or chapter, an arrow symbol is shown followed by the chapter and page numbers, e.g. (➟ 12.5)

- 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, as an additional source of information, the Electronic Parts Catalogue (ETK), which contains clear and easy-to-follow illustrations.

When individual steps within an overall operation only apply to motorcycles with specific accessories or optional equipment, the options the steps refer to are identified in brackets at the beginning of the line. Example: **[heated grips]**.

Please devote your careful attention to the following pages with their explanations describing the symbols used in the manual and their significance.

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How to use this manual

Each chapter starts with the list of contents.

The list of contents is followed by the Technical Data table.

Key to symbols

In this Repair Manual for the R 1150 RT model, the following symbols are used; their meanings are explained in the table.

Special instructions aimed at improving the work procedures

Note:
Specific information on operating, inspecting and adjusting work for the motorcycle as well as maintenance procedures.

Attention:
Instructions and precautions specifically intended to prevent damage to the motorcycle. Failure to comply with them could invalidate the warranty.

Warning:
This symbol stands for precautions and measures which are essential in order to protect the rider or other persons from possibly severe or fatal injury.

Contents

The titles of the tasks described in this chapter..... complete with page numbers

Activities

- Activities
- The bullet symbol means that work steps are described in greater detail under a headline

– preceding activities
– A line indicates work steps described in greater detail under another headline or in another chapter

If the term “undo” or “remove” is used:
the fastener (e.g. screw) must be slackened off and taken out
or
a component (e.g. fuel rail) must be removed to the extent that other components which it conceals (e.g. throttlevalve rail) are accessible

If the term “loosen” or “slacken” is used
the fastener (e.g. screw) must only be slackened off but not taken out

Tightening torque:
Values are stated if they differ from DIN EN 24 014 or DIN 912 ISO industrial standards.

BMW Motorrad
Maintenance schedule
R 1150 RT

Customer	Licence No.	Mileage
Job Order No.	Date	Mechanic's signature

	BMW Inspection at 1,000 km/600 miles	BMW Maintenance Service every 10,000 km/6,000 miles	BMW Inspection every 20,000 km/ 12,000 miles	BMW Annual Service
Use **BMW** MoDiTeC to read stored error codes from fault memory	☐	☐	☐	☐
[Integral ABS] Performing bleed test with **BMW** MoDiTeC	☐	☐	☐	
Change engine oil, warmed to normal operating temperature, replace oil filter **when used exclusively in short-distance operation, or at outside temperatures below 0°C (32 °F), or no later than every 3 months, or every 3,000 km/1,800 miles *)**	☐	☐	☐	☐
Change oil in gearbox, with oil warmed to normal operating temperature **at least every 2 years *)**			☐	■
Change final-drive lubricant, warmed to normal operating temperature **every 40,000 km/25,000 miles, or no later than every 2 years *)**	☐		■	■
Replace fuel filter ***)** **Standard replacement interval is 40,000 km/25,000 miles, with substandard fuel quality every 20,000 km/12,000 miles**			■	
Check battery electrolyte level, top up with distilled water as necessary Battery terminals, clean and grease as necessary			☐	☐
Replace intake air filter element **Replace air filter every 10,000 km/6,000 miles when vehicle is exposed to high levels of dirt and dust, or more frequently as indicated *)**		■	☐	
Check front/rear circuit brake fluid		☐	☐	
Check operation of brake system, inspect for leaks; repair/replace as indicated ***)**			☐	
Check brake pads and discs for wear, replace as required ***)**		☐	☐	
[Integral ABS] Change **wheel-circuit** brake fluid at least **once a year**				☐
[Integral ABS] Change **control circuit** brake fluid at least **every 2 years *)**				■
[Integral ABS] Perform bleed test with **BMW** MoDiTeC				☐
Check clutch operating fluid level		☐	☐	
Change clutch hydraulic circuit fluid ***)** **at least every 2 years**				■
Check rear lug bolts to ensure they are tight	☐			
Check rear wheel bearing play by tilting wheel			☐	
Check swing arm bearings (no play), adjust as required ***)**	☐		☐	
Check operation of side stand switch	☐	☐	☐	☐
Grease the side stand pivot	☐	☐	☐	
Retention poly-V-belt **Re-adjust new poly-V-belt one time at 10,000 km/6,000 miles**		■		
Replace poly-V-belt ***)** **Replace poly-V-belt every 60,000 km/35,000 miles**			■	
Inspect spark plugs		☐		
Replace spark plugs			☐	
Retorque cylinder heads	☐			
Check valve clearance and adjust as necessary	☐	☐	☐	
Check throttle cable for ease of motion, inspect for abrasion and bends, replace as indicated ***)** Check cable free travel Check synchronisation, adjust as necessary	☐	☐	☐	
Final inspection with operation assessment and road safety check: – Condition of wheels and tyres, tire inflation pressure – Clutch, shift mechanism, hand and foot brakes, steering – Lighting and signal indicators, warning and indicator lamps, instruments – Optional equipment – Conduct road test as required	☐	☐	☐	☐

***) Write up on separate invoice; ■ Not part of standard service procedure**

BMW recommends Castrol

BMW Motorrad
Pre-delivery check
R 1150 RT

Customer _____ Licence No. _____ Job Order No. _____ Mechanic's signature _____	**BMW** **Pre-delivery check**
Check the shipping pallet for damage	☐
Unpack the motorcycle	☐
Inspect motorcycle for damage	☐
Check to ensure that consignment is complete: – Vehicle keys – Onboard tool kit and literature – All optional extras	☐
Installing remaining items on motorcycle	☐
Fill and charge battery (record charging date)	☐
[Integral ABS] Perform bleed test with **BMW** MoDiTeC	☐
Check engine oil when cold, correct as required	☐
Check tyre pressures	☐
Check tightness of rear lug bolts (note torque specification!)	☐
Fill with fuel	☐
Check headlight beam angle, adjusting if necessary	☐
Final inspection and function check – Clutch, shift mechanism – Handbrake and foot brake – Lighting and signal indicators, warning and indicator lamps, instruments – Check operation of standard and optional equipment – Road test as indicated	☐
Confirm pre-delivery check in "Service and Technical Booklet"	☐
Final cleaning	☐
Vehicle delivered on:	

BMW Motorrad
Service data
R 1150 RT

Item	Desired value	Units / Specifications
Oil capacities		
Engine (with filter)	3.75 (6.6)	litres (Imp. pints) [SI 11 048 90]
Engine (without filter)	3.5 (6.15)	litres (Imp. pints) [SI 11 048 90]
Transmission Initial filling	approx. 1.0 (1.76) up to lower edge of filler hole	litres (Imp. pints) Brand-name hypoid gear oil, SAE class GL 5 SAE 90
Transmission oil change	approx. 0.8 (1.41) up to lower edge of filler hole	litres (Imp. pints) Brand-name hypoid gear oil, SAE class GL 5 SAE 90
Rear wheel drive Initial filling/oil change	approx. 0.25 (0.44) up to lower edge of filler hole	litres (Imp. pints) Brand-name hypoid gear oil, SAE class GL 5 SAE 90
Valve clearances		measured cold (max. 35 °C/95 °F)
Inlet	0.15 (0.006)	mm (in)
Exhaust	0.30 (0.012)	mm (in)
Ignition timing	adjust at TDC	static setting
Spark plugs	BKR 7 EKC	NGK
Electrode gap	0.8 (0.0315)	mm (in)
Wear limit	1.0 (0.039)	mm (in)
Idle speed	1,100 $^{\pm 50}$	rpm
Throttle cable setting		
for cold-start (increased idle) speed	no play	
for throttle (twistgrip) cable	play approx. 0.5 (0.02)	mm (in)
for divider cable	no play	
Brakes		
Brake fluid		DOT 4
Colour of identification mark on brake calipers/brake pads, front	white	
Minimum front pad thickness	1.0 (0.039)	mm (in)
Minimum rear pad thickness	1.0 (0.039) (wear mark)	mm (in)
Minimum front disc thickness	4.5 (0.177)	mm (in)
Minimum rear disc thickness	4.5 (0.177)	mm (in)
Tyre pressures		depending on load
front	2.2 - 2.5 (31.9 – 36.26)	bar (psi)
rear	2.5 - 2.9 (36.26 – 42.06)	bar (psi)
Tightening torques		
Oil filter	11	Nm
Engine oil drain plug	32	Nm
Gearbox oil filler plug	30	Nm
Gearbox oil drain plug	30	Nm
Rear wheel drive oil filler/drain plug	23	Nm
Fuel tank to rear frame	22	Nm
Fuel pump assembly to tank	5	Nm
Poly-V belt preload	8	Nm
Alternator to cover mount	20	Nm
Brake caliper fasteners, front	30	Nm
Brake caliper fasteners, rear	40	Nm
Rear wheel studs	105	Nm
Tightening cylinder heads		
Nut	unscrew / 20 180	Nm ° tightening angle
M 10 screw	unscrew / 40	Nm
Locknut, valve adjusting screw	8	Nm
Cylinder head cover	8	Nm
Spark plugs	25	Nm

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Group / Chapter

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00 Tightening torques, Table of operating fluids

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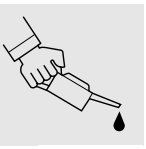
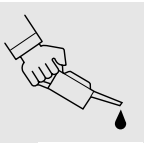


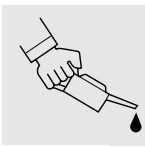
Tightening torques

Model		R 1150 RT
Connection		
11 Engine		
Cylinder head		
Tightening sequence: 1 Tighten cylinder head nuts (oiled) in diagonally opposite sequence		
1.1 Tighten all nuts to closing torque	Nm	20
1.2 Tighten all nuts an additional	°	90
1.3 Tighten all nuts an additional	°	90
2 M 10 screw	Nm	40
3 M 6 screw	Nm	9
After 1,000 km (600 miles), tighten cylinder head nuts in diagonally opposite sequence: 1 Slacken one nut		
2 Tighten nut to initial torque	Nm	20
3 Tighten nut an additional	°	180
4 Slacken and retighten M 10 screw	Nm	40
Timing gear carrier to cylinder head	Nm	9
Bearing cap on rocker shaft	Nm	18
Locknut, valve adjusting screw	Nm	8
Cylinder head cover to cylinder head	Nm	8
Camshaft end cover to cylinder head	Nm	9
Air intake connection to cylinder head	Nm	9
Camshaft		
Chain sprocket to camshaft	Nm	65
Camshaft bearing cap	Nm	15
Alternator mount cover		
M 6 screw	Nm	9
M 8 screw	Nm	20
Auxiliary shaft		
Chain sprocket to crankshaft	Nm	10
Sprocket to auxiliary shaft	Nm	70
Chain tensioner housing to engine block	Nm	9



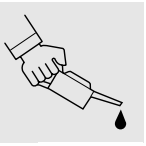
Model		R 1150 RT
Connection		
11 Engine		
Oil filter		
Oil filter	Nm	11
Oil drain plug	Nm	32
Oil pump		
Mesh filter basket to engine block	Nm	10
Oil pump cover	Nm	9
Pressure-relief valve	Nm	42
Oil pressure switch	Nm	30
Oil cooler		
Cooling oil line to engine block	Nm	10
Cooling oil line - banjo bolt with oil vent valve	Nm	25
Oil cooler to bracket	Nm	9
Oil cooler return line to engine block	Nm	35
Oil cooler connection to crankcase	Nm	9
Cylinders		
Tightening sequence:		
1 M 8 screw	Nm	20
2 M 6 screw	Nm	9
3 Chain guide rail pivot screw	Nm	18
Timing chain		
Chain tensioner	Nm	32
Connecting rod		
Big end cap		
Initial torque	Nm	20
Then tighten an additional	°	80
Crankcase		
Tightening sequence:		
M 10 screw (oiled) to initial torque	Nm	25
Wrench angle	°	90
M 8 screw	Nm	22 (oiled)
M 6 screw	Nm	9

Model		R 1150 RT
Connection		
12 Engine electrics		
Starter motor to engine	Nm	20
Positive lead to starter motor	Nm	10
Alternator to alternator mount cover	Nm	20
Tensioning and retaining link to alternator	Nm	21
Spacer to alternator	Nm	21
Positive lead to alternator	Nm	15
Belt pulley to alternator	Nm	50
Belt pulley to crankshaft	Nm	50
Poly-V belt preload	Nm	8
Spark plug NGK BKR 7 EKC	Nm	25
Model		**R 1150 RT**
Connection		
13 Fuel preparation and control		
Temperature sensor, oil, in crankcase	Nm	25
Temperature sensor, air, in air-filter housing	Nm	10
Model		**R 1150 RT**
Connection		
16 Fuel tank and lines		
Fuel tank to rear frame	Nm	22
Fuel pump assembly to tank	Nm	5
Model		**R 1150 RT**
Connection		
18 Exhaust system		
Manifold to cylinder head	Nm	21
Clamp for manifold	Nm	55 (apply Optimoly TA to clamp seat)
Silencer to footrest plate	Nm	35
Oxygen sensor to silencer	Nm	45 (apply Optimoly TA to thread)



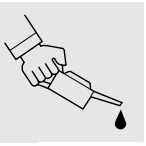
Model		R 1150 RT
Connection		
21 Clutch		
Clutch housing		
Initial torque	Nm	40 (oil screw threads lightly)
+ Additional wrench angle	°	32
Housing cover to housing	Nm	12
Clutch line to handlebar fitting	Nm	14
Slave cylinder to gearbox	Nm	9
Grub screw in filler adapter	Nm	10
Model		**R 1150 RT**
Connection		
23 Transmission		
Oil drain plug	Nm	30
Oil filler plug	Nm	30
Gearbox to engine block	Nm	22
Shift lever to footrest plate	Nm	35
Selector lever to selector shaft	Nm	9
Housing cover to housing	Nm	9
Frame tube to gearbox		
1. to gearbox and left footrest plate	Nm	42 (clean thread + Loctite 2701)
2. terminal block, frame tube to gearbox	Nm	9
3. to gearbox and right footrest plate	Nm	42 (clean thread + Loctite 2701)

Model		R 1150 RT
Connection		
31 Front forks		
Quick-release axle clamp screws	Nm	22
Slider tube bridge to slider tube	Nm	25 (clean thread + Loctite 243)
Threaded fastener, fixed tube to fork bridge	Nm	45 (free from oil and grease)
Threaded stud to frame	Nm	130 (clean thread + Loctite 243)
Ball joint to slider tube bridge	Nm	230 (lightly grease threads with Optimoly TA)
Leading link		
Leading link to ball joint	Nm	130 (clean thread + Loctite 2701)
Leading link to engine		
Right		73
Left-hand screw cap		42 (lightly grease threads with Optimoly TA
Spring strut		
Spring strut to front frame	Nm	43
Spring strut to leading link	Nm	50
Model		**R 1150 RT**
Connection		
32 Steering		
Handlebars to fork bridge	Nm	21
Handlebar weight to handlebars	Nm	21
Pivot screw, handlebar lever	Nm	11 (Tuflok Blue thread-locking compound; screw can be released and tightened a number of times)



Model		R 1150 RT
Connection		
33 Rear wheel drive		
Crown gear and pinion assembly		
Oil filler plug	Nm	23
Oil drain plug	Nm	23
Threaded ring	Nm	160 (clean thread + Loctite 577)
Hexagon nut, input bevel gear	Nm	200 (clean thread + Loctite 2701)
Cover to final drive housing	Nm	35
Swinging arm		
Reaction link to final-drive unit	Nm	43 (load approx. 85 kg/approx. 187 lbs) onto motorcycle and tighten loose reaction link)
Fixed bearing stud bolt, swinging arm to right rear axle housing	Nm	160 (clean thread + Loctite 2701)
Floating bearing stud bolt, swinging arm to left rear axle housing		
1. Initial torque	Nm	9
2. Slacken		
3. Final torque	Nm	7 (clean thread + Loctite 2701)
Lock nut, floating bearing stud bolt, swinging arm to left rear axle housing	Nm	160
Fixed bearing stud bolt, swinging arm to right of gearbox	Nm	160 (clean thread + Loctite 2701)
Floating bearing stud bolt, swinging arm to left of gearbox		
1. Initial torque	Nm	9
2. Slacken		
3. Final torque	Nm	7 (clean thread + Loctite 2701)
Lock nut, floating bearing stud bolt, swinging arm to left of gearbox	Nm	160
Spring strut		
Spring strut to rear frame	Nm	50
Spring strut to rear swinging arm	Nm	58 (clean thread + Loctite 243)
Hydraulic spring adjuster to rear frame	Nm	22

Model		R 1150 RT
Connection		
34 Brakes		
Front brake		
Brake caliper to EVO brake sliding tube	Nm	30
Front brake caliper bleed screw	Nm	7
Brake disc to front wheel	Nm	21 (clean thread + Loctite 2701)
Pivot screw, handlebar lever	Nm	11 (Tuflok Blue thread-locking compound; screw can be released and tightened a number of times)
Rear brake		
Brake caliper to rear wheel drive	Nm	40
Rear brake caliper bleed screw	Nm	5
Brake disc to rear wheel drive	Nm	21 (clean thread + Loctite 2701)
Master cylinder to footrest plate	Nm	9
Brake pedal to footrest plate	Nm	21 (clean thread + Loctite 2701)
Footbrake-lever stop	Nm	9
Brake lines		
Brake lines/brake hose to brake components	Nm	18
Brake hose to brake lever fitting	Nm	18
Filler adapter to brake line	Nm	18
Bracket to front frame	Nm	9
Retainer to rear frame	Nm	9 (clean thread + Loctite 2701)
BMW Integral ABS		
ABS pressure modulator on retainer	Nm	7
ABS pressure modulator on battery carrier	Nm	10
Model		**R 1150 RT**
Connection		
36 Wheels and tyres		
Quick-release axle clamp screws	Nm	22
Quick-release axle threaded fastener	Nm	30
Rear wheel to final-drive unit Hand-tighten wheel studs, then tighten in diagonally opposite sequence	Nm	105



Model		R 1150 RT
Connection		
46 Frame		
Frame		
Frame to engine	Nm	82
Struts to frame	Nm	58
Strut to engine	Nm	58 (clean thread + Loctite 2701)
Rear frame to left/right of engine	Nm	42 (clean thread + Loctite 2701)
Rear frame with footrest plate to left/right of gearbox	Nm	42 (clean thread + Loctite 2701)
Fairing bracket to frame	Nm	20
Side stand		
Mounting bracket to right of engine, M 12 screw	Nm	72 (clean thread + Loctite 2701)
Pivot mount to engine, left		
M 12 screw	Nm	72 (clean thread + Loctite 2701)
M 8 screw	Nm	21 (clean thread + Loctite 2701)
Pivot mount of main (centre) stand (stud bolt)	Nm	21 (clean thread + Loctite 243)
Pivot mount of main (centre) stand (machine screw)	Nm	21
Side stand to pivot mount	Nm	58 (clean thread + Loctite 2701)
Footrest plate		
Footrest plate to left/right of gearbox	Nm	19
Footrest plate to left of rear frame		
M 10 screw	Nm	36
M 8 screw	Nm	19
Footrest plate to right of rear frame		
M 10 screw	Nm	36
M 8 screw	Nm	19
Shift lever to footrest plate	Nm	35

Model		R 1150 RT
Connection		
51 Equipment		
Ignition/steering lock to fork bridge	Nm	20 (micro-encapsulated)
Model		**R 1150 RT**
Connection		
61 General electrical equipment		
Horn to holder	Nm	8 (clean thread + Loctite 243)
Horn to fairing bracket	Nm	10
Ground (earth) cable to engine block	Nm	9
Battery carrier to rubber-metal element	Nm	8
Strut to battery carrier	Nm	10

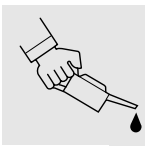
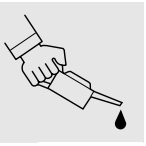
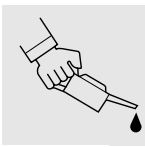


Table of operating fluids



Item	Use	Order No.	Quantity
Lubricant			
Staburags NBU 30 PTM	High-performance lubricating grease	07 55 9 056 992	75 g tube
Optimoly MP 3	High-performance lubricating grease	07 55 9 062 476	100 g tube
Optimoly TA	High-temperature assembly grease	18 21 9 062 599	100 g tube
Silicone grease 300, heavy	Damping grease	07 58 9 058 193	10 g tube
Retinax EP2	Lubricating grease	83 22 9 407 845	100 g tube
Contact spray	Contact spray	81 22 9 400 208	300 ml spray
Chain spray	Lubricant	72 60 2 316 676 72 60 2 316 667	50 ml spray 300 ml spray
Shell HDX2	Variator rolls driven variator plate (pins and bearing)	11 00 7 660 830	400 g tube
Klüber paste 46 MR 401	Lubricating grease	11 00 7 660 831	60 g tube
MOLYKOTE 111	Silicone grease	11 00 7 660 832	100 g tube
Tyre mounting paste	Assembly paste	36 32 1 239 263 36 32 1 239 264	2.5 kg 100 g
Never Seez Compound	Protective grease	83 23 9 407 830	100 g tube
Sealants			
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
Loctite 577	Thread locking compound	33 11 2 328 736	5 g tube
Curil K 2	Heat-conductive sealant	81 22 9 400 243	250 g can
Adhesives and retaining agents			
Loctite 648	Joint adhesive (narrow gap)	07 58 9 067 732	5 g bottle
Loctite 638	Joint adhesive (wide gap)	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

Item	Use	Order No.	Quantity
Cleaners			
Brake cleaner	Cleanser	83 11 9 407 848	600 ml spray
Standard thinner	Cleanser	51 91 9 057 940	1 l bottle
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 aids			
BMW cooling spray	Cooling spray	83 19 9 407 762	300 ml spray



00 Pre-delivery check

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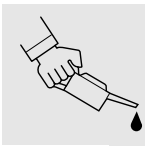
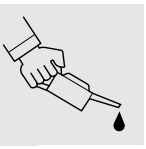
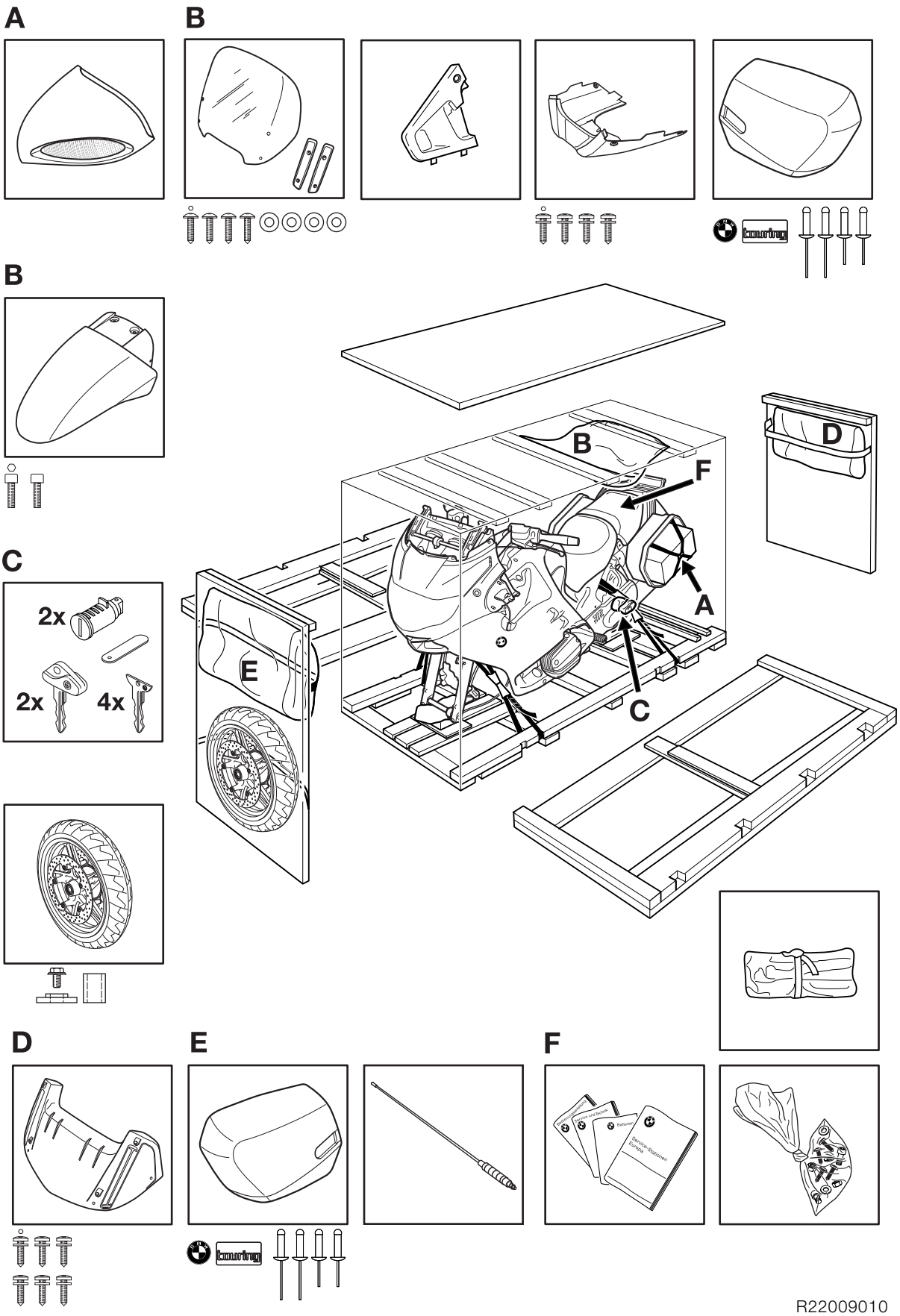




General view of crated motorcycle



Checking the crated motorcycle for damage

- When the motorcycle arrives, check the crated motorcycle 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.
- Notify the supplier without delay (e.g. freight company or DB) and also
  Bavaria Wirtschaftsagentur GmbH
  Abteilung ZW - 12
  80788 München
  Tel. +49 89/14327-632
  Fax. +49 89/14327-709

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
- Notify the supplier (e.g. freight company) without delay.

Unpacking the motorcycle

- Lever off the cover.
- Remove plastic covers.
- Take out the separate pack of items:
- Front wheel
- Case lid
- Aerial
- Windscreen
- Covers
- Engine spoiler
- Cover for windscreen adjuster
- Front mudguard
- Mirrors
- Small parts/fasteners
- Documentation
- Remove the set of keys from the left rear footrest.
- Force off cross-struts with a suitable lever.

Attention:
Do not knock the cross-struts out or the motorcycle may be damaged.

- Remove the end-walls.
- Remove the side-walls.

Attention:
Remove any nails projecting from the base of the crate or lying on the base or on the floor.

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

Inspecting motorcycle for damage

- Check for defects.
- Use the “express handling service” to notify
  BMW Motorrad
  UX-VS-1
  Fax: + 49 89 382 33220
- Rectify the fault.
- If parts are needed, order them through the usual channel.
- 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

Checking that delivery is complete

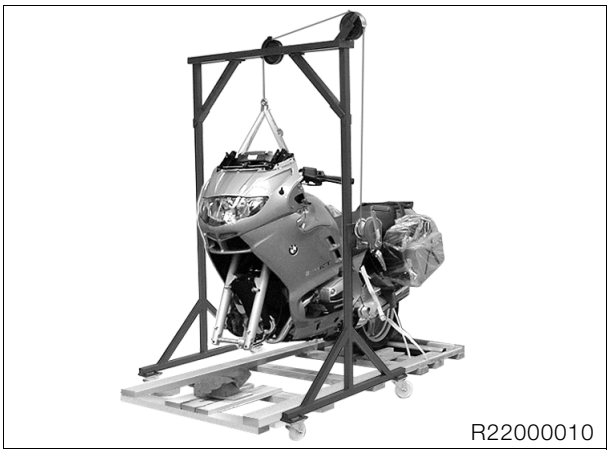
- All optional extras
- Toolkit
- Documentation

Assembling the motorcycle

Installing the front wheel

Attention:
Degrease all brake discs.

- Remove front straps.


R22000010

- Using the straps, secure the front of the motorcycle to the assembly crane, **BMW No. 46 5 640**.

Attention:
Do not damage the brake lines, Bowden cables and fairing panels.

- Raise the front of the motorcycle.

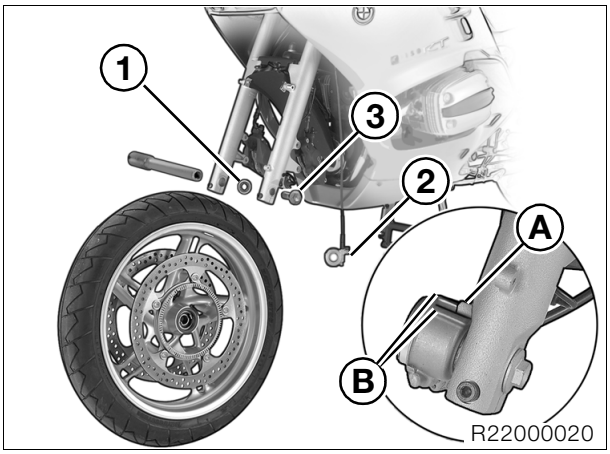
Attention:
Make sure that the motorcycle cannot topple sideways.

- Remove rear straps.
- Using the assembly crane, **BMW No. 46 5 640**, carefully push the motorcycle forward off the pallet.
- Extend the main stand and lower the motorcycle until it is resting firmly on the main stand and the rear wheel.

Warning:
Integral ABS When removing and installing the brake calipers, carefully force back the pistons only far enough to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, top up the level in the wheel-circuit reservoir to the “MAX” mark.

- Remove screws securing the front brake calipers.

Note:
Do not apply handbrake lever or footbrake lever with brake calipers removed/front wheel removed.



R22000020

- Install the front wheel with spacer (1) and speedometer drive (2).

Attention:
Locate stop on slider tube (A) in recess in speedometer drive (B).

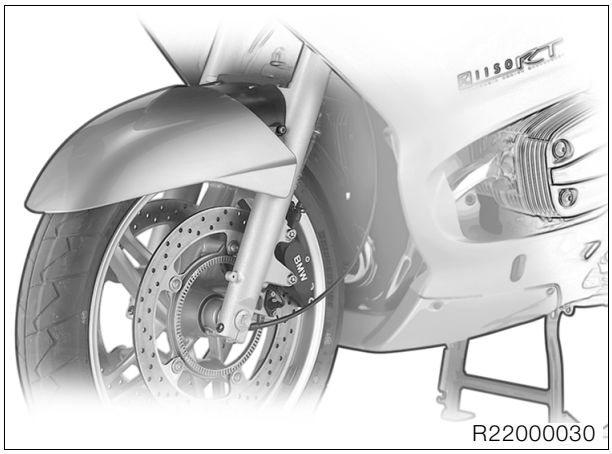
- Tighten the retaining screw (3).
- Install the front brake calipers.
- Release the motorcycle from the assembly crane, **BMW No. 46 5 640**.
- Compress the front fork firmly several times.
- Tighten the clamp screws.

Warning:
The brakes are not ready for use until the brake pads have been bedded against the brake discs with the ignition switched on.

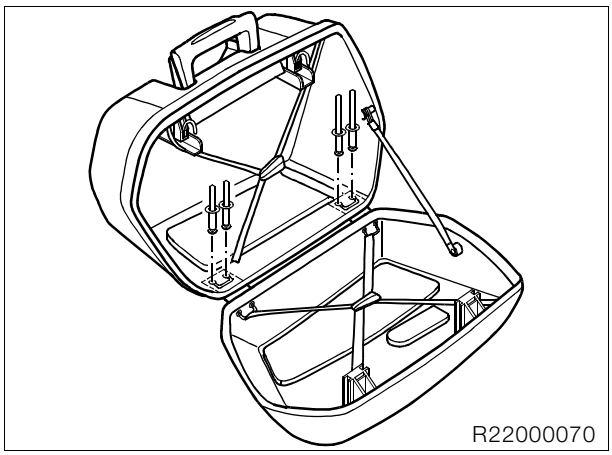
Tightening torque:

Fastener of quick-release axle	30 Nm
Clamping screws of quick-release axle	22 Nm
Brake caliper to fork slider	30 Nm

Installing front mudguard



Assembling case



- Position the lid on the case for alignment. Open the hinges of the lid and guide them into the base with the guide hook.
- From the inside, insert the pop rivets into the base and the hinges.

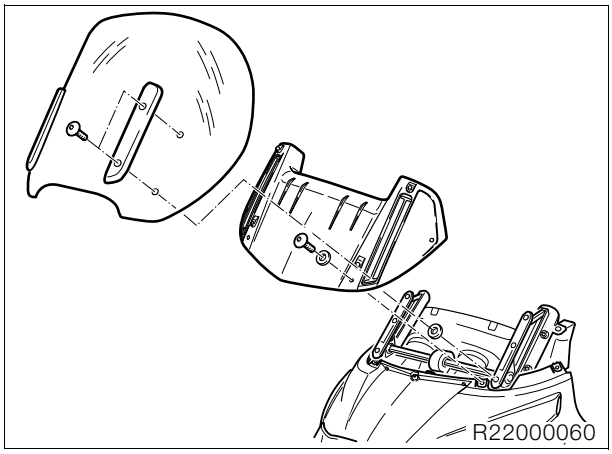
– 2x long rivets in hinge at rear, as viewed in forward direction of travel.
– 2x short rivets in hinge at front, as viewed in forward direction of travel.

- Engage riveting tool on rivets, hold the hinge at the outside to keep it in position and secure all four rivets.
- Oil the seal in the bottom of the case, using the sponge provided for the purpose.

Attention:
Make sure that the seal is not squeezed out of shape and that the lid closes without catching.

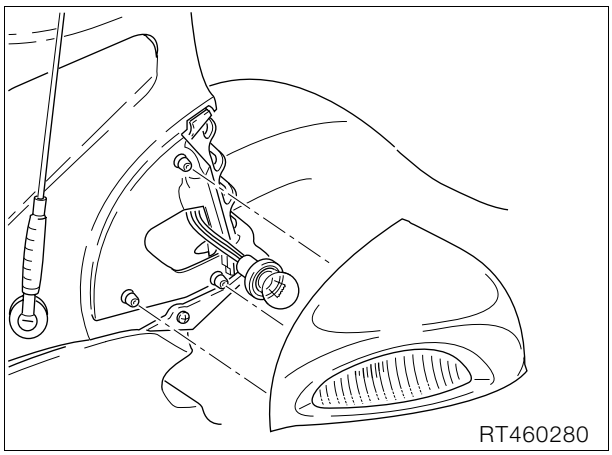
- Carefully close the case.
- Insert the lock cylinder into the case with the key in the lock and turn the lock.
- Affix the stickers.

Installing cover for windscreen adjuster and installing windscreen

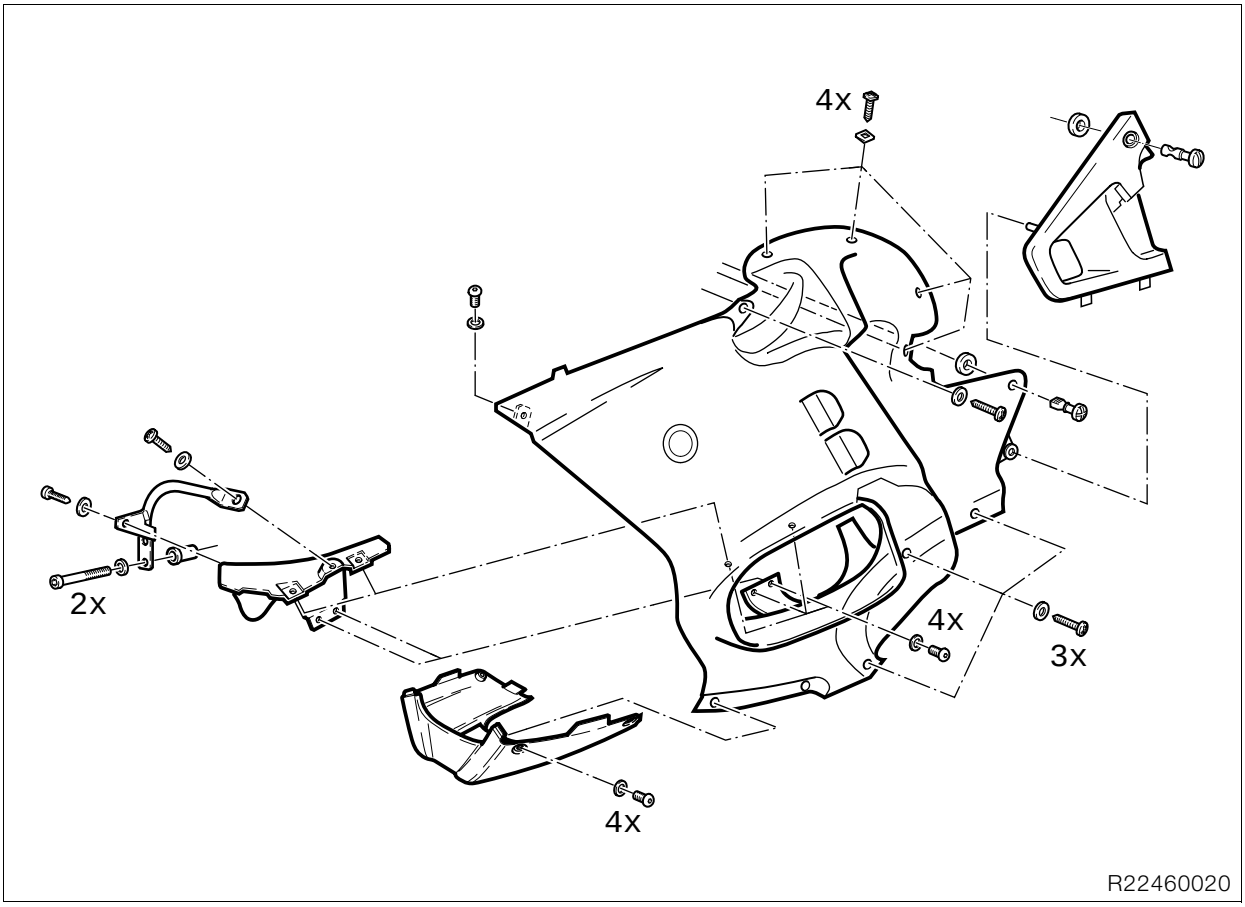


- Install the cover for the windscreen adjuster.
- Install windscreen with washers.
- Install the aerial.

Installing mirrors

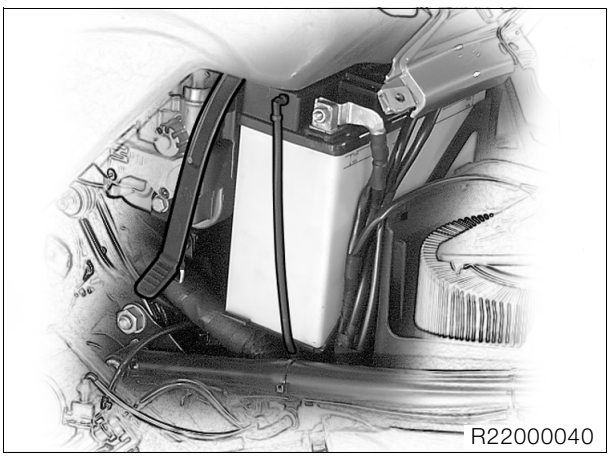


- Connect the turn indicators.
- Position the mirror at the 3 attachment points.
- Engage by pressing at the front first, then the rear.



Filling and charging the battery

- Remove seat.
- Remove left side fairing panel.
- Remove the air filter cover.
- Remove air intake pipe.
- Disengage the rubber strap holding the battery.



- Disconnect the battery breather hose.
- Pull the battery to the left to remove.

Warning:

Battery acid is highly caustic.
It must not contact the eyes, face hands, clothing or the motorcycle's paintwork.

- Fill all the cells with pure battery acid of density 1.28 to the upper mark.
- Allow the battery to stand for approximately 30 minutes.

- The battery does not achieve full charge capacity from being filled, so it has to be charged with a battery charger.

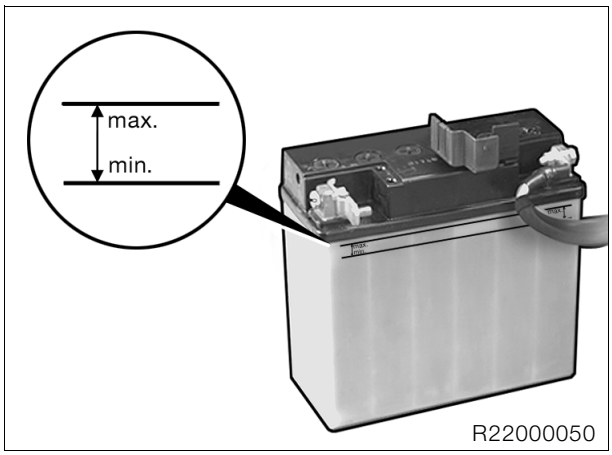
Note:
Follow the instructions for use supplied with the battery charger.

Charge current (amps)
.....10 % of rated battery capacity (Ah)
Charging time
..... 5-10 hours

- Battery charge can be measured by checking the density of the battery acid.

Acid density
Battery full charged
.....1.26-1.30 at a temperature of 20 °C (68 °F)

- Shake the battery slightly to allow the gas bubbles to escape.
- Wait until the battery acid has settled, check that no more bubbles rise and if necessary, top up the acid to the max. mark.
- Reinstall the plugs.
- Make a note of the charging date on the battery.



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

- Connect the positive cable, coat with acid-proof grease and install the protective cap.
- Install the battery.
- Connect the negative cable and coat with acid-proof grease.
- Assembly is the reverse of the disassembly procedure.
- Install the left side fairing panel.
- Install the engine spoiler.
- Install the covers.
- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.

- With the ignition switched on, bed in the brake pads against the brake discs.
- 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 means that the entries in the fault memory of the Motronic MA2.4 control unit are deleted and the adaptation values are reset. This can temporarily impair the operating characteristics when the engine is restarted.

Integral ABS: Performing bleed test with **BMW** MoDiTeC

Warning:
Self-diagnosis is not performed unless both brake levers are in their fully released positions. Prior to conclusion of the self-diagnosis, only RESIDUAL BRAKING FUNCTION is available.

Perform BMW Integral ABS self-diagnosis:
- Release the brake levers, if necessary.
- Switch on the ignition.
- With the ignition switched on, bed in the brake pads against the brake discs.

ABS warning light.....flashes at 4 Hz
General warning light ..... ON

– Self-diagnosis is in progress

ABS warning light.....flashes at 1 Hz
General warning light ..... OFF
– Self-diagnosis successfully completed.

Perform bleed test with BMW MoDiTeC:
- Remove front and rear seats.
- Connect the **BMW** MoDiTeC to the diagnosis connector.

Warning:
When performing maintenance and repair work on BMW Integral ABS, never pump quickly or vigorously.

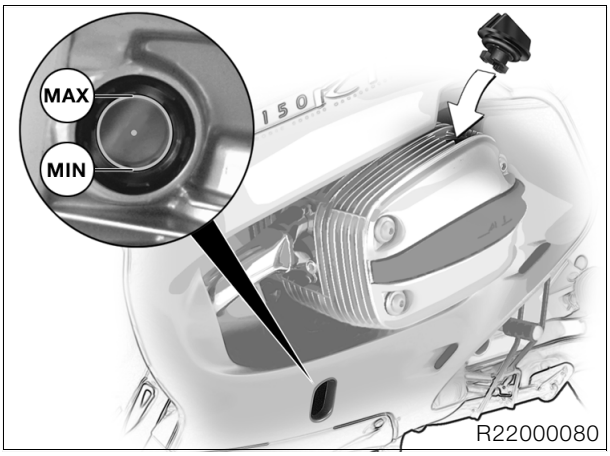
- Perform bleed test.
- Perform all requisite repair work.

Perform BMW Integral ABS pull-away test:
- When a speed of 5 km/h (3 mph) is reached, the ABS warning light must go out.

Note:
The ABS warning light and the general warning light must both be OFF after successful self-diagnosis and the pull-away test.

Checking engine oil level when cold, adding oil if necessary

Note:
The difference between the oil level indicated when the engine is at operating temperature and the oil level indicated when the engine is very cold due to extremely low outdoor temperatures can be as much as 10 mm (0.3937 in).



- Check oil level with the motorcycle upright.

Attention:
Never top up the engine-oil level past the “MAX” mark.

Specified level: ..... MAX

Checking tyre pressures

- Check/correct tyre pressures.

Tyre pressures:

one-up ..... front 2.2 bar (31.9 psi)
..... rear 2.5 bar (36.26 psi)

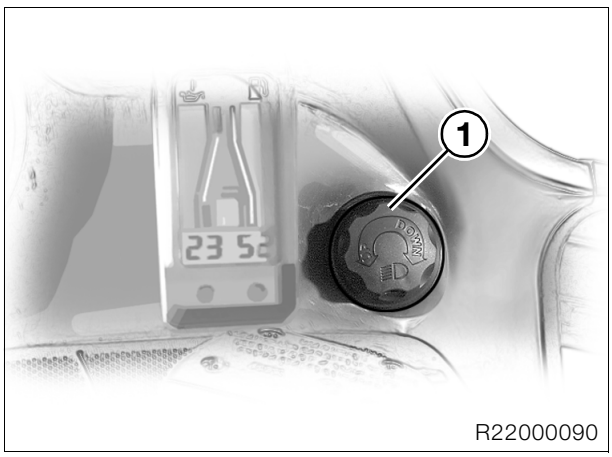
two-up..... front 2.5 bar (36.26 psi)
..... rear 2.9 bar (42.06 psi)

two-up + luggage ..... front 2.5 bar (36.26 psi)
..... rear 2.9 bar (42.06 psi)

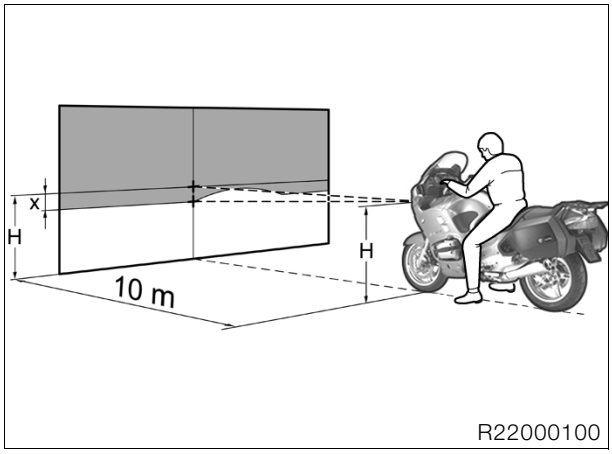
Checking tightness of rear wheel studs

Tightening torque:
Securing screws for rear wheel ..... 105 Nm

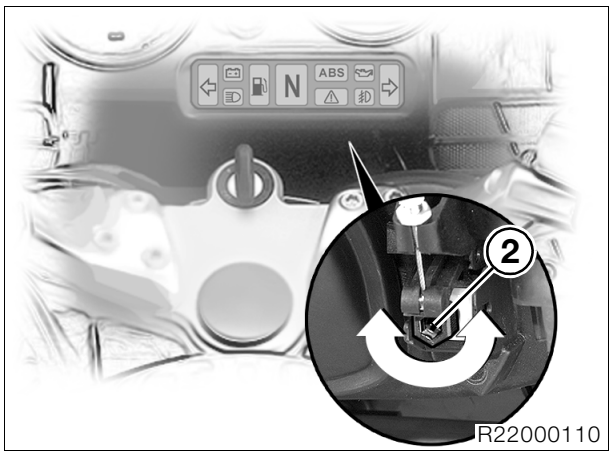
Checking headlight beam angle, adjusting if necessary



- Motorcycle on level surface.
- Rider's weight on motorcycle (approx. 85 kg/approx. 187 lbs).
- Turn knob (1) counter-clockwise as far as it will go.
- Check headlight beam throw.



Setting for headlight beam angle adjuster
X= .....-10 cm (-3.94 in) for 10 m (32.8 ft) distance
H= ..... Height to centre of headlamp



- Turn screw (2) to adjust beam throw, if necessary.

Direction of rotation, left .....further/higher
Direction of rotation, right.....shorter/deeper

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
– Fog lamps
– Brake light (operate brake at front and rear)
– Turn signals left/right
– Hazard warning lights
– Horn
– Telltale and warning lights
– Instruments

- Check operation of optional extras.
- If necessary, take the motorcycle for a test ride.
- Confirm pre-delivery check in Service and Technical Booklet.
- See “Checking motorcycle for damage” if defects are found.

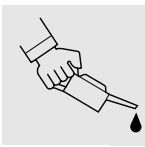
Final cleaning

- 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 handlebars lever positions
– procedure for adjusting seat
– how to adjust the mirrors
– controls
– instruments and telltale lights
– optional equipment and accessories fitted
– features of **BMW Integral ABS**:
brake servo,
residual braking function,
pump noises,
self-diagnosis with pull-away test.

- The user must be given the following information:

– running-in recommendations and inspection intervals
– safety check
– features of **BMW Integral ABS**:
fully integral brake,
brake-fluid levels in the control circuits remain constant despite brake-pad wear.
– the clutch fluid level rises gradually as the motorcycle is ridden (clutch lining wear)
– always check the oil level when the engine is at operating temperature, because the difference between the oil level indicated when the engine is at operating temperature and the oil level indicated when the engine is very cold due to extremely low outdoor temperatures can be as much as 10 mm (0.3937 in). After switching off the engine at operating temperature, wait at least 5 minutes for the oil to drain back into the sump. Checking the oil level just after the engine has been run or when it is not properly warm will falsify the reading.

00 Maintenance

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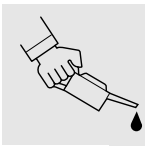
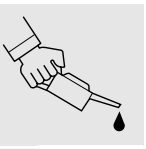




Maintenance interval codes

Service and maintenance operations include the initial Break-in Inspection (after the first 1000 km/600 miles), the BMW Service, BMW Inspection and the BMW Annual Service.

1000 km/600 mile Break-in Inspection
BMW Break-in Inspection after the initial 1000 km/600 miles.

BMW Service
At the end of the first 10 000 km and then at intervals of 20 000 km
(30 000 km ... 50 000 km ... 70 000 km).

BMW Inspection
At the end of the first 20 000 km and then at intervals of 20 000 km
(40 000 km ... 60 000 km ... 80 000 km).

BMW Annual Service
Although the frequency of service operations often depends on mileage, time is also an important factor: many procedures (such as brake fluid changes) should be carried out at least once a year, regardless of elapsed mileage.
If these operations are not performed in the course of a standard, mileage-based Service or Inspection, an extra visit for an Annual Service will be required.

The codes for service and maintenance intervals in this Repair Manual are as follows:

– Break-in Inspection at 1000 km/600 miles ..... **I**
– BMW Service at 10 000 km/6,000 miles ..... **II**
– BMW Inspection at 20 000 km/12,000 miles.... **III**
– BMW Annual Service ..... **IV**

00 13 624 Reading the **BMW** MoDiTeC fault code memory

(Inspections I, II, III and IV)

- Remove front and rear seats.
- Connect the **BMW** MoDiTeC to the diagnosis connector.
- Read all fault memories.
- Perform all requisite repair work.

Integral ABS: Performing bleed test with **BMW** MoDiTeC

(Inspections I, II, III and IV)

- Remove front and rear seats.
- Connect the **BMW** MoDiTeC to the diagnosis connector.

Warning:
When performing maintenance and repair work on BMW Integral ABS, never pump quickly or vigorously.

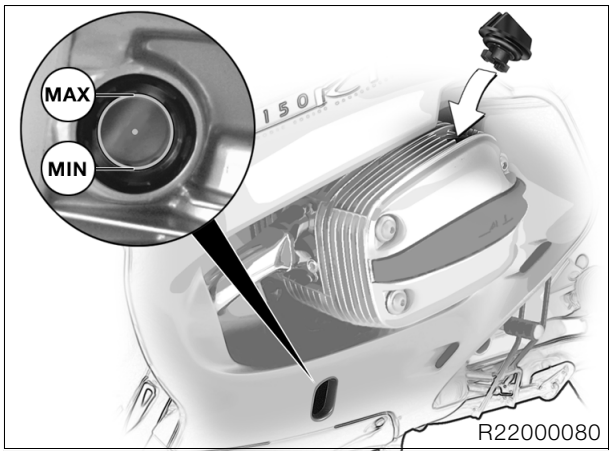
- Perform bleed test.
- Perform all requisite repair work.

00 11 209 Changing engine oil, replacing oil filter element

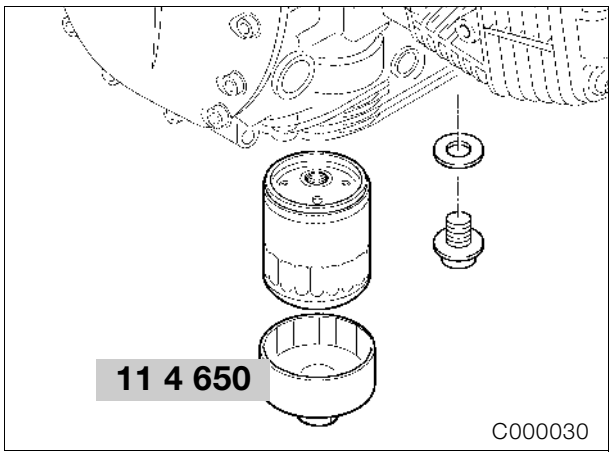
(Inspections I, II, III and IV)

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 not later than every 3,000 km (1,800 miles).

- Change the oil at operating temperature.



- Remove screw plug.
- Remove oil drain plug and drain off oil.



- 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.
- Reinstall the oil drain plug with a new sealing ring.
- Refill with oil to correct level.
- Insert and tighten the screw plug.

Attention:
Never top up the engine-oil level past the “MAX” mark.

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

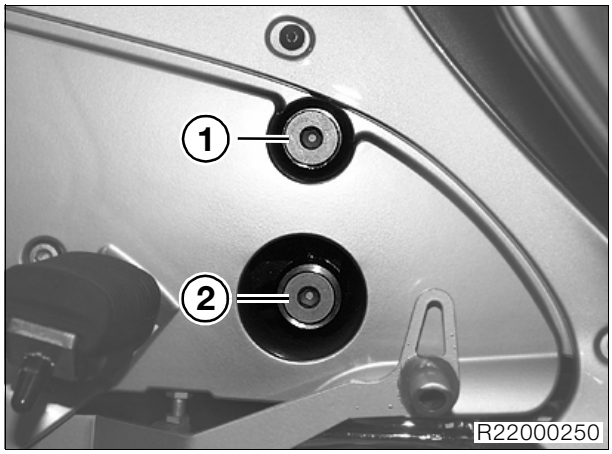
Engine oil capacities:
with oil filter replacement
..... 3.75 l (6.60 Imp. pints/3.96 US quarts)
without oil filter replacement
..... 3.50 l (6.16 Imp. pints/3.69 US quarts)
Quantity of oil between
MIN and MAX marks
..... 0.50 l (0.88 Imp. pints/0.52 US quarts)

Engine oil grade:
Mineral or synthetic multi-grade oils, API quality classes up to **SH**.

00 11 229 Changing oil in gearbox

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

- Change the gear oil at operating temperature.



- Remove oil filler plug (1).
- Install oil drain tube, **BMW No. 23 4 791**, turning it back and forth to seat it.
- Remove oil drain plug (2) and allow the oil to drain out.
- Reinstall the oil drain plug with a new sealing ring.
- Fill with gearbox oil.
- Insert oil filler plug with new seal.

Tightening torque:
Oil drain plug ..... 30 Nm
Oil filler plug ..... 30 Nm

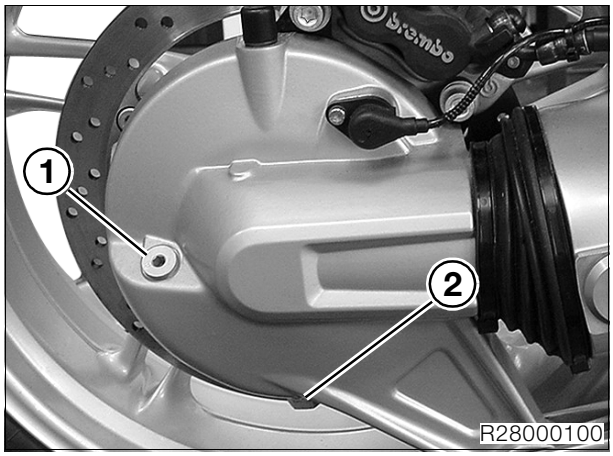
Quantity:
to bottom edge of filler neck
..... approx. 0.8 l (1.41 Imp. pints/0.85 US quarts)

Oil grade for gearbox:
Brand name SAE 90 API GL 5 hypoid lubricant or Castrol MTX 75W-140 GL 5

00 11 229 Changing the oil in the rear wheel drive

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

- Change the gear oil at operating temperature.



Attention:
Do not allow oil to drip onto the rear tyre.

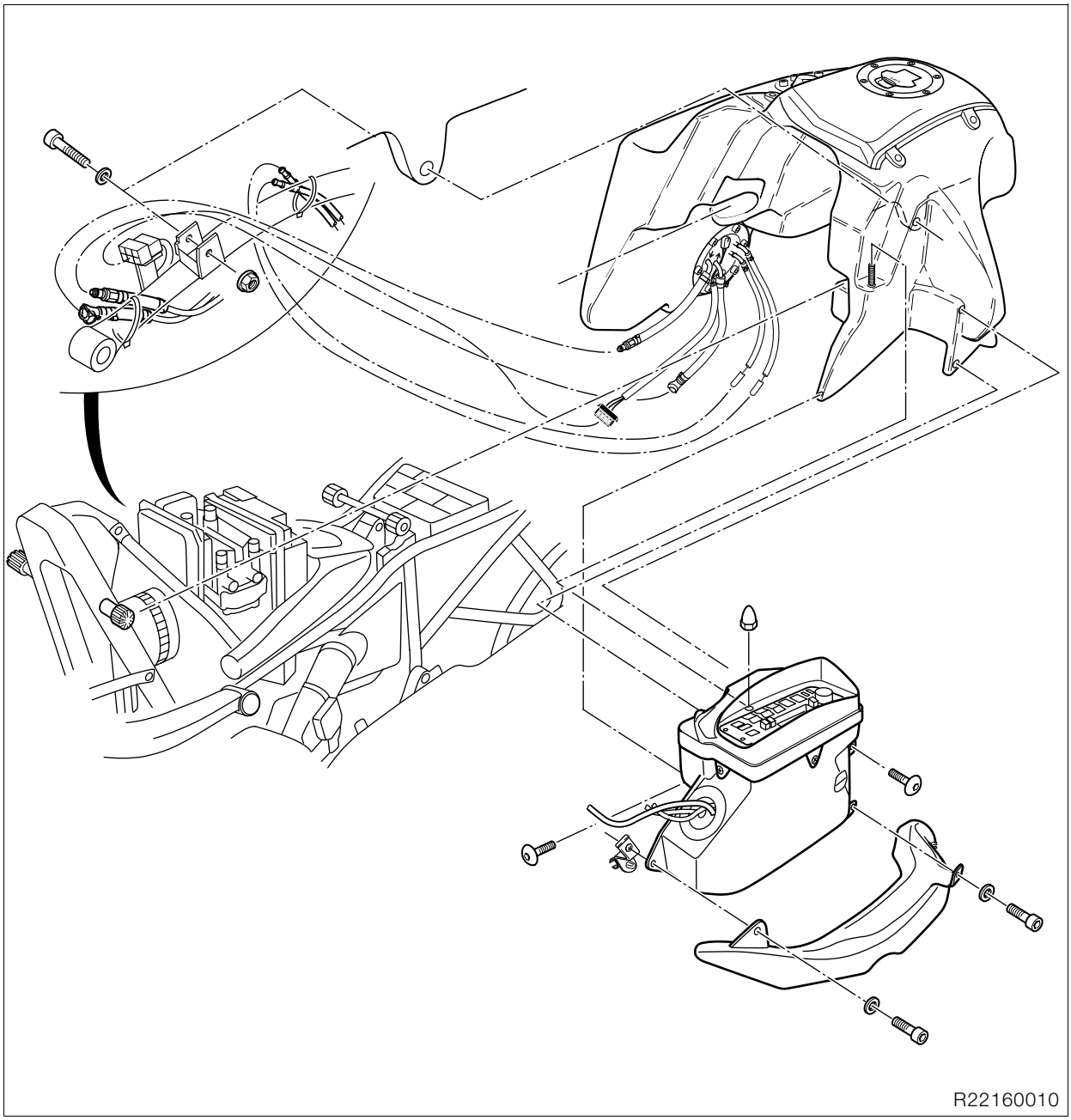
- Remove oil filler plug (1).
- Remove oil drain plug (2) and allow the oil to drain out.
- Reinstall the oil drain plug with a new sealing ring.
- Fill with gearbox oil.
- Insert oil filler plug with new seal.

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

Quantity:
to bottom of thread in oil filler hole
..... approx. 0.25 l (0.44 Imp. pints/0.26 US quarts)

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

BMW recommends Castrol



16 12 008 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)

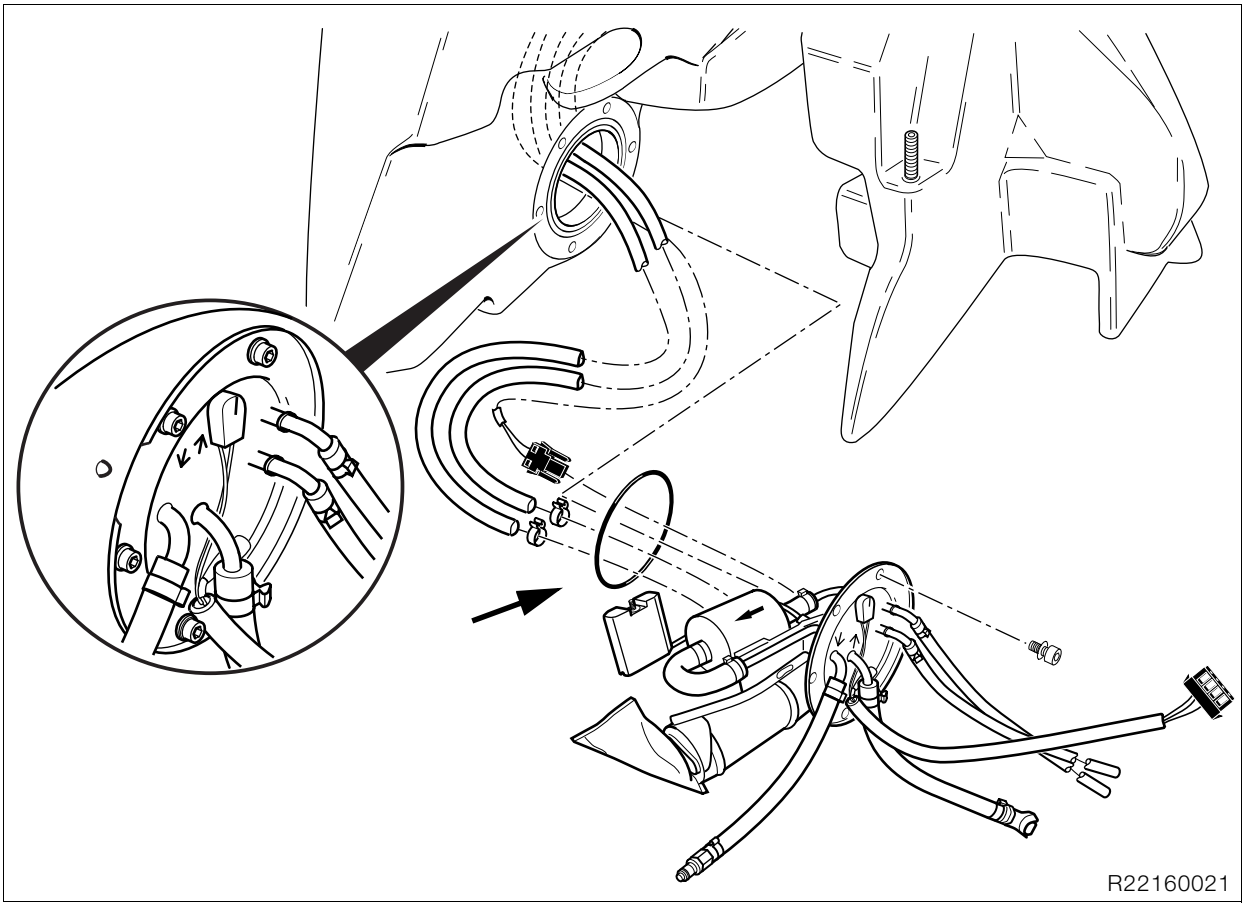
- Remove front and rear seats.
- Remove left and right side sections of fairing.
- Disengage stowage compartment and lift it up to remove.
- Use a cable tie to secure the stowage compartment to the motorcycle.

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

- Remove screw securing fuel tank.
- Disconnect breather and overflow hoses.
- Disconnect quick-connect adapters of the fuel lines.
- Disconnect the plug of the fuel pump.
- Drain fuel tank.

Note:
To avoid damaging the paintwork of the fuel tank, lay a cloth between the fork bridge and the fuel tank.

- Pull fuel tank up and to the rear to remove.
- Remove fuel pump unit.



- Disconnect hoses from fuel filter.
- Install new fuel filter.

Attention:
Note correct direction of flow through fuel filter.

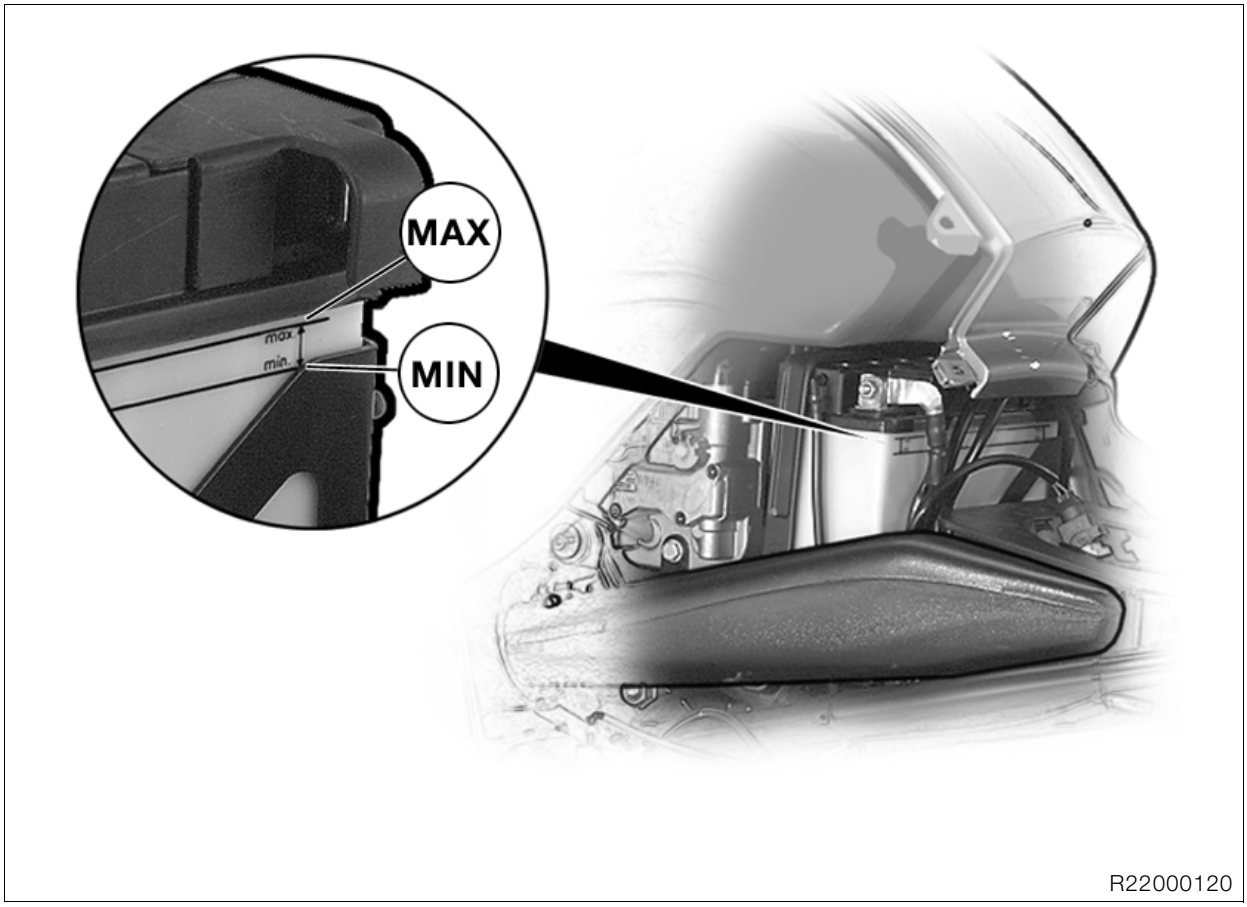
- Secure non-reusable hose clips with pliers, **BMW No. 13 1 500**.

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

- Installation is the reverse of the removal procedure.

Note:
Make sure that breather lines are correctly routed.

Tightening torque:
Fuel pump unit to fuel tank ..... 5 Nm
Fuel tank to rear frame ..... 22 Nm



R22000120

61 20 029 Checking battery fluid level and topping up if necessary; cleaning and greasing the battery posts

(Inspections III and IV)

Warning:
Battery acid is highly caustic.
It must not contact the eyes, face hands, clothing or the motorcycle's paintwork.

- Remove front and rear seats.
- Check the battery fluid level.

Note:
Remove the battery if the acid level is incorrect or cannot be read correctly.

- Remove the left side case.
- Remove left cover and side trim panel.
- Remove the air filter cover.
- Remove air intake pipe.
- Disengage the rubber strap holding the battery.
- Disconnect the battery breather hose.

Attention:
Disconnect the negative battery terminal first, then the positive terminal.

Note:
Disconnecting the battery means that the entries in the fault memory of the Motronic MA2.4 control unit are deleted and the adaptation values are reset. This can temporarily impair the operating characteristics when the engine is restarted.

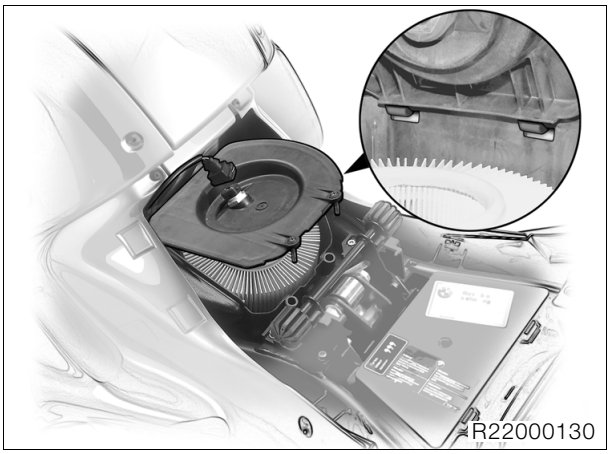
- Disconnect the negative terminal of the battery.
- Pull the battery to the left to remove.
- Disconnect the positive terminal of the battery.
- If necessary, top up the acid level to the "MAX" mark with distilled water.
- Clean and grease the battery terminals.
- Installation is the reverse of the 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.

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

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

13 72 000 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



- Open clips securing air filter cover.
- Replace air filter element.
- Close air filter cover.

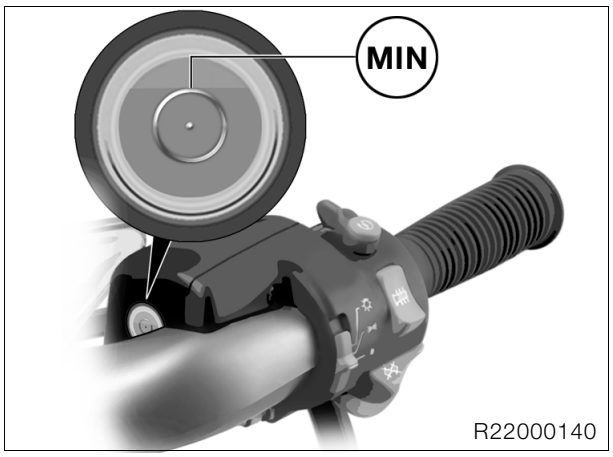
Checking brake fluid level

(Inspections II and III)

Note:
The brake fluid level in the sight glass/brake fluid reservoirs of control circuits remains constant despite wear of the brake pads.
If the level drops below the MIN mark, this indicates some other fault.

Front brake

- Place the motorcycle on its centre stand.
- Turn the handlebars fully to the **left**.
- Check brake fluid level at sight glass.



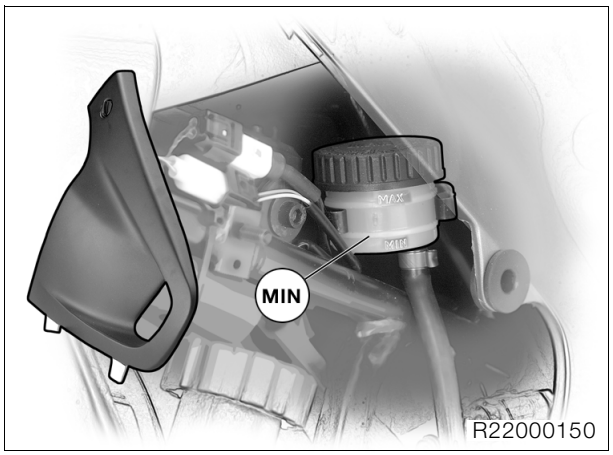
Specified level
not below ..... MIN
(top edge of the marking ring)

- Correct the fluid level if necessary.

Brake fluid.....DOT 4

Rear brake

- Place the motorcycle on its centre stand.
- Remove case and right trim panel.
- Check the brake fluid level.



Specified level
not below ..... MIN

- Correct the fluid level if necessary.

Brake fluid .....DOT 4

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

(Inspection III)

- Check all brake lines and their holders for damage and correct positioning.
- Wipe down all threaded unions on the brake lines and check them.
- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.

Warning:
When performing maintenance and repair work on BMW Integral ABS, never pump quickly or vigorously.

- Apply firm pressure to the brake lever and brake pedal and keep this pressure applied for a few moments.
- After this, inspect the brake lines for leaks.

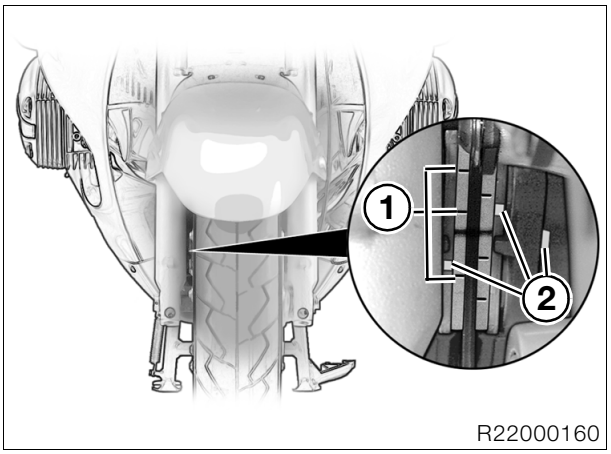
Warning:
Defective lines and threaded unions in the brake system must always be replaced without delay.

Checking brake pads and discs for wear/replacing

(Inspections II and III)

Checking brake pads for wear

Brake pads, front brake



- Visually inspect the brake pads.
– Wear indicators (1) must be clearly visible.
- If necessary, check/measure thickness of brake pads.

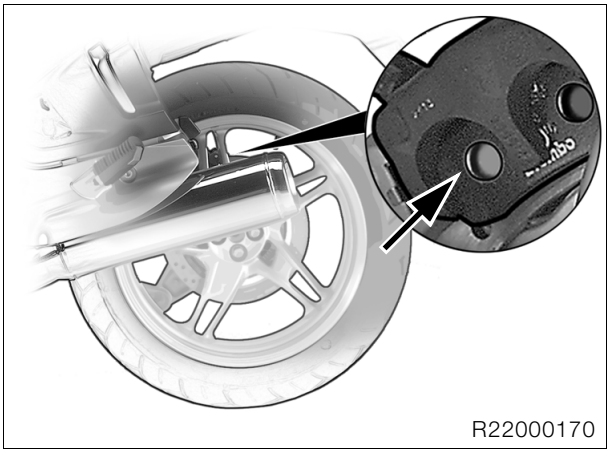
Attention:
Do not permit the brake pads to wear past the specified minimum thickness. Always replace the brake pads as a complete set.

Minimum pad thickness: ..... 1.0 mm (0.0393 in)

- Check that colour codes of brake pads and brake calipers (2) match.

Colour code: ..... white

Brake pads, rear brake



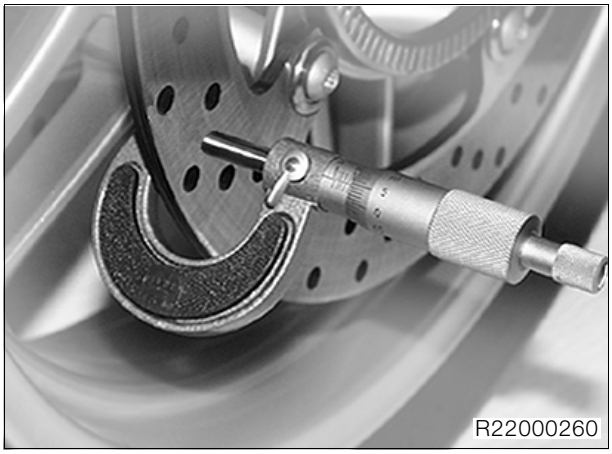
- Visually inspect the brake pads.
– Make sure that the brake disc is not visible through the bore (arrow) in the inner brake pad.
- If necessary, check/measure thickness of brake pads.

Attention:
Do not permit the brake pads to wear past the specified minimum thickness. Always replace the brake pads as a complete set.

Minimum pad thickness: ..... 1.0 mm (0.0393 in)
– 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.

Checking brake disc wear

- Carefully check the brake discs for cracks, damage, deformation and scoring.



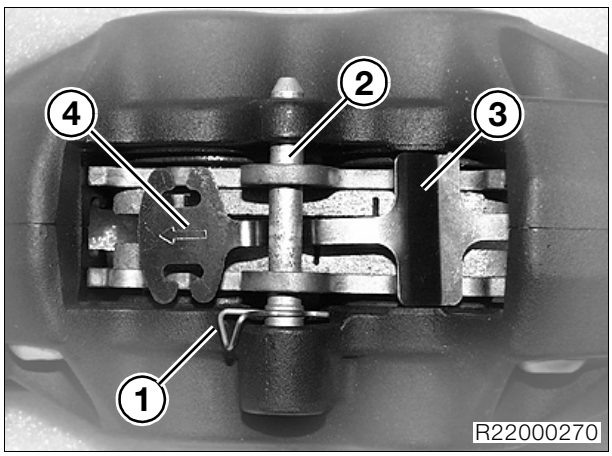
- Measure the thickness of the brake discs at several points with a caliper gauge.

Brake disc wear limit:
front:..... 4.5 mm (0.177 in)
rear:..... 4.5 mm (0.177 in)

Replacing brake pads

34 11 008 Brake pads, front brake

Attention:
Integral brakes, the rear brake must be ready for use.



- Remove the split-pin keeper (1) from threaded pin (2).
- Remove threaded pin (2) and spring (3).

Attention:
Integral ABS Press back pistons on only one side of the brake caliper. Allow the brake pad on the opposite side to remain in the caliper during this process.
Make sure that the fluid level in the wheel-circuit reservoir does not rise above “max”.
Risk of fluid escaping.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir”.

- Press back piston with inner brake pad only far enough to allow the new brake pad to be slipped into position.
- Remove remaining old brake pad and insert new brake pad.
- Press back piston with outer brake pad only far enough to allow the new brake pad to be slipped into position.
- Remove remaining old brake pad and insert new brake pad.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.

- After replacing the pads of a caliper, always bed in the new brake pads with the ignition switched on.

Note:
Note position and arrow (4) of spring (3).

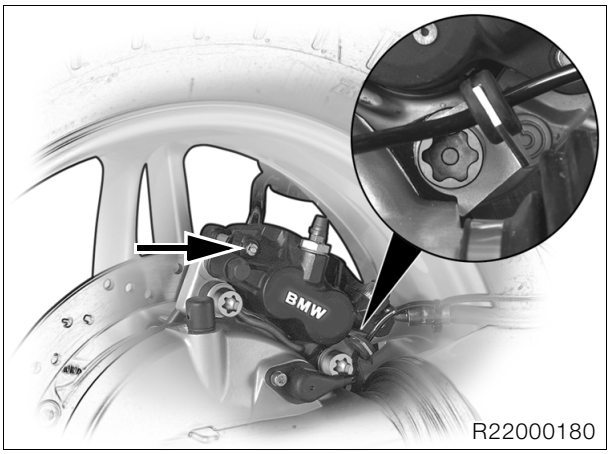
- Install threaded pin (2) and spring (3).
- Reinsert the split-pin keeper (1) in the groove in threaded pin (2).
- Check operation of the brake system with the ignition switched on.

Tightening torque:
Threaded pin in front brake caliper..... 7 Nm

Colour code:
Brake pads/brake calipers .....white

34 21 200 Brake pads, rear brake

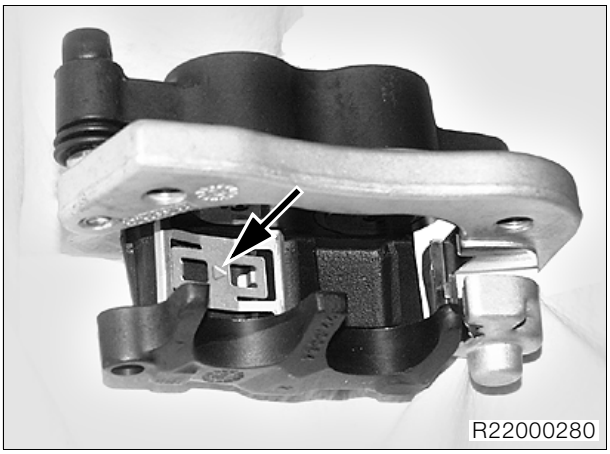
Attention:
Integral brakes, the front brake must be ready for use.



- Remove keeper (arrow) from retaining pin.
- Drive the retaining pin out towards the wheel side.
- Remove brake caliper.
- Remove brake pads.

Attention:
Integral ABS: Press the piston just far enough back into the brake caliper to permit insertion of the brake disc.
Make sure that the fluid level in the wheel-circuit reservoir does not rise above “max”.
Risk of fluid escaping.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir”.

- Force back the pistons.



- Check that spring is correctly positioned and secure.

– Engraved arrow (arrow) points in direction of travel.

- Installation is the reverse of the removal procedure.
- Check operation of the brake system with the ignition switched on.

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

34 00 090 Changing/bleeding brake fluid in wheel circuit

Change brake fluid in wheel circuit once a year (Inspection IV)

Warning:
All repair and maintenance work on the BMW Integral ABS must be performed by trained, qualified specialists.
Comply with all maintenance and repair instructions and always work through the various steps in the correct order.
Use only new brake fluid from freshly opened containers.

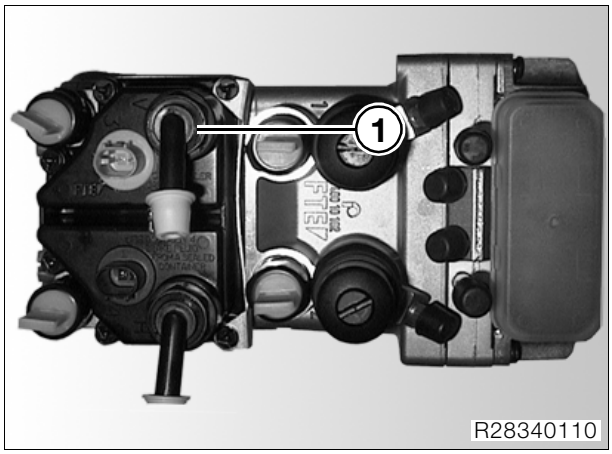
Note:
This description applies for the brake filling and bleeding unit with extraction of the brake fluid by partial vacuum.
If other devices are used, comply with their manufacturers' instructions.

34 00 070 Bleeding/changing brake fluid in front wheel circuit

Attention:
Integral brakes, the rear brake must be ready for use.

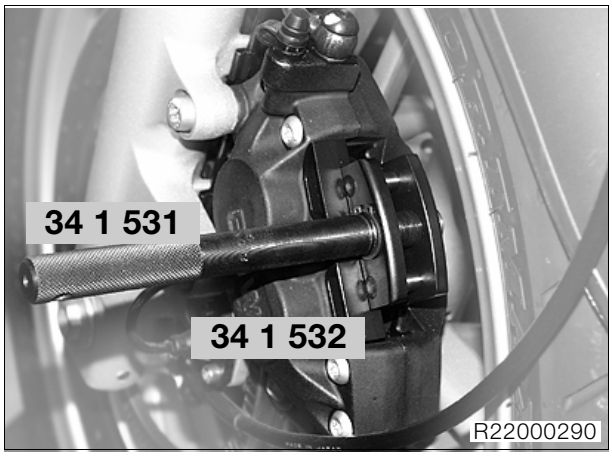
- Remove fuel tank.

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle as brake fluid destroys paint.



- Open front wheel-circuit reservoir (1).
- Draw off the old brake fluid from the wheel-circuit reservoir.
- Remove front brake pads (left and right).

Attention:
Install piston resetting tool, **BMW No. 34 1 531**, only when the cap has been removed from the wheel-circuit reservoir.

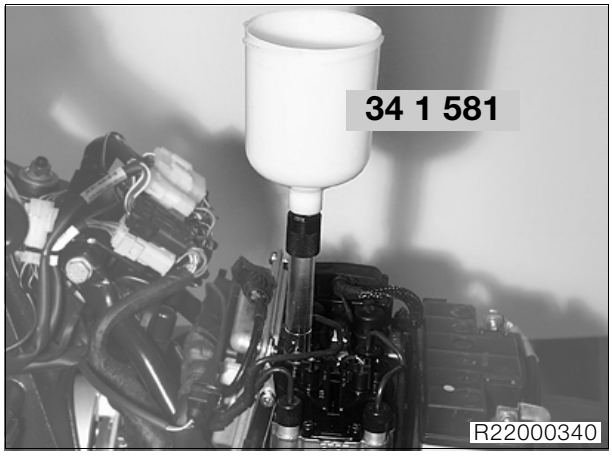


Attention:
Do not scrape the wheel – mask it off if necessary.

- Use resetting tool, **BMW No. 34 1 531**, and locator, **BMW No. 34 1 532**, to force the pistons in the left and right brake calipers all the way back and hold them in this position.
- Wrap cloths around the left and right brake calipers.

– **[Bleeding only]** Bleed the front wheel circuit. (➡ 00.45)

- Draw off the old brake fluid from the wheel-circuit reservoir.

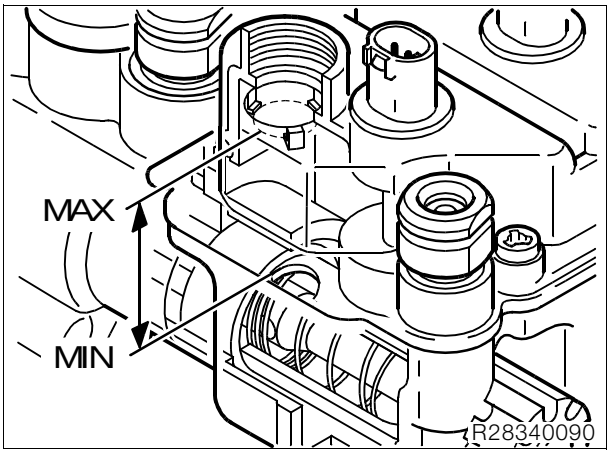


- Screw container, **BMW No. 34 1 581**, onto front wheel circuit reservoir.
- Slowly fill container, **BMW No. 34 1 581**, with new brake fluid until it is approximately 1/2 full.
- Connect the brake bleeding device to the bleed screw of the left brake caliper, but **do not switch on** the device.

Note:
If necessary, use a cable tie to secure the bleed hose to the bleed screw.

- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.



Attention:
The brake fluid must always be visible in the container, because the piston in the base of the wheel-circuit reservoir must always be covered by the fluid. The procedure must be repeated if the fluid drops below the “min” level.

- Very gently pull the handbrake lever until the pump just starts up.
- Open the bleed screw, while topping up the container with new brake fluid if necessary.
- Pump out the brake fluid with virtually no pressure to begin with, then vary the brake pressure.

Note:
The higher the brake pressure the faster the fluid is pumped through the system, which means that the level in the wheel-circuit reservoir drops all the more rapidly.

- Pump off brake fluid until it emerges clear and free from air bubbles.
- Close the bleed screw.
- Release the brake.
- Disconnect the brake bleeding device from the bleed screw.
- Connect the brake bleeding device to the bleed screw of the right brake caliper, but **do not switch on** the device.

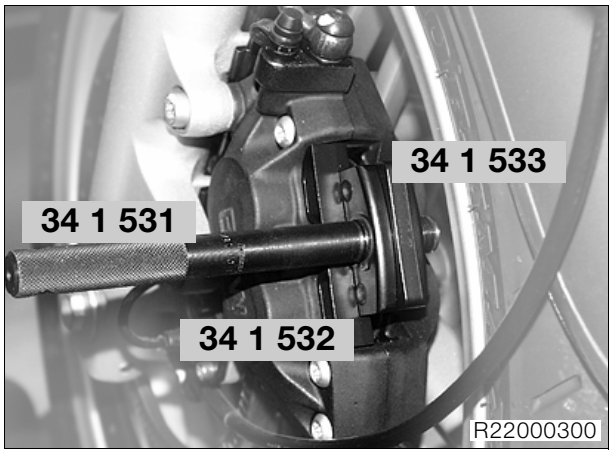
Note:
If necessary, use a cable tie to secure the bleed hose to the bleed screw.

- The procedure for changing the brake fluid in the right brake caliper is the same as that for the left caliper.
- When the brake fluid is clear and free of bubbles, continue pumping until the fluid in the container just disappears from view.
- Close the bleed screw.
- Release the brake and switch off the ignition.
- Disconnect the brake bleeding device from the bleed screw.
- Disconnect the container from the wheel-circuit reservoir.

Attention:
After changing and/or bleeding the brakes, always top up the fluid in the wheel-circuit reservoir to the correct level in accordance with the instructions.

Instructions for filling front wheel circuit reservoir

Attention:
Integral brakes, the rear brake must be ready for use.



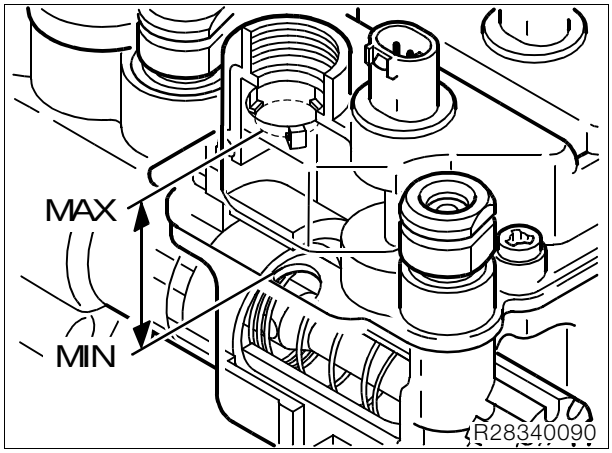
- Top up fluid in front wheel-circuit reservoir to “MAX” if necessary
- Install adapters 22, **BMW No. 34 1 533**, in resetting tool, **BMW No. 34 1 531/532**, for both front brake calipers, and tighten the resetting tool until the adapters are secure.

Attention:
The piston in the base of the wheel-circuit reservoir must always be covered by the fluid, as otherwise air can be drawn into the brake system.
Bleed the system again if this happens.

- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.

- Pull handbrake lever until the pistons of the front brake calipers are in contact with resetting tool, **BMW No. 34 1 531**.



- Top up the fluid in the wheel-circuit reservoir until one of the three protrusions in the filler neck just touches the surface of the fluid (arrow).
- Screw container, **BMW No. 34 1 581**, onto front wheel circuit reservoir.
- Remove adapter, **BMW No. 34 1 533**, and force back pistons far enough to allow the brake pads to be fitted.
- Install front brake pads.
- With the ignition switched on, bed in the brake pads against the brake discs.
- Disconnect the container from the wheel-circuit reservoir.
- Hand-tighten cap of front wheel-circuit reservoir.
- Check the function of the brake system.

Attention:
After all the work on the brake system has been completed, run a bleed test using the **BMW** MoDiTeC and check the fault code memory!

- Install fuel tank.

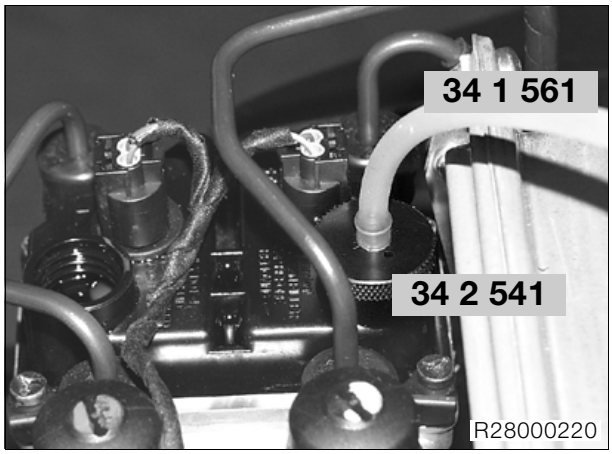
Brake fluid .....DOT 4

Tightening torque:
Bleed screw in front brake caliper ..... 7 Nm

Only bleeding the front wheel circuit

- Draw off the old brake fluid from the wheel-circuit reservoir.
- Remove left and right brake pads, force back the brake pistons and secure the pistons in this position.
- Wrap cloths around the left and right brake calipers.

Attention:
Integral brakes, the rear brake must be ready for use.



- Fill front wheel-circuit reservoir with brake fluid up to “MAX” mark and install cap, **BMW No. 34 2 541**.
- Connect 1.5 m silicon hose, **BMW No. 34 1 561**, to the bleed screw of the left brake caliper.

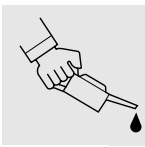
Note:
If necessary, use a cable tie to secure the bleed hose to the bleed screw.

- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.

- Very gently pull the handbrake lever until the pump just starts up.
- Open the bleed screw.
- Pump the brake fluid with virtually no pressure until the hose is full of brake fluid.
- Connect end of hose to cap, **BMW No. 34 2 541**.
- Pump the brake fluid with virtually no pressure to begin with, then vary the brake pressure.

Warning:
Check that the brake fluid in the hose does not foam.
If the fluid foams, proceed as described in the section on bleeding and changing brake fluid in front wheel circuit (➟ 00.42).



- Pump brake fluid through the system until it is clear and free from air bubbles.
- Close the bleed screw.
- Release the brake and disconnect silicon hose, **BMW No. 34 1 561**.
- Fill front wheel-circuit reservoir with brake fluid up to “MAX” mark and install cap, **BMW No. 34 2 541**.
- Connect 1.5 m silicon hose, **BMW No. 34 1 561**, to the bleed screw of the right brake caliper.
- The procedure for bleeding the right brake caliper is the same as that for the left caliper.
- Release the brake and switch off the ignition.
- Disconnect silicon hose, **BMW No. 34 1 561**, from bleed screw and drain the hose.
- Remove cap, **BMW No. 34 2 541**.

Attention:
After changing and/or bleeding the brakes, always top up the fluid in the wheel-circuit reservoir to the correct level in accordance with the instructions.

- Fill front wheel-circuit reservoir with brake fluid in accordance with instructions (➟ 00.44).

- Check operation of the brake system with the ignition switched on.

Attention:
After all the work on the brake system has been completed, run a bleed test using the **BMW** MoDiTeC.

Brake fluid .....DOT 4

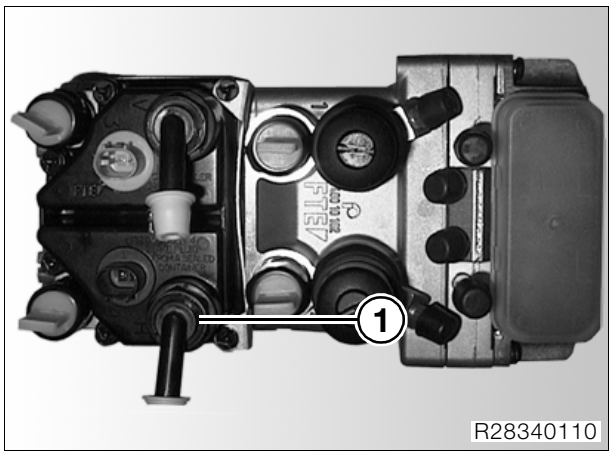
Tightening torque:
Bleed screw in front brake caliper ..... 7 Nm
Threaded pin in front brake caliper..... 7 Nm

34 00 080 Bleeding/changing brake fluid in rear wheel circuit

Attention:
Integral brakes, the front brake must be ready for use.

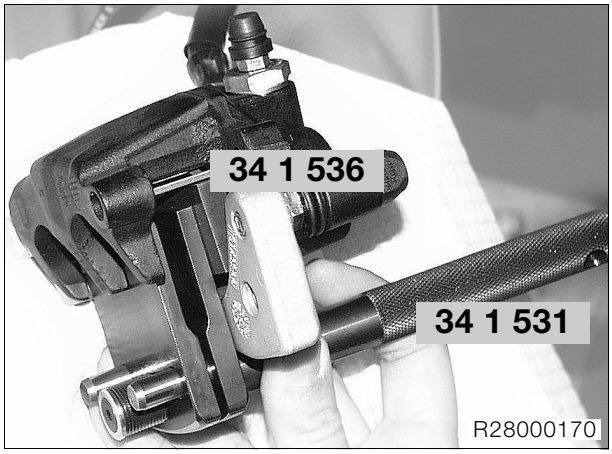
- Remove fuel tank.

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle as brake fluid destroys paint.



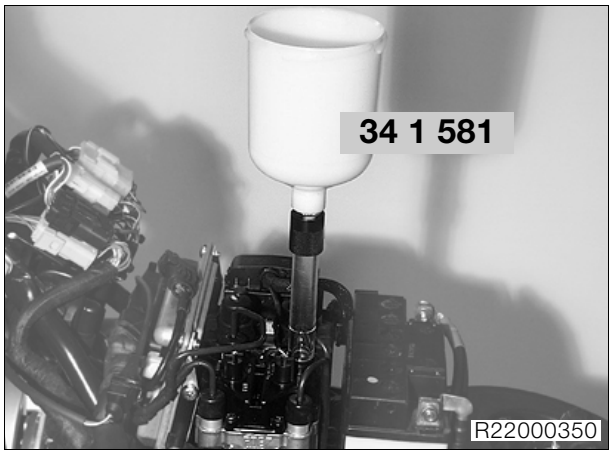
- Open rear wheel-circuit reservoir (1).
- Draw off the old brake fluid from the wheel-circuit reservoir.
- Remove rear brake pads.
- If necessary, manually push back brake piston far enough to permit installation of resetting tool, **BMW No. 34 1 531**.

Attention:
Install piston resetting tool, **BMW No. 34 1 531**, only when the cap has been removed from the wheel-circuit reservoir.



- Install adapter, **BMW No. 34 1 536**, instead of the outboard brake pad.
- Install resetting tool, **BMW No. 34 1 531**, with the handle toward the outside in the rear brake caliper, press the pistons fully back and secure them in this position.
- Wrap a cloth around the brake caliper.

– **[Bleeding only]** Bleed the rear wheel circuit. (➟ 00.49)
- Draw off the old brake fluid from the wheel-circuit reservoir.

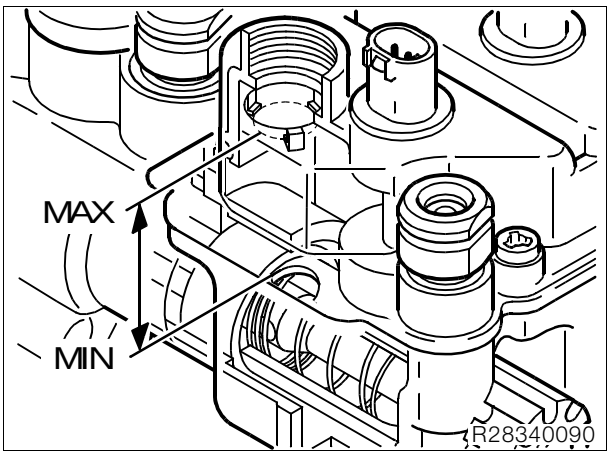


- Screw container, **BMW No. 34 1 581**, onto rear wheel circuit reservoir.
- Slowly fill container, **BMW No. 34 1 581**, with new brake fluid until it is approximately 1/3 full.
- Connect the brake bleeding device to the bleed screw, but **do not switch on** the device.

Note:
If necessary, use a cable tie to secure the bleed hose to the bleed screw.

- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.



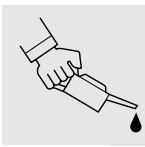
Attention:
The brake fluid must always be visible in the container, because the piston in the base of the wheel-circuit reservoir must always be covered by the fluid. The procedure must be repeated if the fluid drops below the “min” level.

- Very gently press the footbrake lever until the pump just starts up.
- Open the bleed screw, while topping up the container with new brake fluid if necessary.
- Pump out the brake fluid with virtually no pressure to begin with, then vary the brake pressure.

Note:
The higher the brake pressure the faster the fluid is pumped through the system, which means that the level in the wheel-circuit reservoir drops all the more rapidly.

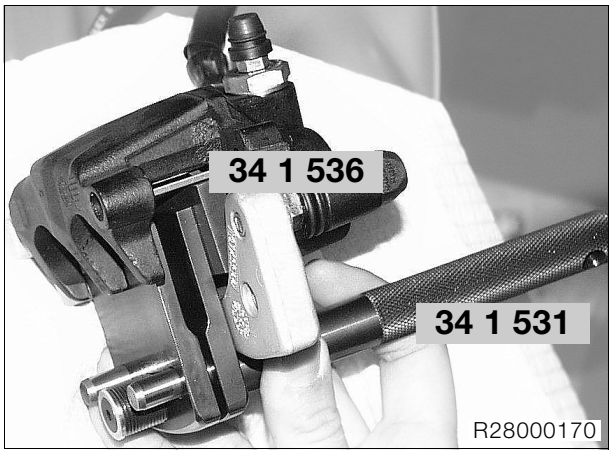
- When the brake fluid is clear and free of bubbles, continue pumping until the fluid in the container just disappears from view.
- Close the bleed screw.
- Release the brake and switch off the ignition.
- Disconnect the brake bleeding device from the bleed screw.
- Disconnect the container from the wheel-circuit reservoir.

Attention:
After changing and/or bleeding the brakes, always top up the fluid in the wheel-circuit reservoir to the correct level in accordance with the instructions.



Instructions for filling rear wheel circuit reservoir

Attention:
Integral brakes, the front brake must be ready for use.



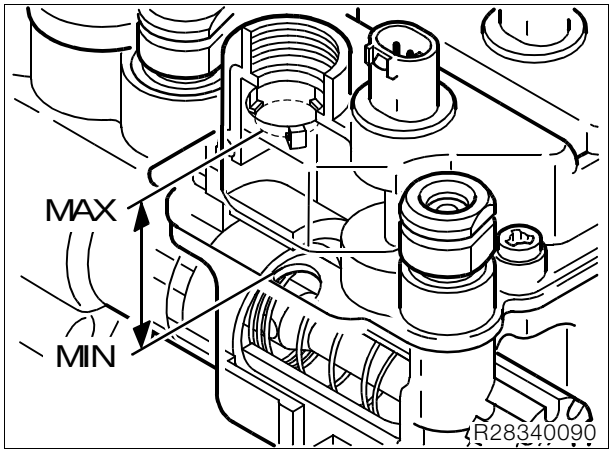
- Top up fluid in rear wheel-circuit reservoir to "MAX" mark if necessary.
- **Fully tighten** resetting tool, **BMW No. 34 1 531**, and adapter, **BMW No. 34 1 536**.

Attention:
The piston in the base of the wheel-circuit reservoir must always be covered by the fluid, as otherwise air can be drawn into the brake system.
Bleed the system again if this happens.

- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.

- Operate the footbrake lever until the pistons of the rear brake caliper are in contact with resetting tool, **BMW No. 34 1 531**, and adapter, **BMW No. 34 1 536**.



- Top up the fluid in the wheel-circuit reservoir until one of the three protrusions in the filler neck just touches the surface of the fluid (arrow).
- Remove resetting tool, **BMW No. 34 1 531**, and adapter, **BMW No. 34 1 536**.

Warning:
Make sure that the wheel-circuit reservoir does not overflow when the brake pads/brake calipers are installed.

- Install rear brake pads and brake caliper.
- Hand-tighten cap of rear wheel-circuit reservoir.
- Check operation of the brake system with the ignition switched on.

Attention:
After all the work on the brake system has been completed, run a bleed test using the **BMW** MoDiTeC.

- Perform bleed test with **BMW** MoDiTeC (➡ 00.31).

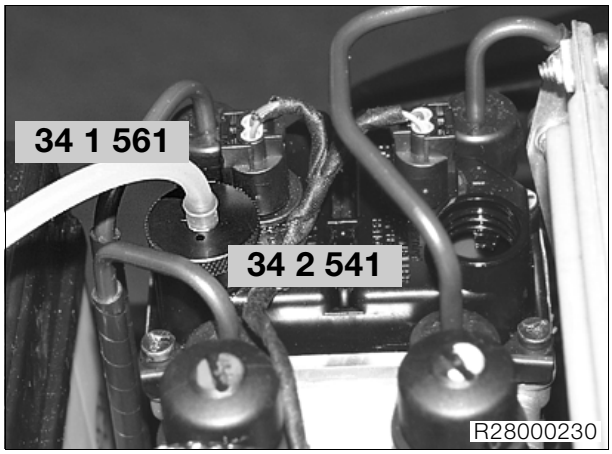
- Install fuel tank.

Brake fluid .....DOT 4

Tightening torque:
Bleed screw in rear brake caliper ..... 5 Nm
Brake caliper to rear wheel drive ..... 40 Nm

Only bleeding the rear wheel circuit

– Draw off the old brake fluid from the wheel-circuit reservoir.
– Remove rear brake pads, force back the brake pistons and secure the pistons in this position.
– Wrap a cloth around the rear brake caliper.



- Fill rear wheel-circuit reservoir with brake fluid up to “MAX” mark and install cap, **BMW No. 34 2 541**.
- Connect 1.5 m silicon hose, **BMW No. 34 1 561**, to the bleed screw.

Note:
If necessary, use a cable tie to secure the bleed hose to the bleed screw.

- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.

- Very gently press the footbrake lever until the pump just starts up.
- Open the bleed screw.
- Pump the brake fluid with virtually no pressure until the hose is full of brake fluid.
- Connect end of hose to cap, **BMW No. 34 2 541**.
- Pump the brake fluid with virtually no pressure to begin with, then vary the brake pressure.

Warning:
Check that the brake fluid in the hose does not foam.
If the fluid foams, proceed as described in the section on bleeding and changing brake fluid in rear wheel circuit (➟ 00.46).

- Pump brake fluid through the system until it is clear and free from air bubbles.
- Close the bleed screw.
- Release the brake and switch off the ignition.
- Disconnect silicon hose, **BMW No. 34 1 561**, from bleed screw and drain the hose.
- Remove cap, **BMW No. 34 2 541**.

Attention:
After changing and/or bleeding the brakes, always top up the fluid in the wheel-circuit reservoir to the correct level in accordance with the instructions.

- Fill rear wheel-circuit reservoir with brake fluid in accordance with instructions (➟ 00.48).
- Check operation of the brake system with the ignition switched on.

Attention:
After all the work on the brake system has been completed, run a bleed test using the **BMW** MoDiTeC.

Brake fluid .....DOT 4

Tightening torque:
Bleed screw in rear brake caliper ..... 5 Nm
Brake caliper to rear wheel drive ..... 40 Nm

34 00 091 Changing/bleeding brake fluid in control circuit

Change brake fluid in control circuit every 2 years
(Inspection IV)

Warning:
All repair and maintenance work on the BMW Integral ABS must be performed by trained, qualified specialists.
Comply with all maintenance and repair instructions and always work through the various steps in the correct order.
Use only new brake fluid from freshly opened containers.

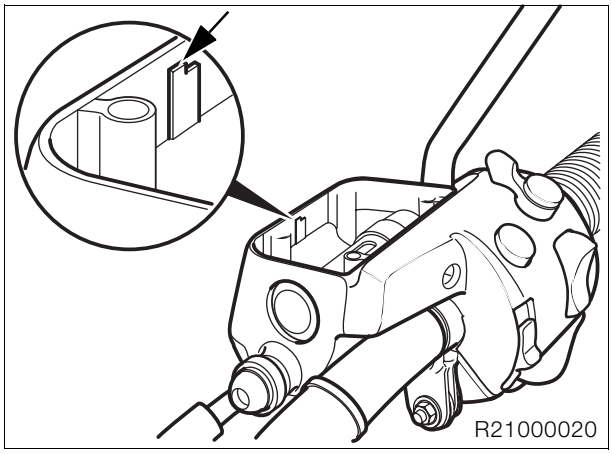
34 00 072 Bleeding/changing brake fluid in front control circuit

Warning:
When performing maintenance and repair work on BMW Integral ABS, never pump quickly or vigorously.

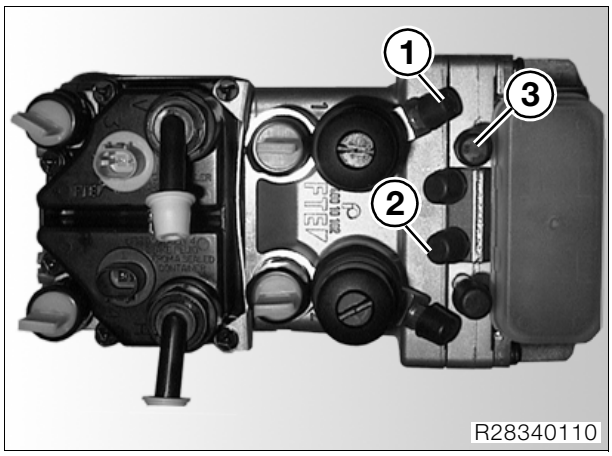
- Turn the handlebars to full left lock.
- Repeatedly and slowly pull front brake lever lightly to expel air from brake master cylinder.
- Place the motorcycle on its main stand.
- Remove fuel tank.
- Turn the front wheel to a position in which the brake fluid reservoir is horizontal and secure the handlebars in this position.

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle as brake fluid destroys paint.

- Wrap cloths around the reservoir.
- Remove front reservoir cap with rubber diaphragm, draw off the old brake fluid and clean the reservoir.



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



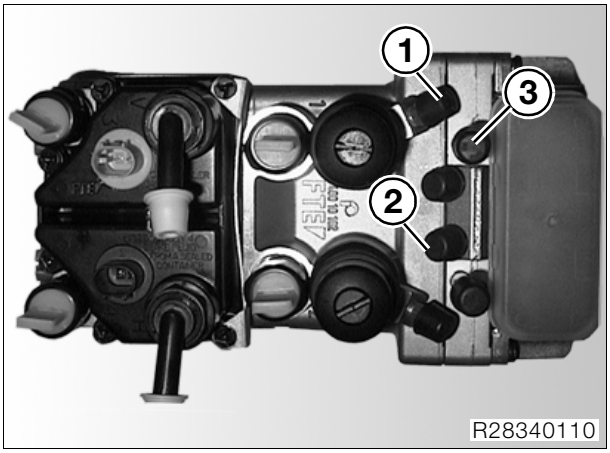
- Connect the brake bleeding device to bleed screw (1) of the front metering cylinder, but **do not switch on**.

Warning:
Do not use vacuum extraction to change the brake fluid in the control circuits or bleed the control circuits.

Attention:
During the fluid-change and bleeding procedure, make sure that the fluid replenishing hole is always below the level of the brake fluid, or else air will be drawn into the brake system.
Bleed the system again if this happens.

- Set the handbrake lever to position 4.

Warning:
When performing maintenance and repair work on BMW Integral ABS, never pump quickly or vigorously.

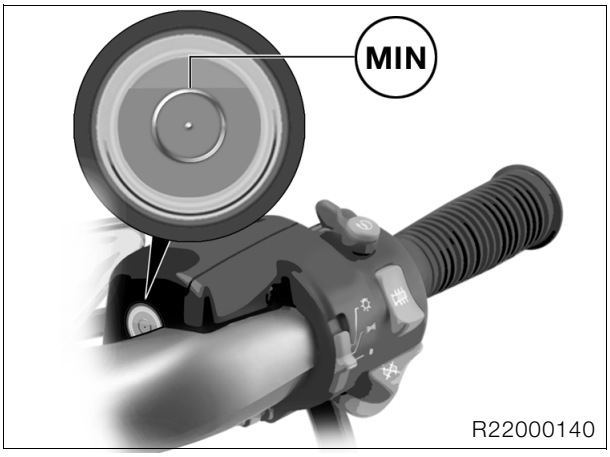


- In the following sequence, bleed:
– front metering cylinder (1)
– front integral circuit (2)
– front control circuit (3) and
– front metering cylinder (1) for the second time

using ring spanner, **BMW No. 34 2 532**, in accordance with instructions for bleeding.

Instructions for bleeding:
1. Slowly pull brake lever until brake-light switch clicks (blow-by bore closed).
2. Open the bleed screw.
3. Slowly pull brake lever to full extent of its travel and close the bleed screw.
4. Slowly release the brake lever.
5. Repeat steps 1 to 4 until the bake fluid is clear and free of bubbles.

- Fit the protective caps on the bleed screws.
- Top up the brake fluid until the level reaches the “MAX” mark.
- Wipe the rim of the reservoir, the rubber diaphragm and the cover to remove brake fluid, and carefully reassemble the components.
- Recheck the brake-fluid level.
- Place the motorcycle on its centre stand.
- Turn the handlebars fully to the **left**.



Specified level
not below ..... MIN
(top edge of the marking ring)

Attention:
After all the work on the brake system has been completed, run a bleed test using the **BMW** MoDiTeC.

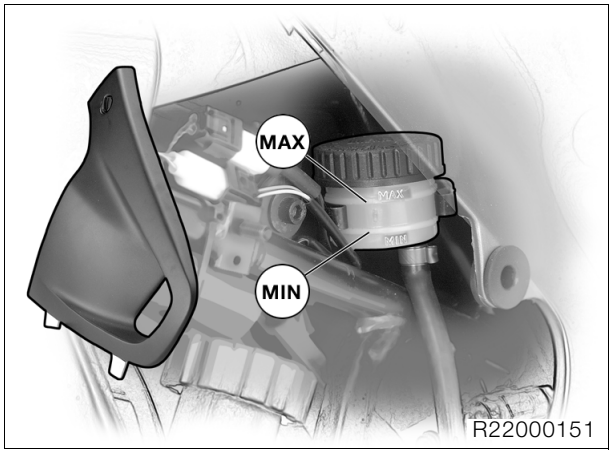
Brake fluid .....DOT 4

34 00 082 Bleeding/changing brake fluid in rear control circuit

– Place the motorcycle on its main (centre) stand.
– Fuel tank removed.

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle as brake fluid destroys paint.

- Remove right case, if necessary.
- Remove small right side fairing panel.
- Remove rear reservoir cap with rubber diaphragm, draw off the old brake fluid and clean the reservoir.

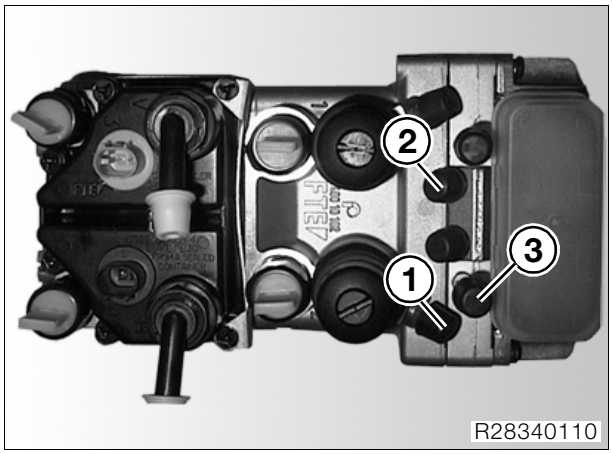


- Top up the brake fluid level to the “MAX” mark.
- Connect the brake bleeding device to bleed screw (1) of the rear metering cylinder, but **do not switch on**.

Warning:
Do not use vacuum extraction to change the brake fluid in the control circuits or bleed the control circuits.

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

Warning:
When performing maintenance and repair work on BMW Integral ABS, never pump quickly or vigorously.



- In the following sequence, bleed:

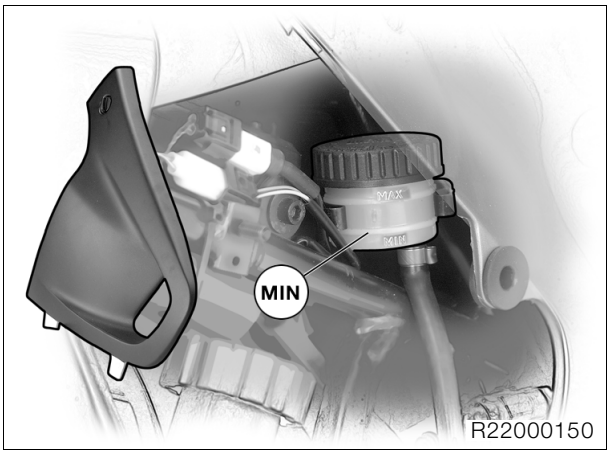
– rear metering cylinder (1),
– rear integral circuit (2),
– rear control circuit (3) and
– rear metering cylinder (1) for the second time

using ring spanner, **BMW No. 34 2 532**, in accordance with instructions for bleeding.

Instructions for bleeding:
1. Slowly depress brake lever until brake-light switch clicks (blow-by bore closed).
2. Open the bleed screw.
3. Slowly depress brake lever to full extent of its travel and close the bleed screw.
4. Slowly release the brake lever.
5. Repeat steps 1 to 4 until the bake fluid is clear and free of bubbles.

- Fit the protective caps on the bleed screws.

- Correct the brake fluid level.
- Wipe the rim of the reservoir, the rubber diaphragm and the cover to remove brake fluid, and carefully reassemble the components.
- Place the motorcycle on its centre stand.



Specified level
not below ..... MIN

Attention:
After all the work on the brake system has been completed, run a bleed test using the **BMW** MoDiTeC.

- Perform bleed test with **BMW** MoDiTeC. (➟ 00.31)

- Install fuel tank.

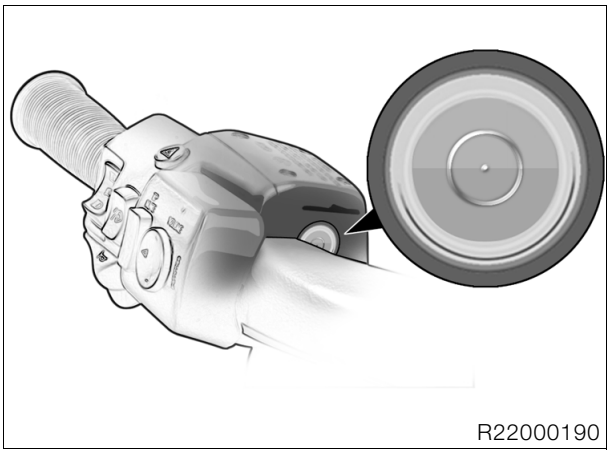
Brake fluid.....DOT 4

Checking clutch operating fluid level

(Inspections II and III)

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

- Place motorcycle on its **centre stand**.
- Move the handlebars to the **straight-ahead position**.



Specified 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 cap with insert.
- Correct the fluid level.
– Mark in reservoir: same as brake circuit.
- Reinstall the reservoir cap with insert.
- Tighten the reservoir cap carefully and without using force.

Brake fluid .....DOT 4

21 52 005 Changing the clutch fluid

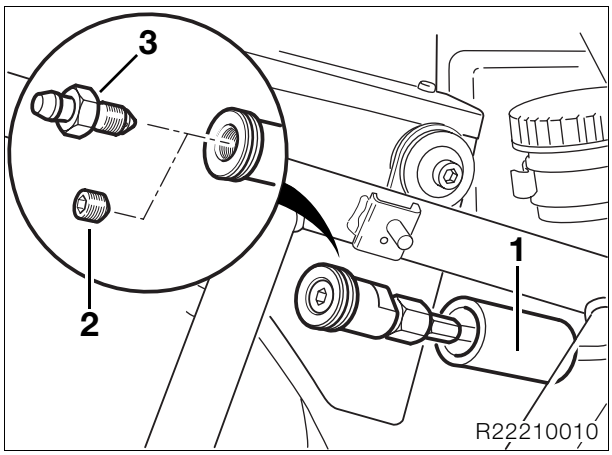
(Inspection IV)
every 2 years at the latest

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 its main (centre) stand.
- Turn the handlebars to a position in which the clutch fluid reservoir is horizontal.
- Secure front wheel in position.

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

- Remove reservoir cap with rubber diaphragm.
- Draw off the brake fluid and clean the reservoir.
- Top up the brake fluid.



- Pull back protective hose (1).
- Wrap a cloth around the filler adapter.
- Remove socket-head grub screw (2) from the filler adapter.
- Connect the brake bleeding device to bleed screw (3).
- Screw the bleed screw all the way into the filler adapter (valve in filler adapter closed).

Attention:
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.

- Open the bleed screw by half a turn (valve open).
- Draw off brake fluid until it emerges clear and free from air bubbles.
- Remove the bleed screw.
- Disconnect the brake bleeding device from the bleed screw.

Note:
On account of the vacuum extraction process, it might not be possible to tell whether there is brake fluid in the hose of the brake bleeding device when it is free of bubbles.
In this case bleed the system manually.

- Reinstall socket-head grub screw (2) in the filler adapter.

Attention:
The motorcycle is not permitted on the road without the grub screw in place and secure in the filler adapter.

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

Tightening torque:
Grub screw in filler adapter ..... 10 Nm

Consumables
Brake fluid.....DOT 4

Checking tightness of rear wheel studs

(Inspection I)

- Tighten the rear wheel studs with a torque wrench.

Tightening torque:
Securing screws for rear wheel ..... 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 (➟ 33.5).

Checking swinging arm bearings, adjusting if necessary

(Inspections I and III)

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

– If play is perceptible, remove fixed-bearing stud and floating-bearing stud of the bearing in question, clean the threads and reinstall (➟ 33.20).

Checking function of side stand contact switch

(Inspections I, II, III and IV)

- Place the motorcycle on its centre stand.
- Retract the side stand, if extended.
- Disengage the clutch and select a gear.
- Start the engine, without releasing the clutch lever.
- Extend the side stand.

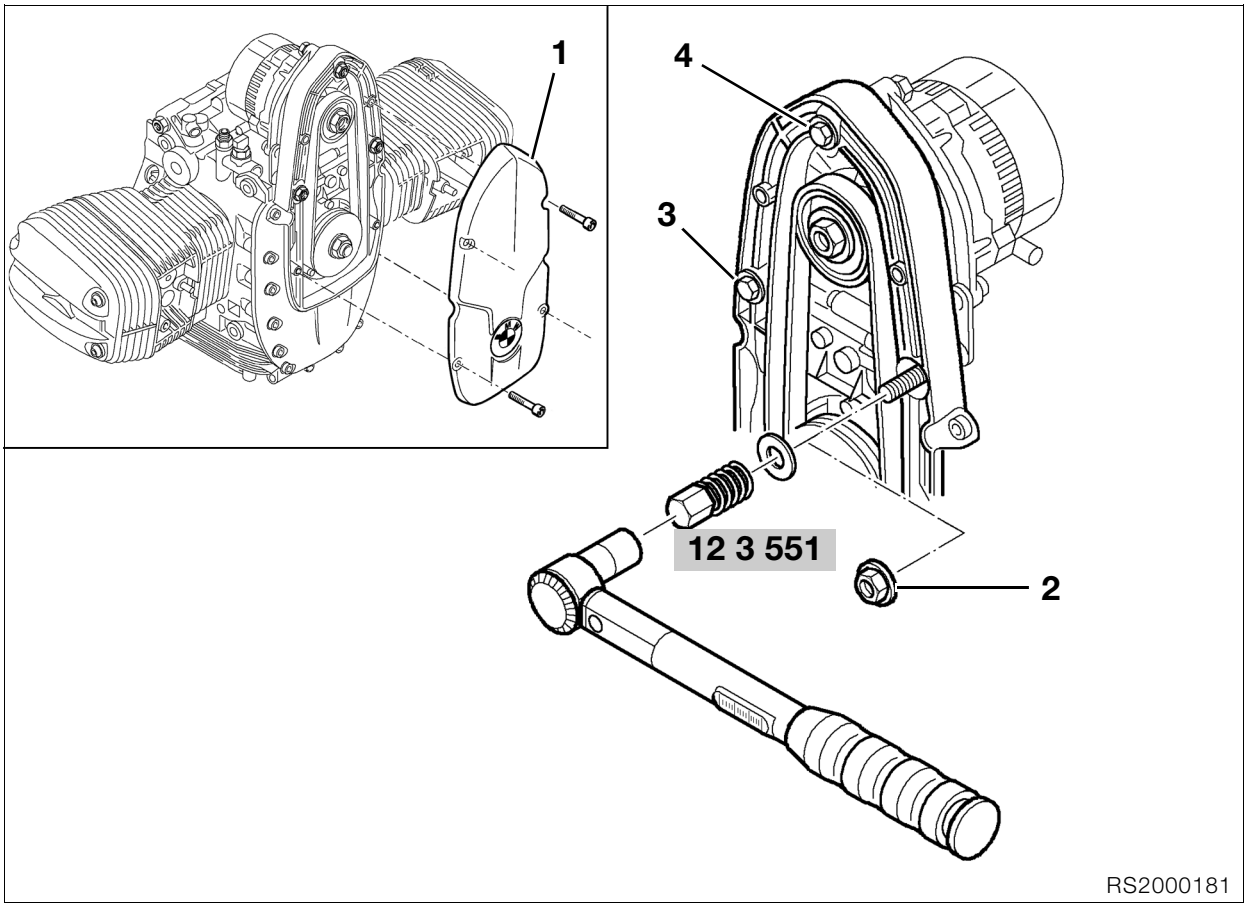
Note:
The side-stand switch is in correct working order if the engine stops when the side stand is extended.

Greasing the side stand pivot

(Inspections I, II and III)

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

Lubricant:
..... Shell Retinax EP2



00 12 610 Tensioning poly-V belt

(Inspection II)
Retension new poly-V belt once after 10,000 km (6,000 miles)

Attention:
Work on the poly-V belt only when the engine is cold.

- Remove left side fairing panel.
- Remove front intake pipe.
- Disengage fairing bracket from end cover on left.
- Remove front cover (1).

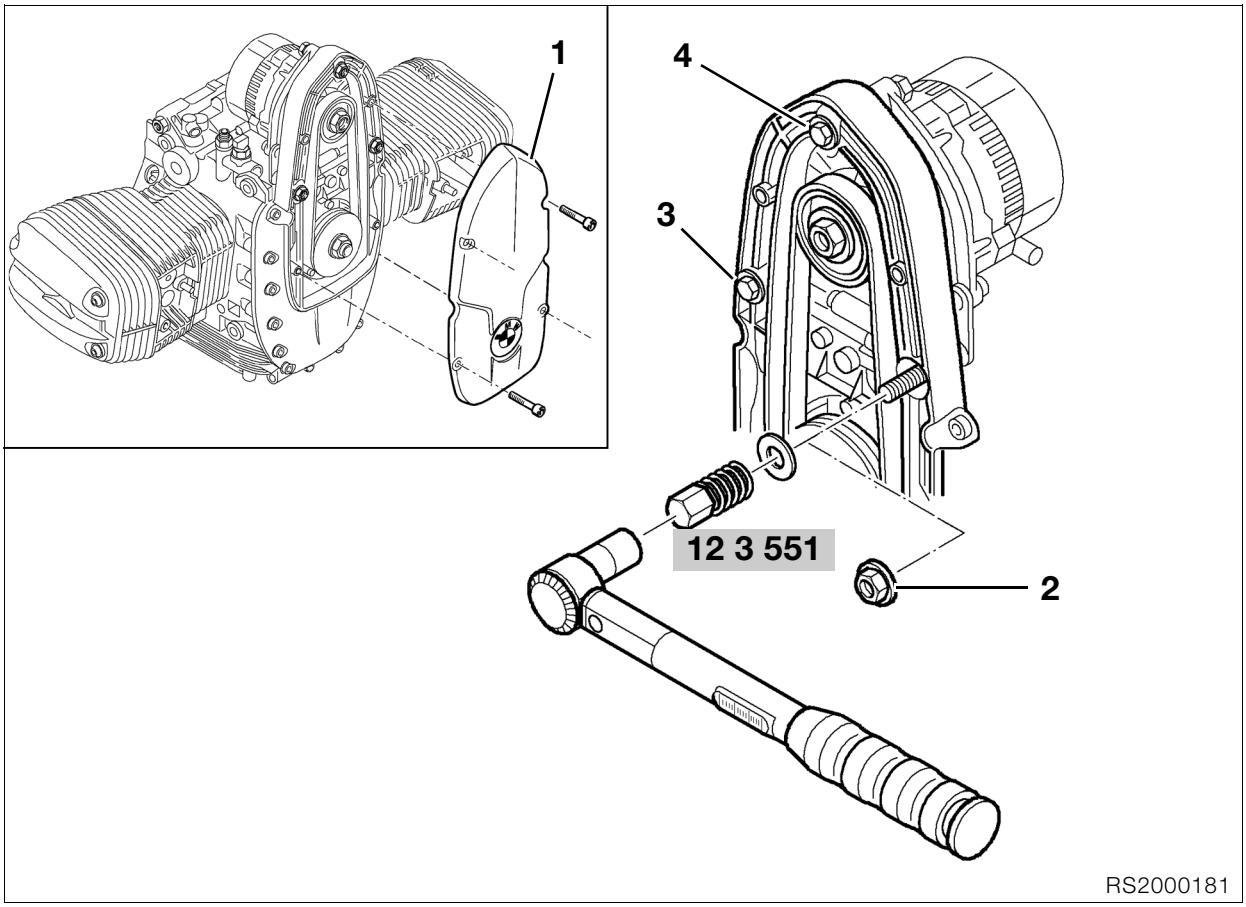
Poly-V belt tensioning procedure:

1 Remove nut (2) and install tensioning nut **BMW No. 12 3 551**.
2 Loosen the alternator mounting bolts (3, 4).
3 Tighten and hold tensioning nut, **BMW No. 12 3 551**, with torque wrench.
4 Tighten upper retaining nut (4), then remove torque wrench from adjusting screw.
5 Tighten all screws and nuts.

- Installation is the reverse of the removal procedure.

Tightening torque:

Preload for poly-V belt ..... 8 Nm
Alternator
to alternator mount cover ..... 20 Nm



12 31 240 Replacing poly-V belt

(Inspection III)
Replace poly-V belt every
60,000 km (37,000 miles)

Attention:
Work on the poly-V belt only when the engine is cold.

- Remove left side fairing panel.
- Remove front intake pipe.
- Disengage fairing bracket from end cover on left.
- Remove front cover (1).
- Loosen alternator mounting bolts (2, 3, 4).
- Remove old poly-V belt.
- Start by mounting the new poly-V belt on the crankshaft pulley, then proceed to mount it on the alternator pulley.
- Install new poly-V belt.

Poly-V belt tensioning procedure
Poly-V belt installation procedure:

- Mount the poly-V belt on the pulleys and tension it slightly, then turn the crankshaft through one revolution and relieve the tension on the belt.
- Tension the poly-V belt in accordance with the specified procedure.

Poly-V belt tensioning procedure:

1 Remove nut (2) and install tensioning nut **BMW No. 12 3 551**.
2 Loosen the alternator mounting bolts (3, 4).
3 Tighten and hold tensioning nut, **BMW No. 12 3 551**, with torque wrench.
4 Tighten upper retaining nut (4), then remove torque wrench from adjusting screw.
5 Tighten all screws and nuts.

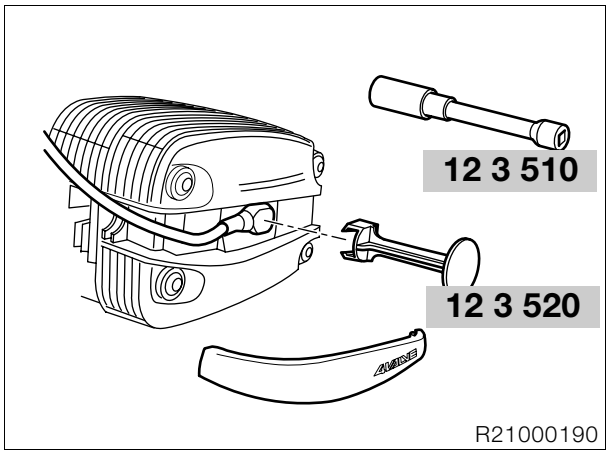
- Installation is the reverse of the removal procedure.

Tightening torque:

Preload for poly-V belt	8 Nm
Alternator to alternator mount cover	20 Nm

12 12 011 Checking/replacing spark plugs

(Inspection II) check/(Inspection III) replace



- 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.

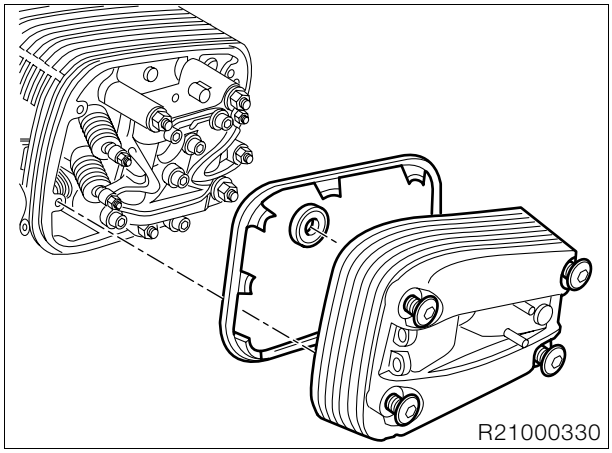
Attention:
Do not bend electrodes - risk of breakage!

Spark plug:..... NGK BKR 7 EKC
Electrode gap: ..... 0.8 mm (0.0314 in)
Wear limit:..... 1.0 mm (0.04 in)

Tightening torque:
Spark plug NGK BKR7EKC ..... 25 Nm

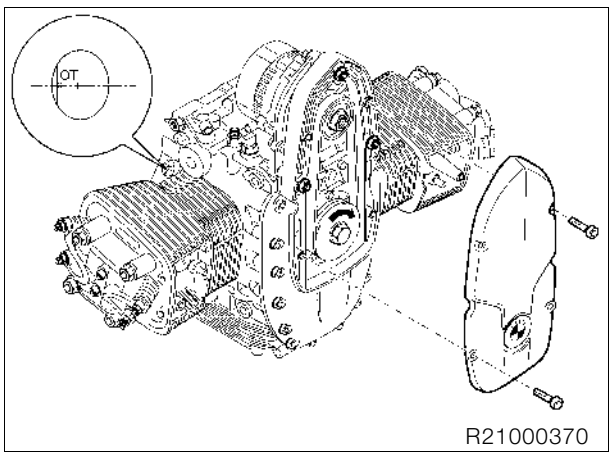
11 12 009 Tightening cylinder heads

(Inspection I)



- Remove cylinder head cover.

Attention:
Catch escaping oil.



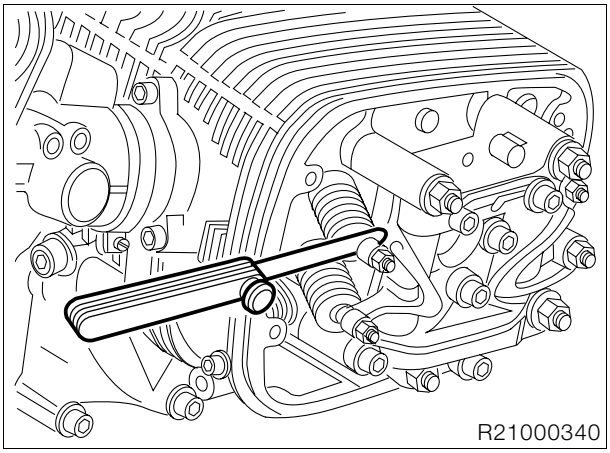
- Select a gear and turn the rear wheel, or set the piston to TDC on the ignition stroke by turning the belt pulley.

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 one nut at a time
1.2. Tighten nut to initial torque..... 20 Nm
1.3. Tighten nut to specified wrench angle..... 180°
2. Slacken/retighten M10 screw..... 40 Nm

11 34 004 Checking/adjusting valve clearances

(Inspections I, II and III)



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

Valve clearances with engine cold(max. 35 °C/ 95°F):
Inlet ..... 0.15 mm (0.0059 in)
Exhaust ..... 0.30 mm (0.0118 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.
- Assembly is the reverse of the disassembly procedure.

Attention:
Make sure that all seals are correctly seated. Seals and sealing faces must be free from oil and grease.

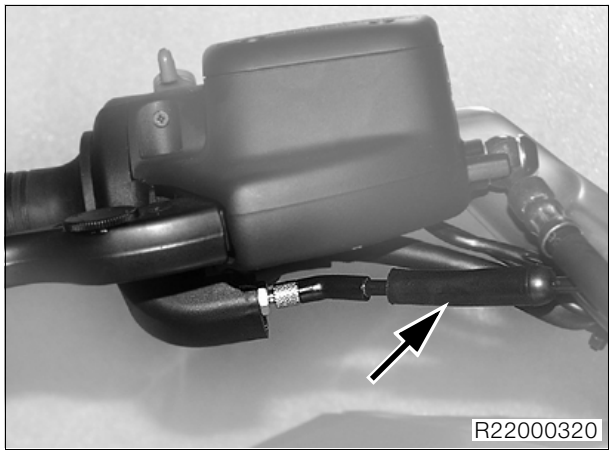
Tightening torque:
Cylinder head cover ..... 8 Nm

13 60 110 Checking freedom of throttle cable, checking for chafing and kinks, replacing if necessary Checking throttle-cable play, checking and adjusting idle speed and throttle-valve synchronisation

(Inspections I, II and III)

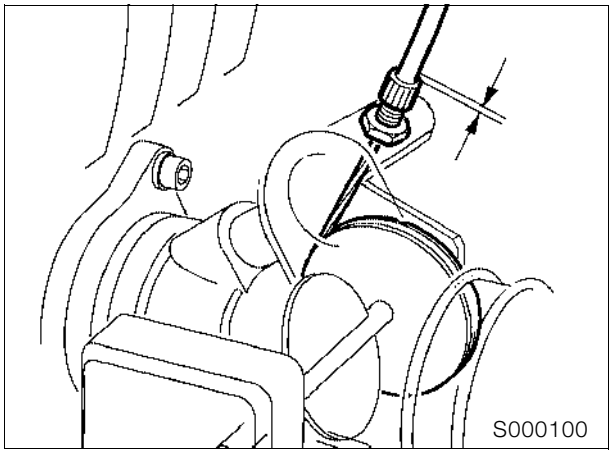
- Test-drive the motorcycle until the engine is warm.
- Remove the left side panel.
- Remove the flap in the right side panel.

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.

Choke cable free travel:
.....approx. 1 mm (0.0393 in)
Throttle cable free travel:
.....approx. 1 mm (0.0393 in)



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

Throttle cable free travel:
..... approx. 2 mm (0.0787 in)

- Connect hose of **BMW** Synchro to vacuum adapter and connect cables to **BMW** MoDiTeC.
- Start the engine.

Attention:
Do not allow the engine to idle for longer than is necessary, because the trim panels near the exhaust could be damaged.

- Adjust idle speed by turning the air bypass screws while checking that the carburettors are balanced.

Idle speed: ..... 1,100 ±50 rpm

Note:
Make sure that both throttle valves are closed.

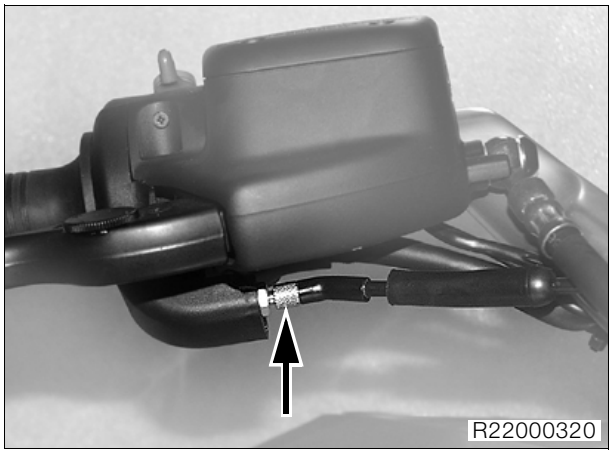
Attention:
Do not tamper with the sealed stop screws of the throttle valves, as otherwise the idle-speed volume flow will have to be reset by the manufacturer.

- 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 throttle cable play at throttle valve so that no play is perceptible, but the throttle valve reliably contacts the stop screw (no strain on cable).

- Adjust the right throttle valve in the same way.

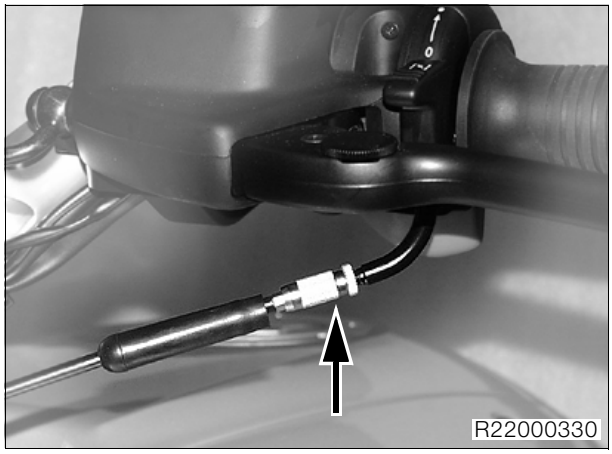
Note:
Zero play can cause the throttle valves to rattle.



- Use the adjusting screws (arrow) to adjust play of the throttle cables.

Play of throttle cable:
.....approx. 0.5 mm (0.0197 in)

- Push the rubber cap into position over the adjusting screw.



- 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 = 2,500 rpm 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 throttle-valve Bowden 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.
- Assembly is the reverse of the disassembly procedure.

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 heating the engine to operating temperature in the trial run/road test before checking/correcting engine oil level.

Tyre pressures:

one-up	front 2.2 bar (31.9 psi)
	rear 2.5 bar (36.26 psi)
two-up	front 2.5 bar (36.26 psi)
	rear 2.9 bar (42.06 psi)
two-up + luggage	front 2.5 bar (36.26 psi)
	rear 2.9 bar (42.06 psi)

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

11 Motor

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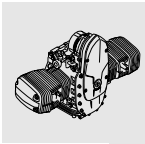
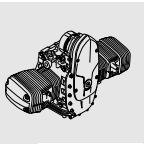
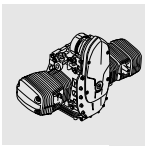
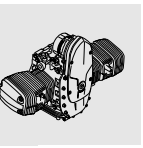




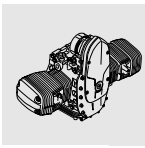
Technical Data 11 Engine		R 1150 RT	
Engine, general			
Type		Four-stroke opposed twin, air-cooled with oil-cooled exhaust ports, installed longitudinally, 4 valves per cylinder, two overhead camshafts, electronic fuel injection.	
Location of engine number		Crankcase	
Cylinder bore	mm (in)	101 (3.9764)	
Stroke	mm (in)	70.5 (2.77)	
Effective displacement	cc	1,130	
Compression ratio		11.3:1	
Power rating	kW/bhp	70/95	
at	rpm	7,250	
Max. torque	Nm	100	
at	rpm	5,500	
Maximum permissible engine speed	rpm	7,900	
Idle speed	rpm	$1{,}100^{+/-50}$	
Direction of rotation		Clockwise, looking at ignition system	
Compression test pressure			
good	bar (psi)	above	10 (145)
normal	bar (psi)		8.5...10 (121...142)
poor	bar (psi)	below	8.5 (121)
Lubrication system			
Type		Wet sump lubrication	
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)	
Oil filter		Filter cartridge	
Oil pressure warning light comes on below	bar (psi)	0.3 (4.35)	
Pressure-relief valve opens at	bar (psi)	5.5 (79.77)	
Operating pressure	bar (psi)	3.5...6.0 (50.76...87.02)	
Max. oil consumption	l/1,000 km (Imp. miles/ gal/mpg)	1.0 (2825/2352)	

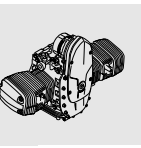




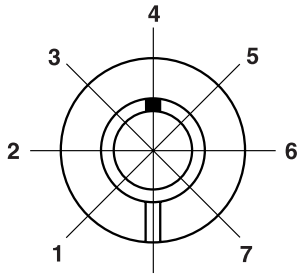
Technical Data 11 Engine		R 1150 RT
Oil pump		
Oil pump		2 duocentric pumps
Housing depth		
Cooling oil	mm (in)	11.02...11.05 (0.4339...0.4350)
Lubricating oil	mm (in)	10.02...10.05 (0.3945...0.3957)
Height of rotor		
Cooling oil	mm (in)	10.965...10.98 (0.4317...0.4323)
Lubricating oil	mm (in)	9.965...9.98 (0.3923...0.3929)
End float	mm (in)	0.04...0.085 (0.0016...0.0033)
Wear limit	mm (in)	0.25 (0.0098)
Valves		
Valve clearances with engine cold (max. 35 °C/95 °F)		
Inlet valve	mm (in)	0.15 (0.0059)
Exhaust valve	mm (in)	0.30 (0.0118)
Included angle between valves		
Inlet valve angle	°	19
Exhaust valve angle	°	22
Valve timing		without valve clearance, 3 mm (0.1181 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 (1.3386)
Exhaust	mm (in)	29 (1.1417)
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 (0.0197)
Exhaust	mm (in)	$0.9^{\pm 0.2}$ ($0.0354^{\pm 0.0079}$)
Wear limit	mm (in)	0.5 (0.0197)
Max. runout of valve head at valve seat		
Inlet, exhaust	mm (in)	0.035 (0.0014)

Technical Data 11 Engine		R 1150 RT
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 (0.0984)
Exhaust	mm (in)	1.4 $^{\pm 0.15}$ (0.0551 $^{\pm 0.0059}$)
Wear limit	mm (in)	3.0 (0.1181)
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/+0.0079 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/+0.0079 in)		
Inlet	mm (in)	36.500...36.525 (1.4370...1.4380)
Exhaust	mm (in)	32.000...32.025 (1.2599...1.2608)
Valve guide		
Valve guide, outside 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 (0.0059...0.0017)
Repair stages		
Replacement valve guide, outside dia.	mm (in)	12.550...12.561 (0.4941...0.4945)
Oversize valve guide, outside dia.	mm (in)	12.733...12.744 (0.5013...0.5017)
Valve guide inside 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 (0.0059)
Exhaust	mm (in)	0.030...0.056 (0.0012...0.0022)
Wear limit	mm (in)	0.17 (0.0067)
Valve spring		
Spring length, off-load	mm (in)	41.1 (1.6181)
Wear limit	mm (in)	39.0 (1.5354)

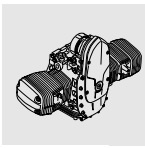


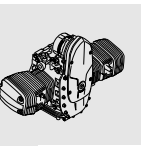


Technical Data 11 Engine		R 1150 RT
Rocker arm		
Bore dia.	mm (in)	16.016...16.034 (0.6306...0.6312)
Rocker shaft dia.	mm (in)	15.973...15.984 (0.6289...0.6293)
Radial clearance	mm (in)	0.032...0.061 (0.0016...0.0024)
Wear limit	mm (in)	0.1 (0.0039)
End float		
min.	mm (in)	0.05 (0.0019)
max.	mm (in)	0.40 (0.0157)
Camshaft		
Opening angle, inlet/exhaust cams	°	300/300
Cam spread, inlet/exhaust	°	109/106
Marking		Mark in position **4**
Inlet valve lift	mm (in)	9.70 (0.3819) (valve clearance = 0)
Exhaust valve lift	mm (in)	9.30 (0.3661) (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 (0.0059)
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)
End float	mm (in)	0.05 ... 0.13 (0.0031...0.0051)
Wear limit	mm (in)	0.25 (0.0098)
Bucket-type tappet		
Extl. dia.	mm (in)	23.947...23.960 (0.9428...0.9433)
Bore dia. 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 (0.0070)
Auxiliary shaft		
Crankcase bore dia. front/rear	mm (in)	25.020...25.041 (0.9851...0.9859)
Auxiliary shaft dia. front/rear	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 (0.0066)



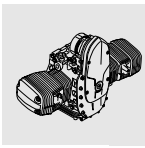
Technical Data 11 Engine		R 1150 RT
Crankshaft		
Marking of main bearing and crankpin on front crank web		
no paint mark		Undersize 0
paint mark		Undersize 1 (-0.25 mm/-0.0098 in)
Undersize 0 (Undersize 1 = –0.25 mm/–0.0098 in)		
Guide bearing bore dia.	mm (in)	64.949...64.969 (2.5571...2.5579)
Guide bearing dia.	mm (in)	Green: 59.965...59.999 (2.3608...2.3621)
	mm (in)	Yellow: 59.979...60.013 (2.3614...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)	0.017...0.060 (0.0007...0.0023)
Wear limit	mm (in)	0.1 (0.0039)
Main bearing bore dia.	mm (in)	60.010...60.029 (2.3626...2.3633)
Main bearing dia.	mm (in)	Green: 55.000...55.039 (2.1654...2.1669)
	mm (in)	Yellow: 55.008...55.047 (2.1657...2.1672)
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...0.066 (0.0007...0.0026)
Wear limit	mm (in)	0.13 (0.0051)
Width of guide bearing	mm (in)	24.890...24.940 (0.9799...0.9819)
Bearing width of main bearing journal	mm (in)	25.065...25.098 (0.9868...0.9881)
End float	mm (in)	0.125...0.208 (0.0049...0.0082)
Wear limit	mm (in)	0.2 (0.0079)
Undersize 0 (undersize 1 = –0.25 mm/–0.0098 in)		
Crankpin dia.	mm (in)	47.975...47.991 (1.8888...1.8894)
Bearing width of crankpin	mm (in)	22.065...22.195 (0.8687...0.8738)

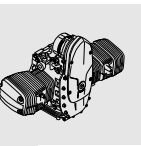




Technical Data 11 Engine		R 1150 RT
Connecting rod		
Bore dia. for big end bearing	mm (in)	51.000...51.013 (2.0079...2.0084)
Big end bearing dia.	mm (in)	48.016...48.050 (1.8904...1.8918)
Radial clearance	mm (in)	0.025...0.075 (0.0010...0.0030)
Wear limit	mm (in)	0.13 (0.0051)
Width of big end bearing 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 (0.0197)
Small end bearing bore dia.	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 (0.0024)
Distance between centers	mm (in)	125 (4.9212)
Max. deviation from parallel of conrod bores at 150 mm (5.9055 in) spacing	mm (in)	0.02 (0.0008)
Weight classes		
Class		
0 (2 spots, white)	g (oz.)	520.0...525.9 (18.356...18.565)
1 (2 spots, blue)	g (oz.)	526.0...531.9 (18.568...18.776)
2 (3 spots, white)	g (oz.)	532.0...537.9 (18.780...18.988)
3 (3 spots, yellow)	g (oz.)	538.0...543.9 (18.992...19.200)
4 (1 spot, blue)	g (oz.)	544.0...549.9 (19.201...19.412)
Cylinders		
Bore dia.		(20 mm/0.7874 in) from top edge)
A	mm (in)	100.992...101.000 (3.9761...3.9764)
Wear limit	mm (in)	101.050 (3.9784)
B	mm (in)	101.000...101.008 (3.9764...3.9768)
Wear limit	mm (in)	101.058 (3.9787)
Total wear clearance of piston and cylinder	mm (in)	0.12 (0.0047)
Permitted out-of-roundness of cylinder bore		
at 20 mm (0.7874 in) from the top edge	mm (in)	0.03 (0.0012)
100 mm (3.9370 in) from the bottom edge	mm (in)	0.04 (0.0016)

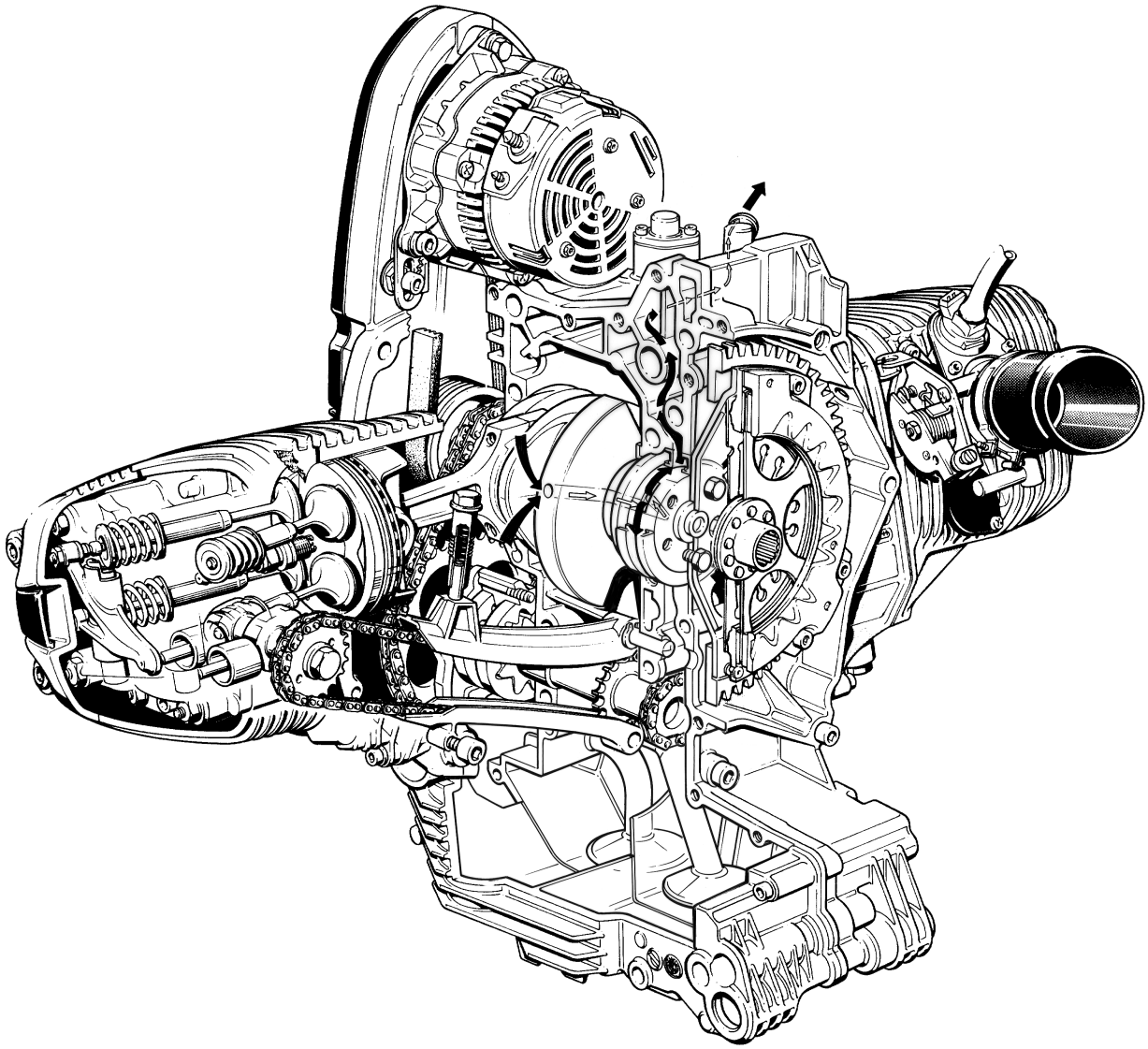
Technical Data 11 Engine		R 1150 RT
Pistons		
Piston dia.		(Measuring plane A – see Checking pistons and cylinders)
A	mm (in)	100.971...100.983 (3.9753...3.9758)
Wear limit	mm (in)	100.895 (3.9723)
B	mm (in)	100.983...100.995 (3.9757...3.9763)
Wear limit	mm (in)	100.905 (3.9727)
AB	mm (in)	100.979...100.987 (3.9756...3.9759)
Wear limit	mm (in)	100.900 (3.9725)
Installed clearance	mm (in)	0.005...0.029 (0.0002...0.0011)
Total wear clearance of piston and cylinder	mm (in)	0.12 (0.0047)
Piston pin bore dia.	mm (in)	22.005...22.011 (0.8663...0.8666)
Weight classes		+ and –
Weight difference in one class	g (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)
Piston rings		
Installed direction of piston rings		"Top" marking uppermost
1st groove		
asymmetric piston ring, curved, oval section		
Height	mm (in)	1.170...1.190 (0.0461...0.0469)
Wear limit	mm (in)	1.1 (0.0433)
Gap	mm (in)	0.1...0.3 (0.0039...0.0118)
Wear limit	mm (in)	0.8 (0.0315)
Float	mm (in)	0.030...0.070 (0.0012...0.0027)
Wear limit	mm (in)	0.15 (0.0059)
2nd groove		
Micro-taper compression ring		
Height	mm (in)	1.170...1.190 (0.0461...0.0469)
Wear limit	mm (in)	1.1 (0.0433)
Gap	mm (in)	0.2...0.4 (0.0078...0.0158)
Wear limit	mm (in)	0.8 (0.0315)
Float	mm (in)	0.030...0.07 (0.0012...0.0027)
Wear limit	mm (in)	0.15 (0.0059)



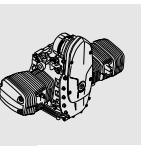


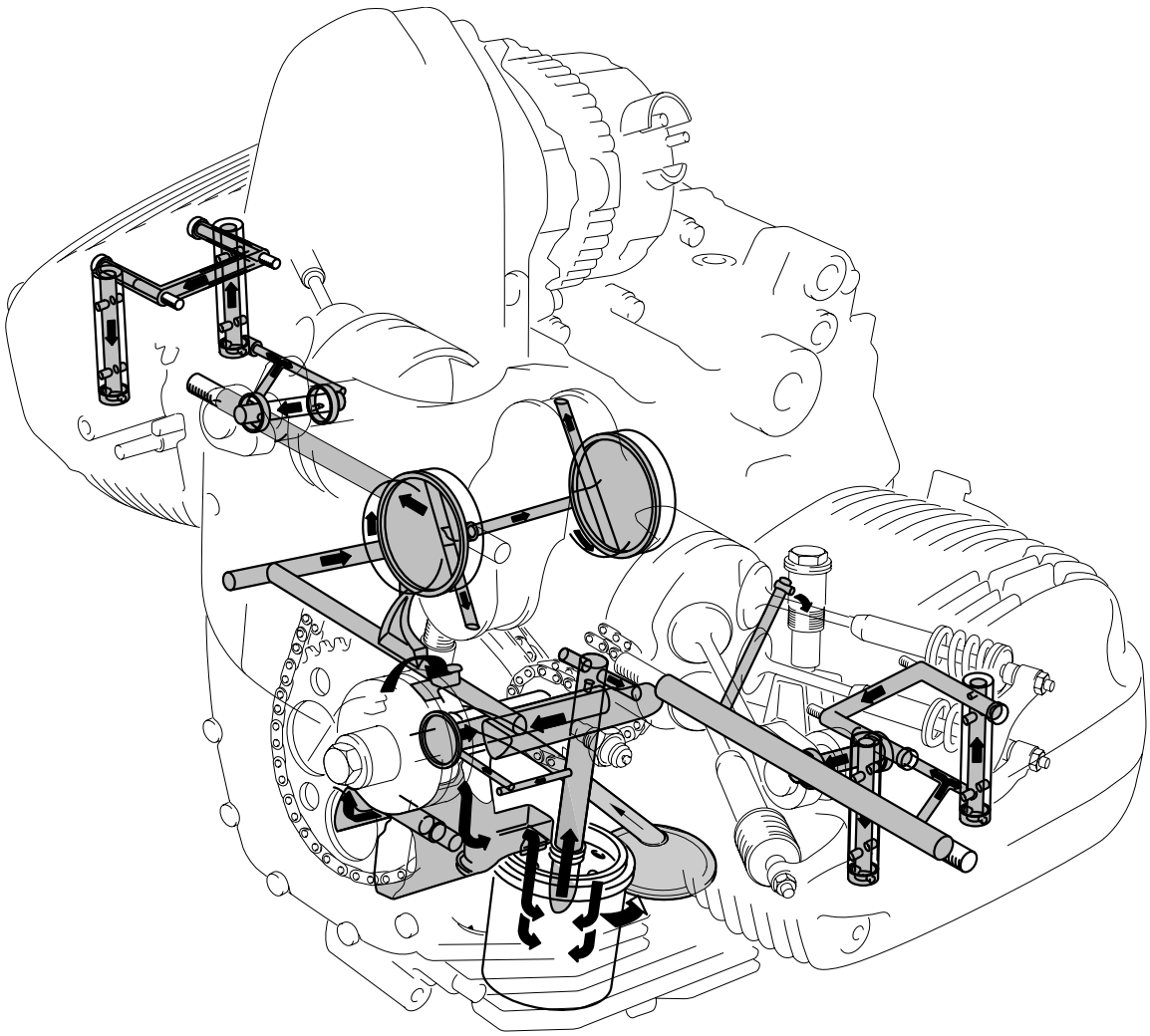
Technical Data 11 Engine		R 1150 RT
3rd groove		
Coiled-spring ring		
Height	mm (in)	1.97...1.99 (0.0776...0.0783)
Wear limit	mm (in)	1.9 (0.0748)
Gap	mm (in)	0.30...0.55 (0.0118...0.0217)
Wear limit	mm (in)	1.20 (0.0472)
Float	mm (in)	0.020...0.060 (0.0008...0.0024)
Wear limit	mm (in)	0.15 (0.0059)
Piston pin		
Piston pin dia.	mm (in)	21.995...22.000 (0.8664...0.8662)
Wear limit	mm (in)	21.960 (0.8646)
Bore dia. in piston	mm (in)	22.005...22.011 (0.8663...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

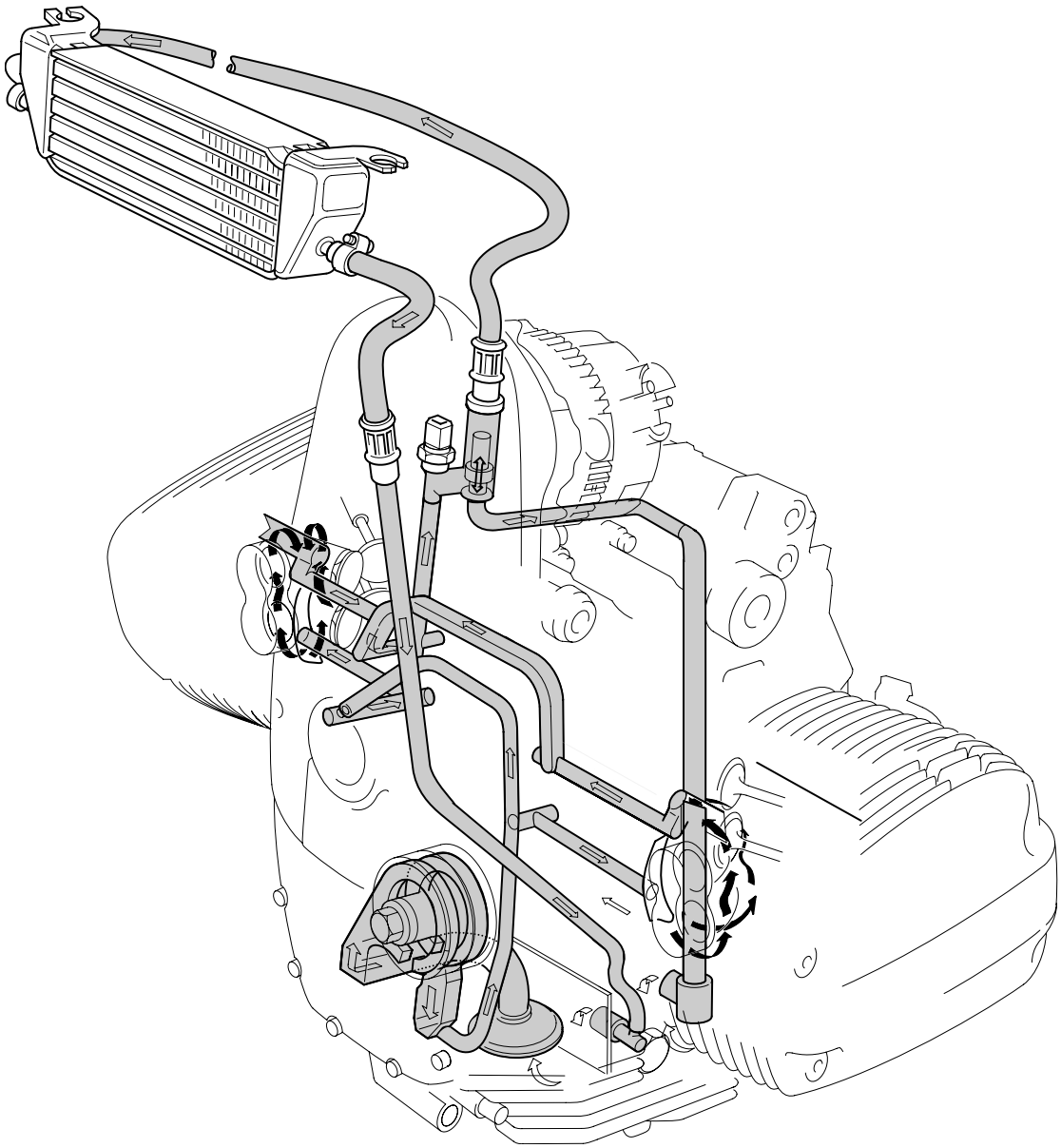


Lubricating-oil circuit





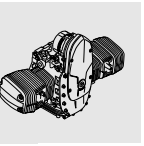
Cooling-oil circuit



11 00 050 Removing and installing engine

11 00 Removing engine

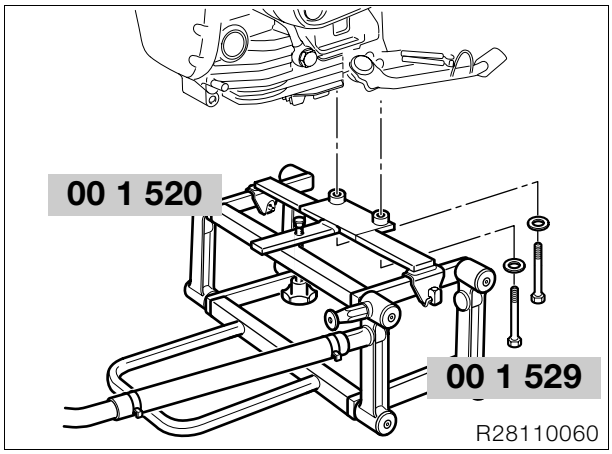
Note:
Auxiliary shaft, timing chains, chain tensioner/guide rails and crankshaft can only be removed after the engine has been removed. All other components can be removed with the engine installed.



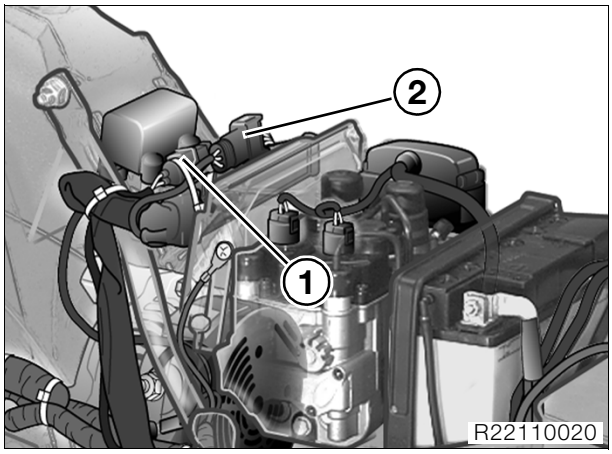
- Drain oil from engine.
- Remove the seat.
- Remove side panels (➡ 46.8).

Attention:
Fuel is flammable and a hazard to health. Observe all applicable safety regulations.

- Remove fuel tank (➡ 16.5).



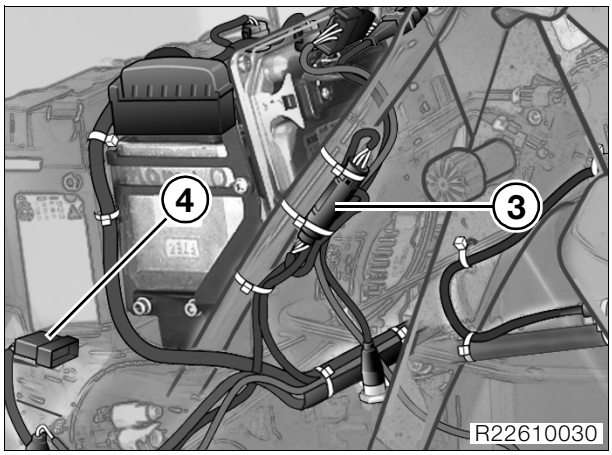
- Secure stand, **BMW No. 00 1 520**, to motorcycle with bushes and screws, **BMW No. 00 1 529**.
- Disconnect the air temperature sensor plug.
- Remove air filter cover.
- Remove the intake air pipe.



- Disconnect plug of NTC oil-temperature sensor (1).
- Disconnect plug from Hall transmitter (2).

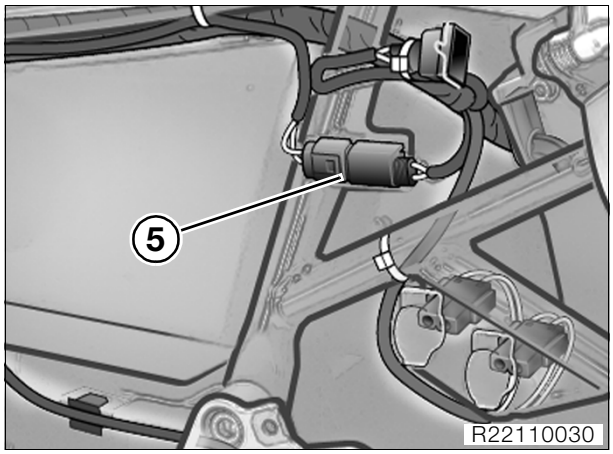
Attention:
Disconnect the negative battery terminal first, then the positive terminal. Connect the positive battery terminal first, then the negative terminal.

- Remove the battery.
- Use hose clip pliers, **BMW No. 17 5 500**, to open clamp on crankcase breather hose at engine.
- Disconnect the hose for the crankcase breather from the crankcase.

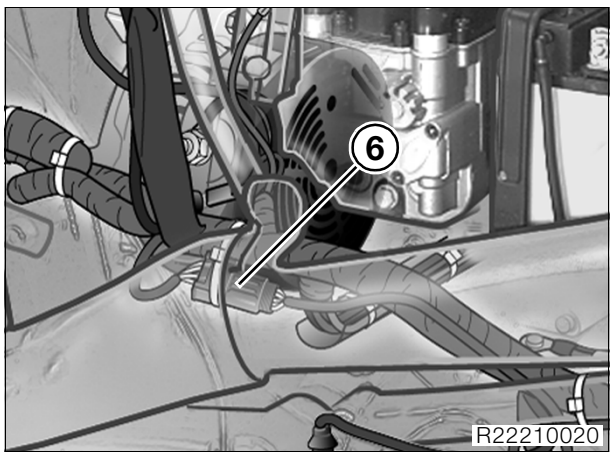


- Disconnect plug for oxygen sensor (3) and remove cable.
- Remove the plug/fuel pump unit (4) from the frame.
- Remove cable strap from cable guide under battery carrier.
- Disconnect the leads from the alternator.
- Disconnect ground lead from terminal at top of engine.
- Disconnect right-hand oil cooler line from engine.
- Remove 4 nuts securing the battery carrier to the engine.

- Remove spark plug covers.
- Pull off spark plug cap with special puller, **BMW No. 12 3 520**.
- Disconnect plugs of injection valves.
- Disengage Bowden cables from throttle stub pipes.
- Disconnect hose clamps/throttle stub pipes and push the stubs into the air filter box.
- Disconnect ground cable from left throttle stub pipe.
- Disconnect plug of throttle-valve potentiometer.
- Remove holders of injection valves.
- Remove injection valves from throttle stub pipes.
- Remove right throttle stub pipe.
- Remove left throttle stub pipe with flange.
- Remove the left footrest plate (➟ 46.16).
- Disconnect cables from starter motor.
- Remove starter motor.
- Disconnect cable from oil pressure switch.



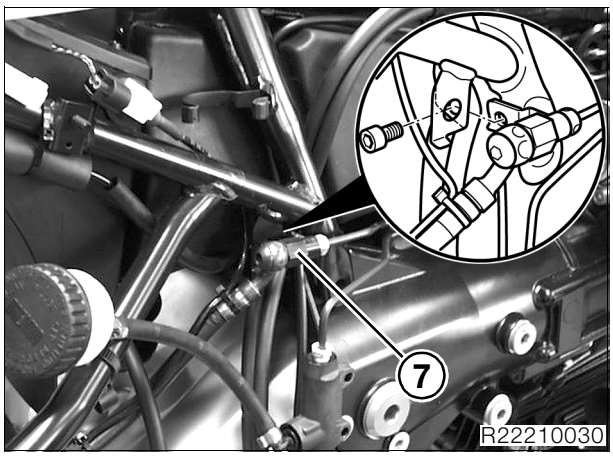
- Disconnect side-stand switch plug (5) and remove the cable.
- Remove the right footrest plate (➟ 46.17).
- Remove exhaust.
- Remove manifold.



- Disconnect gear-indicator plug (6) and remove the cable.
- Remove fasteners securing fairing bracket to engine on left and right.
- Remove front cover.
- Disconnect oil cooler line from engine and oil cooler.
- Carefully remove the oil-cooler line.

Warning:
Integral ABS When removing and installing the brake calipers, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➟ 00.48).

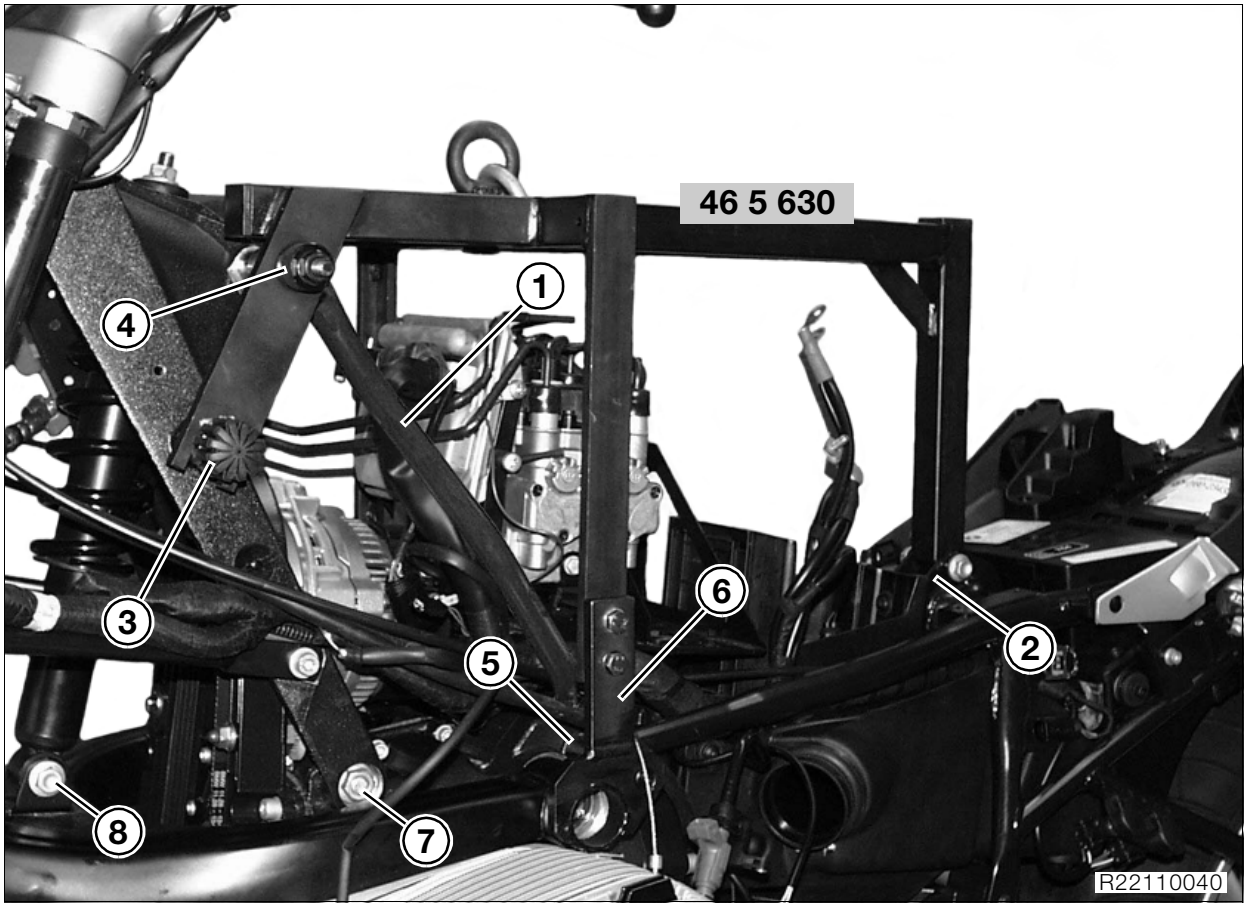
- Remove rear brake caliper.
- **Integral ABS** Remove ABS sensor from rear wheel drive.
- Remove brake line from swinging arm.
- Use cable ties to secure the brake caliper to the rear frame.



- Remove brake line (7) from the rear frame.
- Disconnect clutch-system bleed line from rear frame, left.
- Remove the main stand and the side stand.
- Remove starter motor.
- Remove the left screw cap.
- Remove the screw on the right.

Attention:
If necessary, mask off the leading link to prevent it from being scratched.

- Pull the shaft of the leading link out to the left.



Installing auxiliary frame (raising frame unit clear of engine)

- Remove rear wheel.
- Remove hydraulic spring-strut adjuster.
- Support the rear swinging arm.
- Heat bottom fastener of spring strut to max. 120 °C (248 °F) and remove.
- Remove rear spring strut.
- Install the rear wheel.
- Remove the upper securing screw and the bottom bolt of the engine/frame connecting strut (1).

Attention:
Use adhesive tape to mask the fuel tank anchorage and protect it against scratches.

- Place auxiliary frame, **BMW No. 46 5 630**, in position and secure to the rear spring-strut mount (2).
- Engage the auxiliary frame to the front anchorage point for the fuel tank (3).
- Centre the auxiliary frame relative to the flat of the fuel-tank anchorage, install the threaded bushings (4) at the connecting struts/frame and tighten.
- Pass threaded rod of auxiliary frame through threaded bushes (4) and secure.
- Remove front fasteners for rear frame (5) on left and right.
- Install adapter (6) in link/rear-frame anchorage and secure to auxiliary frame.
- Remove screw (8) of bottom spring-strut mount.
- Press leading link down at front, or pull tail section down.

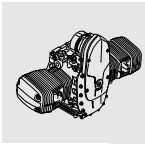
Attention:
If necessary, mask off the leading link to prevent it from being scratched.

- Heat both nuts on stud (7) to max. 120 °C (248 °F) and remove.
- Remove stud (7).
- Install screw (8) of bottom spring-strut mount.
- Slightly raise the frame unit and remove the fasteners securing the clutch slave cylinder.
- Raise the frame unit at the front.
- Remove the gearbox, swinging arm, rear axle and rear wheel together.

Removing auxiliary frame (lowering frame unit onto engine)

Attention:
Make sure that all components are correctly positioned. Do not damage cables, lines and Bowden cables.

- Lower the frame unit into position from front.
- Install the clutch slave cylinder.
- Lightly grease the shaft of the leading link, insert it from the left and tighten.
- Remove screw (8) of bottom spring-strut mount.
- Press leading link down at front, or pull tail section down.

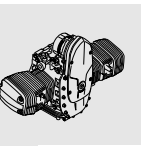


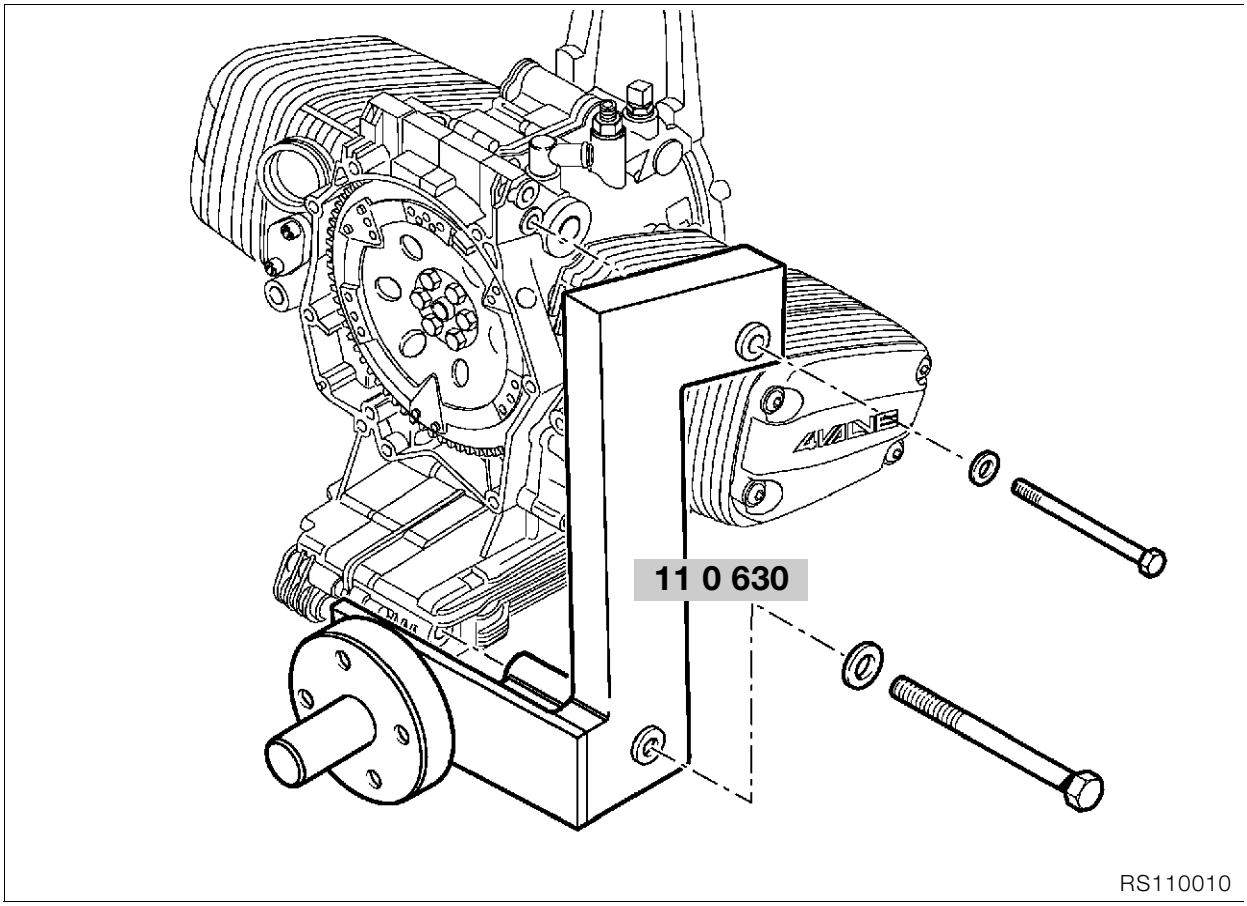
Attention:
If necessary, mask off the leading link to prevent it from being scratched.

- Insert pin, **BMW No. 46 5 630**, from the left to align the front frame bores with the corresponding bores in the engine, insert the bolt from the right and tighten.
- Install screw (8) of bottom spring-strut mount.
- Remove adapter (6) from the auxiliary frame.
- Install front fasteners for rear frame (5) on left and right.
- Remove the auxiliary frame.
- Support the rear swinging arm.
- Remove rear wheel.
- Install rear spring strut.
- Install hydraulic spring-strut adjuster.
- Install rear wheel and spacer.
- Secure ground cable below the battery carrier.
- Secure the battery carrier.
- Connect the leads to the alternator.
- Use hose clip pliers, **BMW No. 17 5 500**, to close clamp on crankcase breather hose at engine.
- Install connecting struts (1) at bottom.
- Install screws for securing rear frame to gearbox.
- Raise the rear section to align the frame and connecting struts (1) and secure.
- Remove screws for securing rear frame to gearbox.

Tightening torque:

Clutch slave cylinder	9 Nm
Leading-link pivot shaft to engine, right	73 Nm
Spring strut to leading link	50 Nm
Bolt for front frame to engine	82 Nm
Spring strut to rear frame	50 Nm
Spring strut to rear swinging arm (clean thread + Loctite 243)	58 Nm
Hydraulic spring preload adjuster to rear frame	22 Nm
Rear wheel	105 Nm
Connecting strut (1) to frame	58 Nm
Connecting strut (1) to engine (clean thread + Loctite 2701)	58 Nm

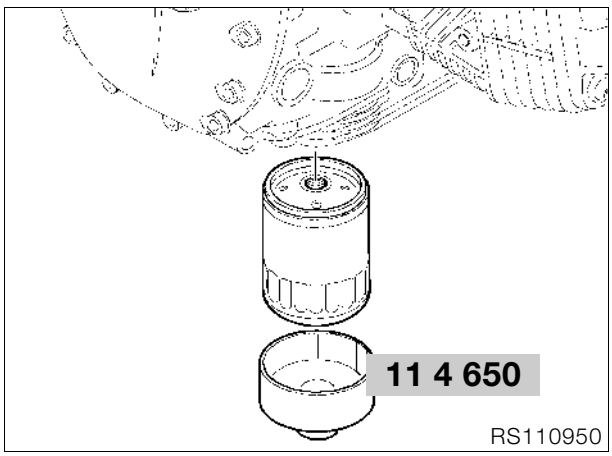




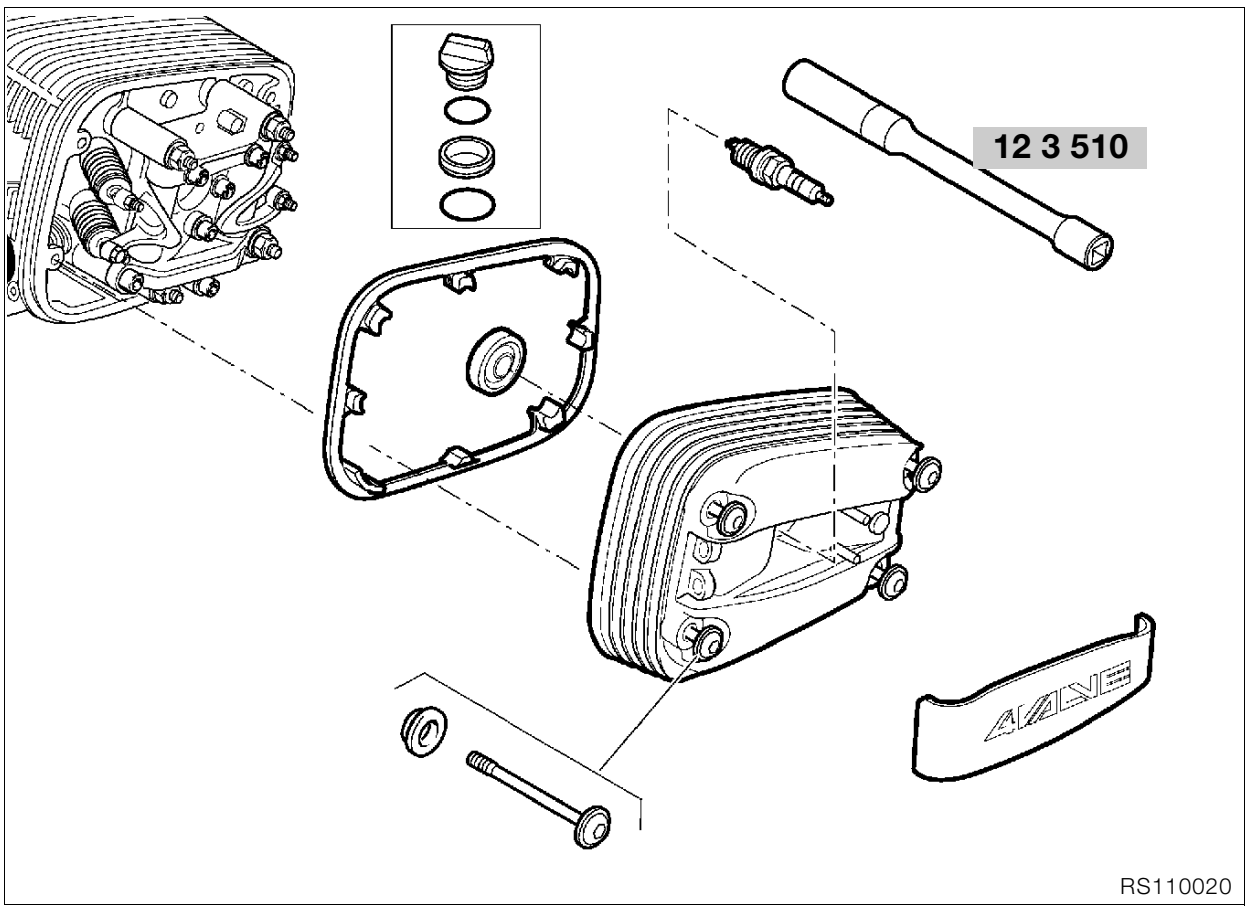
11 00 103 Disassembling and reassembling engine

11 00 Disassembling engine

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



- Drain oil from engine.
- Remove oil filter with oil filter wrench, **BMW No. 11 4 650**.

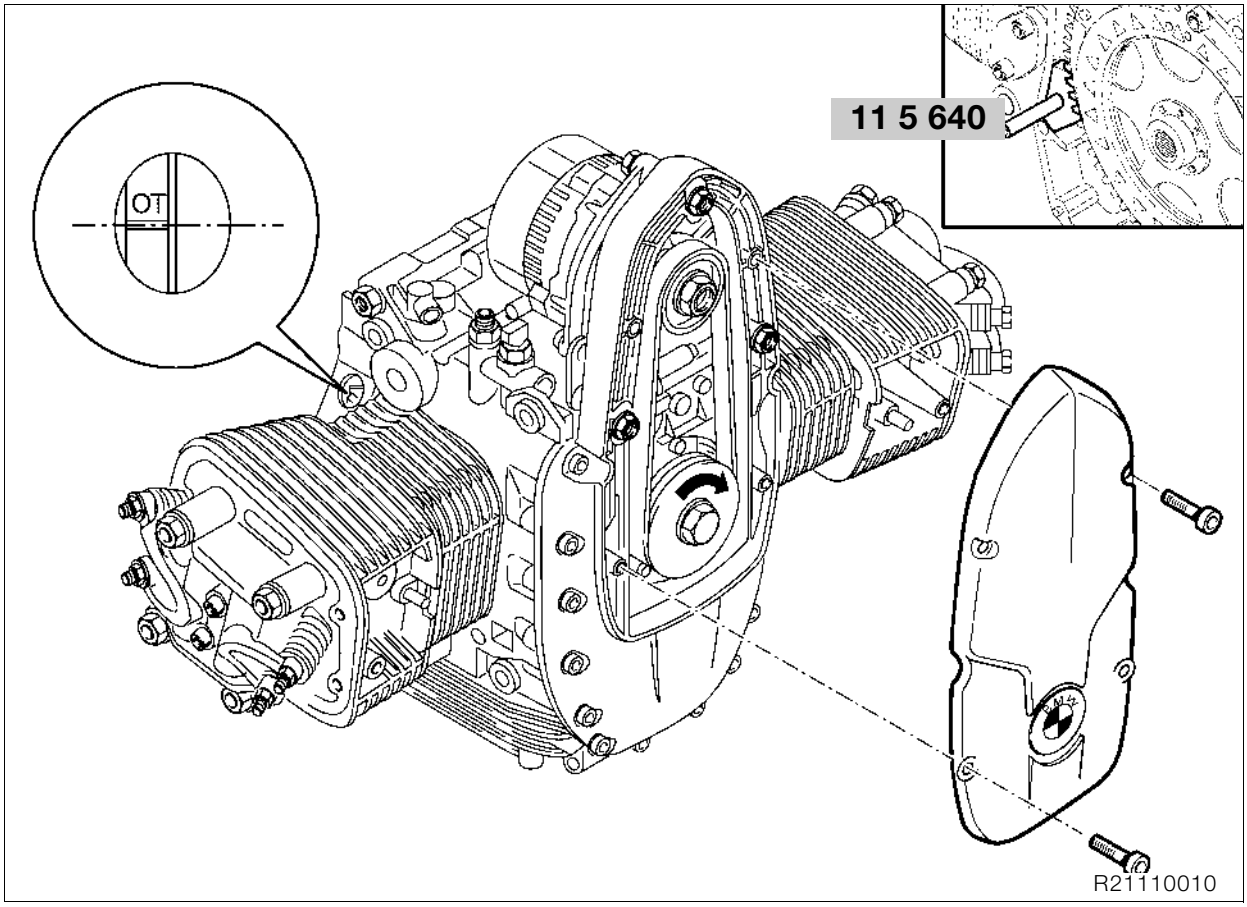


11 12 050 Removing cylinder head cover

- Use spark plug wrench, **BMW No. 12 3 510** to remove the spark plugs.

Attention:
Catch escaping oil.

- Remove cylinder head cover.



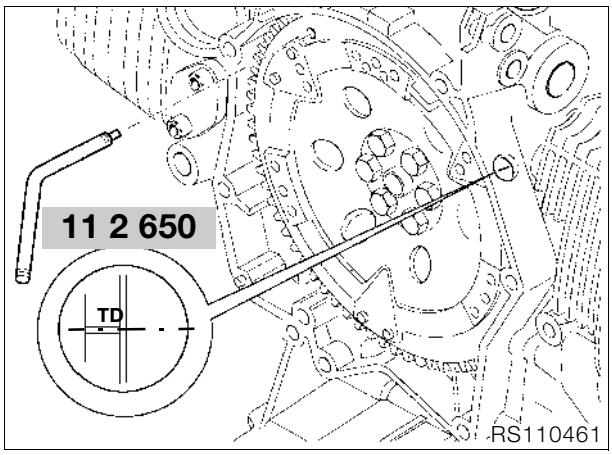
Locking the engine at TDC

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

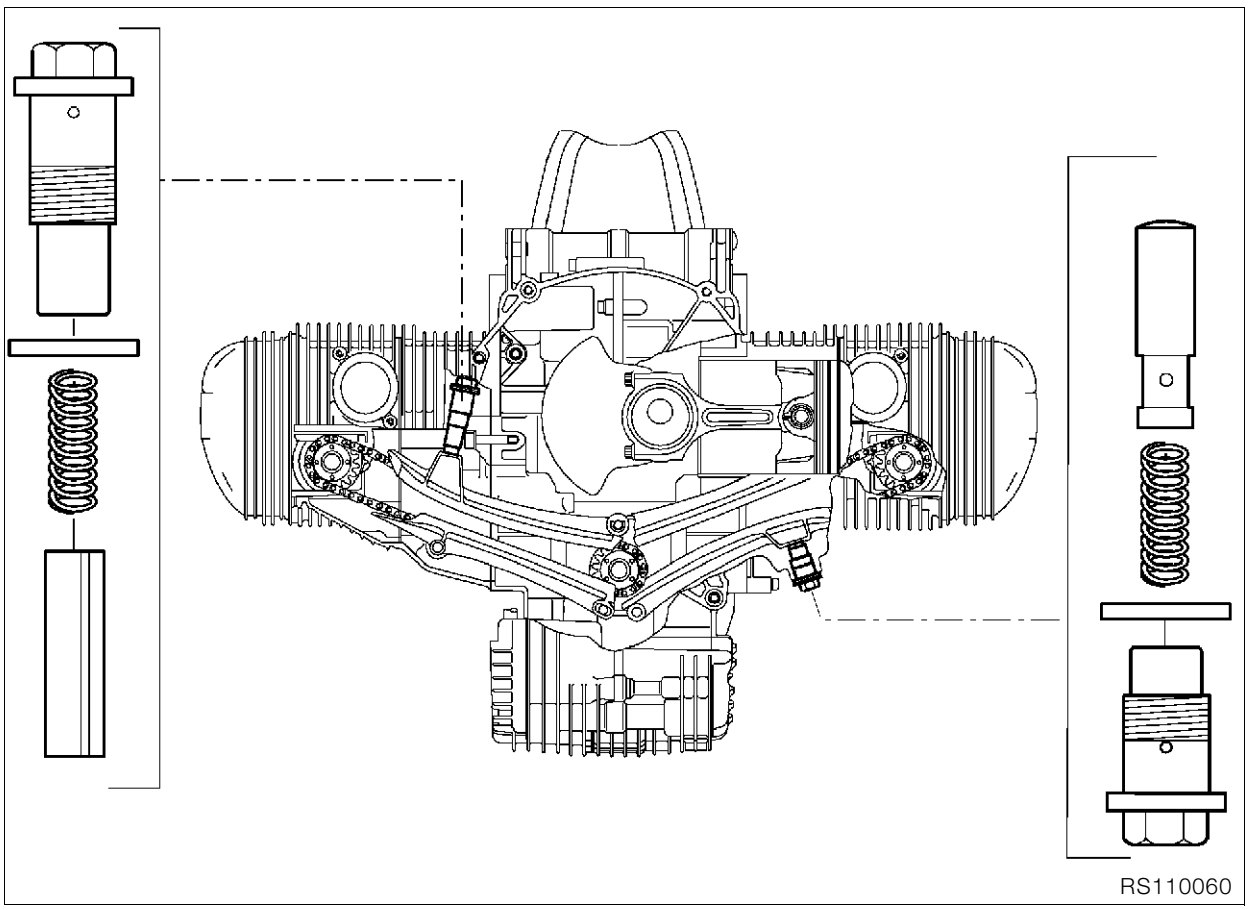
Firing TDC

1. TDC mark is visible, and
2. the cylinder's inlet and exhaust valves are both closed.

- Install locking device, **BMW No. 11 5 640**, to lock clutch housing.



Note:
The engine can be set to top dead centre with the TDC pin,
BMW No. 11 2 650, which is inserted into the clutch housing and the engine block at TDC.



11 31 120 Removing and installing chain tensioner

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

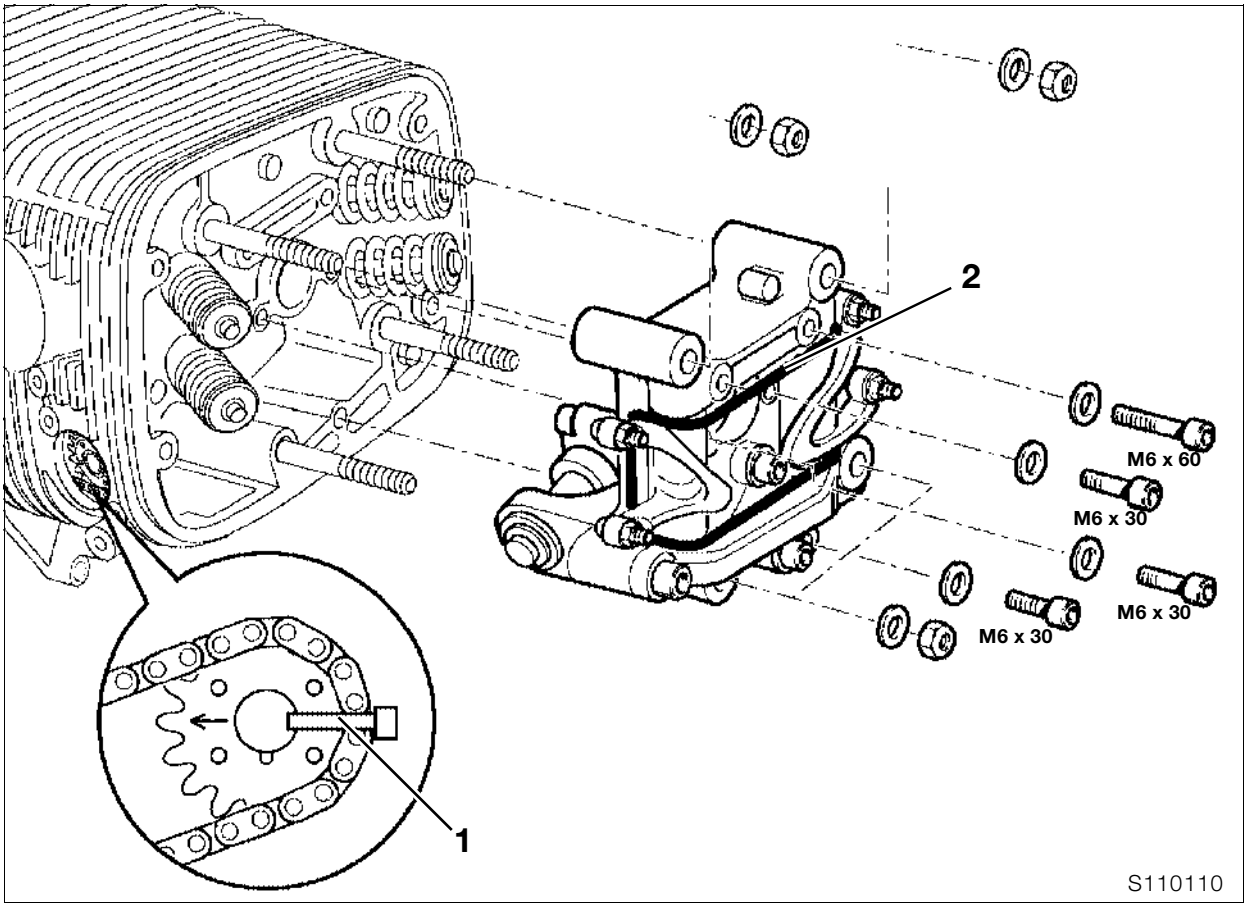
Work instructions, timing-chain tensioner

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

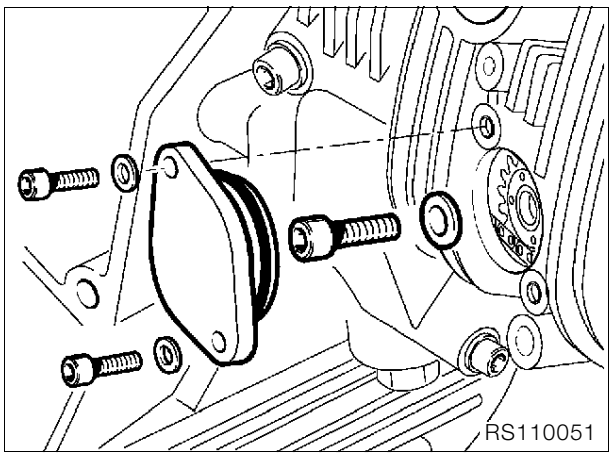
Removing:
- Remove timing chain tensioner, then remove camshaft sprocket from camshaft.

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

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



11 33 Removing and installing valve gear carrier



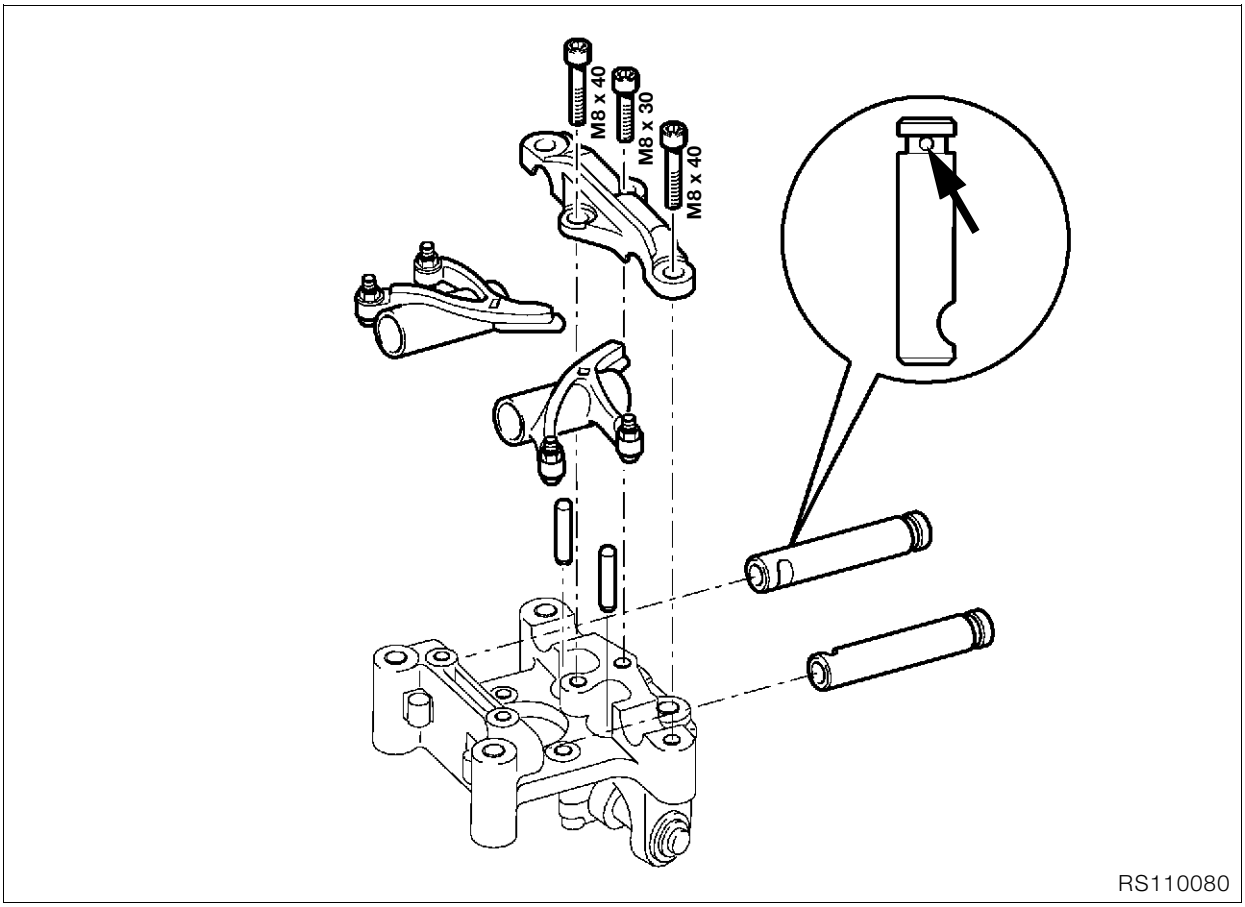
- Remove camshaft sprocket cover.

Note:
If the camshaft sprocket (1) is not removed after being released, it will be necessary to position and secure it to prevent it from dropping into the engine (for instance, with cable ties).

- Remove/pull off camshaft sprocket.

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

- Remove valve gear carrier.
- Secure rocker arms with a rubber band (2).
- Install valve gear carrier (➠ 11.58).

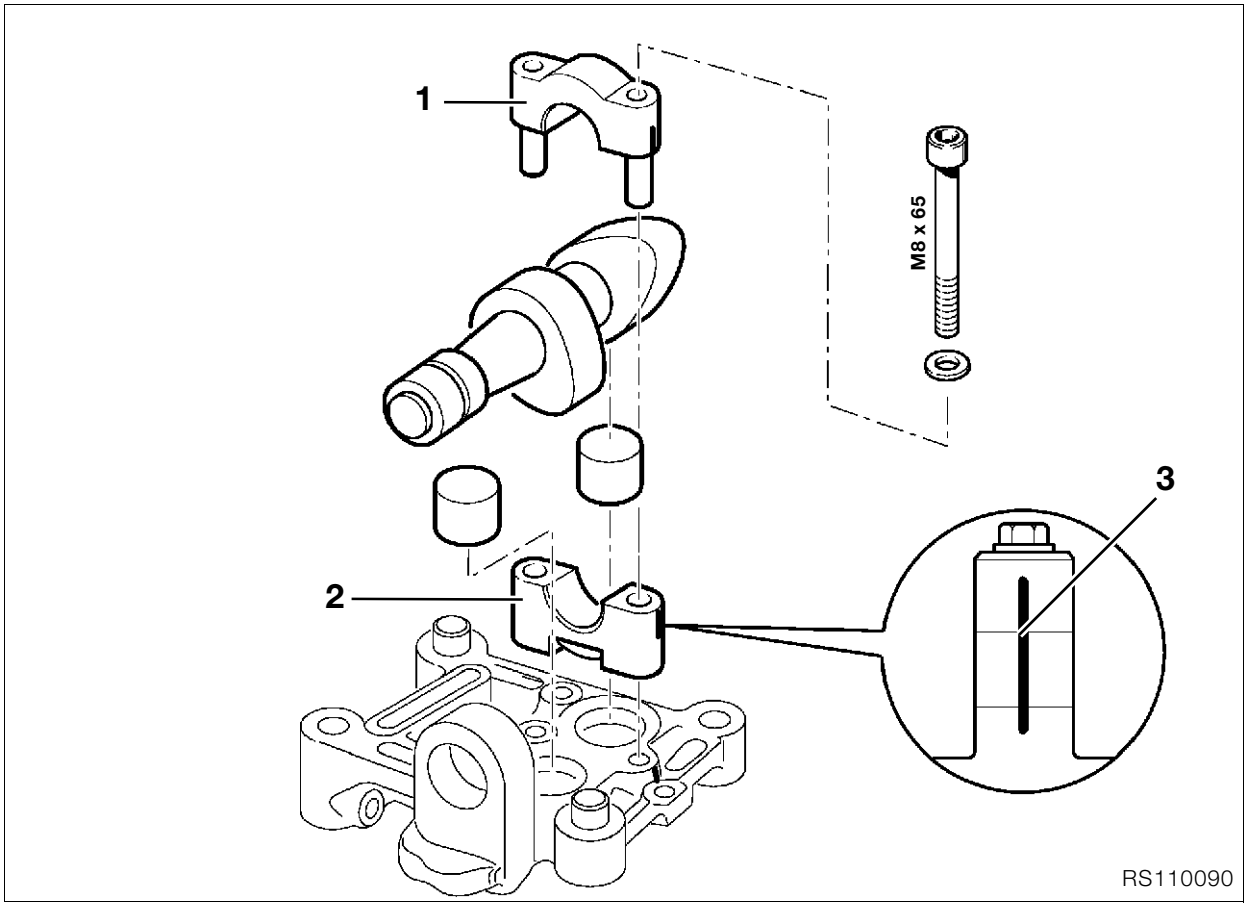


11 33 280 Disassembling and assembling valve gear carrier

- 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.

Attention:
Do not mix up the rocker shafts and pushrods.

- Remove pushrods.



- Remove camshaft bearing cap (1).
- Remove camshaft and bearing (2).

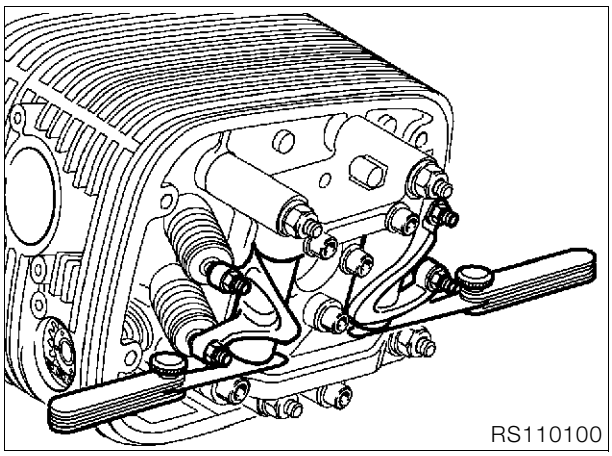
Attention:
Do not mix up the bucket-type tappets.

- Remove bucket-type tappets.
- Assembly is the reverse of the disassembly procedure.

Attention:
Note direction of installation (3) for camshaft bearing cap. The recesses in the rocker arm shafts must be in alignment with the holes for the fasteners.

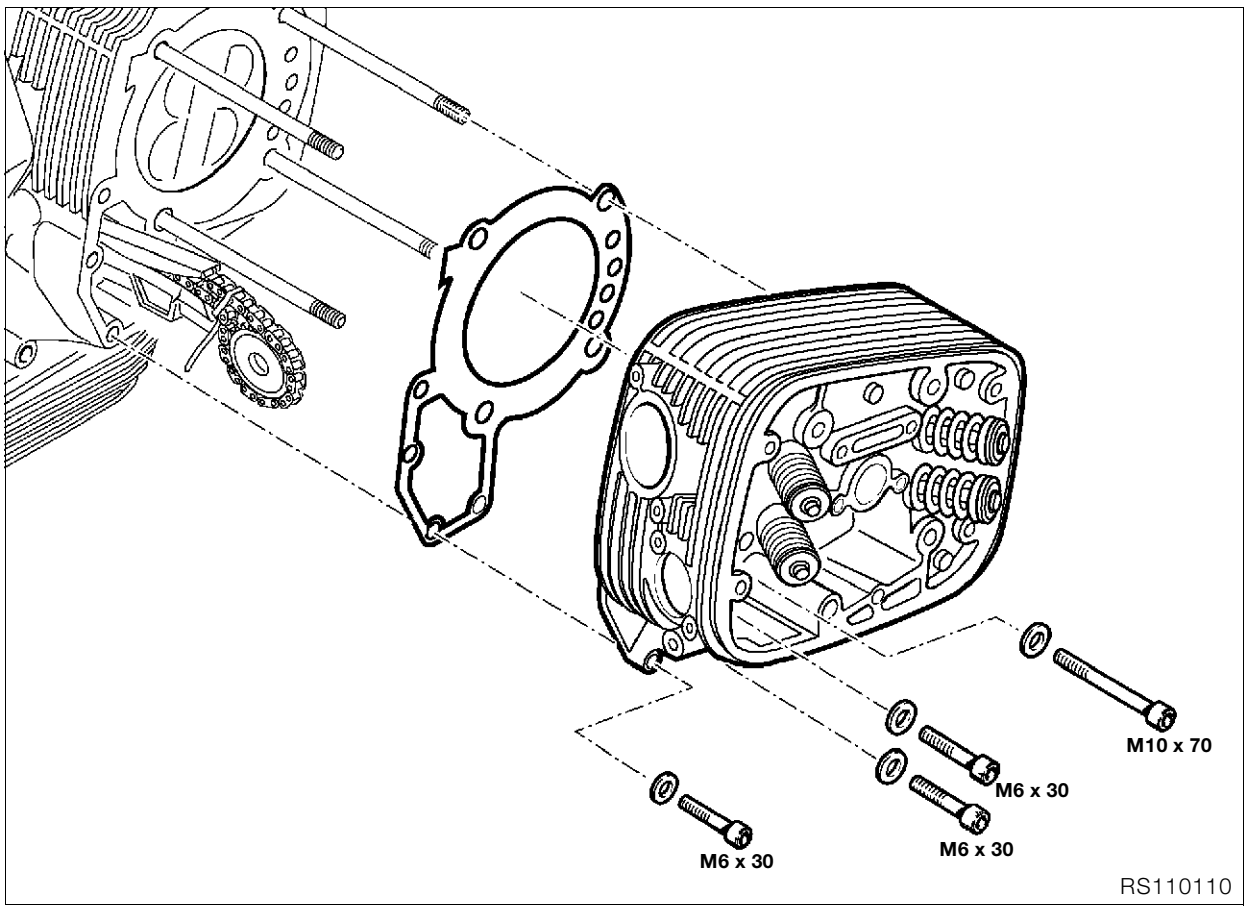
Note:
Locate pushrods in ball cups of rockers and hold the rockers together with a rubber band to hold the pushrods in position.

Tightening torque:
M 8 screw, rocker shaft bearing cap ..... 18 Nm
M 8 screw, camshaft bearing cap ..... 15 Nm

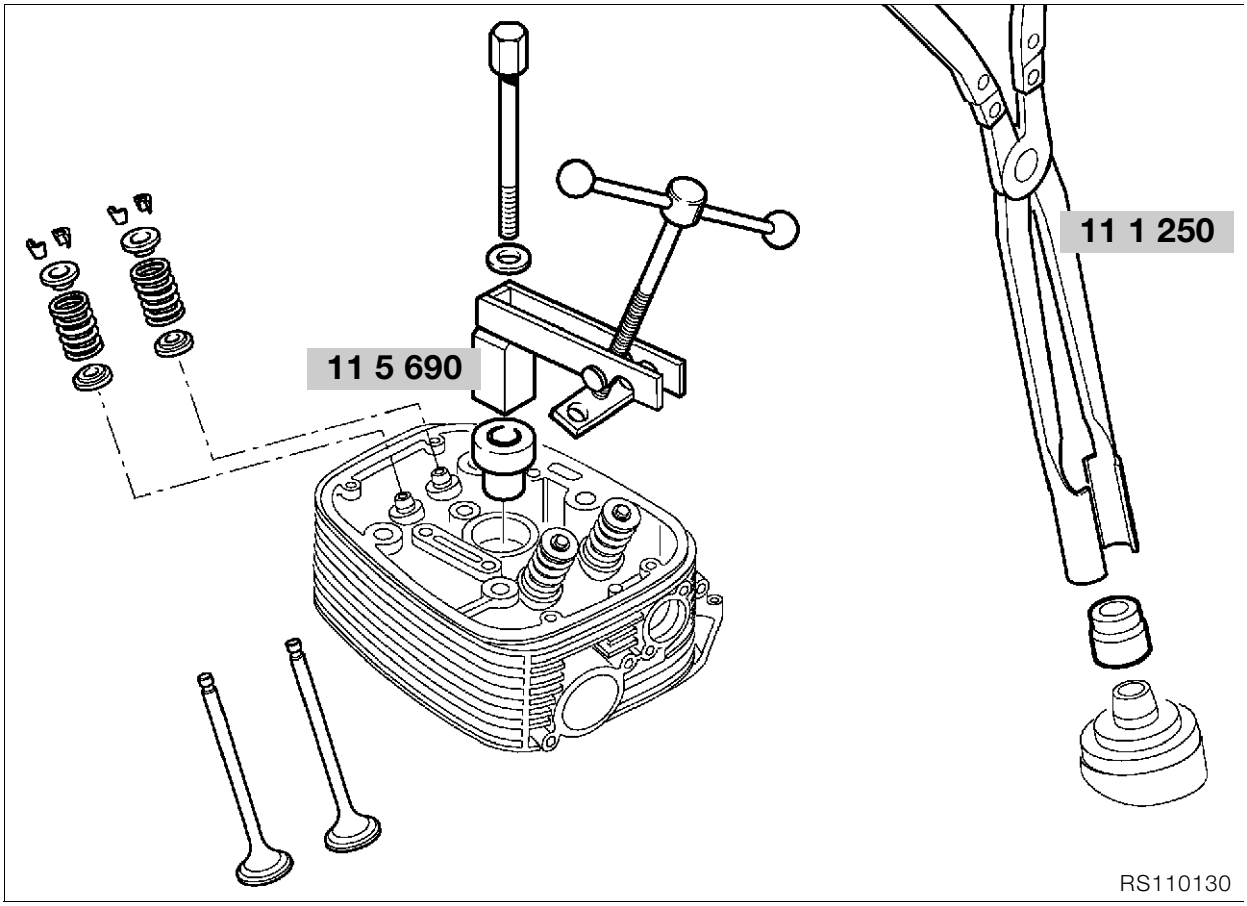


- Adjust the holder for minimum end float.

End float of rockers:
min. ..... 0.05 mm (0.0020 in)
max. ..... 0.40 mm (0.0157 in)



11 12 090 Removing cylinder head



11 12 232 Disassembling, checking, repairing and reassembling cylinder head

11 34 Removing and installing valves

Attention:
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**, onto cylinder head.
- Compress the valve springs.
- Gently tap valve head to release collets from spring retainer.
- Remove valve collets.
- Relieve tension on valve springs.
- Remove top and bottom spring retainers, valve springs and valves.

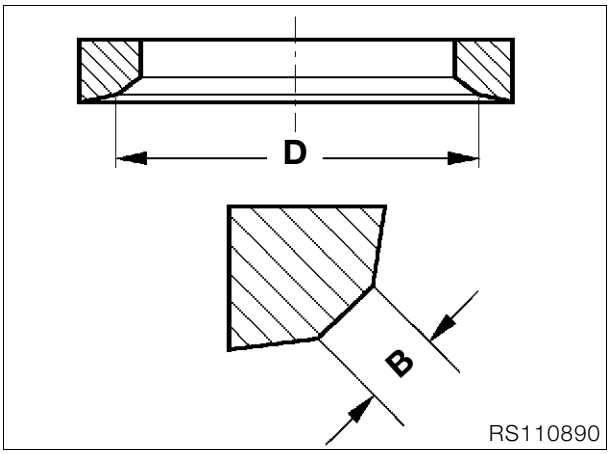
11 34 Removing valve stem seals

Note:
The valve stem seal must always be replaced whenever a valve is removed.

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

Checking valves for wear
- Clean combustion residue from valves.
- Check valve dimensions (➟ 11.6).

Remachining valve seat



⚠ Attention:
Width (B) and diameter (D) must always be maintained if valve seat is machined (➟ 11.7).

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

Milling head mating surface:
..... max. 0.2 mm (0.008 in) metal removal

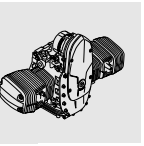
Checking valve guide for wear
- Check valve guide bore (➟ 11.7).

Replacing valve guides

Attention:
Wear protective gloves when handling heated parts.

- Heat cylinder head slowly and uniformly to 200 °C (392 °F) in a suitable oven.
- Drive out valve guides with 5 mm (0.1969 in) dia. drift, **BMW No. 11 5 674**, from the combustion chamber side.
- Allow cylinder head to cool down to room temperature (approx. 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 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 mm (0.5000 in) H7 (12.700...12.718 mm/0.5000...0.5007 in) reamer.

Repair method 2 – turn the valve guide on a lathe
(bore must be undamaged)

- Use bore gauge to check internal diameter of valve guide.
- Calculate the nominal diameter of the valve guide:

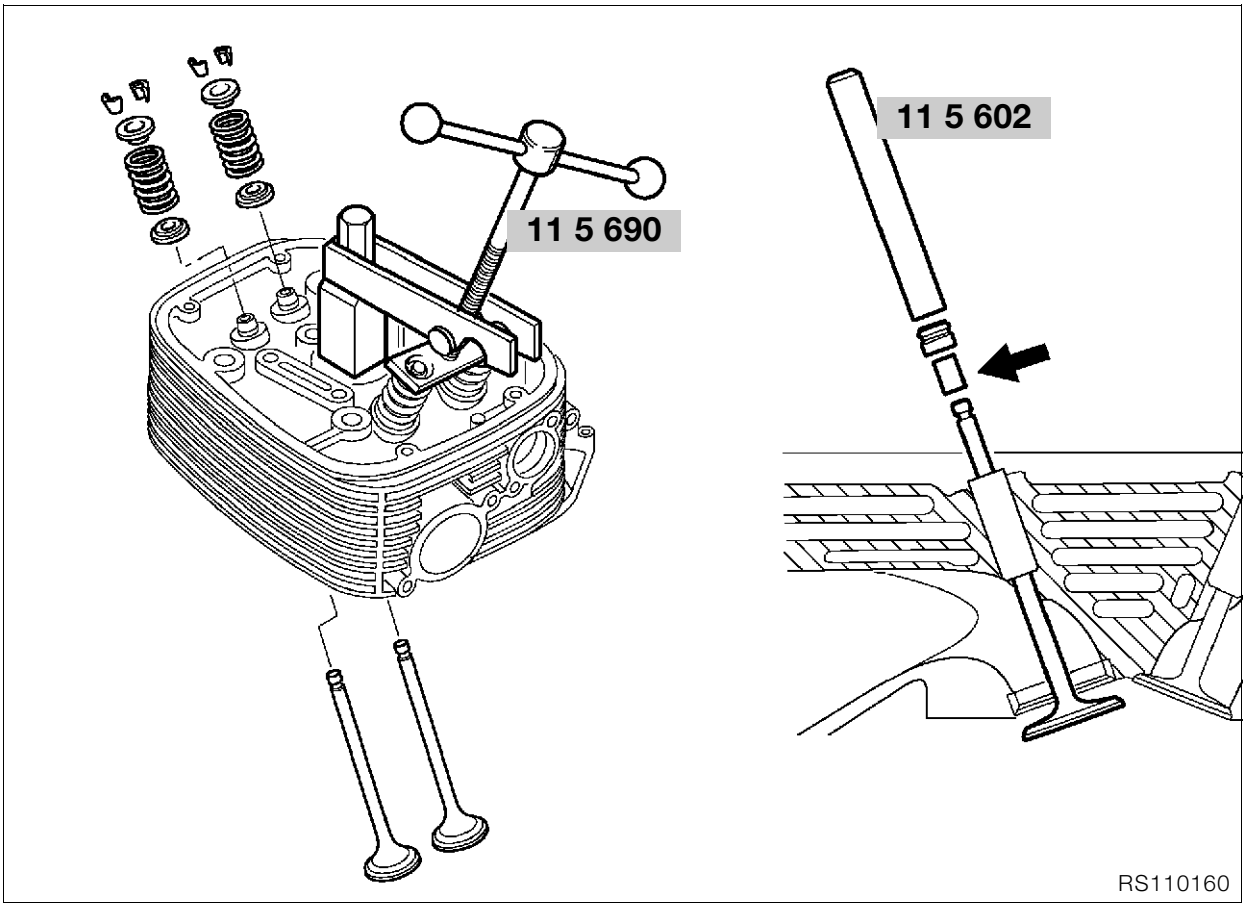
Required diameter of valve guide = bore dia. + interference-fit value
(0.015...0.044 mm/0.0006...0.0017 in).

- 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.

Attention:
The temperature must be –40 °C (–40 °F) immediately prior to insertion.

- Place heated cylinder head flat on workbench or a similar surface.
- Mount the chilled valve guide on dia. 5 mm (0.1969 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, approx. 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.



11 34 Installing valve and valve stem seal

Note:
The valve stem seal must be replaced whenever a valve is removed.

- 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 (0.1969 in) dia. drift, **BMW No. 11 5 602**.

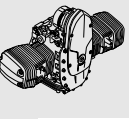
Attention:
Remove the shrink-fit tube.

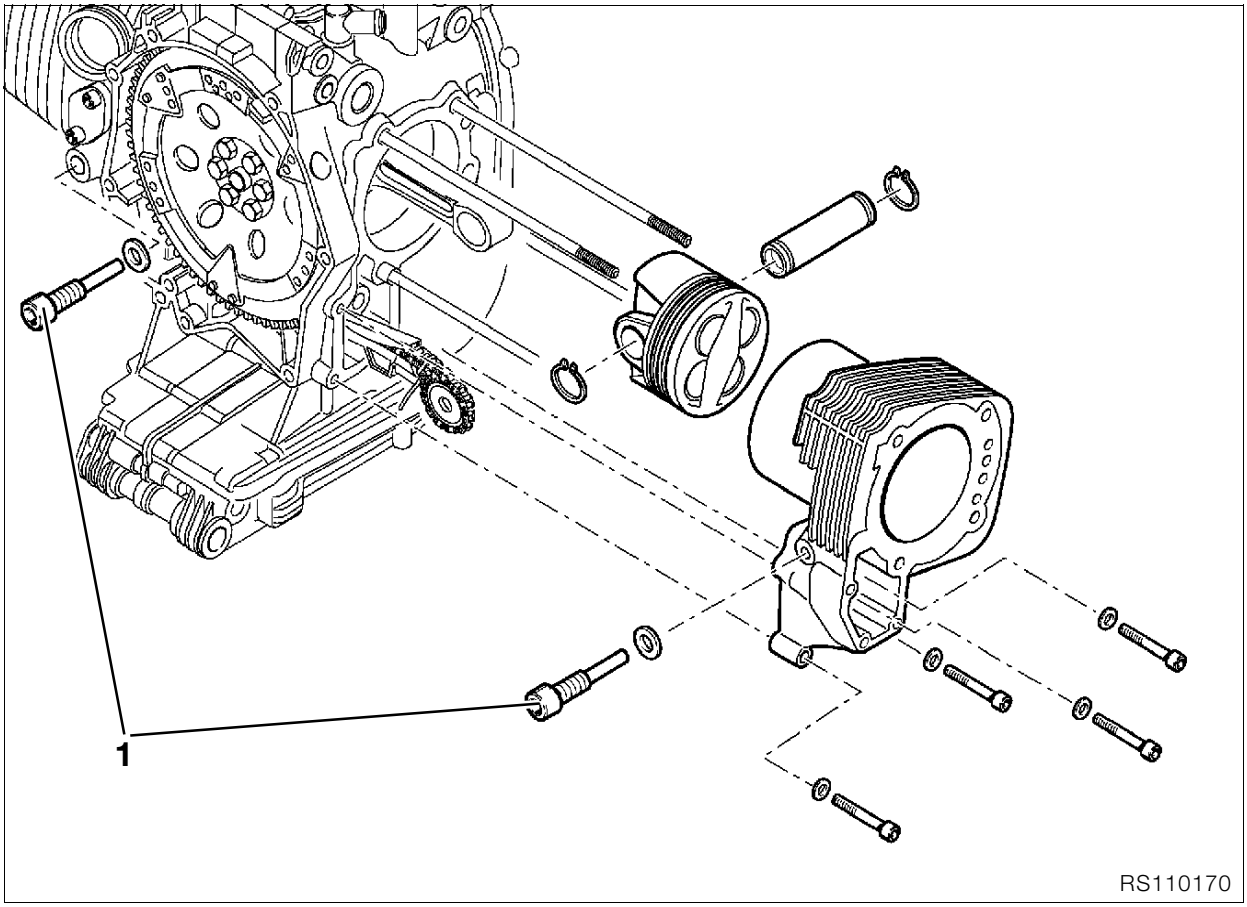
- Install lower spring retainer, valve spring and upper spring retainer.
- Compress the valve springs with the valve spring compressor, **BMW No. 11 5 690**.

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

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

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





11 11 120 Removing cylinder

- Remove guide rail bearing screws (1).

Attention:
When removing the cylinder, use care to prevent the piston from knocking against the engine casing.

- Remove cylinder retaining screws, and remove cylinder.

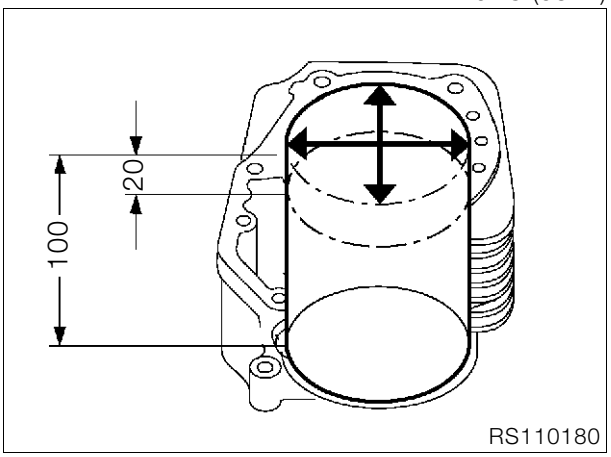
11 25 000 Removing and disassembling piston assembly

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

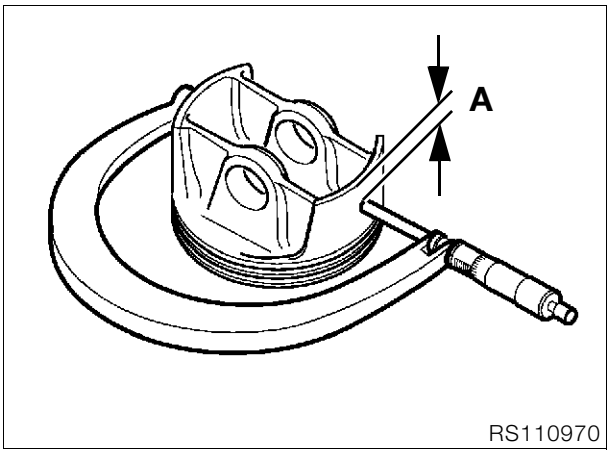
- Remove both retaining rings from piston pin.
- Press out piston pin by hand.
- Remove piston.
- Carefully remove piston rings with piston ring pliers.
- Remove combustion residues from piston crown and clean piston.

11 25 Checking pistons and cylinders

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

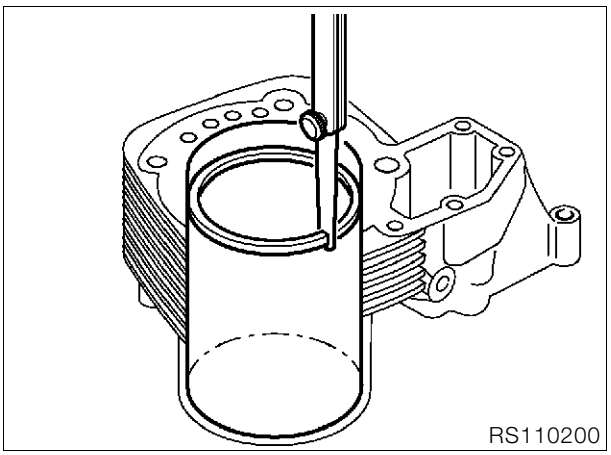


Measure cylinder bore with internal probe at 20 mm (0.7874 in) and 100 mm (3.9370 in) from the top in direction of piston pin, and again at a right angle to the first measurement (➟ 11.10).



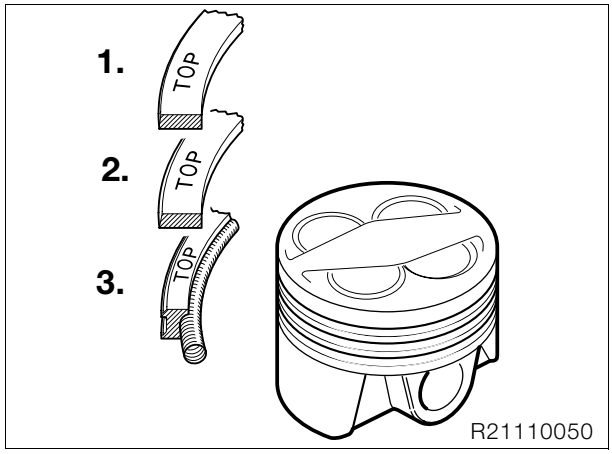
Measuring plane A:..... 6 mm (0.2362 in)
Piston sizes (➟ 11.11).

- Install piston rings in cylinder.



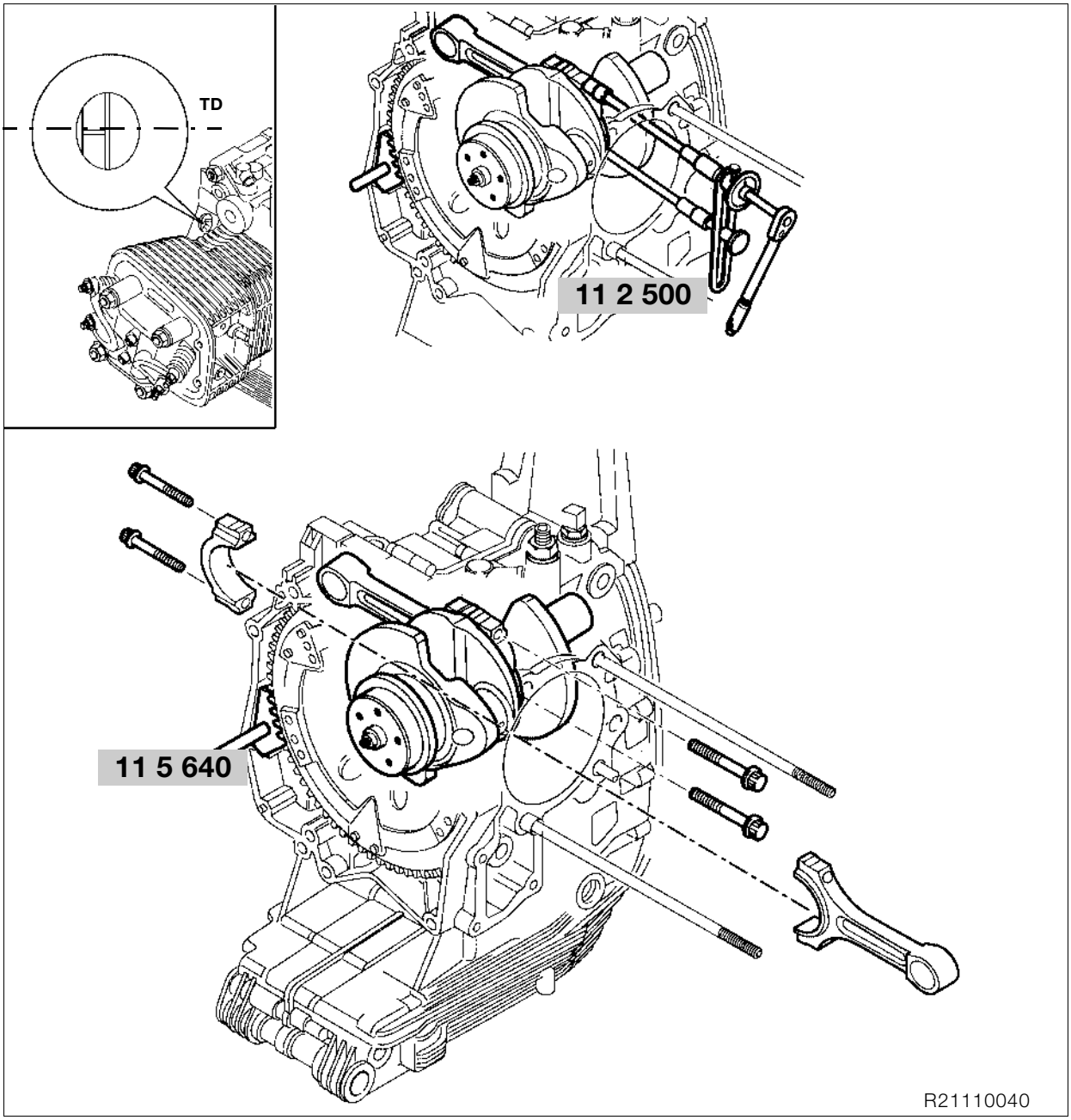
- Measure end gap using feeler gauge (➟ 11.11).

11 25 Assembling pistons



Note:
Make sure that the gap of the coiled spring is offset approximately 180° from the gap of the oil control ring.
Install with “TOP” uppermost.

- Carefully fit piston rings to piston in the following sequence, using piston ring pliers:
  3rd groove - coiled-spring ring
  2nd groove - micro-chamfer ring
  1st groove - asymmetric piston ring, oval section (➟ 11.11).



11 24 030 Removing and installing conrods

- Turn crankshaft to TDC position.
- Install locking device, **BMW No. 11 5 640**, to lock clutch housing.

Attention:
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.

- Remove connecting rods.

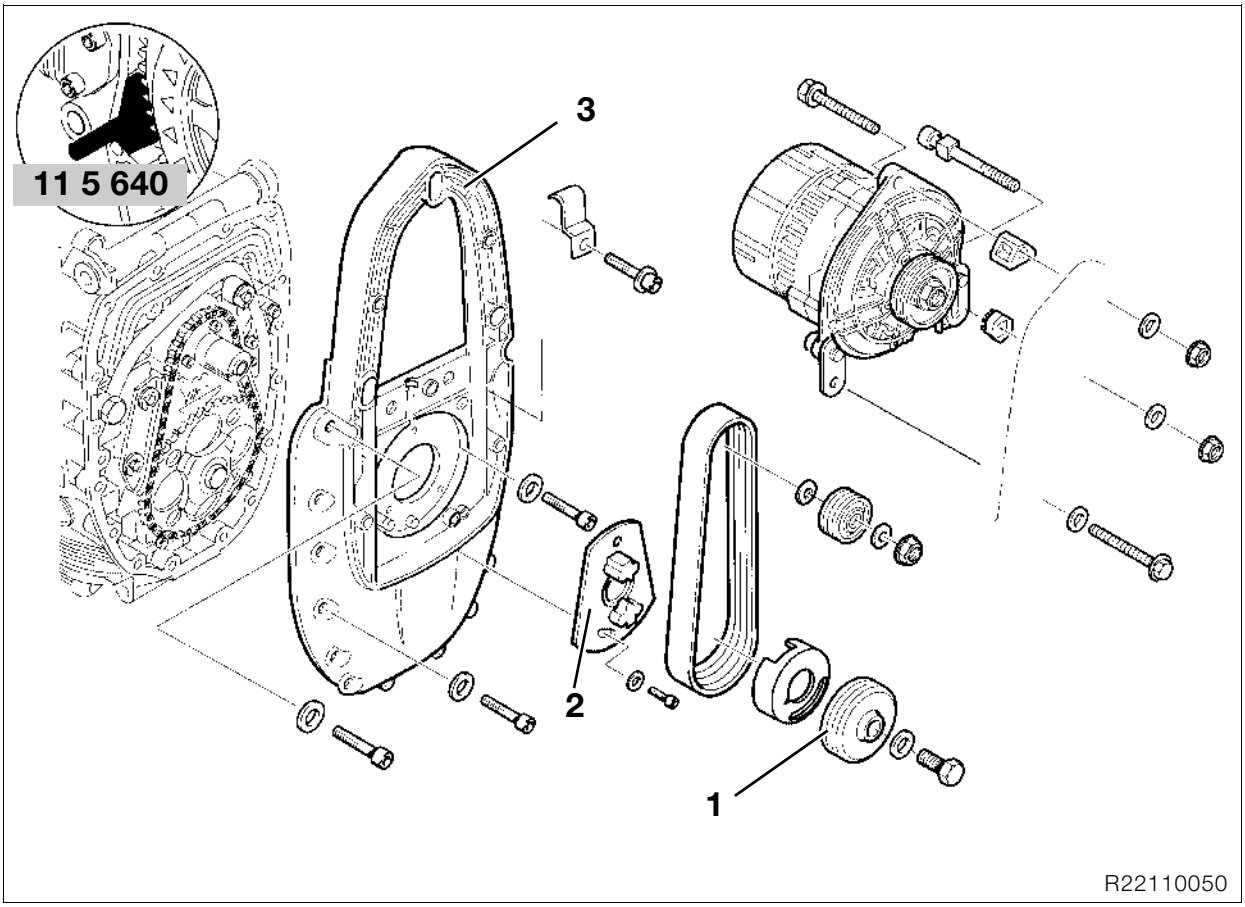
Note:
Connecting rods can also be removed and installed with the crankshaft removed.

Attention:
Oil the bearings. Never re-use the big end bolts.

- Install conrods.
- Oil the big end bolts, screw them in by hand and tighten with commercially available angle-of-rotation indicator or tightening angle indicator, **BMW No. 11 2 500**.

Note:
When using tightening angle indicator, **BMW No. 11 2 500**, make sure the extensions are of the same length.
Use a 3/8" square-drive socket wrench.

Tightening torque:
Big end bolts, oiled
Initial torque ..... 20 Nm
Tightening angle..... 80 °



11 11 045 Removing and installing alternator mount cover with engine installed

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

- Drain oil from engine.
- Remove the seat.
- Remove side panels (➡ 46.8).

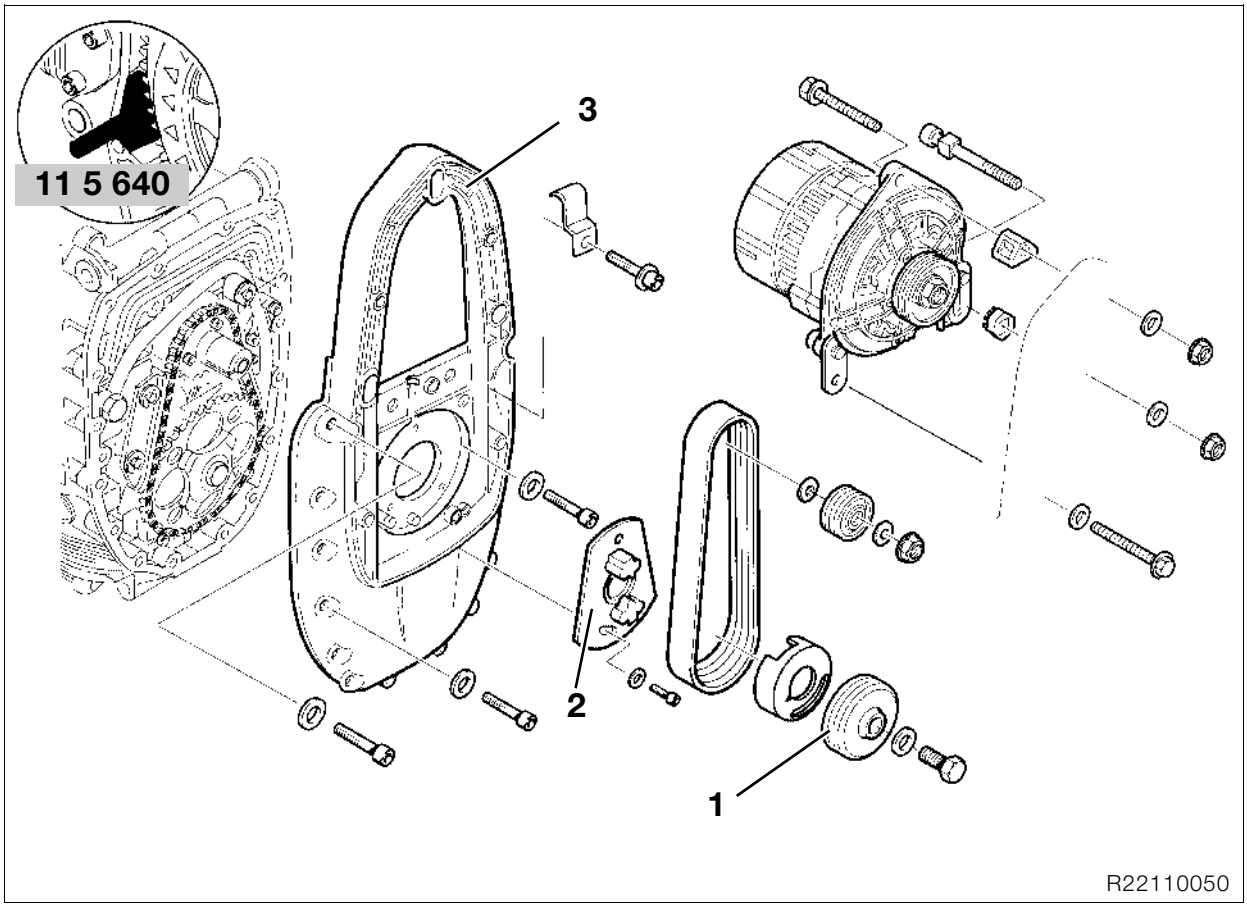
Attention:
Fuel is flammable and a hazard to health. Observe all applicable safety regulations.

- Remove fuel tank (➡ 16.5).
- Remove bracket for trim panels from alternator mount cover.
- Remove exhaust.
- Remove manifold.
- Disconnect oil cooler line from engine.
- Disconnect the Hall transmitter.
- Remove starter motor.
- Remove the horn, if necessary.
- Disengage spring strut.
- Remove the alternator.
- Remove poly-V belt.
- Install locking device, **BMW No. 11 5 640**, to lock clutch housing.
- Remove pulley (1).

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

- Remove magnetic gate (2).
- Swivel the leading link up.
- Remove alternator mount cover (3).
- Assembly is the reverse of the disassembly procedure.
- Place assembly sleeve, **BMW No. 11 5 680**, on crankshaft.
- Clean and degrease sealing face (arrow) and apply **3-Bond 1209**.
- Install alternator mount cover.

Tightening torque:
M 8 screw ..... 20 Nm
M 6 screw ..... 9 Nm



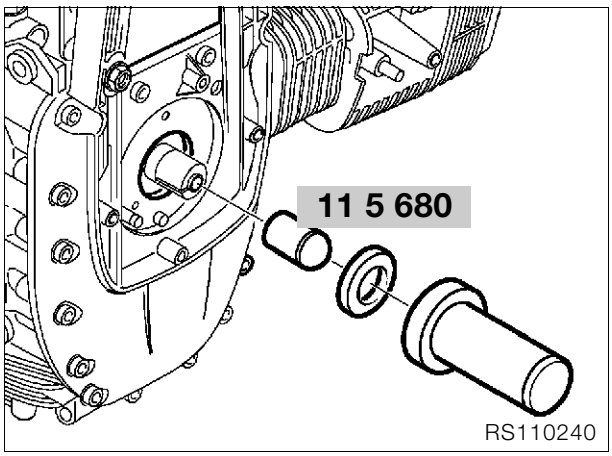
11 11 Removing alternator mount cover

- Remove the alternator.
- Install locking device, **BMW No. 11 5 640**, to lock clutch housing.
- Remove pulley (1).

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

- Remove magnetic gate (2).
- Remove alternator mount cover (3).

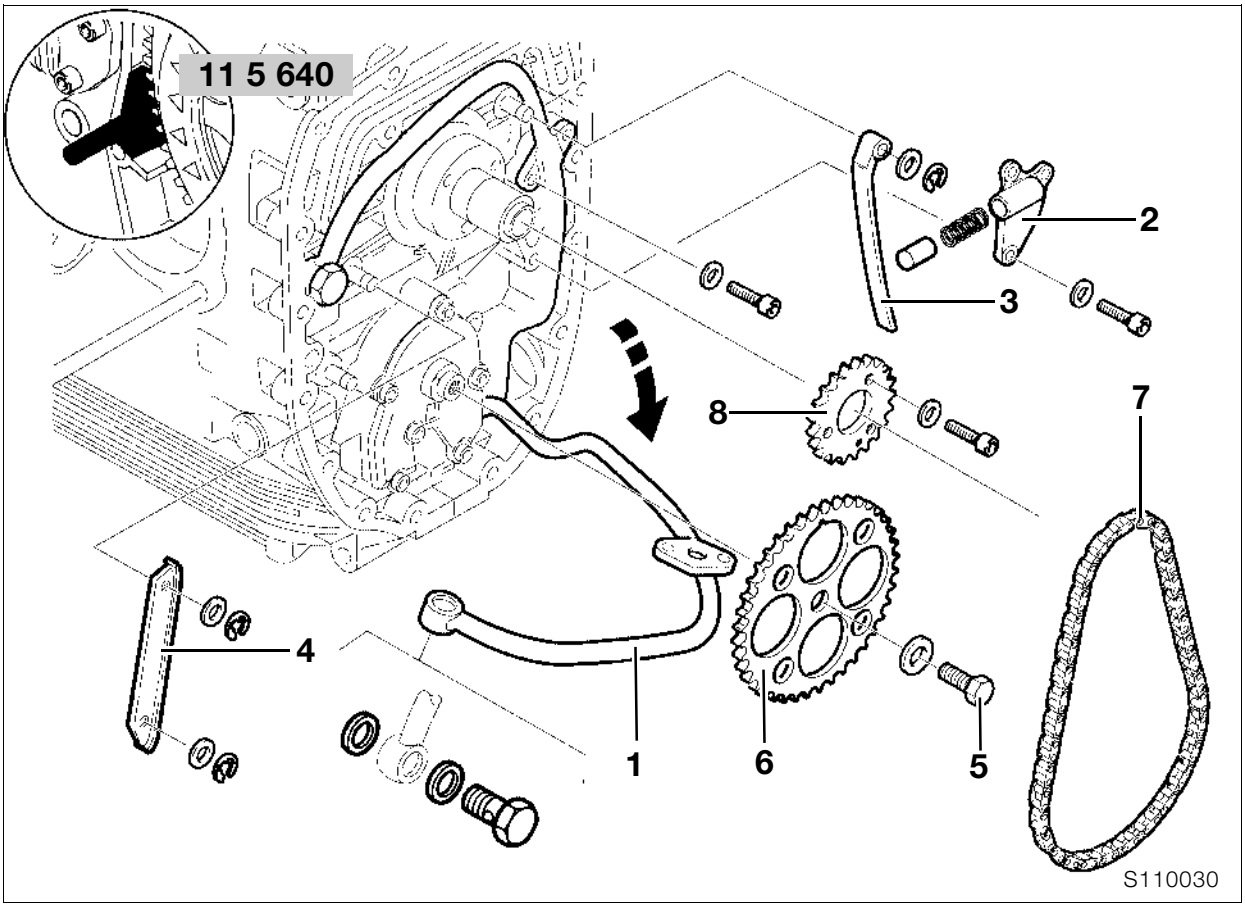
11 11 047 Replacing radial shaft seal in alternator mount cover



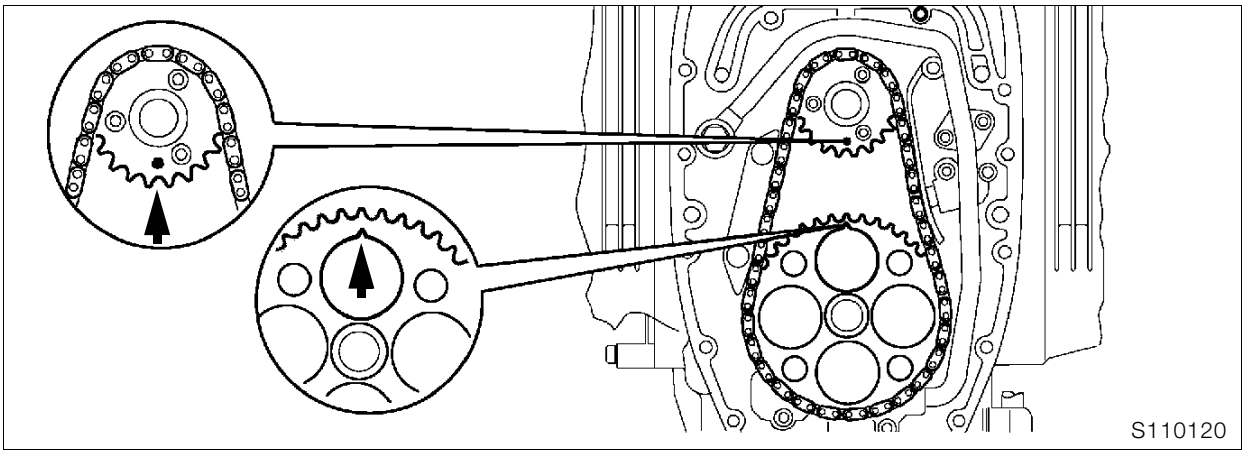
- Carefully lever out radial shaft seal, using a screwdriver.

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

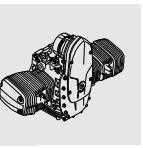
- Drive in the new radial shaft seal with drift and sliding sleeve, **BMW No. 11 5 680**.

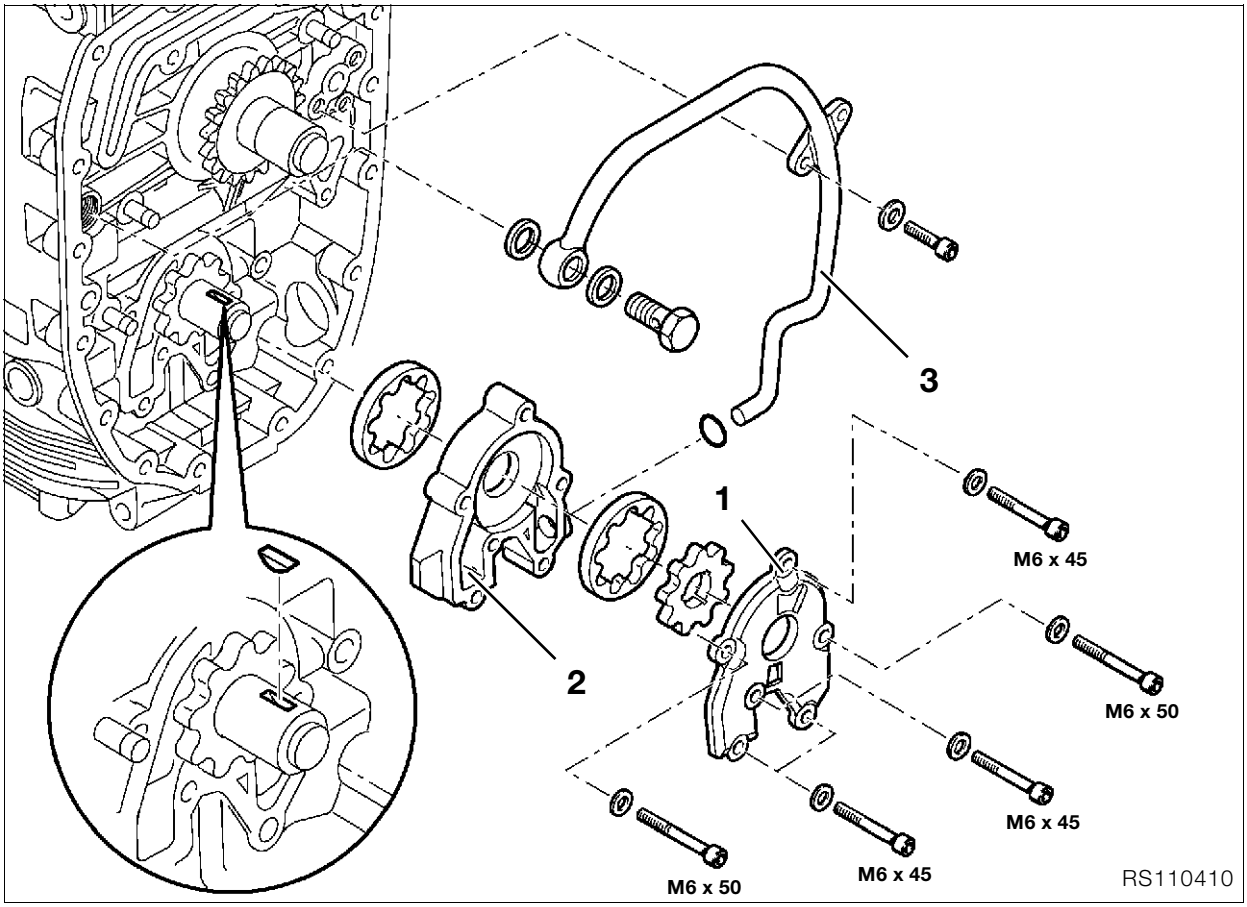


11 31 Removing auxiliary shaft drive



- 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).
- Install locking device, **BMW No. 11 5 640**, to lock clutch housing.
- Remove chain sprocket fastener (5).
- Remove sprocket (6) and timing chain (7).
- If necessary, remove chain sprocket (8).



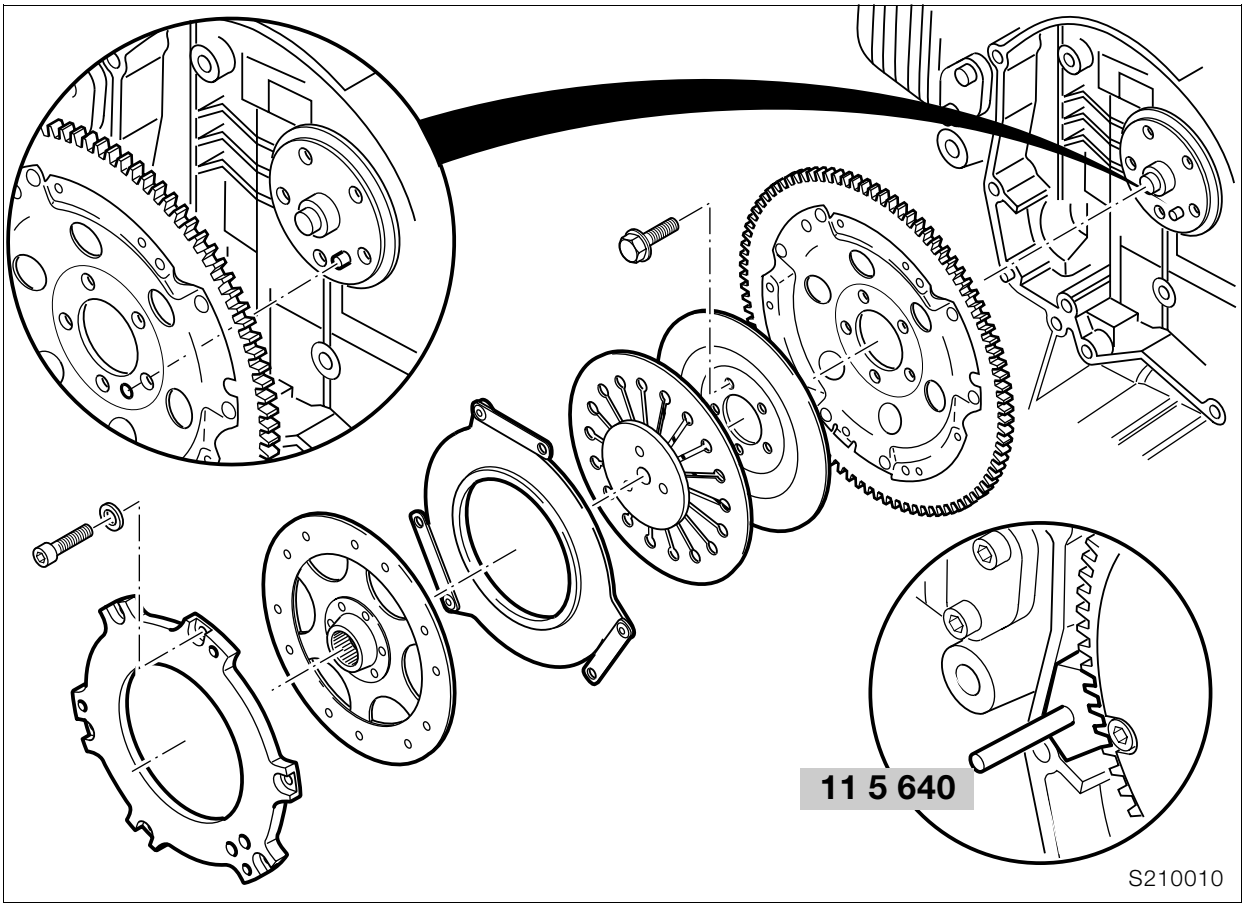


11 41 000 Removing oil pump

- Remove oil pump cover (1).

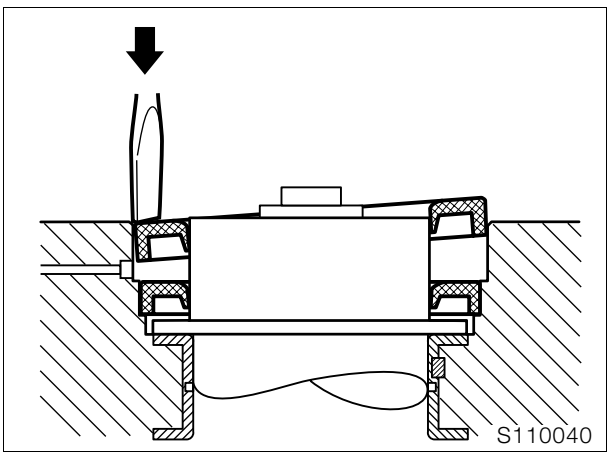
⚠ Attention:
Check installed positions of parts which have already been run together.

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



11 11 Removing radial shaft seal on crankshaft with engine installed

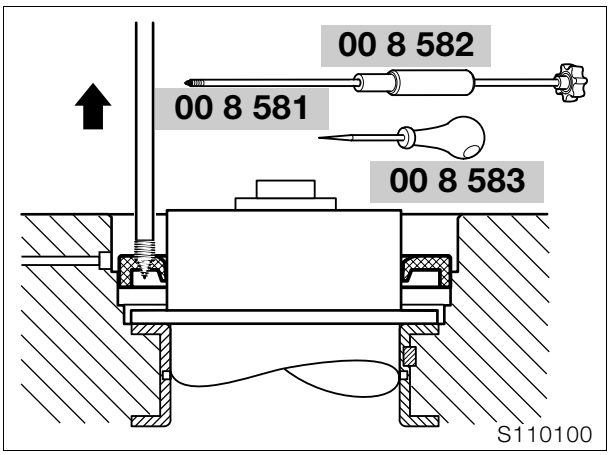
- Install locking device, **BMW No. 11 5 640**, to lock clutch housing.
- Remove the clutch.



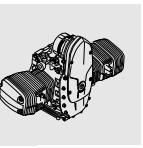
Attention:
Take care not to damage the sealing faces of crankcase and crankshaft.

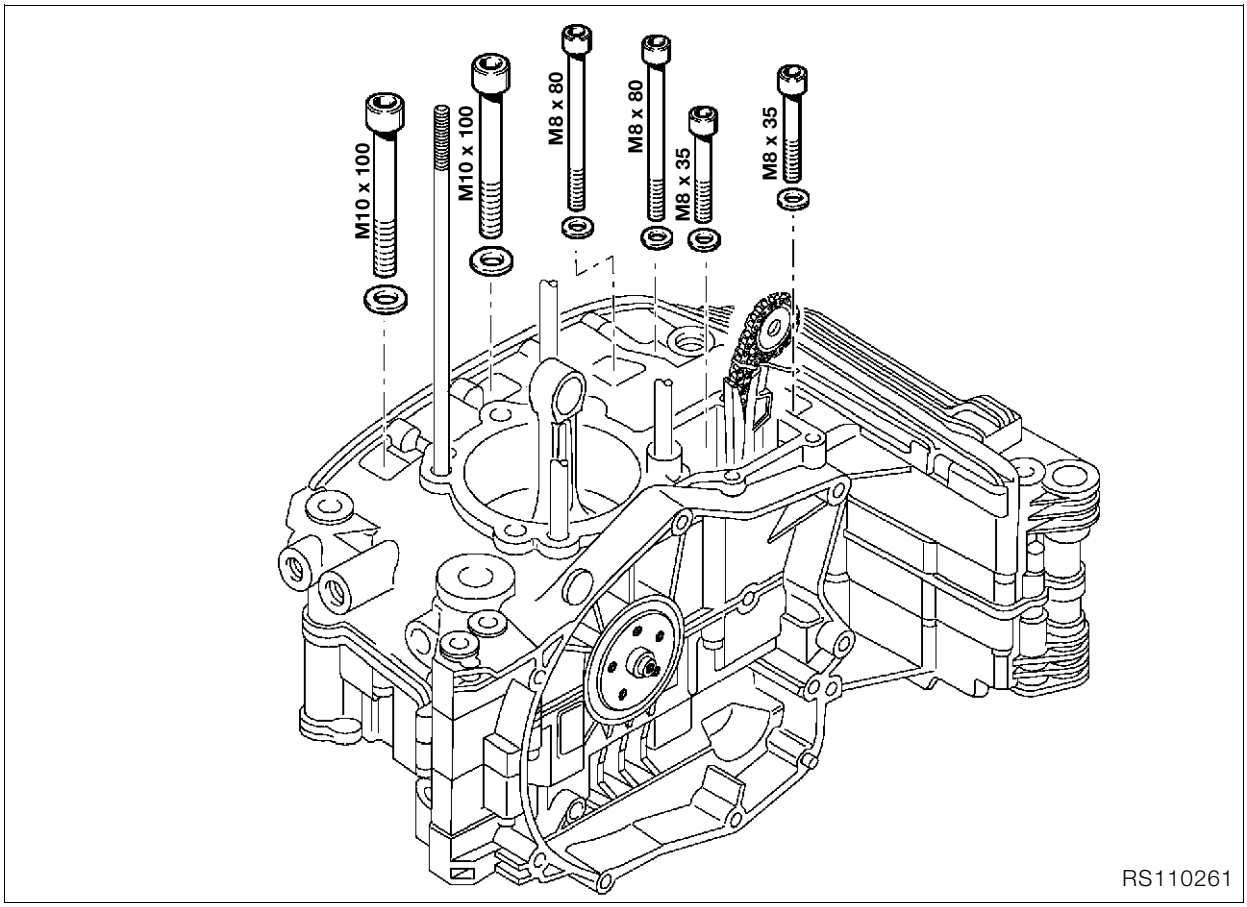
- Carefully lever out radial shaft seal, using a screwdriver.

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



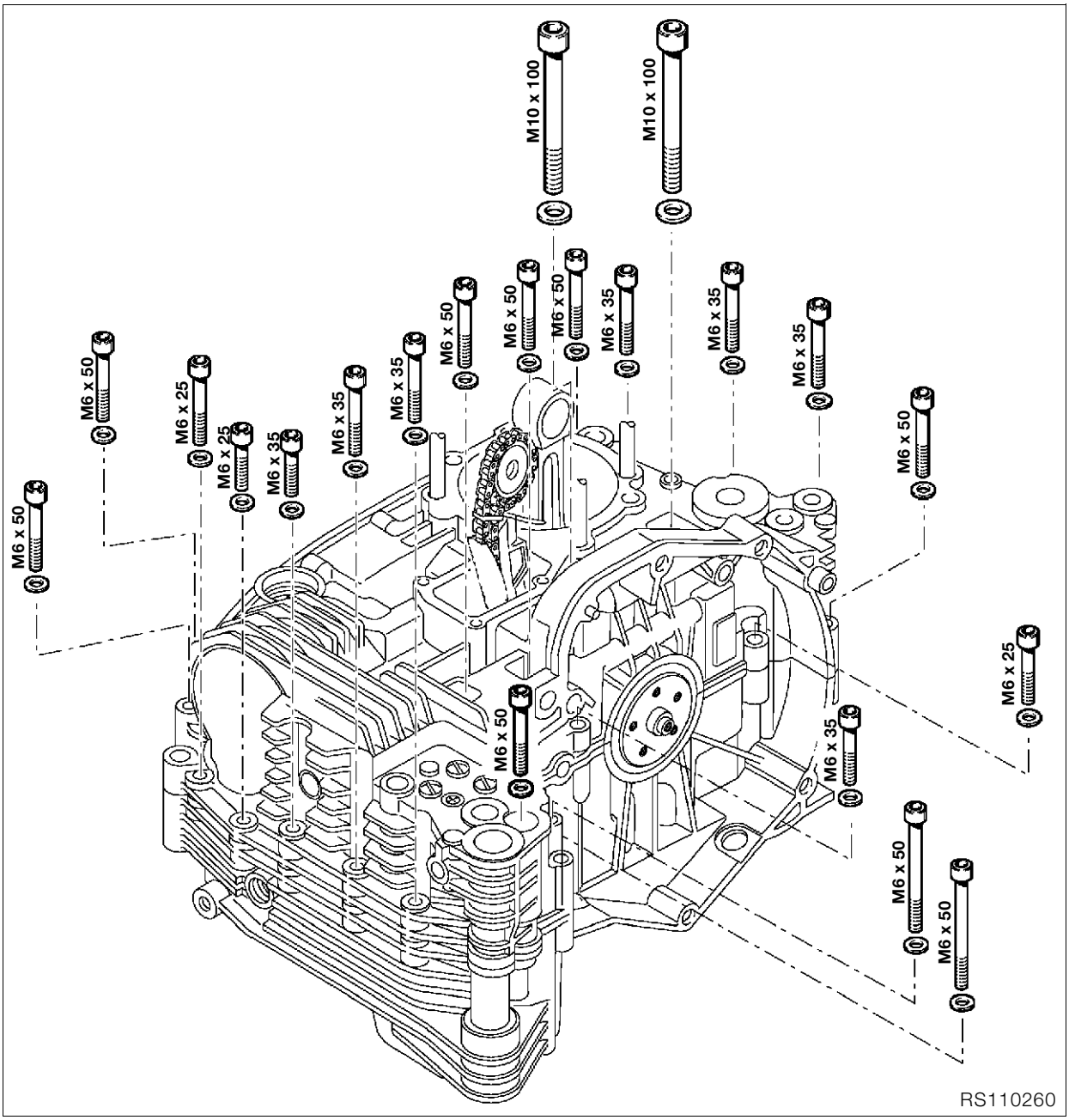
- Using awl, **BMW No. 00 8 583**, carefully punch a hole in the shaft sealing ring.
- Screw the pull rod, **BMW No. 00 8 581**, into the hole and use impact weight, **BMW No. 00 8 582**, to remove the shaft sealing ring.



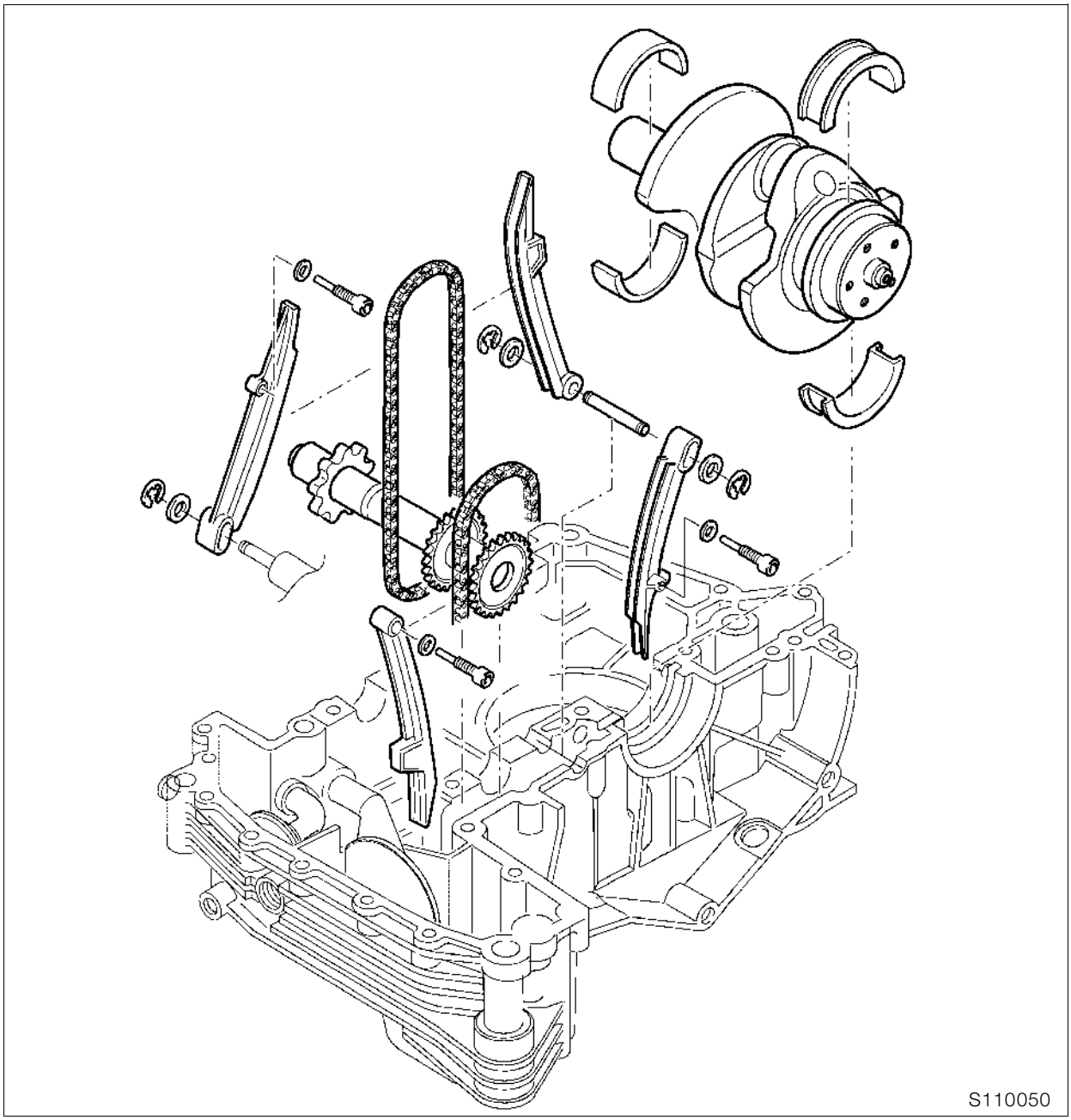


11 11 Disassembling crankcase

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

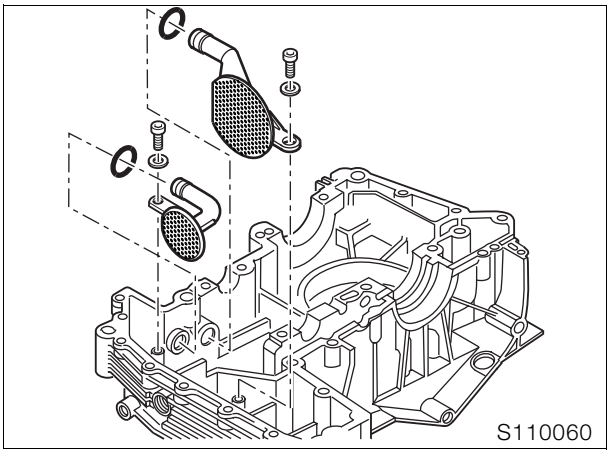


- Turn engine on to its side.
- Remove screws on left side.
- Remove upper section of crankcase.



11 21 Removing crankshaft, auxiliary shaft and timing chain tensioning and slide rails

11 41 Removing and installing oil intake strainers



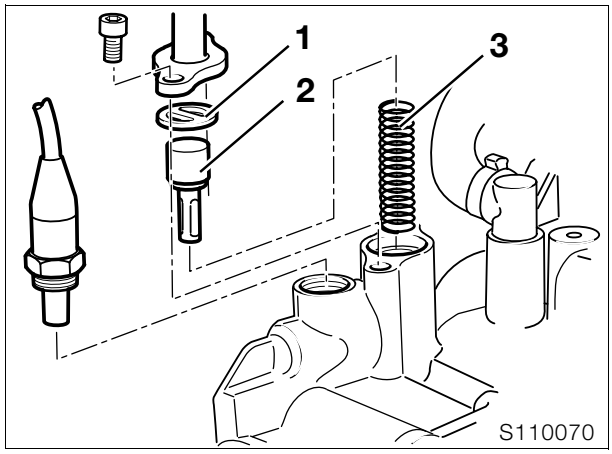
Attention:
Ensure that the O-ring is in position and that it is not damaged.

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

11 11 043 Replacing oil level sight glass

- Pierce the plastic disc with a large screwdriver and lever out the oil level sight glass.
- Use thinners to remove all traces of oil from the seating face of the sight glass.
- Coat the sealing face of the new oil level sight glass with tyre assembly paste and drive it in with drift, **BMW No. 00 5 550**.

17 21 Removing and installing oil thermostat



- Remove screws securing oil cooler line to fairing bracket.
- Disconnect the oil cooler line fitting from the engine casing.
- 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

11 24 043 Removing conrods

- Clamp crankshaft in a vise with protective jaws.

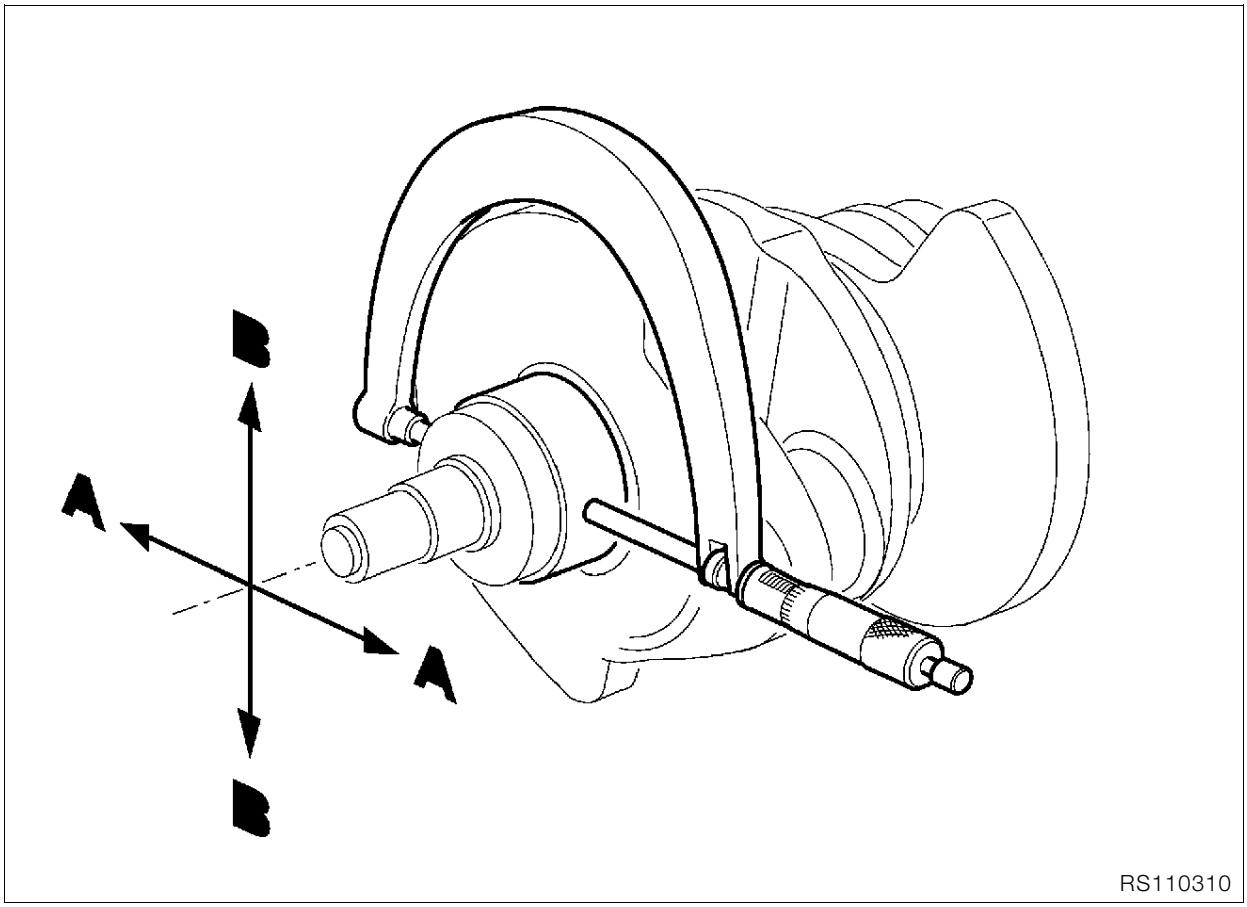
Attention:
Do not mix up the conrods.

- Remove connecting rods.

11 24 Checking conrods

- Check conrod dimensions (➠ 11.10).

Attention:
Do not attempt to straighten the steel fracture-split conrods – risk of breakage.

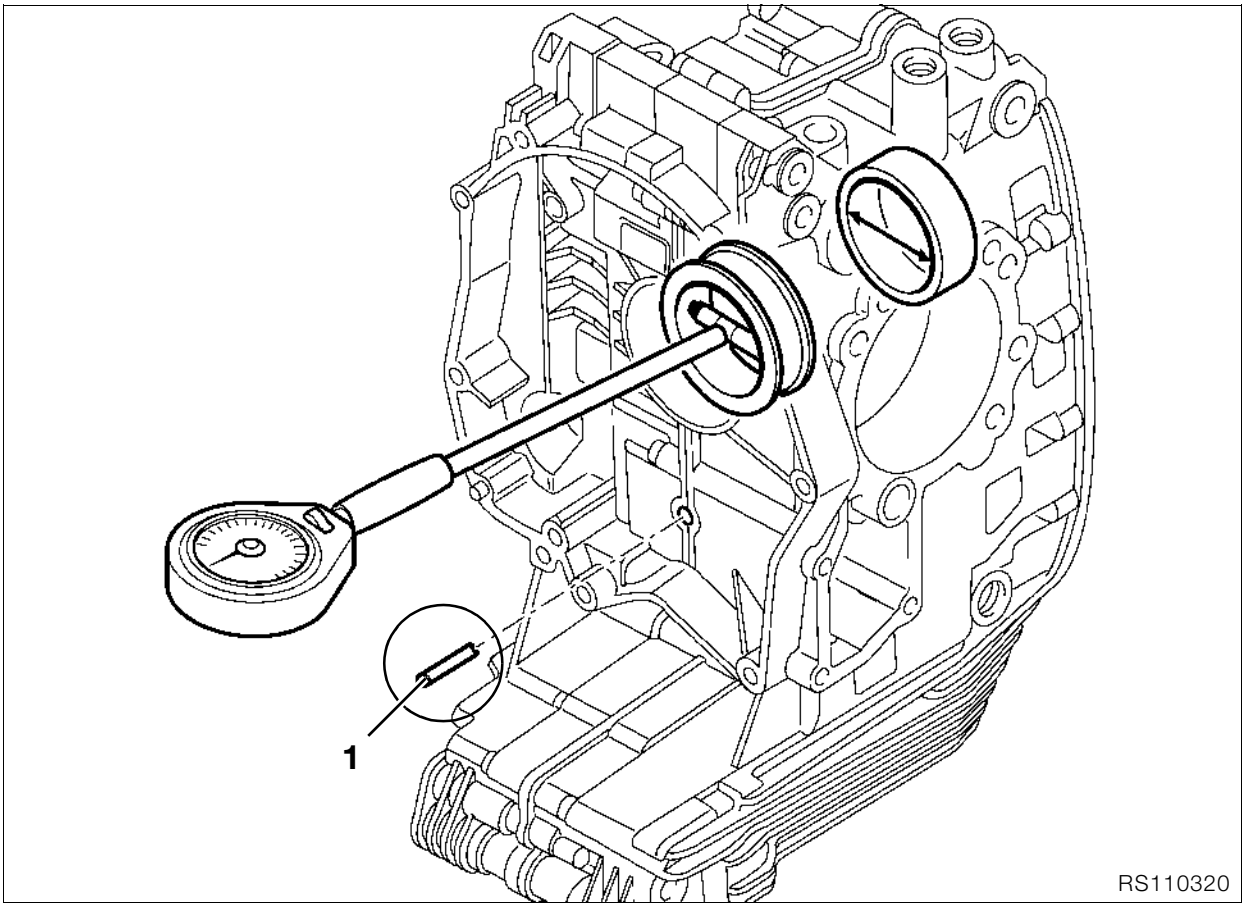


11 21 Measuring main bearing play

Measuring radial bearing play

- Measure main bearing journal with an external micrometer in two planes, A and B, at right angles to each other.
- Enter measured values on record sheet (➠ 11.9).

⚠ Attention:
The crankshaft can only be reground in stage 0, and must be hardened and finished afterwards. Grinding stages are identified by a paint mark on the front crank web (➠ 11.9). If the bearing shells have to be replaced, note coloured marks on crankpins and big end bearings.



Installing main bearing

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

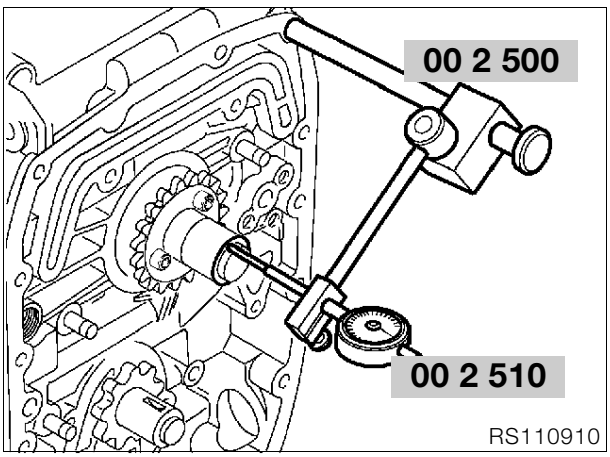
Tightening torque/tightening order:

1. M 10 screw (oiled) to initial torque ..... 25 Nm
   Tightening angle ..... 90°
2. M 8 screw (oiled) ..... 22 Nm

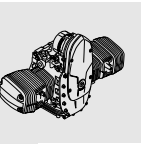
- Measure front and rear bearings in the load direction.
- Enter measured values on record sheet and calculate main bearing play (➡ 11.9).

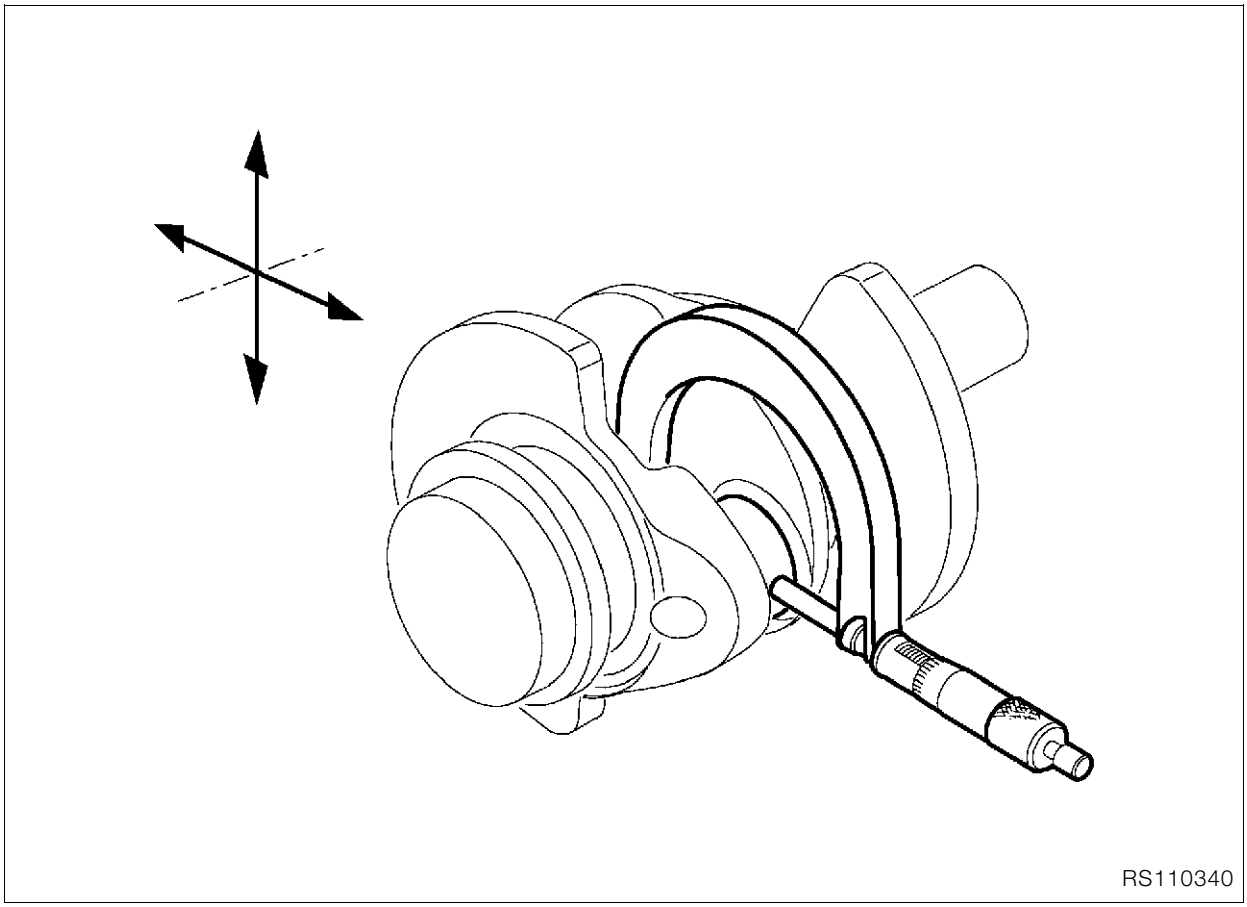
Measuring axial bearing play

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



- Secure measuring device, **BMW No. 00 2 500**, with dial gauge, **BMW No. 00 2 510**, in tapped hole for alternator mount cover.
- Move crankshaft back and forth and read axial play from dial gauge (➡ 11.9).

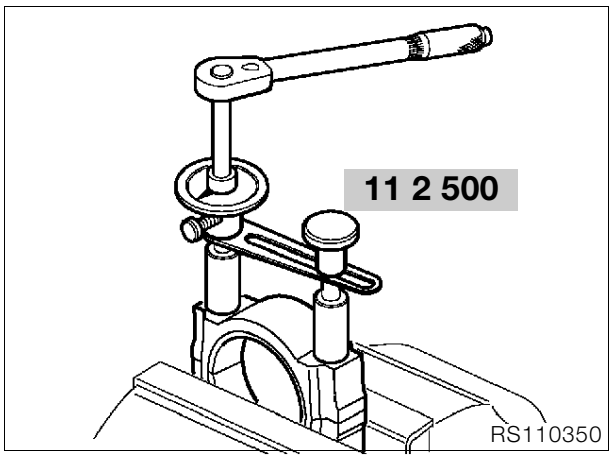




RS110340

11 24 Measuring big end bearing play

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

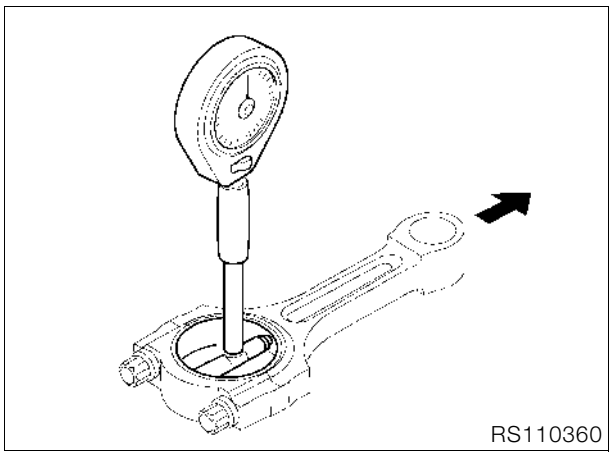


RS110350

- Install bearing shells and assemble conrods.
- Using tightening angle indicator, **BMW No. 11 2 500**, tighten the big end bolts.

Tightening torque:

Big end bolts, oiled
Initial torque ..... 20 Nm
Tightening angle..... 80 °

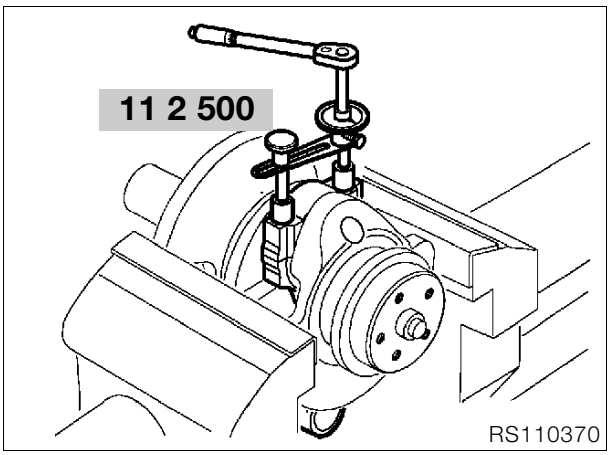


RS110360

- Measure big end bearing with bore gauge in thrust direction.
- Enter measured values on record sheet and calculate big end bearing play (➟ 11.10).

11 00 103 Assembling engine

11 24 030 Installing conrods

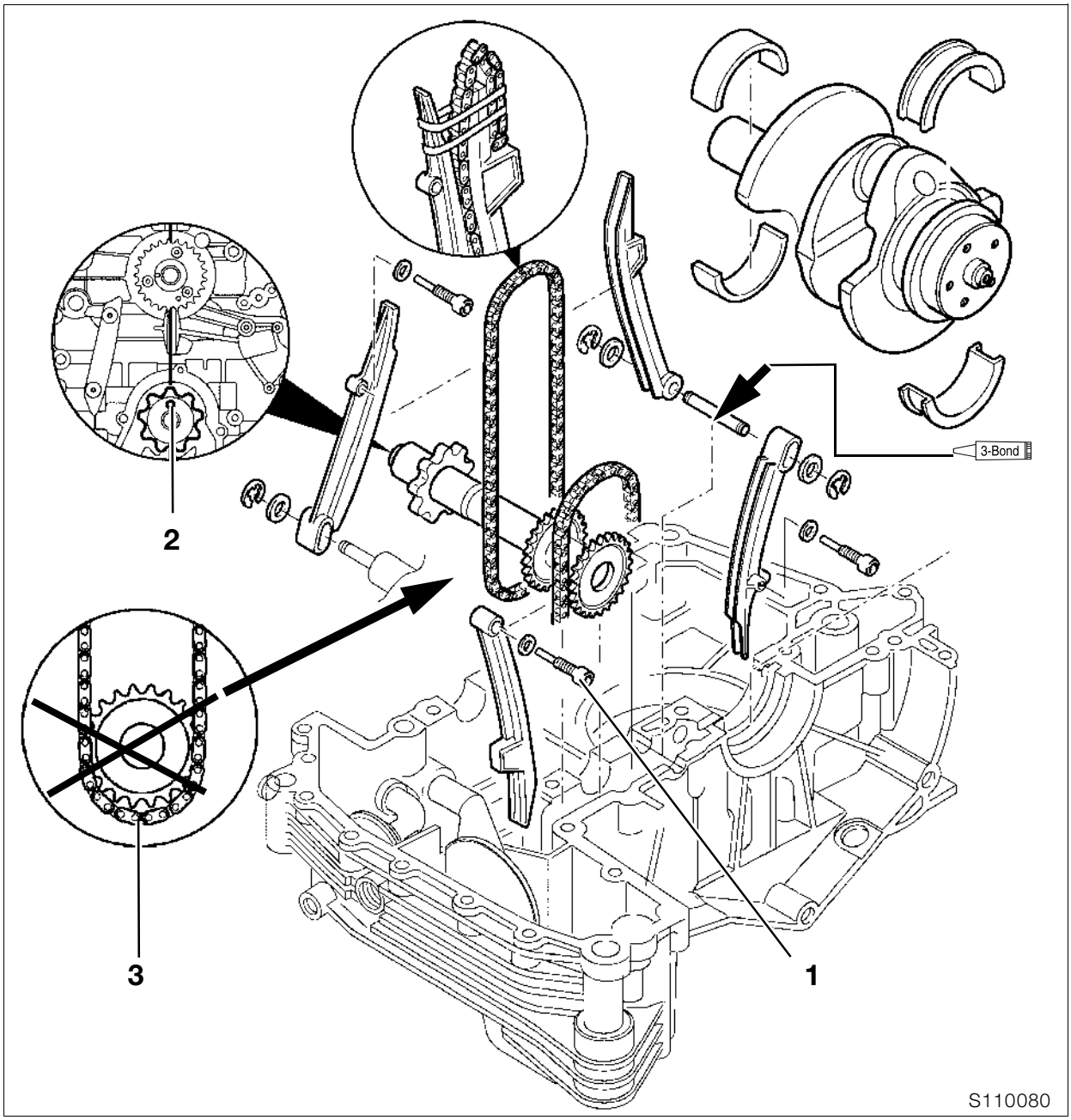


- Clamp crankshaft in a vise with protective jaws.

Attention:
Oil the bearings.
Do not mix up conrods or bearing shells.
Always use new big end bolts.
Use a felt-tipped pen or similar to mark the installed positions on the conrods.

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

Tightening torque:
Connecting rod bolts (oiled)
Initial torque ..... 20 Nm
Tightening angle..... 80°



11 21 Installing crankshaft

Attention:
Oil the bearings.

11 31 Installing timing chain tensioning and slide rails

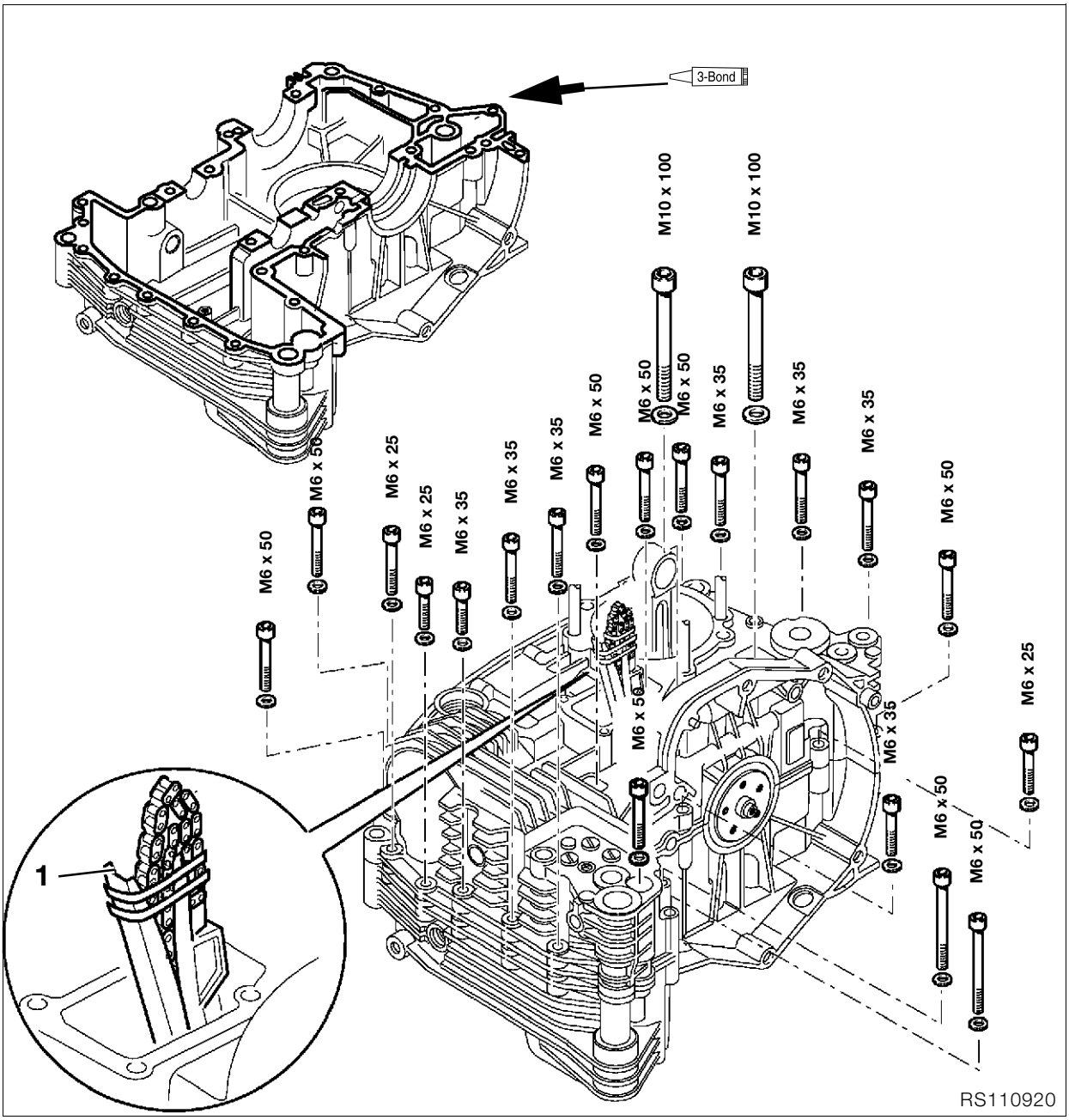
- Seal pivot pin for tensioner rail/slide rail at clutch side (arrow) with **3-Bond 1209**.
- Insert pivot screw (1) into chain tensioner rail, using a new seal.

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

11 31 Installing auxiliary shaft/timing chains

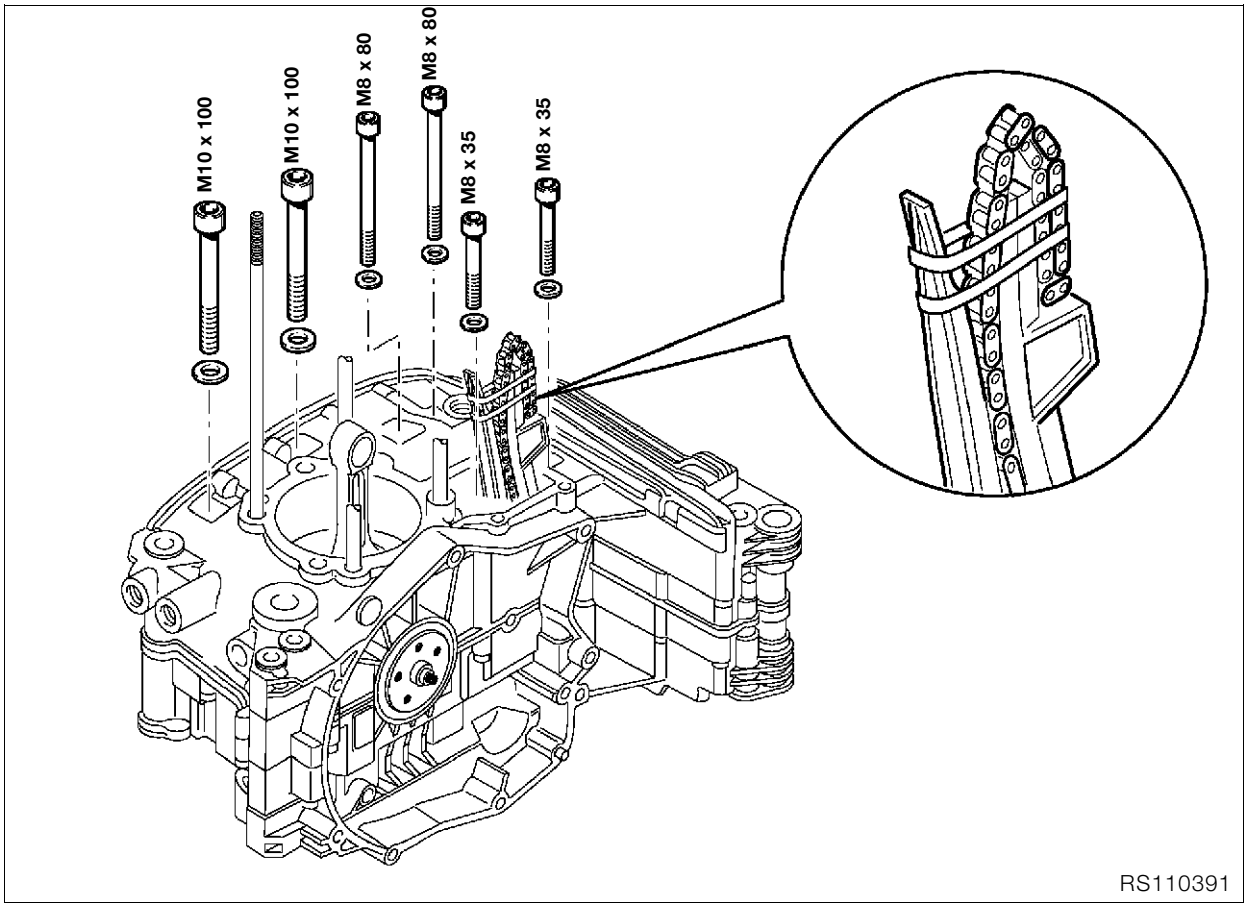
- When installing the auxiliary shaft (2), ensure that its dowel pin socket is aligned with the housing flange on the side toward the crankshaft.

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



11 00 Assembling engine block

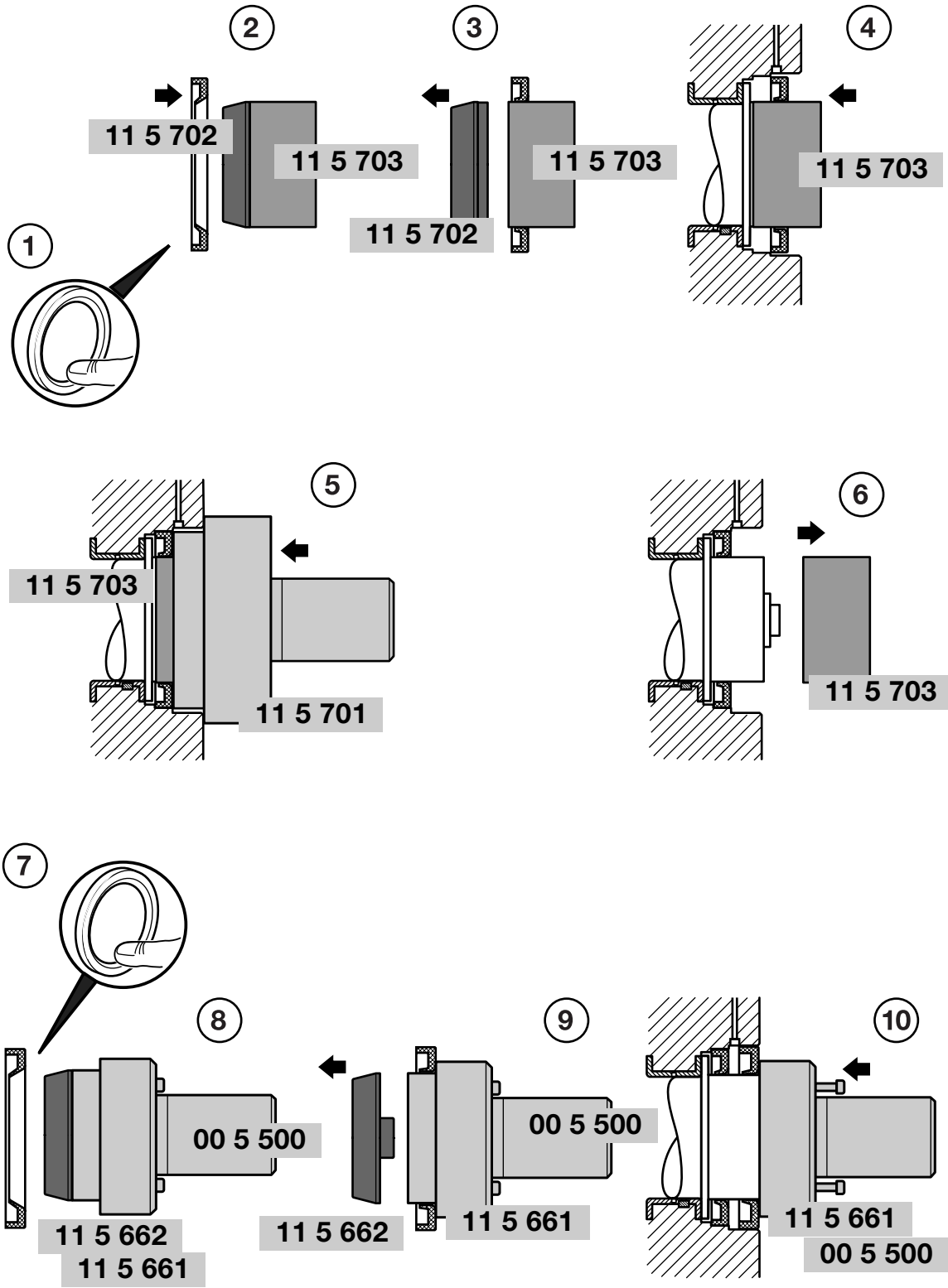
- Clean and degrease sealing faces (arrow) and coat with **3-Bond 1209**.
- Secure the timing chain with rubber band (1) to the timing chain tensioner and slide rail.



- Bolt the crankcase sections together.

Tightening torque/tightening order:

1. M 10 screw (oiled) to initial torque ..... 25 Nm
   Tightening angle..... 90°
2. M 8 screw (oiled) ..... 22 Nm
3. M 6 screw ..... 9 Nm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11 5 703
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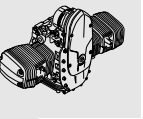
9
10
00 5 500
11 5 662
11 5 661
11 5 662
00 5 500
11 5 661
11 5 661
00 5 500

11 11 Installing the crankshaft-end radial shaft seal

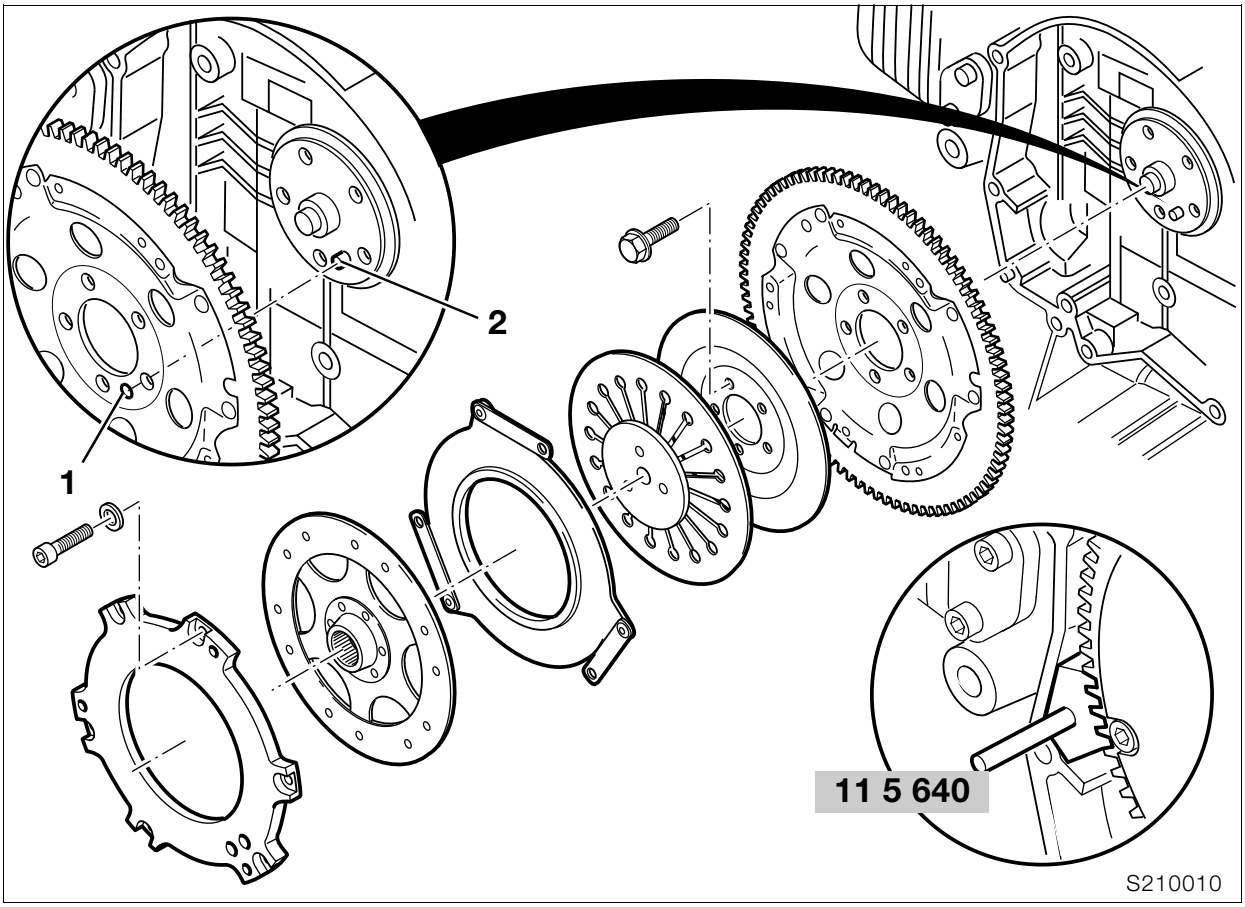
- Shape the lip of the radial shaft seal carefully by hand (1).
- Oil the radial shaft seal at the sealing/contact surface.
- Using assembly sleeve, **BMW No. 11 5 702**, mount the radial shaft seal with the closed side toward the clutch onto sleeve, **BMW No. 11 5 703**, (2).
- Remove assembly sleeve (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).

11 11 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 home radial shaft seal (10).

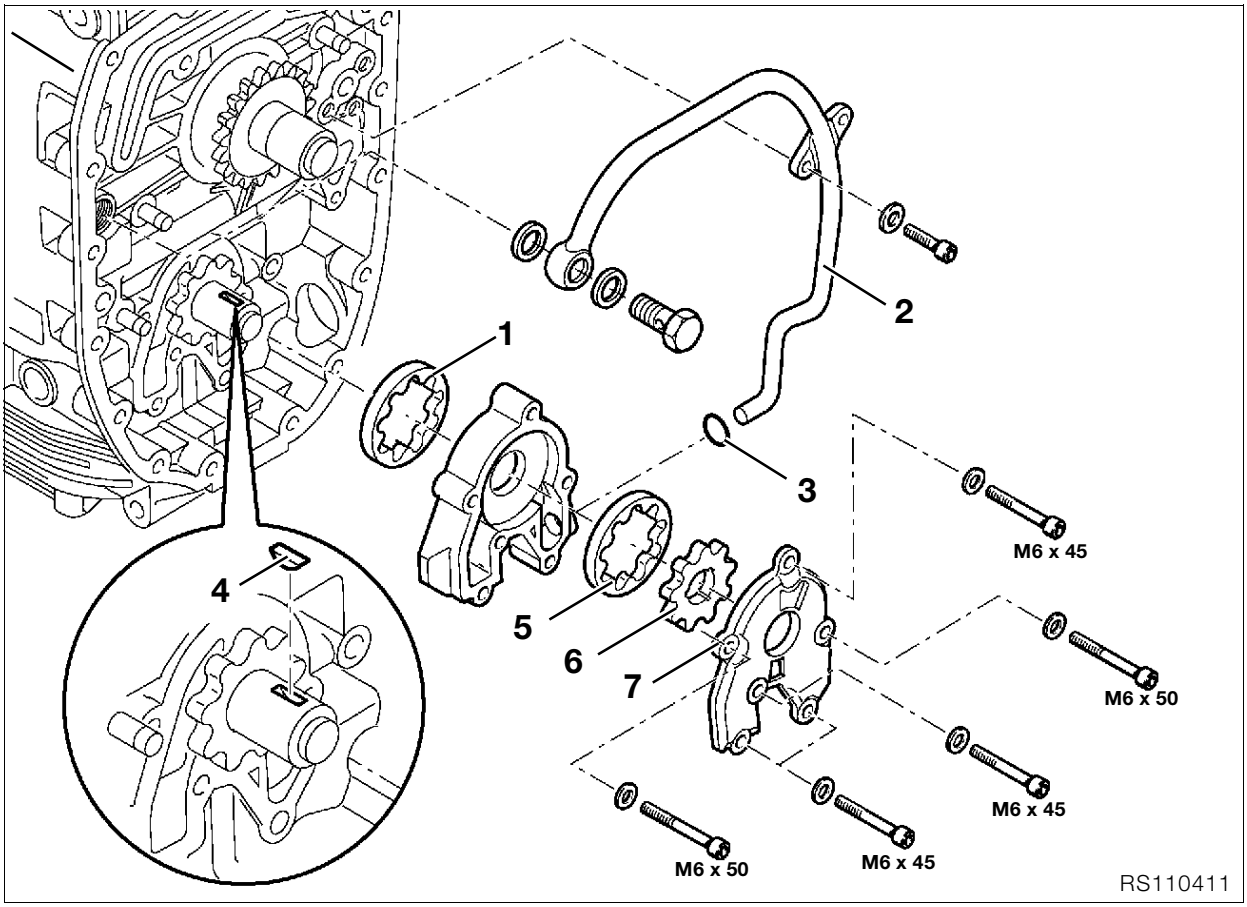


21 21 105 Installing clutch housing

Attention:
Always use new screws for housing and cover.

- Install clutch housing with mark (1) aligned with crankshaft mark (2).
- Install locking device, **BMW No. 11 5 640,** to lock clutch housing.
- Insert all screws by hand and tighten.

Tightening torque:
Clutch housing to crankshaft
(threads lightly oiled)..... 40 Nm
Additional angle of rotation..... 32°



11 41 000 Installing oil pump

Attention:
Oil the friction faces.

- Install outer rotor (1) of oil pump in pump housing.

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

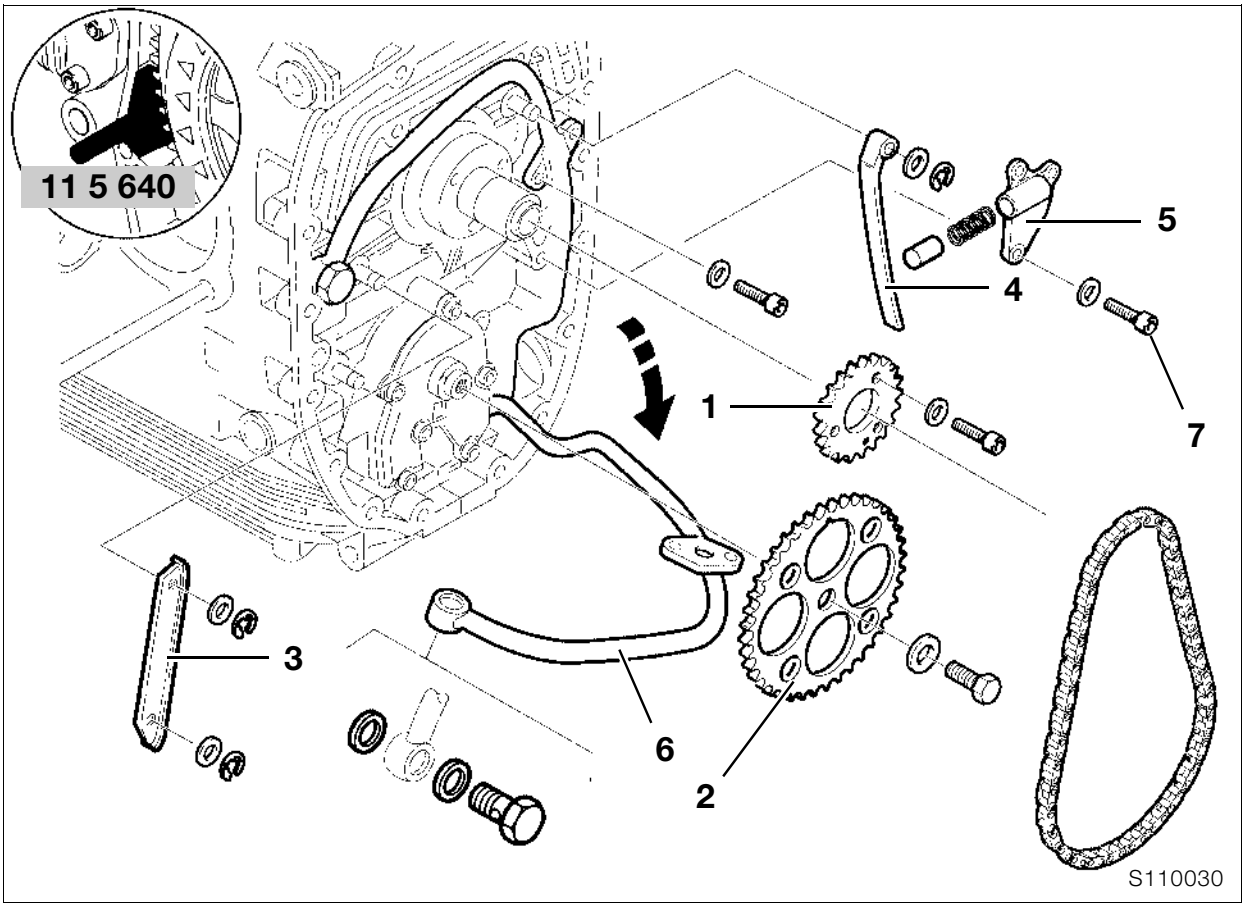
- Install oil pump housing with cooling oil pipe (2).
- Install Woodruff key (4), outer rotor (5) and inner rotor (6) in cooling oil pump.

Attention:
Note different lengths of screws.

- Secure housing cover (7) to oil pump.

Tightening torque:

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



11 31 Installing auxiliary shaft drive

Attention:
Adjust in accordance with the adjusting instructions (➡ 11.60).

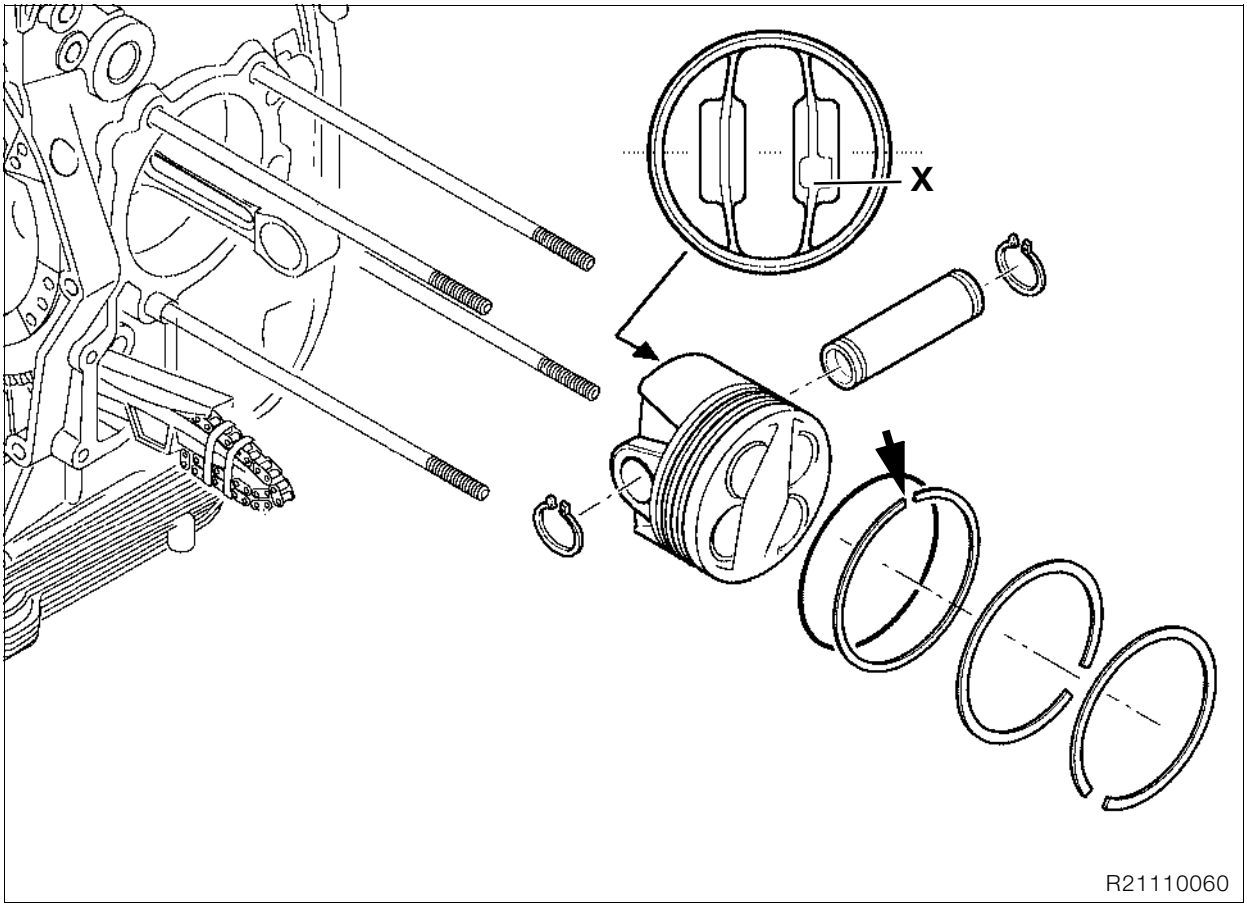
- Align crankshaft mark with mark on auxiliary shaft.
- Install locking device, **BMW No. 11 5 640**, to lock clutch housing.
- Install chain sprocket (1).
- Install drive-shaft chain with chainwheel (2).
- Install and secure chain guide rail (3).
- Install and secure chain tensioner rail (4).
- Install chain tensioner housing (5) with piston and spring.

Attention:
Use a new sealing ring.

- Tighten cooling oil line (6).

Tightening torque:

M 6 screw (7)	9 Nm
M 6 screw	10 Nm
Banjo bolt for cooling oil line with oil vent valve	25 Nm
Chain sprocket fastener	70 Nm



11 25 000 Installing piston

⚠ Attention:
Always install piston and cylinder as a matched pair.
Do not mix up pistons and piston pins.

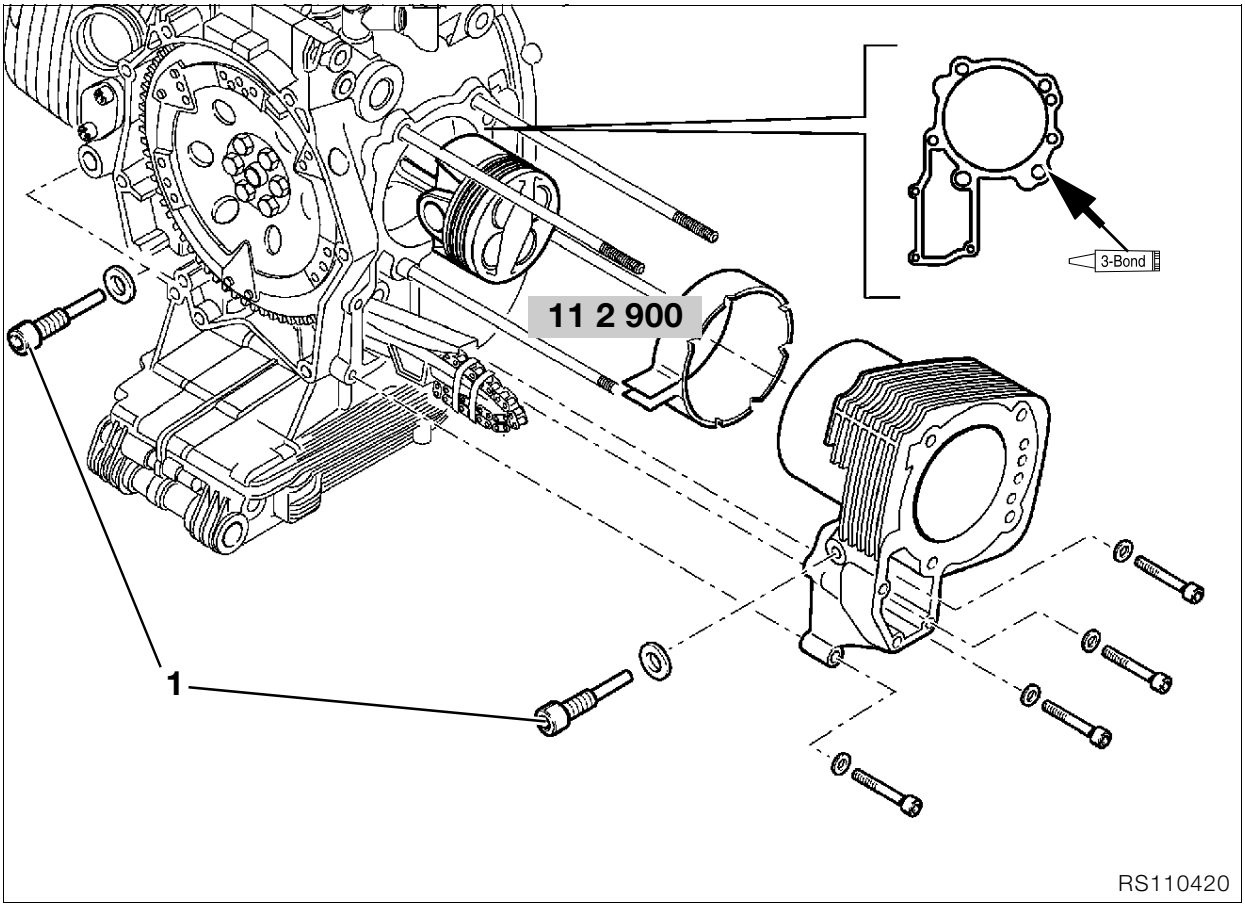
- Turn oil scraper ring so that gap (arrow) is at top.
- Install piston rings with gaps offset by 120°.

Assembly position **X** = installation toward exhaust side

⚠ Attention:
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–
(➡ 11.11)

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

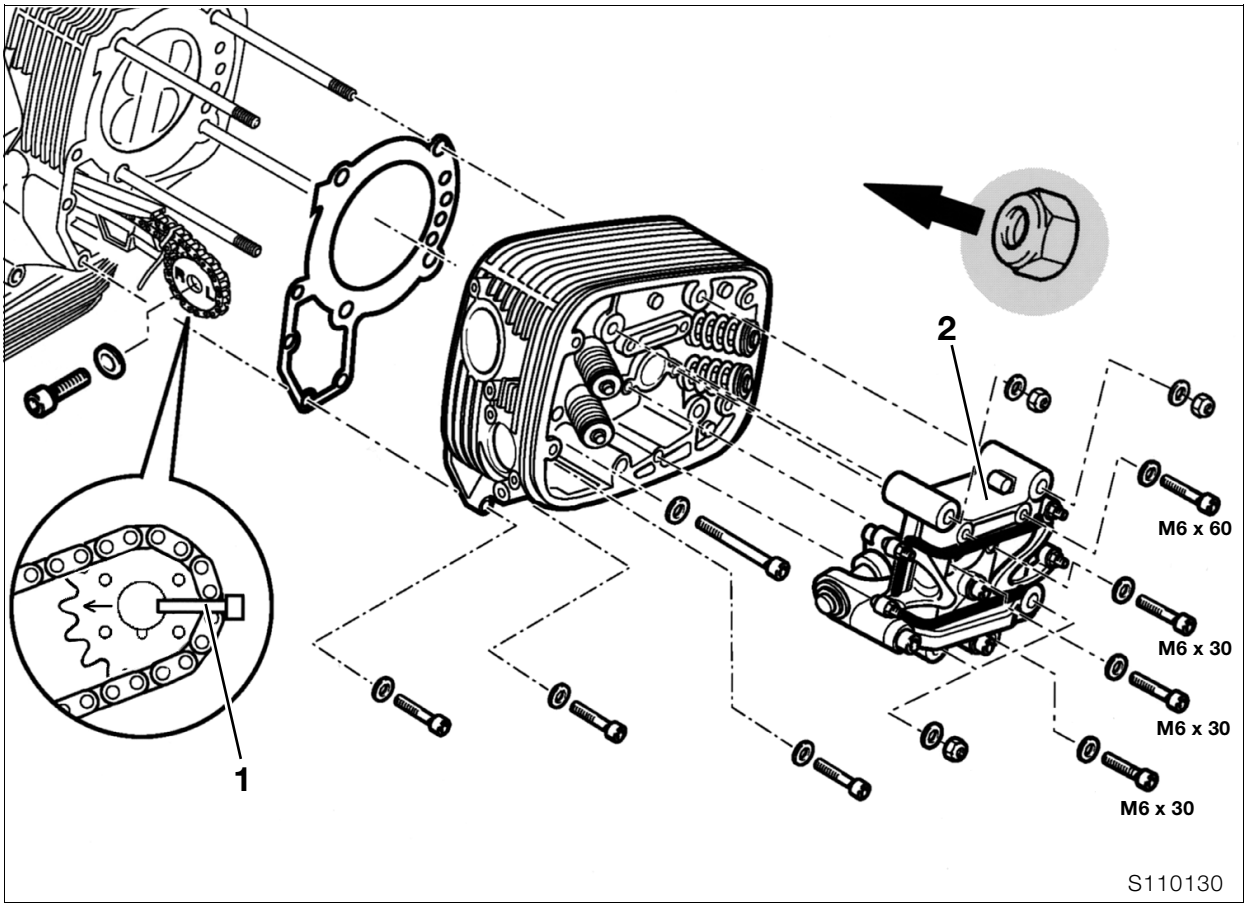


11 11 120 Installing cylinder

- Clean and degrease 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 fasteners.
- Fit new seals to pivot pins for chain guide rail (1).
- Install chain sprocket.

Tightening torque/tightening order:

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



11 12 090 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 carrier (2).

Attention:
Install cylinder head nuts with collar arrow toward cylinder head.

- Tighten cylinder head.

Tightening torque/tightening order:

1. Tighten cylinder head nuts (oiled) in diagonally opposite sequence
1.1 Tighten all nuts to ..... 20 Nm
1.2 Tighten all nuts an additional ..... 90°
1.3 Tighten all nuts a further ..... 90°
2. M 10 screw ..... 40 Nm
3. M 6 screw ..... 9 Nm

Tightening torque:

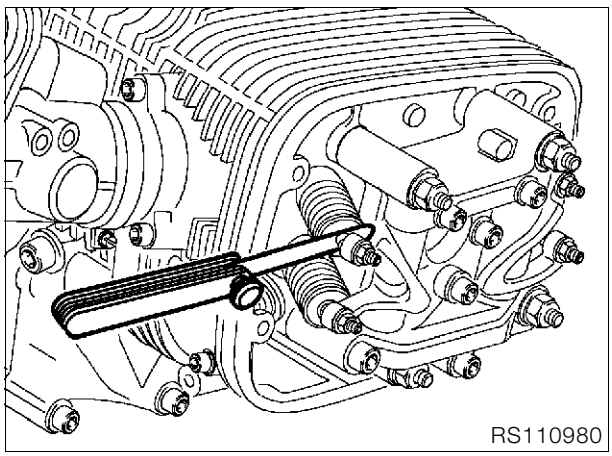
After 1,000 km (600 miles),
tighten cylinder head nuts in diagonally opposite sequence

1. Slacken one nut
2. Tighten nut to initial torque of ..... 20 Nm
3. Tighten nut an additional ..... 180°
4. Loosen/tighten M 10 screw ..... 40 Nm

- Fit camshaft chain sprocket in accordance with adjustment specification.
- Install locking device, **BMW No. 11 5 640**, to lock clutch housing.
- Tighten camshaft chain sprocket.
- 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 aligned as specified.

Tightening torque:

Chain tensioner ..... 32 Nm
Camshaft sprocket fastener ..... 65 Nm



11 34 004 Adjusting valve clearances

- Set piston to firing TDC on the ignition stroke.
- 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)

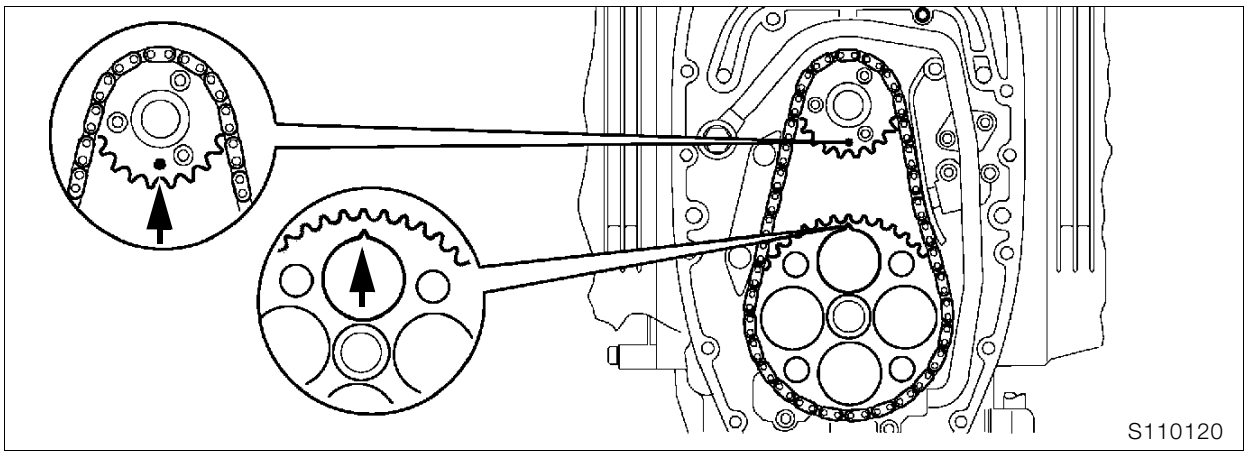
Tightening torque:

Locknut ..... 8 Nm

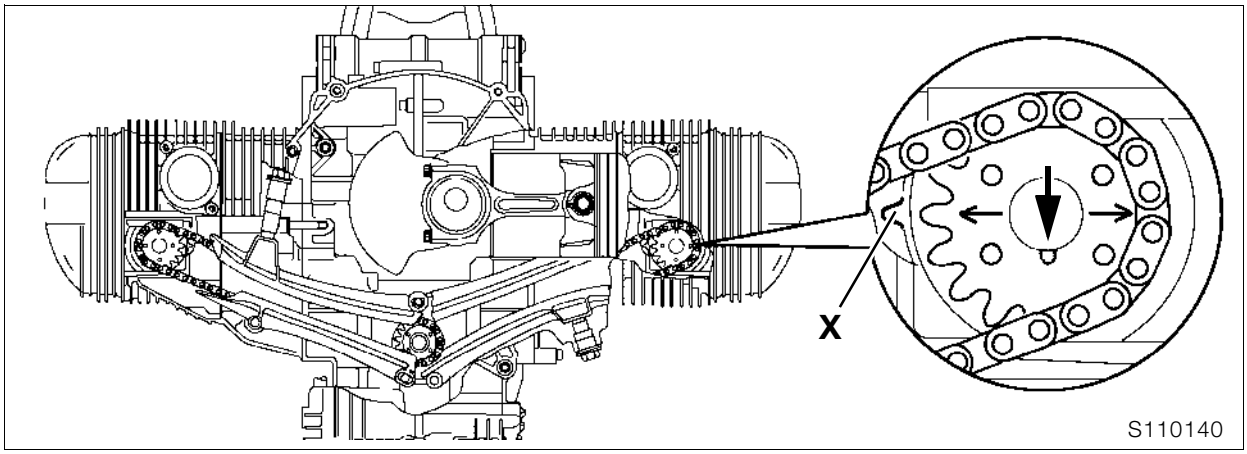
- Recheck the valve clearances. You should feel slight resistance as the blade of the feeler gauge slides between the valve stem and the rocker arm.

Adjustment specification

Attention:
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**.

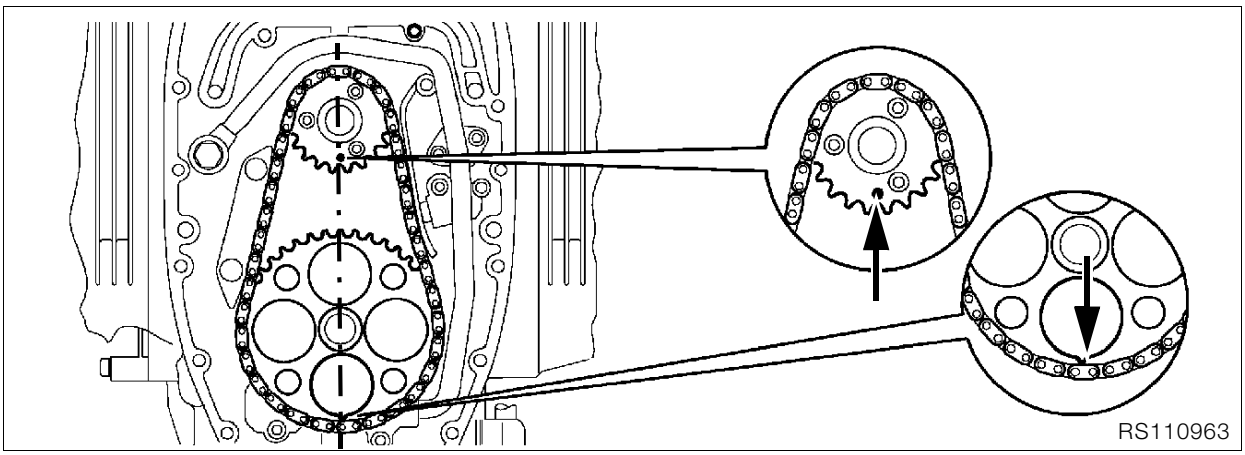
Right cylinder = at firing TDC:
Locating pin (arrow) on right camshaft sprocket points downwards.
Mark (**arrow**) and tip of tooth on right camshaft gear are **exactly** aligned with mark **X** on valve gear carrier.

- Recheck setting with timing chain tensioner installed.

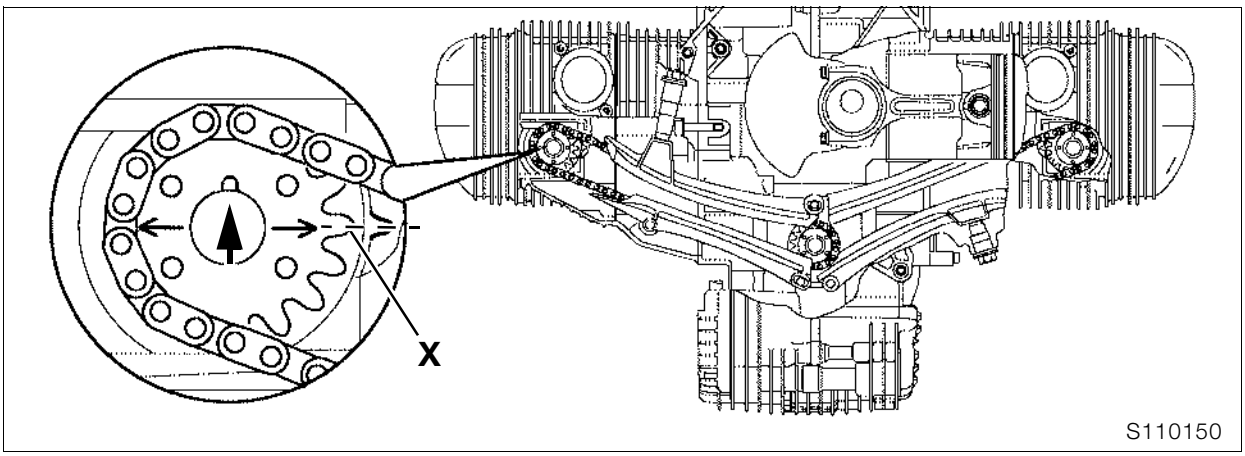
11 12 055 Installing left cylinder head

Adjustment specification

Attention:
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.

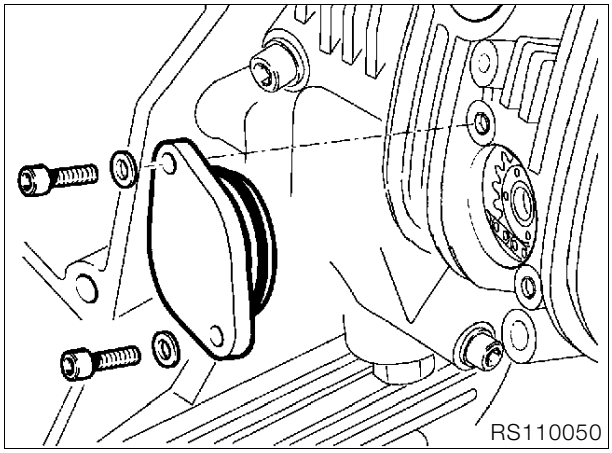


- Lock engine at firing TDC by inserting pin, **BMW No. 11 2 650**, through holes in clutch housing and engine block.

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**.

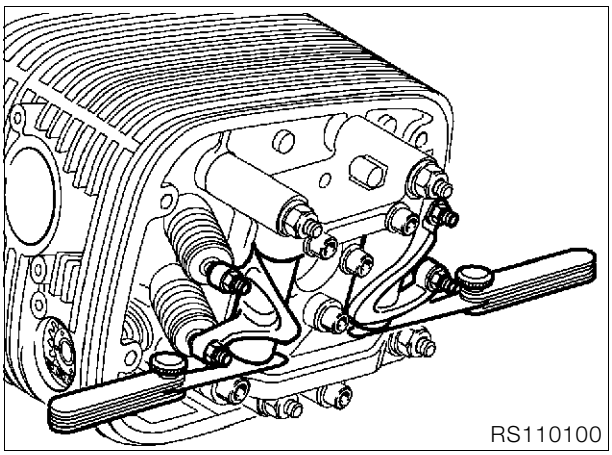
Left cylinder = at firing TDC:
Locating pin (arrow) on left camshaft sprocket points upwards.
Mark (**arrow**) and tip of tooth of left camshaft gear are **exactly aligned** with mark **X** on valve gear carrier.

- Recheck setting with timing chain tensioner installed.



- Install the cover, ensuring that the O-ring is in perfect condition.

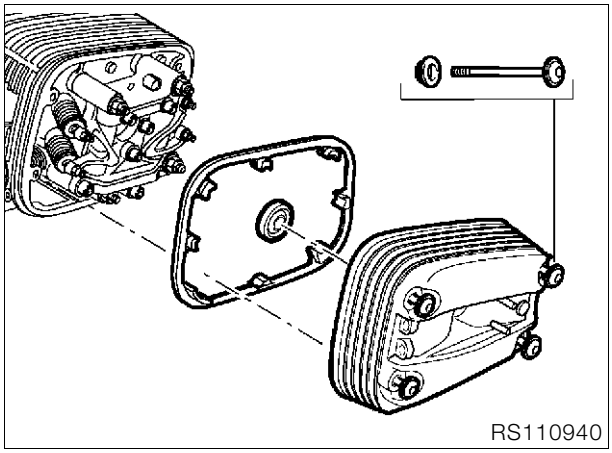
Tightening torque:
M 6 screw ..... 9 Nm



- Adjust the valve gear carrier for minimum end float.

Rocker end float:
min. ..... 0.05 mm (0.0020 in)
max. ..... 0.40 mm (0.0157 in)

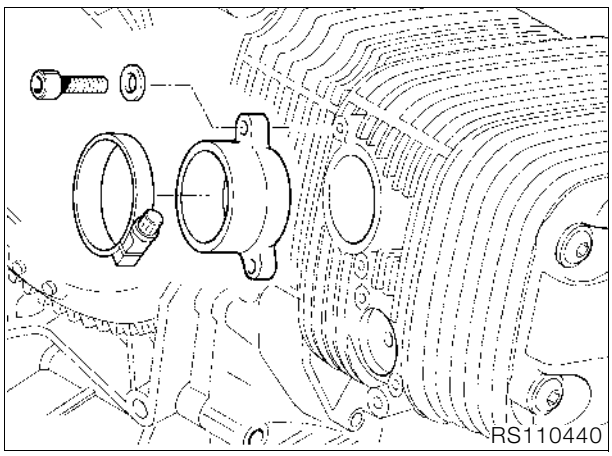
Attention:
Make sure that gaskets are correctly seated. Gaskets and sealing faces must be free from oil and grease.



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

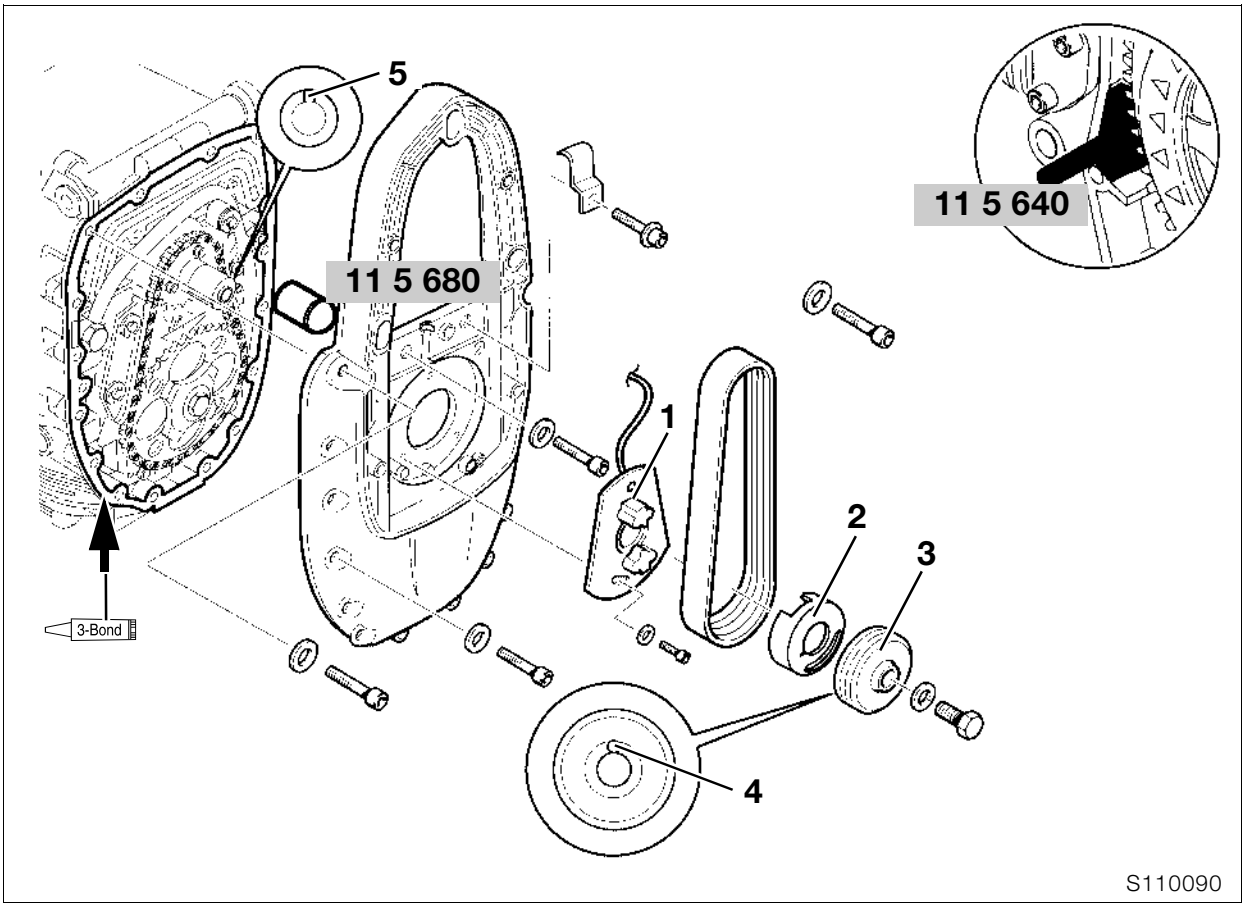
- Install cylinder head cover.

Tightening torque:
Cover bolt ..... 8 Nm



- Secure air intake stub pipe.

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



11 11 045 Installing alternator mount cover

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

Tightening torque:

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

12 11 Installing magnetic gate/belt pulley

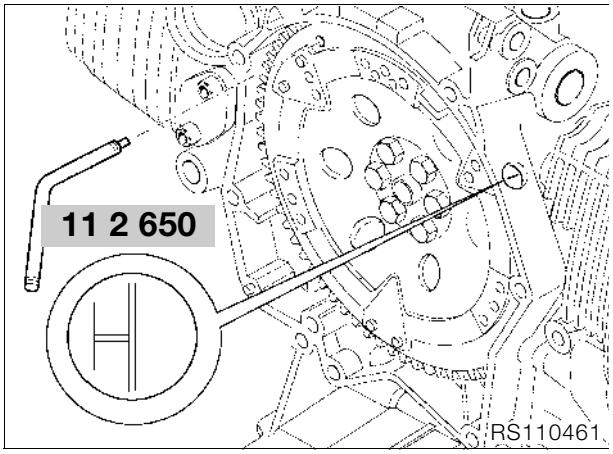
- Install Hall-effect trigger plate (1).
- Install locking device, **BMW No. 11 5 640**, to lock clutch housing.
- Secure rotor (2) of Hall-effect gate to the poly-V belt pulley (3) with, for example, **Loctite instant adhesive.**

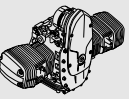
Attention:
Seat retainer (4) for Hall-effect gate rotor in groove in crankshaft (5).

- Install the poly-V belt pulley.

Tightening torque:

Pulley screw ..... 50 Nm

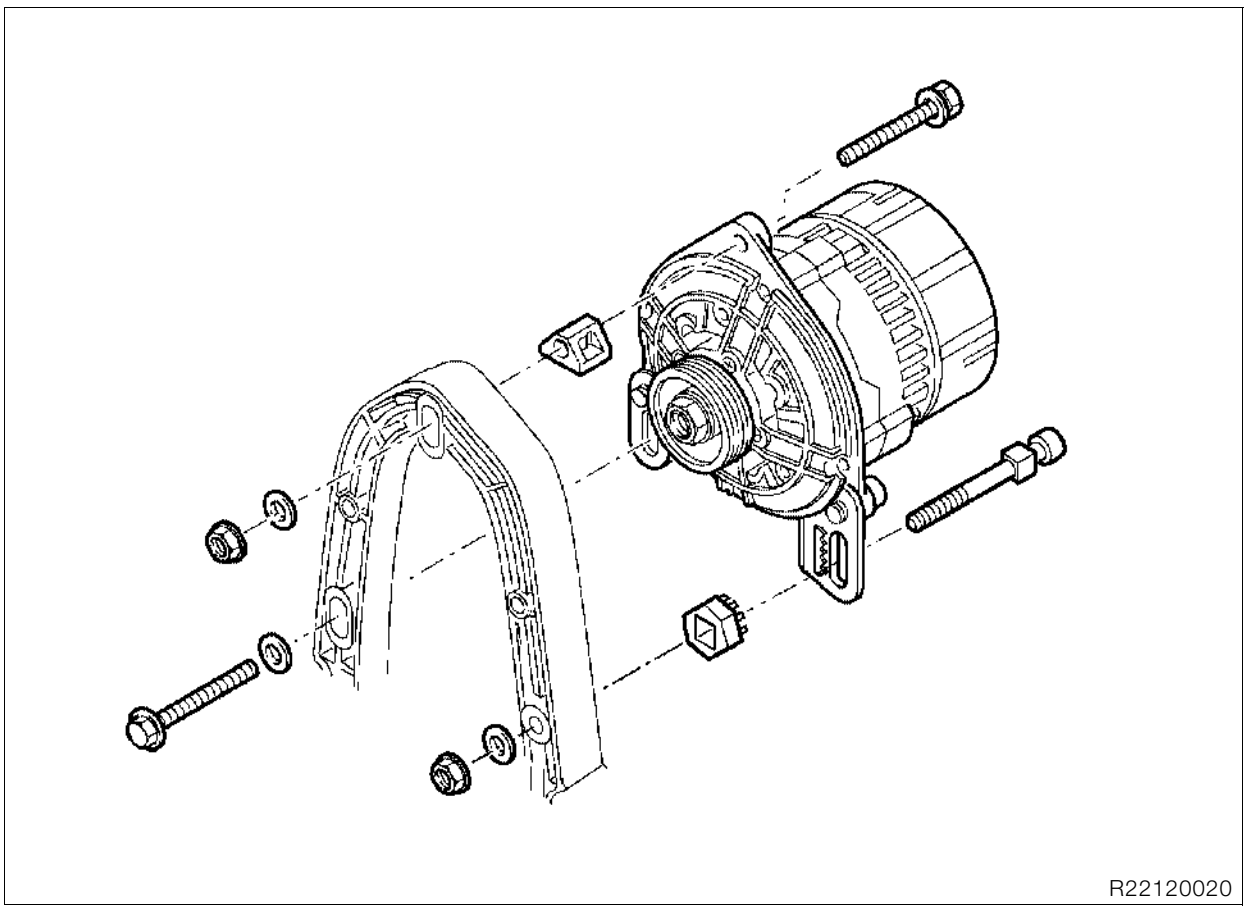




12 11 004 Timing the ignition

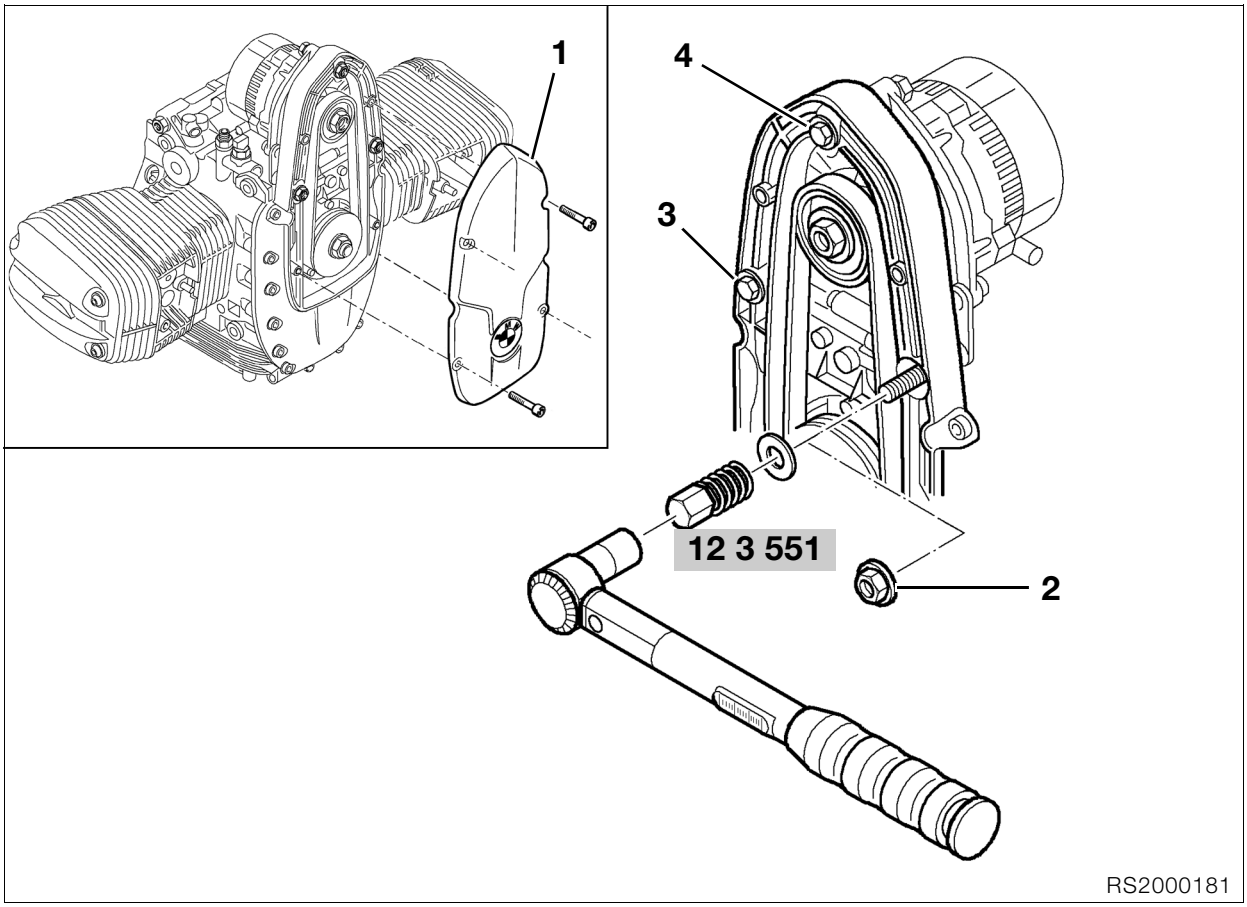
Note:
With engine installed.

- 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.



12 31 Installing alternator

- Install alternator.
- Adjust poly-V belt in accordance with the adjusting procedure (➟ 11.66).



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

- Mount the poly-V belt on the pulleys and tension it slightly, then turn the crankshaft through one revolution and relieve the tension on the belt.
- Tension the poly-V belt in accordance with the specified procedure.

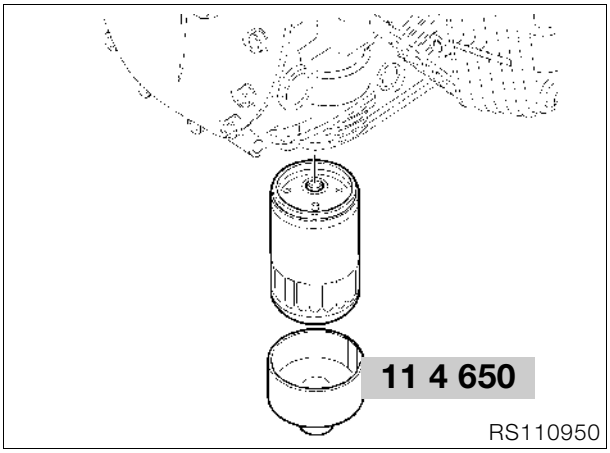
Poly-V belt tensioning procedure:

1 Undo nut (2) and screw on tensioning nut **BMW No. 12 3 551**.
2 Loosen the alternator mounting bolts (3, 4).
3 Use torque wrench to tighten and hold tensioning nut **BMW No. 12 3 551**.
4 Tighten upper retaining nut (4), then remove torque wrench from adjusting screw.
5 Tighten all screws and nuts.

- Install front cover (1).

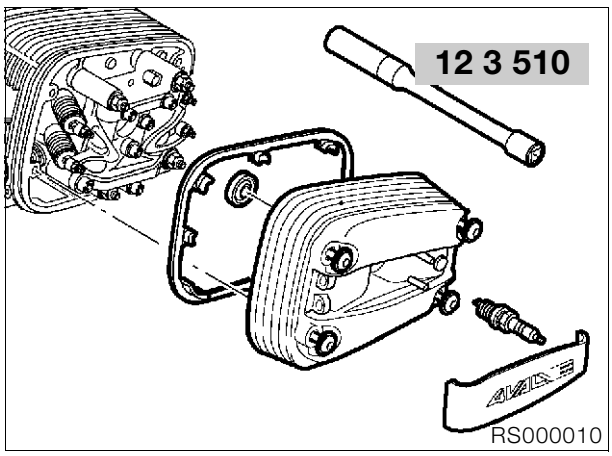
Tightening torque:

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



- 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



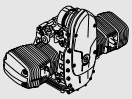
- Install spark plugs with spark plug socket wrench, **BMW No. 12 3 510**.

Tightening torque:
Spark plug NGK BKR 7 EKC..... 25 Nm

11 00 050 Installing engine

Note:
Integral ABS After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until the self-diagnosis routine has been completed.

- 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.

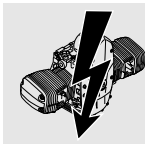


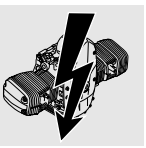
Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

- Installation is the reverse of the removal procedure (➟ 11.16).
- Check and, if necessary, adjust idling speed, synchronisation, throttle flaps (➟ 00.59).

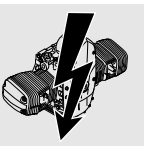
12 Engine electrics

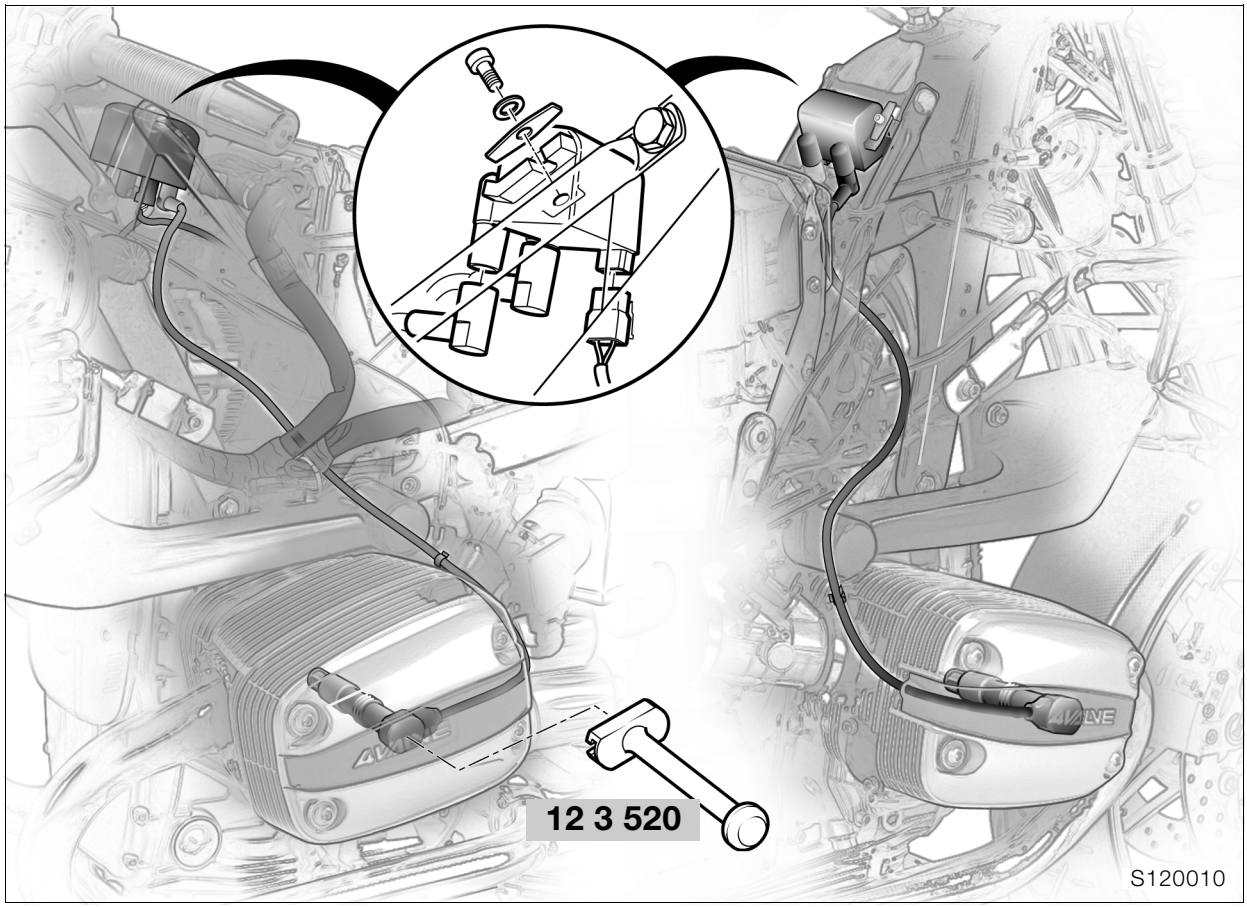
Contents





Technical Data 12 Engine electrical system		R 1150 RT
Starter motor		
Type		Permanent-magnet motor with planetary gear drive
Gear ratio		Planetary gears 5.5 : 1
Power rating	kW	1.1
Alternator		
Type		Bosch three-phase alternator with integrated, fully electronic voltage regulator
Gear ratio		1:1.5
Drive		Poly-V belt
Maximum output rating	W/V	700/14
Maximum current at engine speed 4,000 rpm	A	50
Nominal current at engine speed 1,000 rpm	A	18
Maximum engine speed	rpm	20,000
Spark plugs		
Manufacturer		NGK
Description		BKR 7 EKC
Thread	metric	14
Electrode gap	mm (in)	0.8 (0.0315)
Wear limit	mm (in)	1.0 (0.0393)
Ignition		
Ignition system		Motronic MA 2.4
Ignition trigger		Two camshaft-driven magnetic gates (Hall transmitters)
Ignition timing	°CS	0...+43 before TDC (ignition map control)
Static ignition timing	°CS	Adjustment at TDC
Ignition coil		
Type		Double spark coil
Manufacturer		Beru
Resistance		when engine is cold
Primary current (between terminals 15 and 1)	Ω	~0.5
Secondary current (between terminals 4a and 4b)	kΩ	~7.5





12 13 Removing and installing coil and ignition lead

- Remove the seat.
- Remove side panels (➡ 46.8).

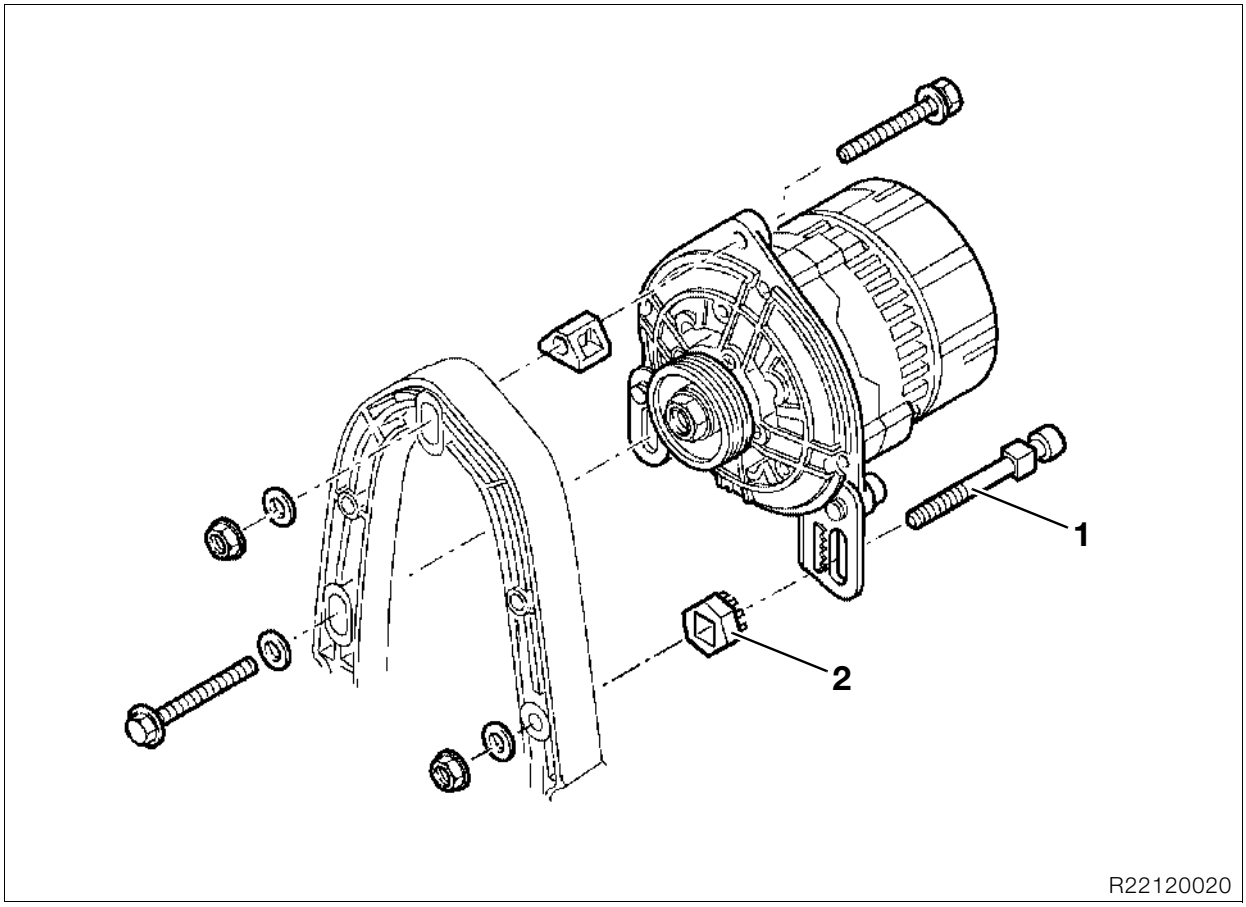
Attention:
Fuel is flammable and a hazard to health. Observe all applicable safety regulations.

- Remove fuel tank (➡ 16.5).
- Remove the ignition coil.
- Disconnect plug.
- Disconnect ignition lead.
- Remove spark plug covers.
- Pull off spark plug cap with special puller, **BMW No. 12 3 520**.
- Remove ignition leads.
- 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.

61 00 009 Checking ignition coil resistance

- Test with **BMW** MoDiTeC.



12 31 022 Removing and installing alternator

- Remove the seat.
- Remove side panels (➡ 46.8).

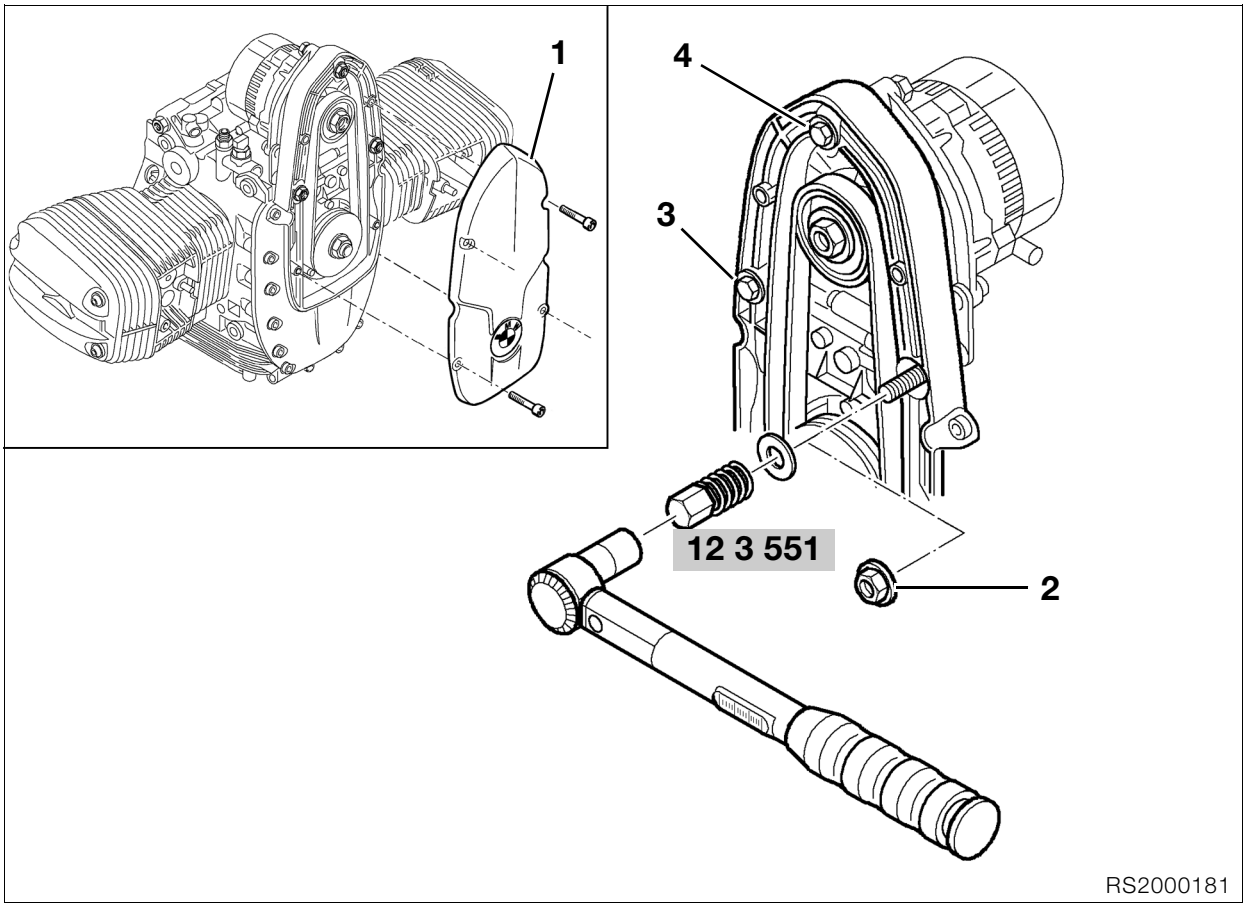
⚠ Attention:
Fuel is flammable and a hazard to health. Observe all applicable safety regulations.

- Remove fuel tank (➡ 16.5).
- Disconnect ground (earth) cable from battery.
- Remove the horn, if necessary.
- Remove spring strut.
- Remove alternator mount cover (➡ 11.35).
- Disconnect wiring from alternator.
- Remove bolt (1) and nut (2).

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

- Remove the alternator.
- Installation is the reverse of the removal procedure.
- Install poly-V belt in accordance with the adjusting procedure (➡ 12.7).
- 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:

- Mount the poly-V belt on the pulleys and tension it slightly, then turn the crankshaft through one revolution and relieve the tension on the belt.
- Tension the poly-V belt in accordance with the specified procedure.

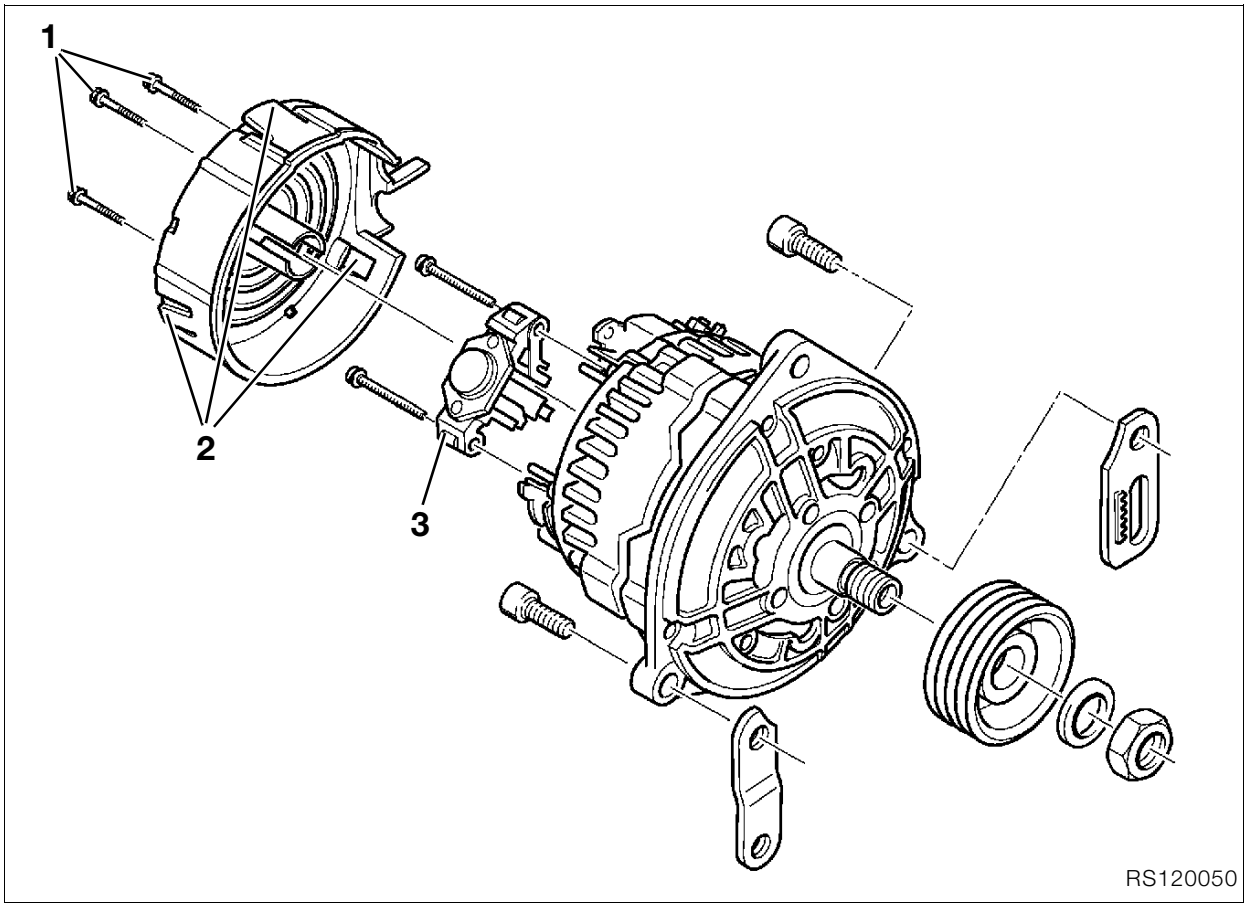
Poly-V belt tensioning procedure:

1 Undo nut (2) and screw on tensioning nut **BMW No. 12 3 551**.
2 Loosen the alternator mounting bolts (3, 4).
3 Use torque wrench to tighten and hold tensioning nut **BMW No. 12 3 551**.
4 Tighten upper retaining nut (4), then remove torque wrench from adjusting screw.
5 Tighten all screws and nuts.

- Install front cover (1).

Tightening torque:

Poly-V belt preload ..... 8 Nm
Alternator
to alternator mount cover ..... 20 Nm
Positive cable to alternator ..... 15 Nm
Belt pulley to alternator ..... 50 Nm



12 31 Disassembling and assembling alternator

- 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.

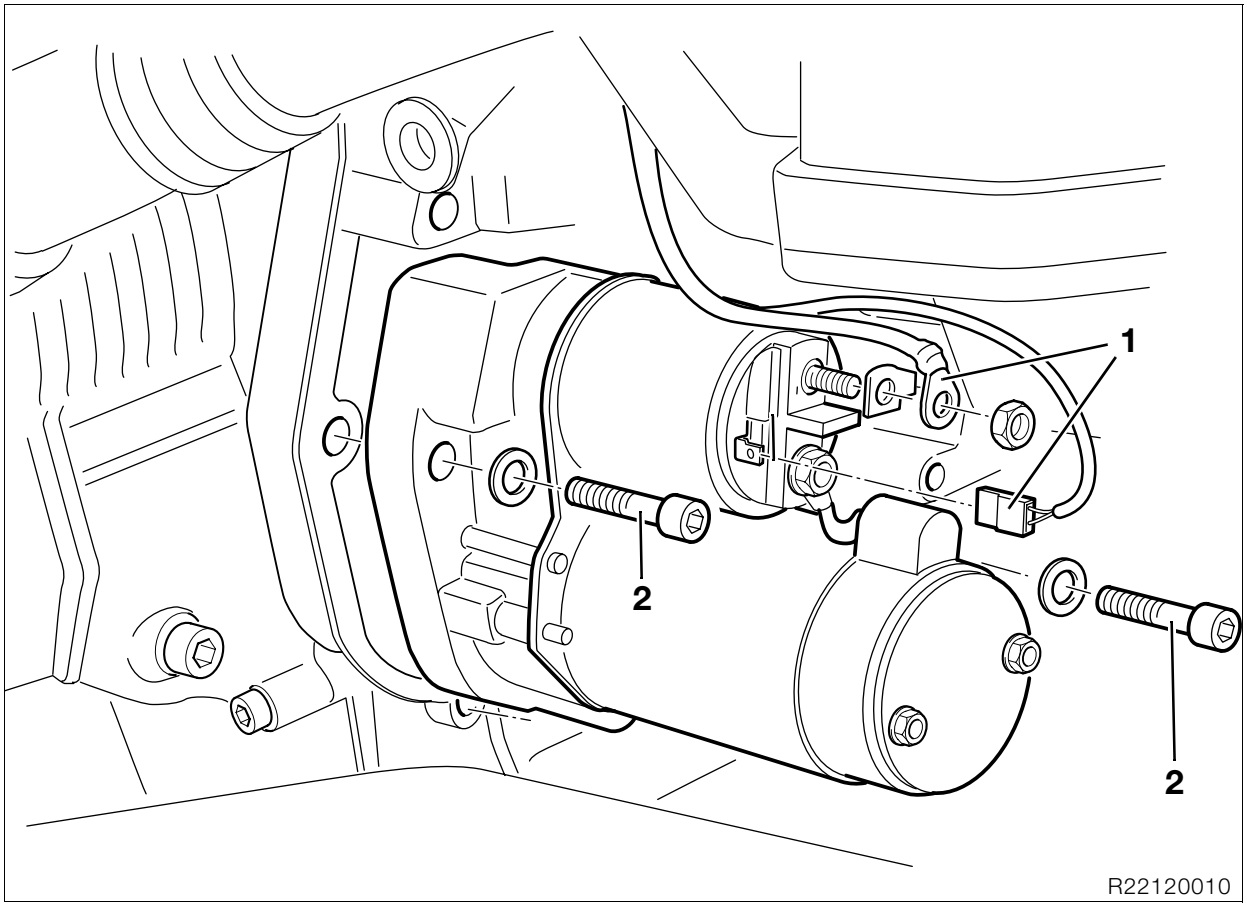
Tightening torque:
Belt pulley to alternator ..... 50 Nm

61 00 Checking alternator

- Test with **BMW** MoDiTeC**.**

61 00 Checking armature for short to ground (earth)

- Test with **BMW** MoDiTeC.



12 41 025 Removing and installing starter motor

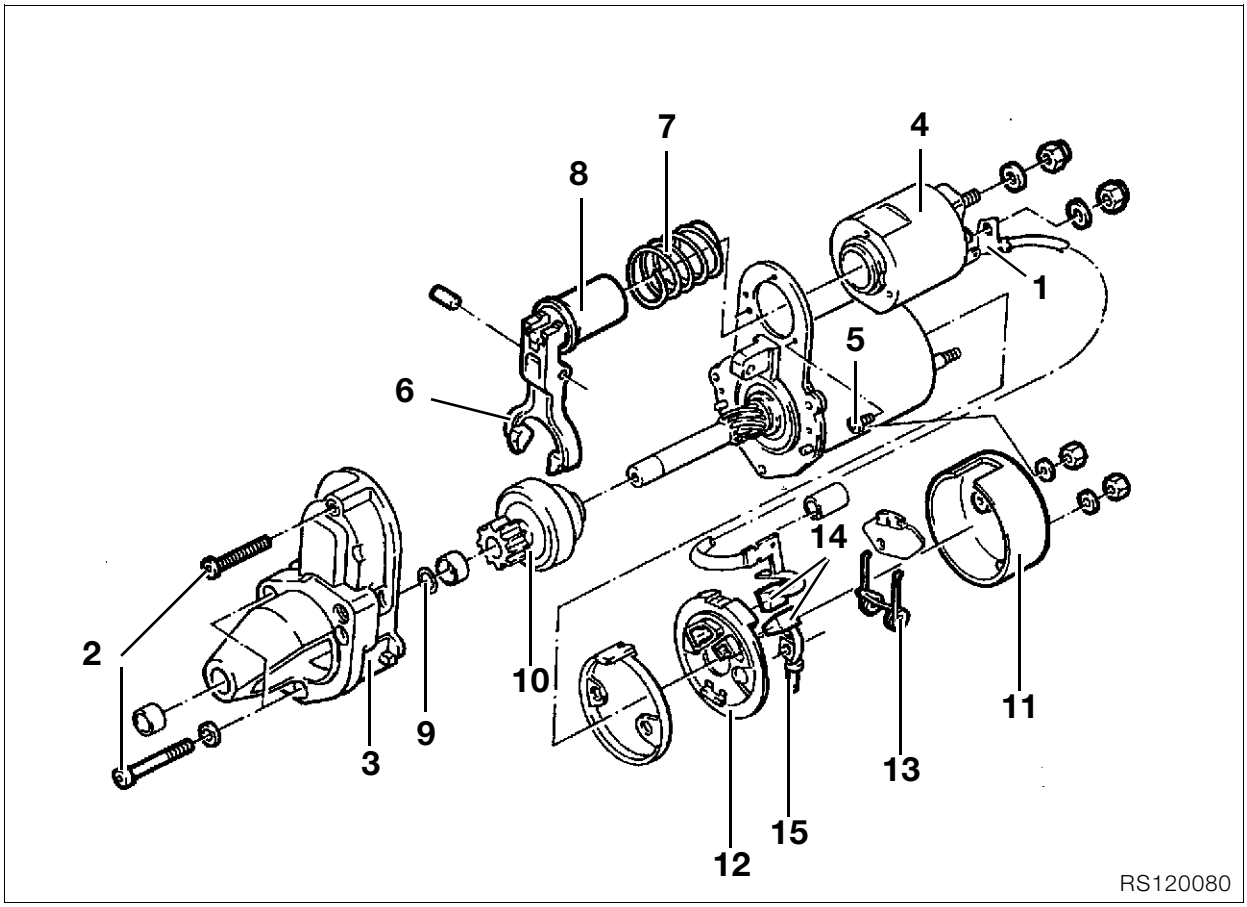
- Remove the seat.
- Remove left side section of fairing (➟ 46.8).

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

- Disconnect cables (1) .
- Remove securing screws (2) and remove the starter.
- 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 to engine ..... 20 Nm
Positive lead to starter..... 10 Nm



12 41 525 Disassembling and 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

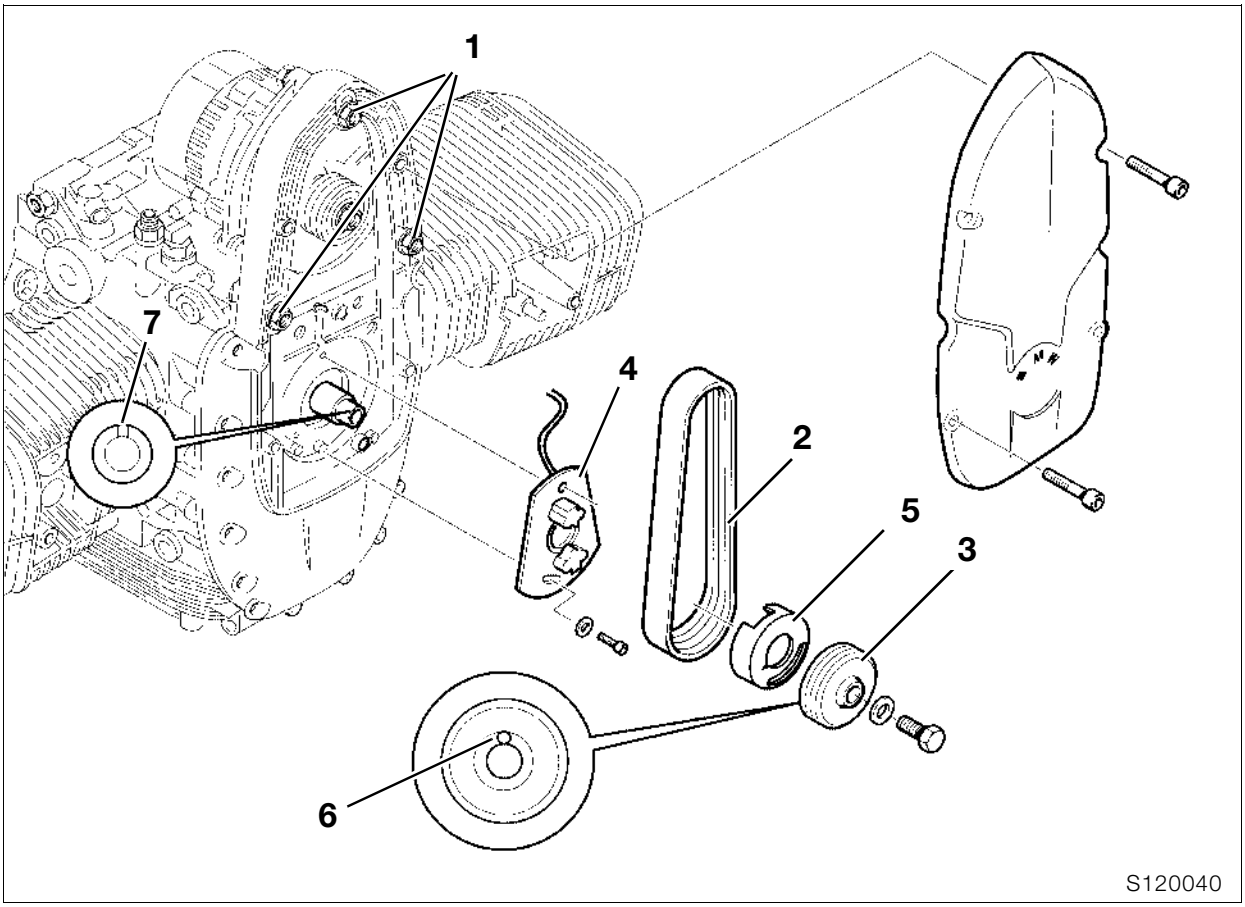
- Disconnect lead (1).
- Remove cover (11).
- Remove holder (12) for carbon brushes.
- Lift up retaining springs (13) and remove carbon brushes (14).
- Install carbon brushes with retaining plate.
- Slide short lead (15) on to threaded pin.
- Install cover (11).
- Connect lead (1).

61 00 Checking starter motor

- Test with **BMW** MoDiTeC.

61 00 Checking starter relay

- Test with **BMW** MoDiTeC.



12 11 Removing and installing magnetic gate

- Remove the seat.
- Remove side panels (➡ 46.8).

⚠ Attention:
Fuel is flammable and a hazard to health. Observe all applicable safety regulations.

- Remove fuel tank (➡ 16.5).
- Remove the right-hand fairing bracket.
- Remove front cover from engine.
- Remove fasteners (1) for alternator.
- Remove poly V belt (2).

⚠ Attention:
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 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.
- Locate rotor (5) of Hall-effect gate on poly-V belt pulley (3) with adhesive.

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

⚠ Attention:
Seat retainer (6) for Hall-effect gate rotor in groove in crankshaft (7).
Carefully route cable for magnetic gate.

- Tension poly-V belt in accordance with the adjusting procedure (➡ 12.7).

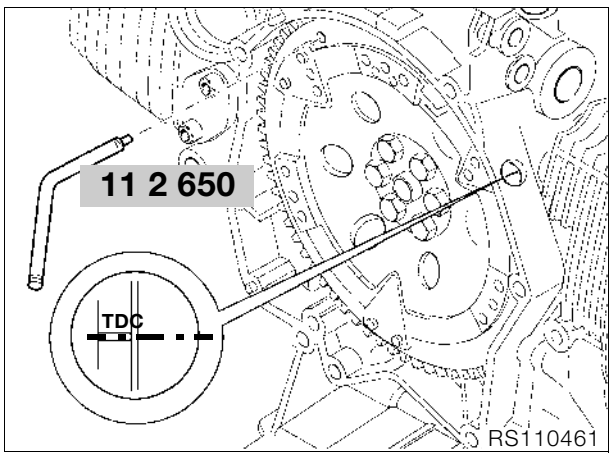
- Switch on the ignition.
- Without starting the engine, fully open the throttle once or twice so that the Motronic control unit can register the throttle-valve positions.

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 for poly-V belt ..... 8 Nm
Alternator
to alternator mount cover ..... 20 Nm
Belt pulley to crankshaft ..... 50 Nm

12 11 004 Timing the ignition



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

13 Fuel preparation and control

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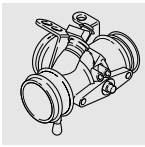
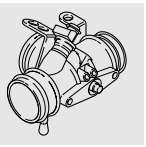
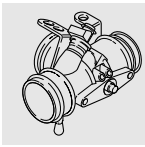
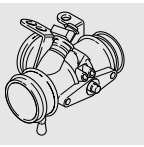
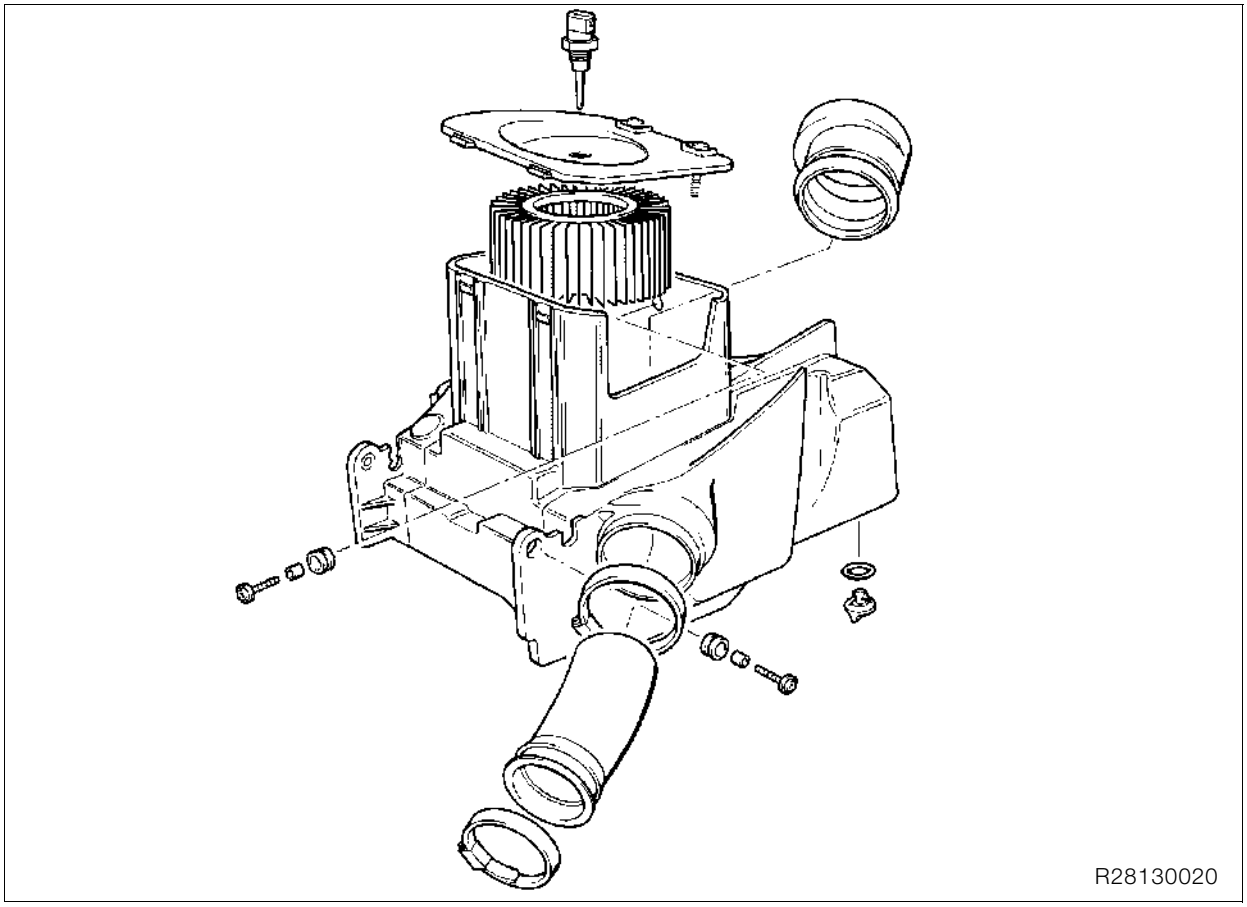




Technical Data 13 Fuel system		R 1150 RT
Fuel grade		Super (premium), unleaded, 95 octane (RON)
Fuel-injection system		Motronic MA 2.4
Fuel pressure	bar (psi)	3.0 (42.69)
Max. engine speed	rpm	7,900
Throttle valve stub pipe inside dia.	mm (in)	45 (1.7717)
Air filter		Circular paper element

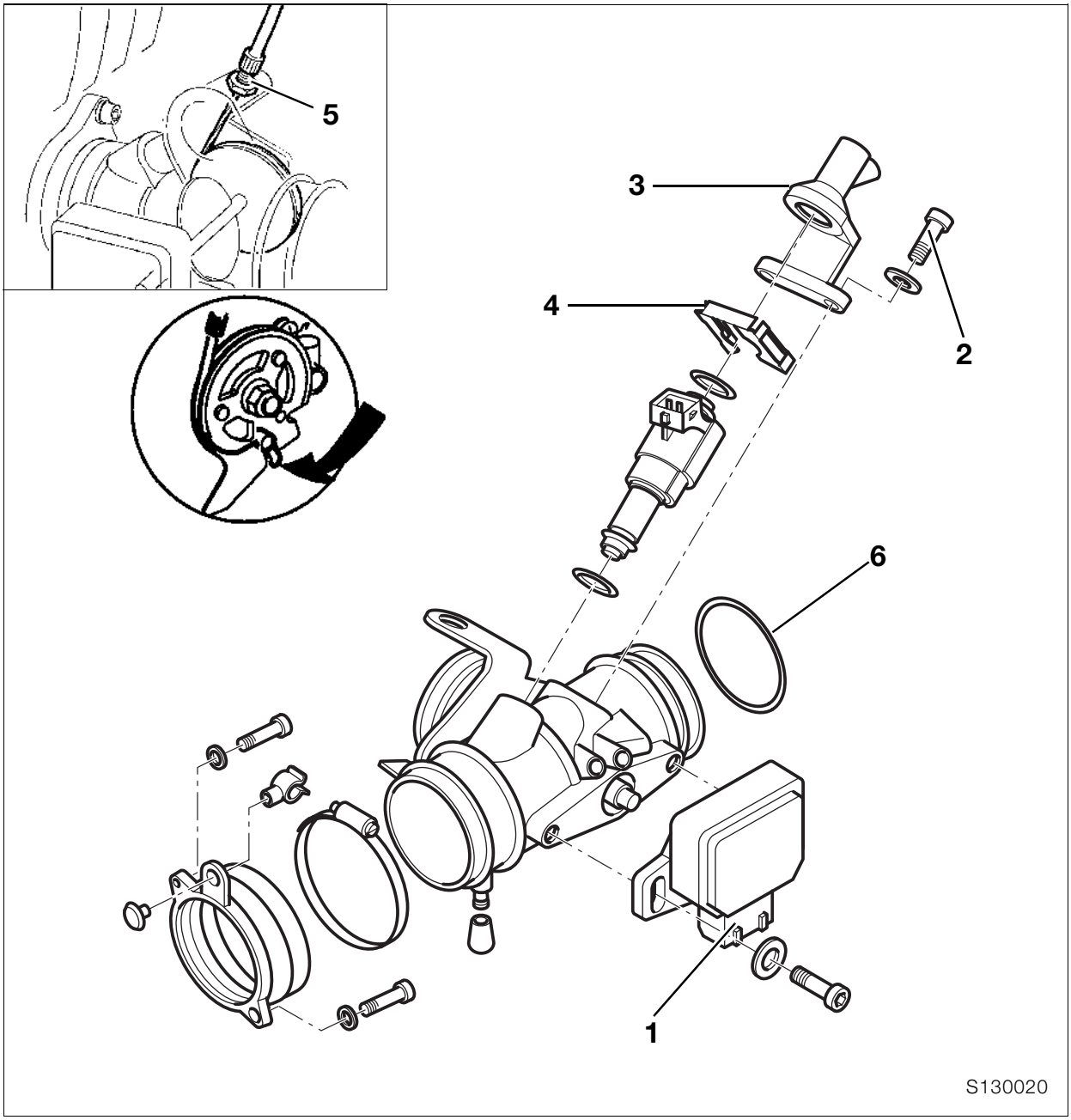






13 72 110 Removing and installing air filter housing

➠ Preparatory work
See “Instructions for removing and installing clutch”
(➠ 21.5)



13 54 030 Removing and installing throttle-valve stub pipe

- Remove the seat.
- Remove side panels (➟ 46.8).
- 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 **BMW** MoDiTeC)

- Remove screws (2).
- Remove holder (3) with fuel line and injector.
- Remove fuel injector, if necessary:

– Press in the spring catch at the injector plug and pull off the plug.
– Remove locking device (4) from the injector.

- Slacken hose clamps.
- Disconnect ground cable from left throttle stub pipe.
- Push intake neck into air filter box and remove throttle-valve assembly.

- Disengage throttle cables (5) from right and left throttle-valve stubs.
- Installation is the reverse of the removal procedure.

Attention:
Make sure that O-ring (6) on throttle-valve stub is in perfect condition.

Adjusting speed increase, idle speed and synchronisation (➟ 00.59)

13 63 000 Removing and installing throttle-valve potentiometer

- Remove the seat.
- Remove left side section of fairing (➟ 46.8).
- 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 **BMW** MoDiTeC)

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

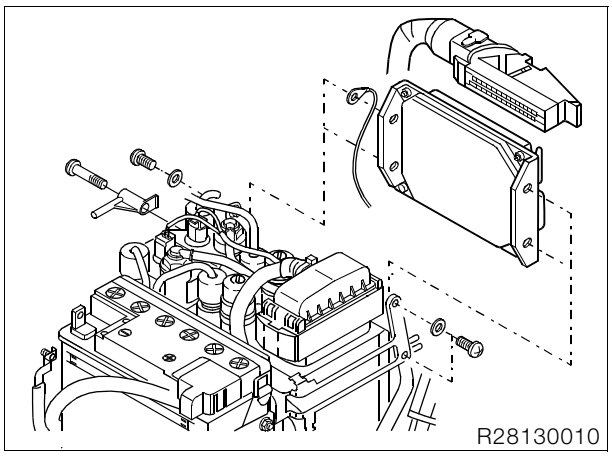
13 61 010 Removing and installing Motronic control unit

- Remove the seat.
- Remove side panels (➟ 46.8).

Attention:
Fuel is flammable and a hazard to health. Observe all applicable safety regulations.

- Remove fuel tank (➟ 16.5).

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



- Disconnect plug from Hall transmitter.
- 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

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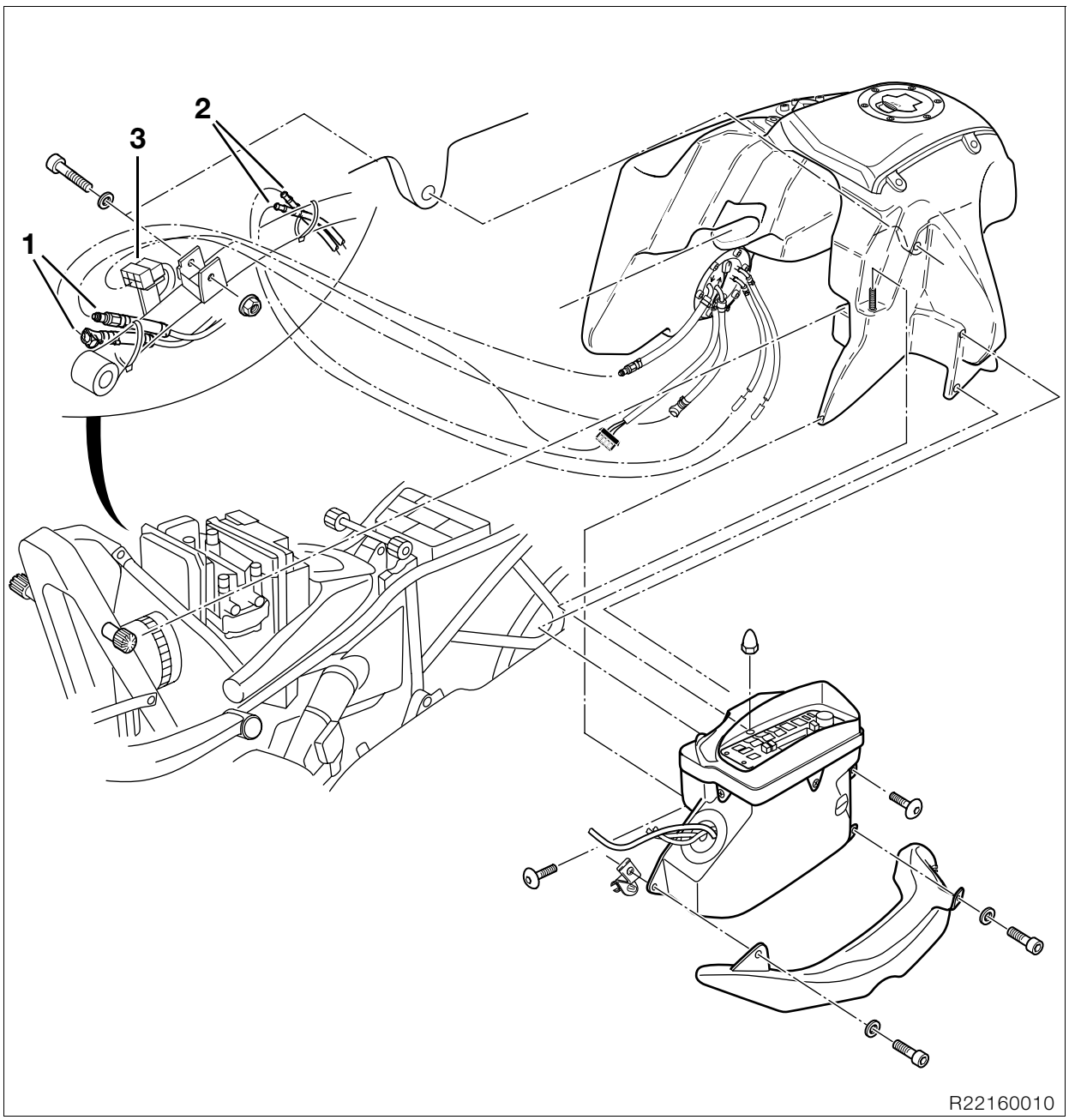
Technical Data 16 Fuel tank		R 1150 RT
Fuel tank		
Type		Plastic tank
Fuel grade		Super (premium), unleaded, 95 octane (RON)
Tank capacity (usable)	l (Imp. gal/US gal)	25.2 (5.55/6.66)
including reserve of	l (Imp. gal/US gal)	approx. 4 litres (0.88/1.06)
Fuel pump		
Type		VDO HPI-3 turbine pump
Operating voltage	V	7...15
Operating pressure	bar (psi)	3.0±0.2 (55.11±2.85)
Delivery rate	l/h (Imp. gal/US gal/h)	120 (26.41/31.70) (at 12V)

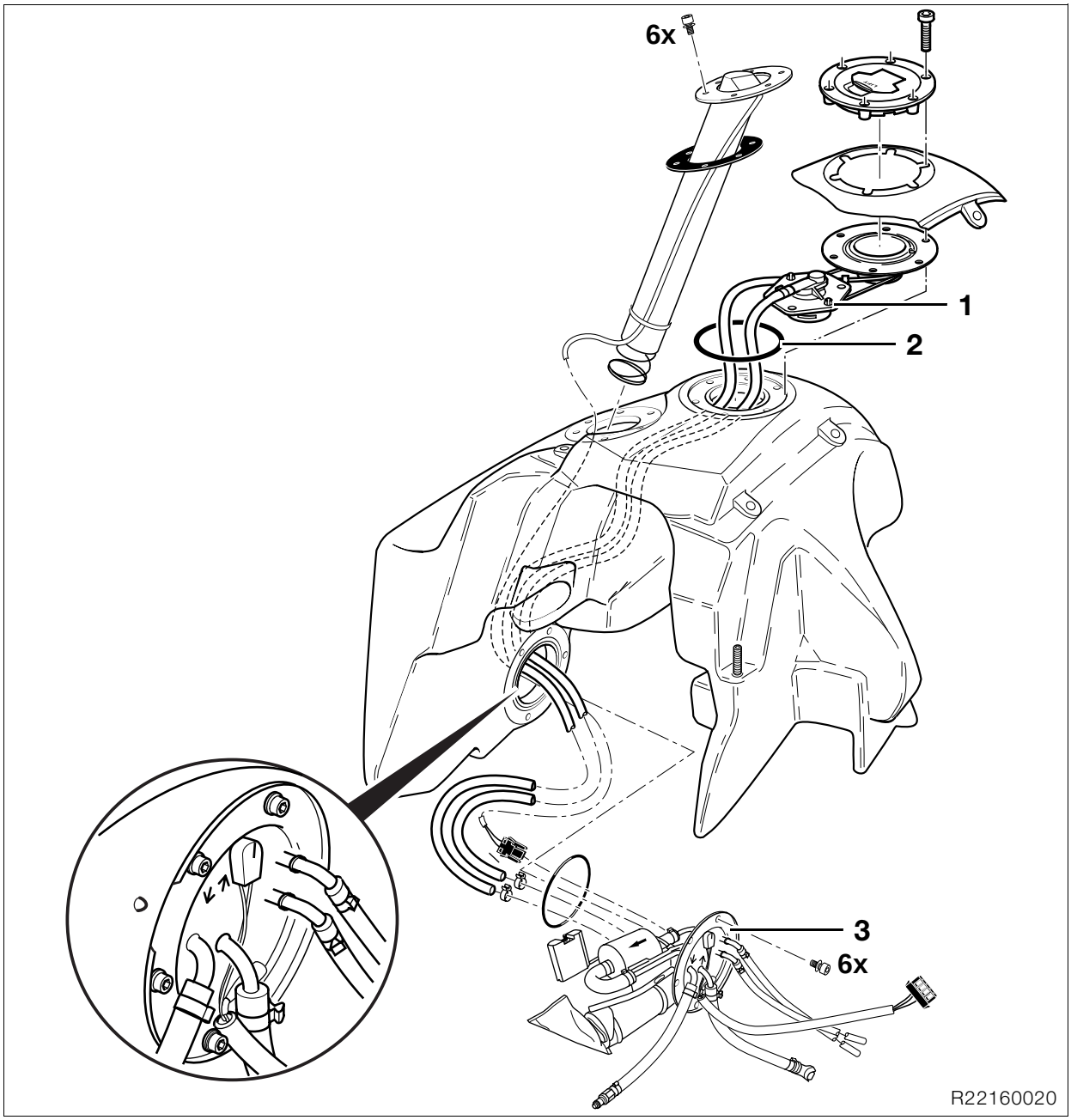


16 11 030 Removing and installing fuel tank

- Remove the seat.
- Remove fairing side sections.
- Release the radio compartment and secure it to the motorcycle.
- Disengage fuel tank.
- Disconnect quick-action couplings (1) in fuel flow and return lines.
- Disconnect vent lines (2).
- Disconnect plug of fuel pump unit (3).
- Remove fuel tank.
- Installation is the reverse of the removal procedure.

Tightening torque:

Fuel tank to rear frame ..... 22 Nm

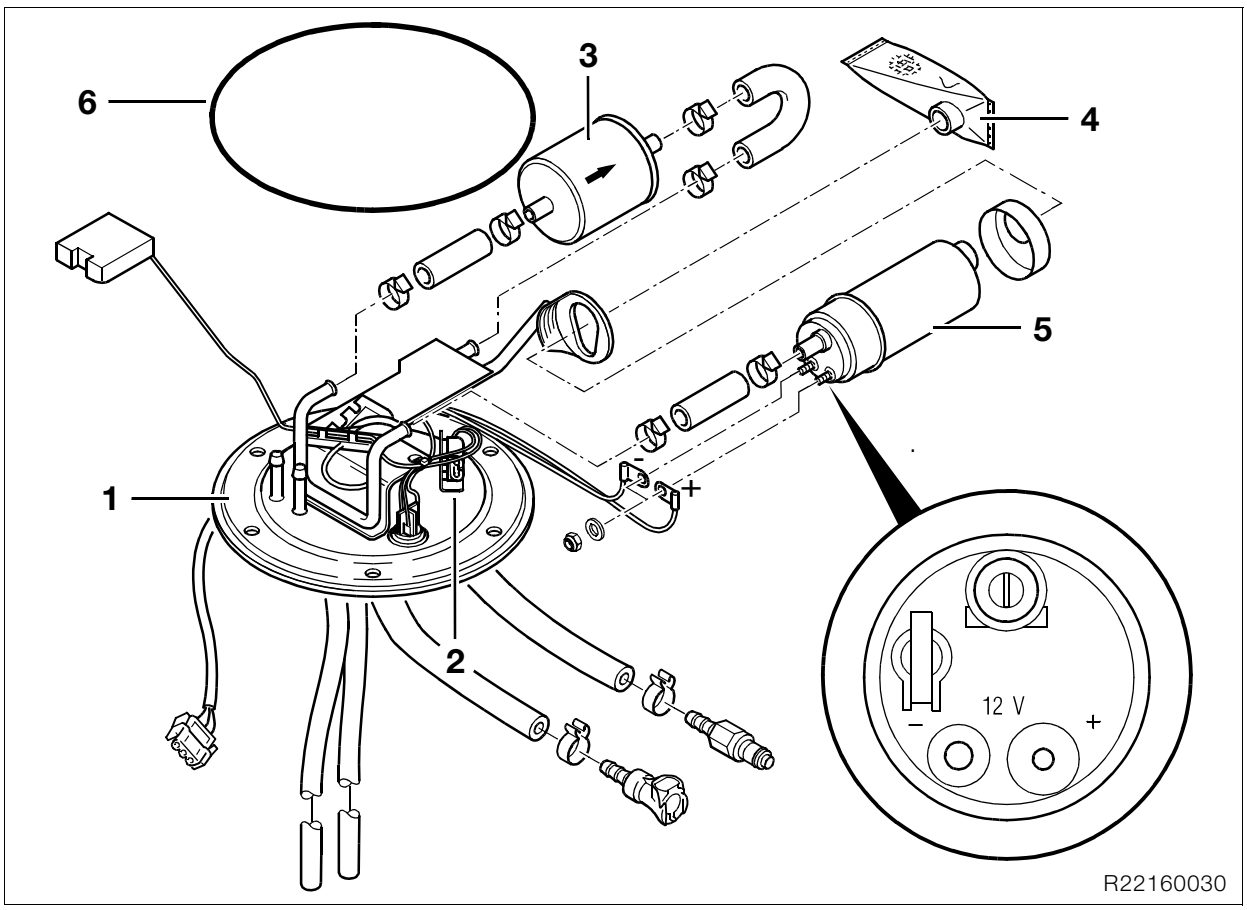


16 11 Removing and installing roll-over valve

Attention:
Fuel is flammable and a hazard to health.
Observe all applicable safety regulations.

- Remove side panels.
- Remove the fuel filler cap.
- Remove tank cover.
- Remove the reducer unit with roll-over valve (1).
- Release the hose clips with pliers, **BMW No. 17 5 500**, and disconnect hoses.
- Remove the reducer unit with roll-over valve.
- Remove the roll-over valve.
- Installation is the reverse of the removal procedure.
- Secure hose clips with pliers, **BMW No. 17 5 500**.

Attention:
Fit a new O-ring (2) if necessary.
Make sure that the O-ring seal is correctly seated.
After installing, check fuel filler cap for leaks.



16 14 Removing and installing fuel-pump unit

Attention:
Fuel is flammable and a hazard to health.
Observe all applicable safety regulations.

- Remove fuel tank (➟ 16.5).
- Drain fuel tank.
- Remove fasteners of fuel pump unit (1) and raise the unit slightly.
- Disconnect plug (2).
- Release the hose clips with pliers, **BMW No. 17 5 500**, and disconnect hoses.
- Carefully remove the fuel-pump unit.

16 12 008 Fuel filter removal and installation

- Open non-reusable hose clips at fuel filter (3).

Attention:
Note correct direction of flow through fuel filter.

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

16 12 000 Removing and installing fuel pump

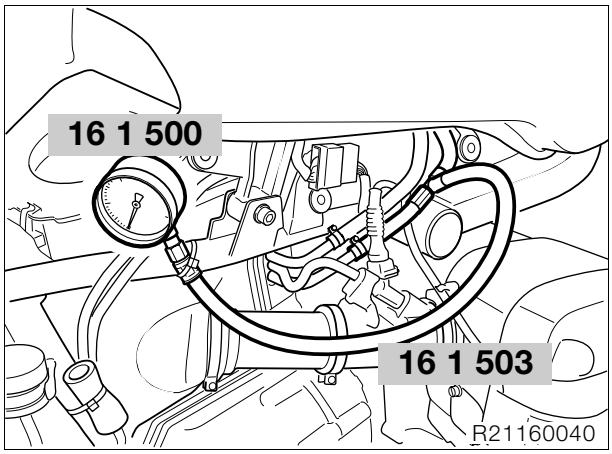
- Carefully remove strainer (4) from fuel pump.
- Open non-reusable hose clips at fuel pump (5).
- Carefully disconnect the hoses from the fuel pump.
- Disconnect the electrical connections at the fuel pump.
- Remove fuel pump.
- Installation is the reverse of the removal procedure.
- Secure non-reusable hose clips with pliers, **BMW No. 13 1 500**.

Attention:
Make sure O-ring (6) is in perfect condition.
After installing, check fuel pump unit for leaks.

Tightening torque:
Fuel pump unit to fuel tank ..... 5 Nm

13 60 505 Checking fuel pump pressure

Attention:
Fuel is flammable and a hazard to health.
Observe all applicable safety regulations.



- Disconnect quick-action coupling in fuel flow line (bottom line).
- Connect pressure gauge, **BMW No. 16 1 500**, with adapter hose, **BMW No. 16 1 503**, for quick-action couplings.
- Start engine and allow to idle.

Attention:
Do not allow the engine to idle for longer than is necessary, because the trim panels near the exhaust could be damaged.

- Installation is the reverse of the removal procedure.

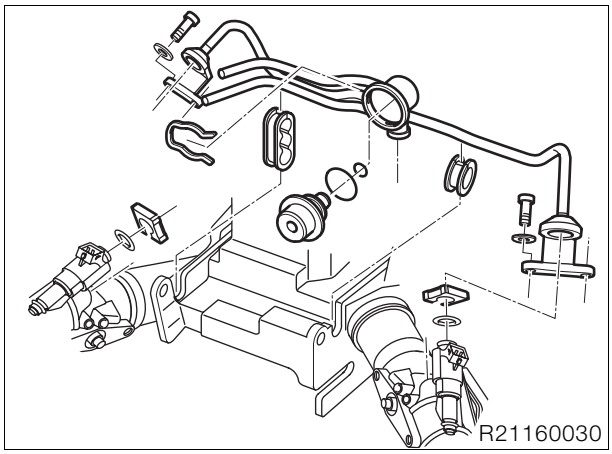
Fuel pressure:
Specified: ..... 3.0±0.2 bar (55.11±2.85 psi)

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

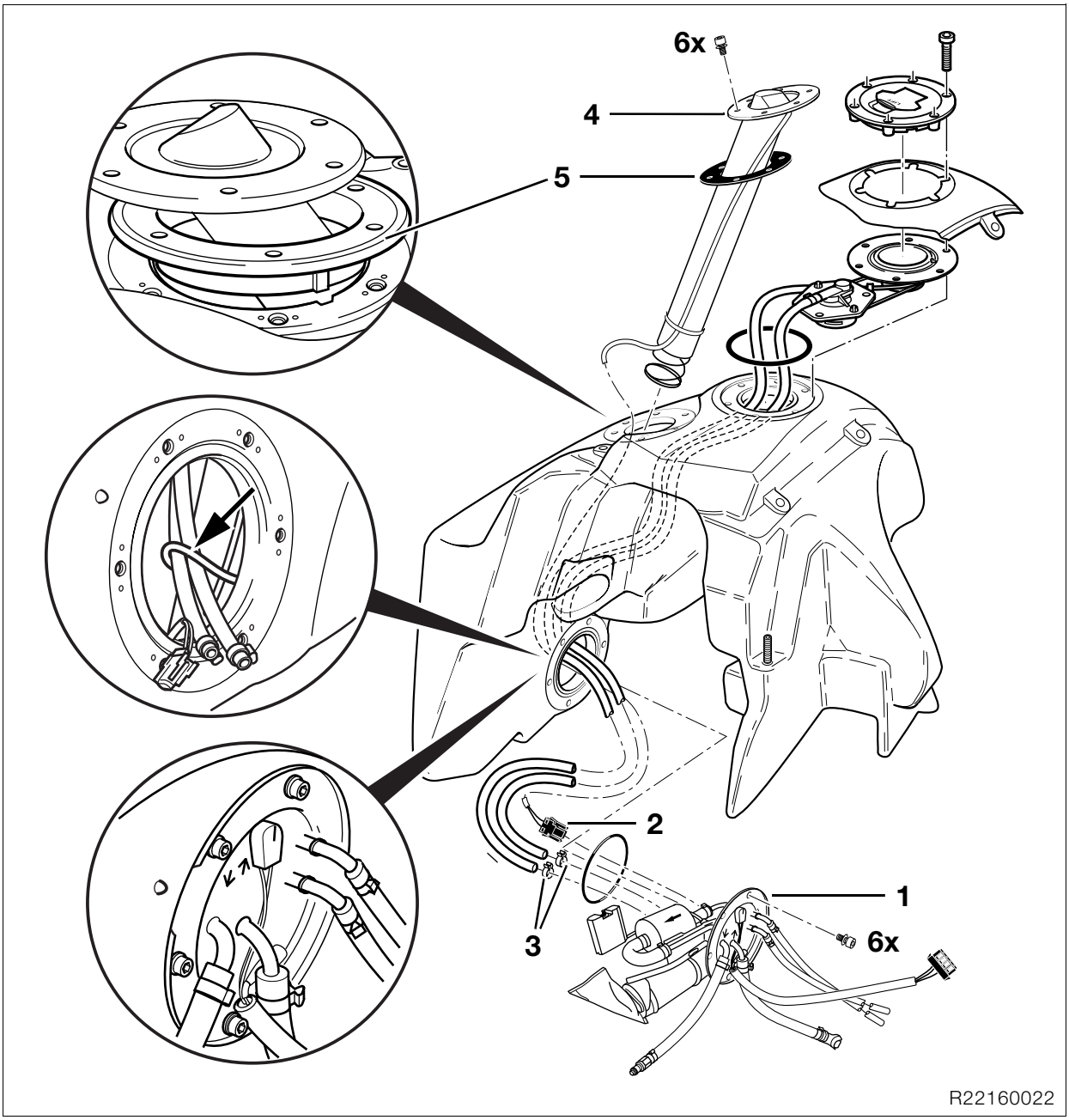
13 53 Removing and installing fuel distributor and pressure regulator

- Remove air filter box.

➡ See Instructions for removing clutch (➡ 21.5)



- Remove the fuel distributor with pressure regulator from the holder.
- Installation is the reverse of the removal procedure.



62 16 Removing and installing immersed level sensor

Attention:
Fuel is flammable and a hazard to health.
Observe all applicable safety regulations.

- Remove fuel tank (➠ 16.5).
- Drain fuel tank.
- Remove fuel filler cap and tank trim panels.
- Remove fasteners of fuel pump unit (1) and raise the unit slightly.
- Disconnect plug (2).
- Release the hose clips (3) with pliers, **BMW No. 17 5 500**, and disconnect hoses.
- Release immersed level sensor (4) and lift out complete with hoses.
- Installation is the reverse of the removal procedure.

Note:
Note locator (arrow) for hoses on the immersed level sensor.

Attention:
Make sure seal (5) and O-rings are in perfect condition.
After installing, check fuel tank for leaks.

18 Exhaust system

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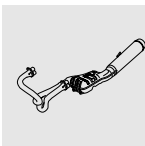
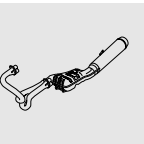
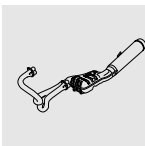
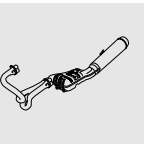
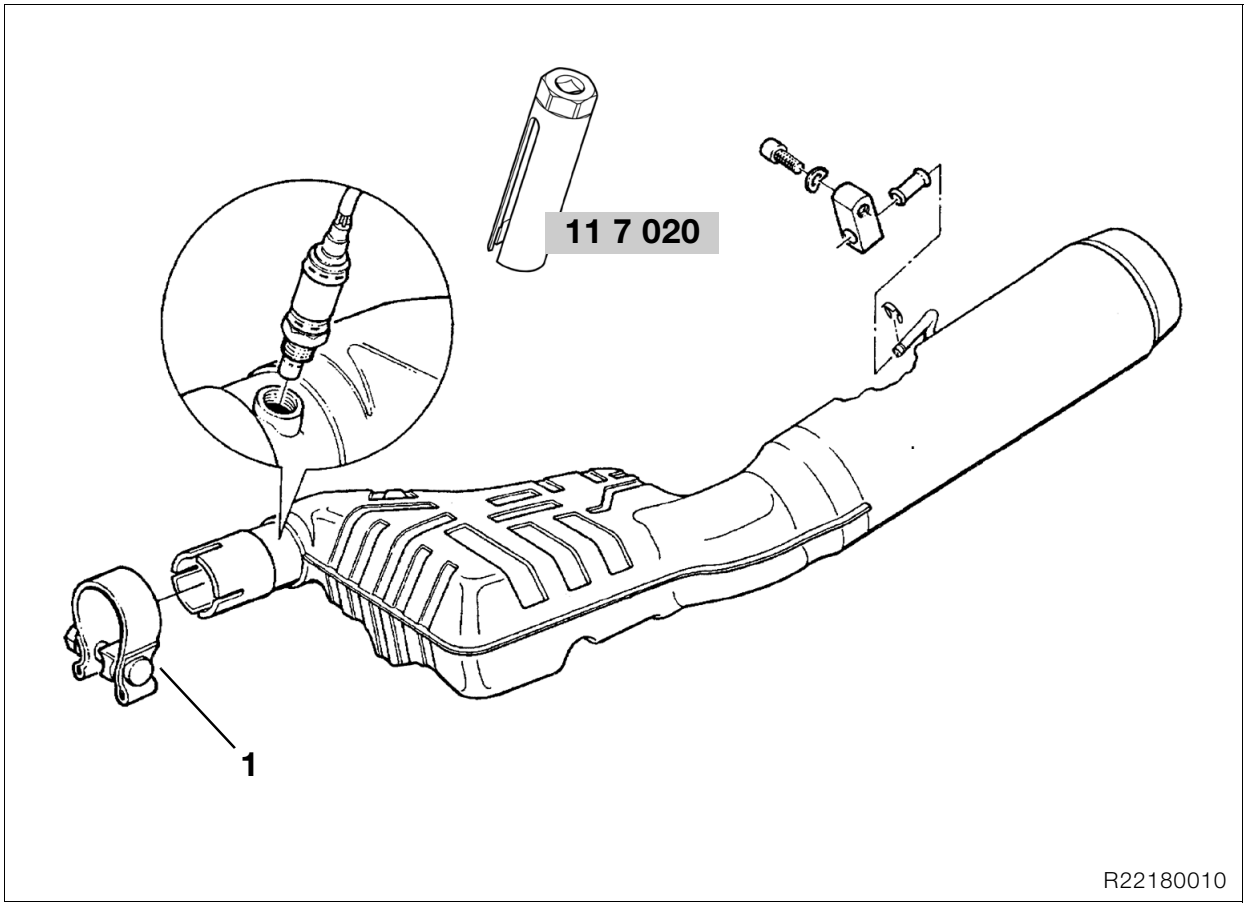




Technical Data 18 Exhaust system	**R 1150 RT**
Type	2 in 1
Emission control	3-way catalytic converter with lambda control
Silencer (muffler)	Stainless steel reflection silencer with aluminium-coated inner surface



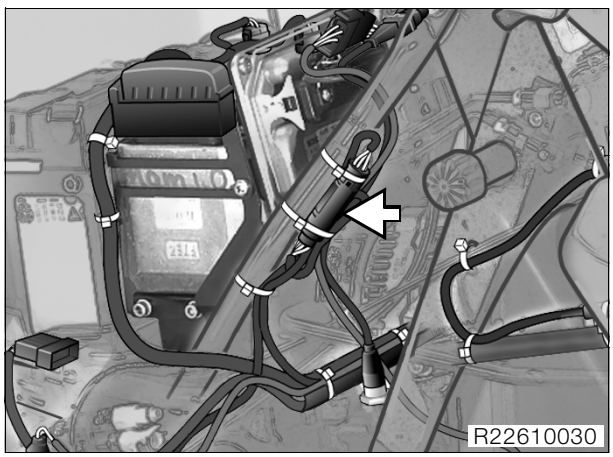




18 30 Removing and installing exhaust system

18 12 Removing and installing silencer and oxygen sensor

- Remove fuel tank.



- Disconnect the oxygen-sensor plug (arrow) and remove the cable holders.

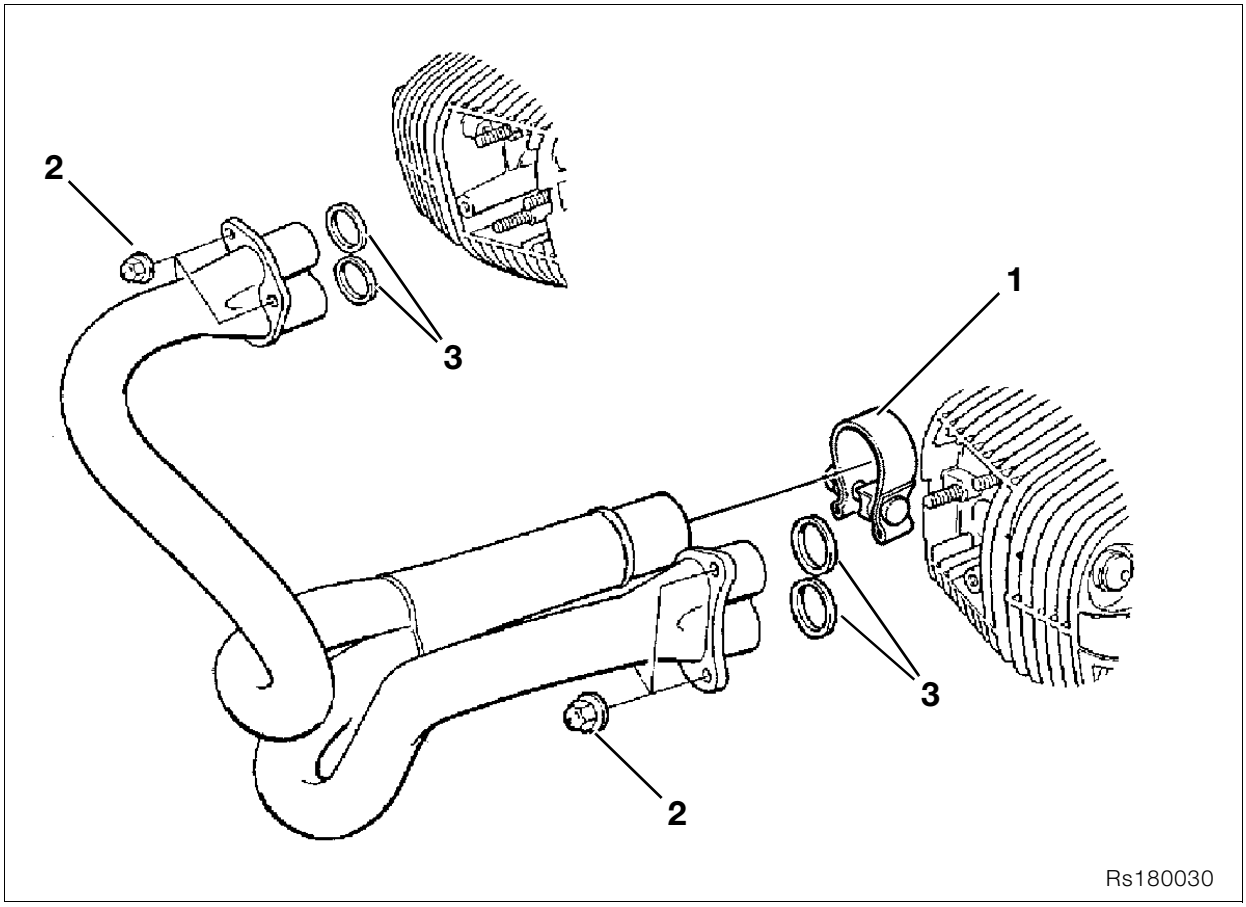
Attention:
Do not pull the oxygen sensor cable.

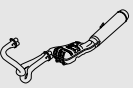
- Slacken the clamp (1).
- Remove the fasteners securing the rear silencer to the rear frame section.
- Remove rear silencer.
- Remove the oxygen sensor with special socket wrench insert, **BMW No. 11 7 020**.
- Installation is the reverse of the removal procedure.

Attention:
Note position of cable for oxygen sensor.
After a trial run, read out Motronic fault memory.

Tightening torque:

Oxygen sensor (apply Optimoly TA to thread)	45 Nm
Clamp, rear silencer to manifold (apply Optimoly TA to clamp seat)	55 Nm
Silencer to footrest plate	35 Nm





18 11 Removing and installing exhaust manifold

- Remove side panels.
- Slacken clamp (1) holding the rear silencer.
- Remove fasteners securing exhaust manifold (2).

Attention:
Secure rear silencer in such a way that it cannot fall.

- Remove exhaust manifold.
- Installation is the reverse of the removal procedure.

Note:
When installing, fit new sealing rings (3).

Attention:
After a trial run, read out Motronic fault memory.
Note position of cable for oxygen sensor.

Tightening torque:
Clamp, manifold to front silencer
(apply Optimoly TA to clamp seat)..... 55 Nm
Exhaust manifold to cylinder head..... 21 Nm

21 Clutch

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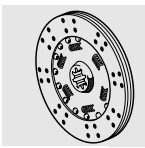
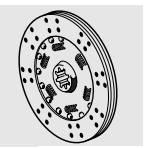


Technical Data 21 Clutch		R 1150 RT
Type		Single dry plate with high-leverage pressure plate
Clutch plate dia.	mm (in)	165 (6.4960)
Wear limit	mm (in)	4.8 (0.1890) (Measured with caliper tips pressed by hand against rivets of clutch plate)
Operation		hydraulic
Piston dia.		
Master cylinder	mm (in)	13 (0.5118)
Slave cylinder	mm (in)	24 (0.9449)
Hydraulic fluid, clutch-release circuit		DOT 4 brake fluid



21 21 000 Removing and installing clutch

21 21 Removing clutch

Removing clutch from vehicle

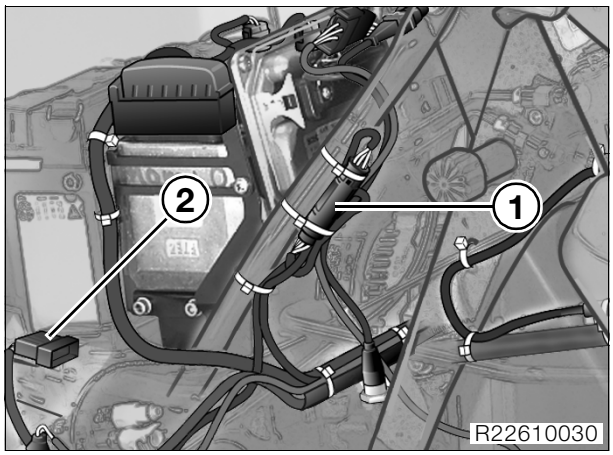
- Remove the seat.
- Remove side panels (➡ 46.8).

⚠ Attention:
Fuel is flammable and a hazard to health. Observe all applicable safety regulations.

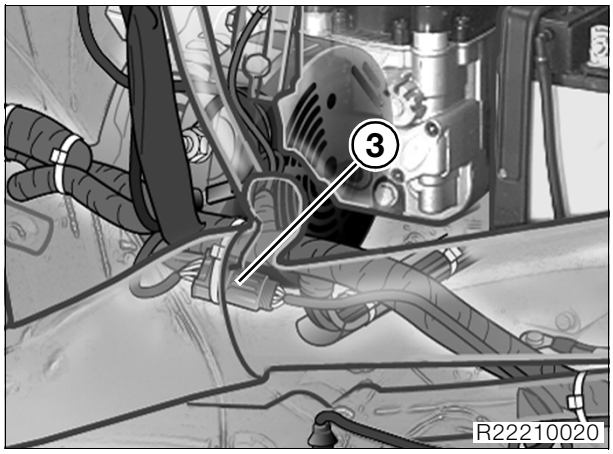
- Remove fuel tank (➡ 16.5).
- Secure stand, **BMW No. 00 1 520**, to motorcycle with spacers, **BMW No. 00 1 529**.
- Disconnect plug for air-temperature sensor from air filter cover.
- Remove air filter cover.
- Remove the air filter element.
- Remove the intake air pipe.

⚠ Attention:
Disconnect the negative battery terminal first, then the positive terminal. Connect the positive battery terminal first, then the negative terminal.

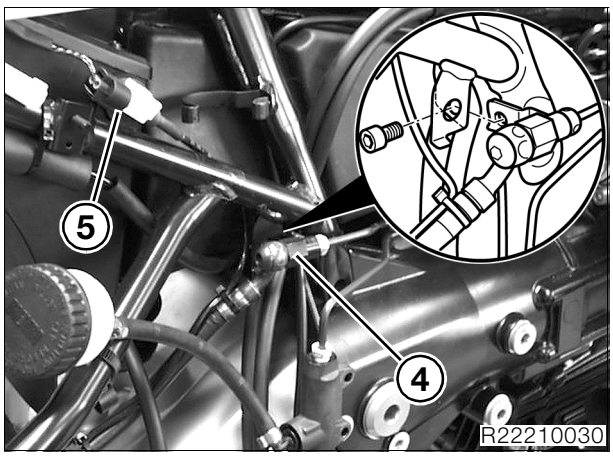
- Remove the battery.
- Unfasten air filter box at front and rear.



- Disconnect plug for oxygen sensor (1) and remove cable.
- Remove the plug/fuel pump unit (2) from the frame.
- Disconnect hose clamps/throttle stub pipes and push the stubs into the air filter box.
- Disconnect plugs of injection valves.
- Remove holders of injection valves.
- Remove injection valves from throttle stub pipes.
- Remove top screw from spring strut and lower the rear wheel drive.
- Remove the left footrest plate (➡ 46.16).
- Remove securing screws for brake master cylinder from footrest plate.
- Remove the right footrest plate (➡ 46.17).
- Remove rear-frame fasteners on left and right at front, but only loosen strut fasteners.
- Remove rear silencer.
- Disconnect cables from starter motor.
- Remove starter motor.



- Disconnect gear-indicator plug (3) and remove the cable.
- Remove hydraulic spring adjuster.
- Remove rear brake fluid reservoir from its holder.

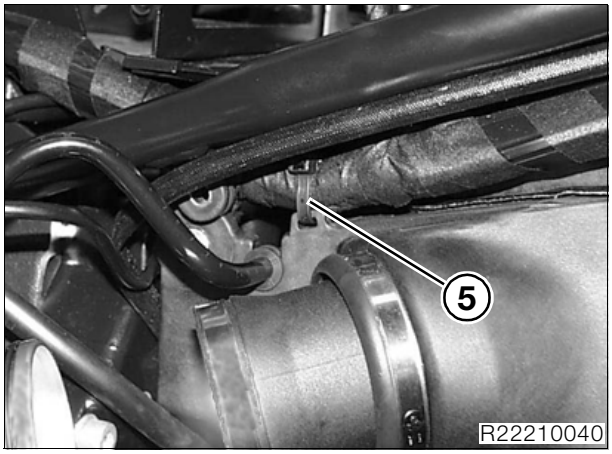


- Remove brake line (4) from the rear frame.
- Remove brake line from swinging arm.
- Disconnect plug (5) of the ABS sensor.

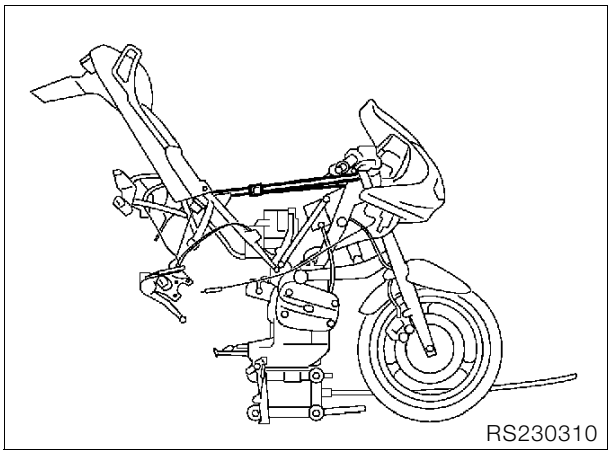
- Remove the rear ABS sensor.

Warning:
Integral ABS When removing and installing the brake calipers, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➟ 00.48).

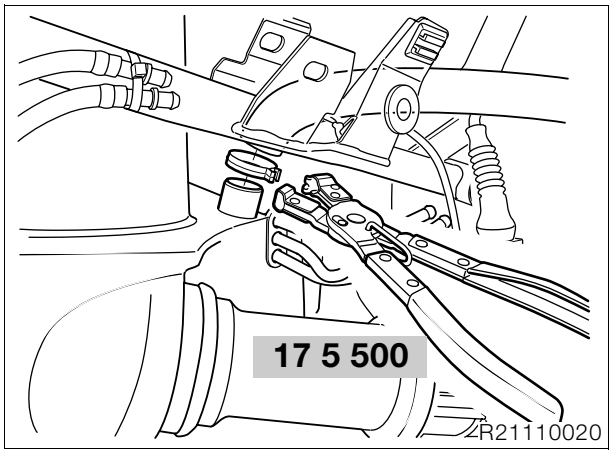
- Remove rear brake caliper.
- Use cable ties to secure the brake caliper to the rear frame.
- Disconnect clutch-system bleed line from rear frame.



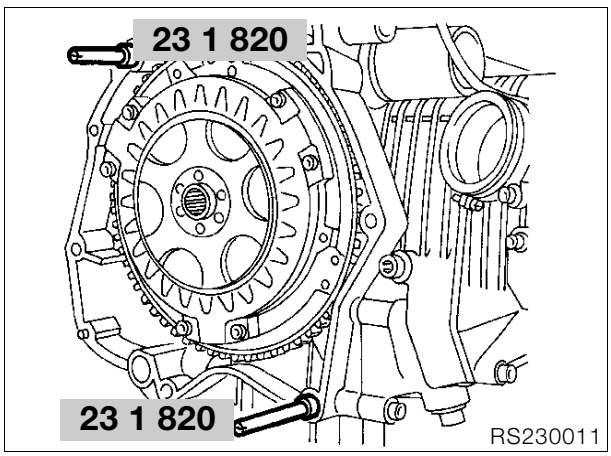
- Remove cable ties (5) from left air filter box.



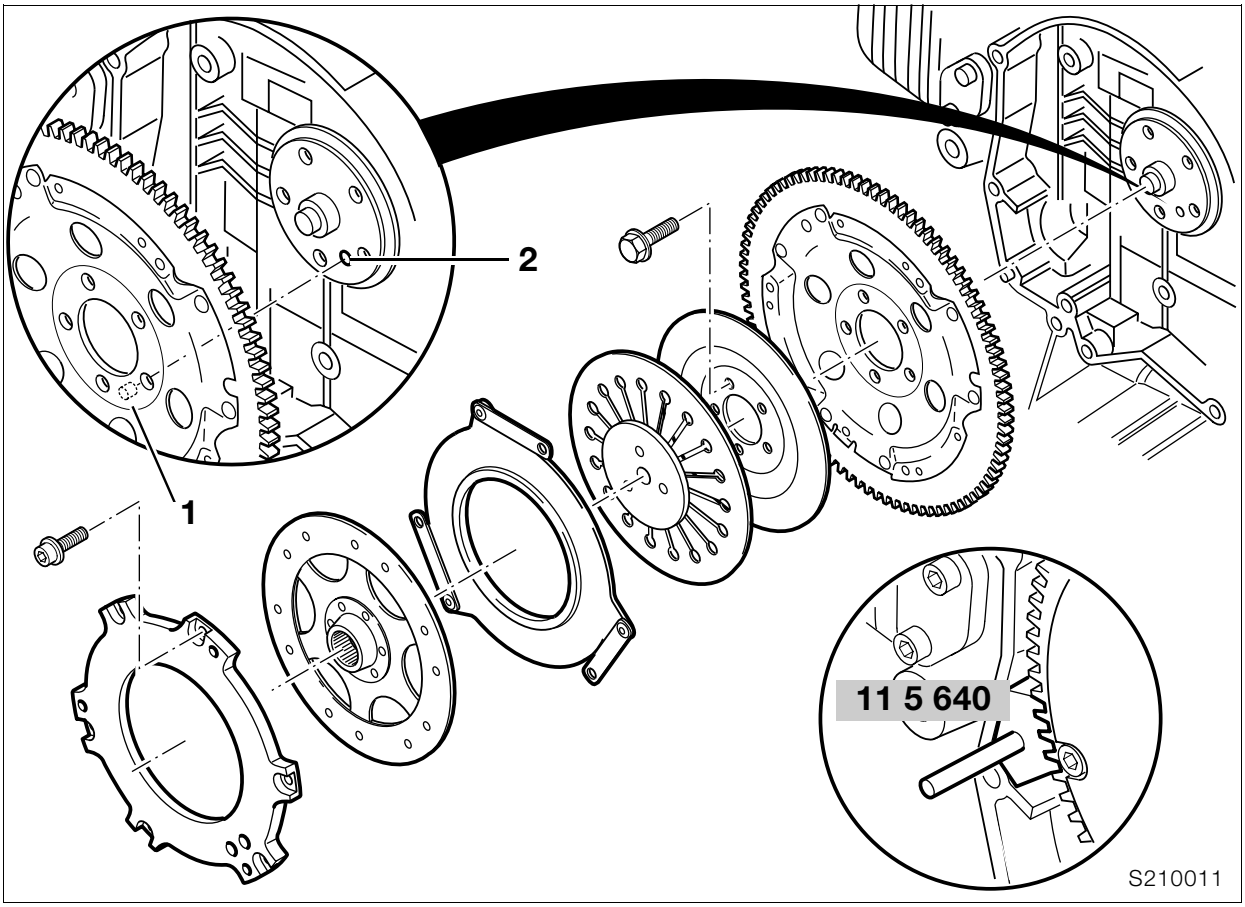
- Tilt the rear frame up and secure it in this position with a strap attached to the handlebars.
- Remove spring strut.



- Use hose clip pliers, **BMW No. 17 5 500**, to disconnect hose for crankcase breather from air-filter box.
- Remove air filter box.
- Remove the fuel distributor.
- Remove clutch slave cylinder.
- Remove clutch pushrod.
- Remove rear battery carrier fasteners.
- Disconnect ground cable below the battery carrier.



- Always use oiled guide pins, **BMW No. 23 1 820**, when removing or installing the gearbox.
- Remove the rear wheel, rear wheel drive and swinging arm together with the gearbox.



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

21 21 Installing clutch

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

Attention:
Always use new screws for housing and cover.

- Insert all screws by hand and tighten.
- Install clutch.

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

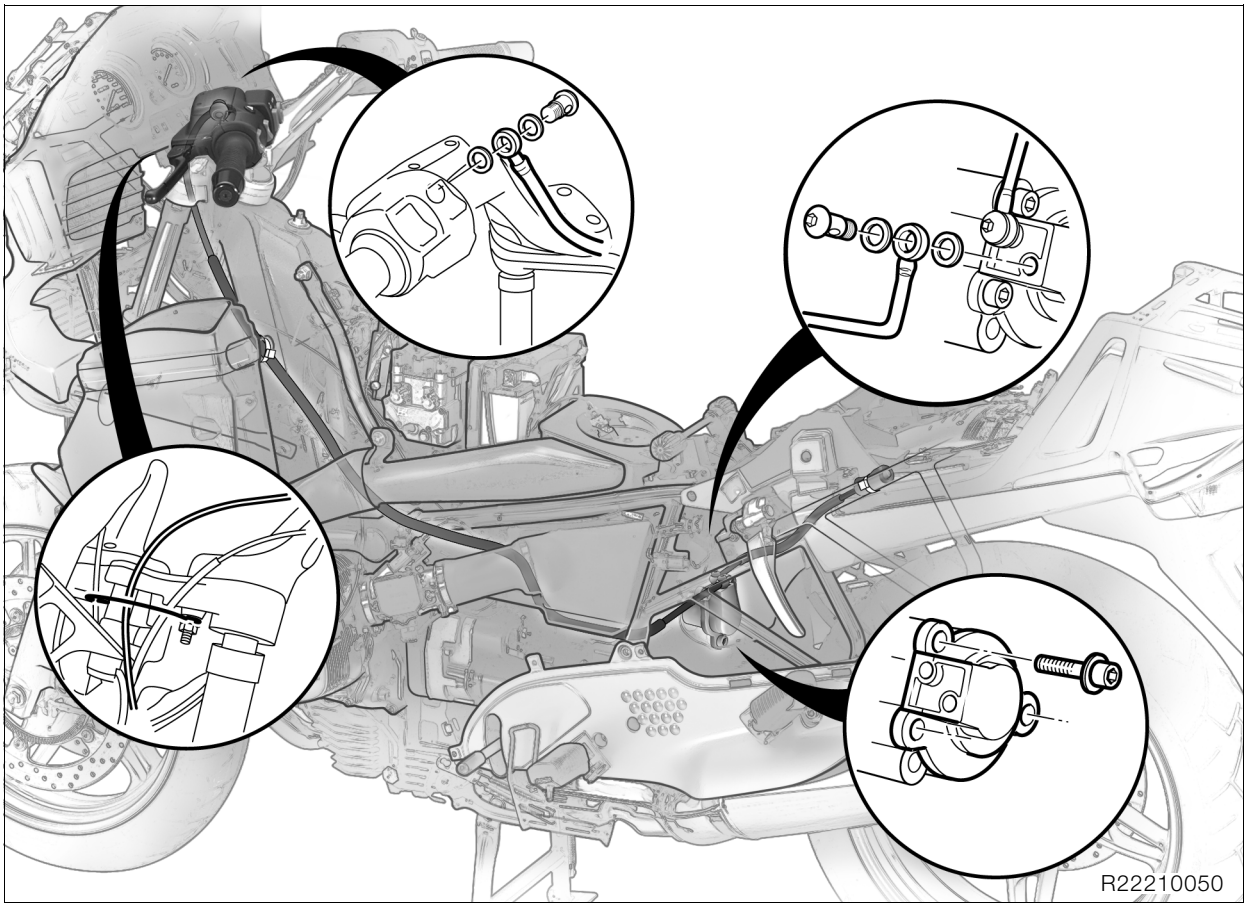
- Secure the clutch with the retaining screws.
- Centre clutch plate with centering pin, **BMW No. 21 2 673**.
- Tighten retaining screws in diagonally opposite sequence.

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:
Clutch housing to crankshaft
(threads lightly oiled)
Initial torque ..... 40 Nm
Tightening angle..... 32°
Housing cover to flywheel ..... 12 Nm

Installing clutch in vehicle
- Installation is the reverse of the removal procedure.

Note:
When installing, fit a new seal on the clutch slave cylinder.



21 52 Removing and installing clutch hydraulic line

- Remove the seat.
- Remove side panels (➟ 46.8).

Attention:
Fuel is flammable and a hazard to health. Observe all applicable safety regulations.

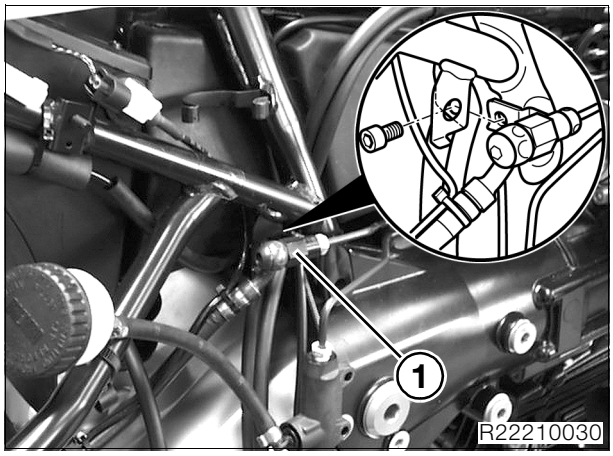
- Remove fuel tank (➟ 16.5).
- Remove screw from intake air pipe.
- Remove rear silencer.

Warning:
Integral ABS When removing and installing the brake calipers, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➟ 00.44).

- Remove rear brake caliper.
- Remove rear wheel.
- Place support under rear wheel drive.
- Remove spring strut.

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle - brake fluid destroys paint.

- Drain the clutch operating system.



- Remove brake line (1) from the rear frame.
- Remove rear brake fluid reservoir from its holder.
- Loosen the fasteners securing the right and left footrest plates.
- Remove top screws of footrest plates on left and right.
- Remove rear screws of footrest plates on left and right.
- Remove rear-frame fasteners on left and right at front, but only loosen strut fasteners.
- Carefully lift rear frame approx. 15 mm (approx. 0.5906 in).
- Disconnect line from master cylinder.
- Disconnect the lines from the clutch slave cylinder.
- Remove clutch line.
- Installation is the reverse of the removal procedure.

Note:
When installing, fit new sealing rings.

- Fill the clutch operating system (➟ 00.54).

Tightening torque:
Clutch line to handlebar fitting ..... 14 Nm
Clutch line to slave cylinder ..... 9 Nm

21 52 012 Removing and installing clutch slave cylinder

- Remove the seat.
- Remove side panels (➟ 46.8).

Attention:
Fuel is flammable and a hazard to health. Observe all applicable safety regulations.

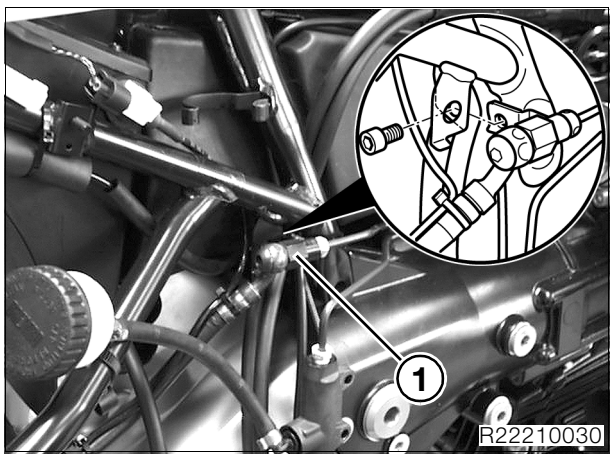
- Remove fuel tank (➟ 16.5).
- Remove screw from intake air pipe.
- Remove rear silencer.

Warning:
Integral ABS When removing and installing the brake calipers, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➟ 00.44).

- Remove rear brake caliper.
- Remove rear wheel.
- Place support under rear wheel drive.
- Remove spring strut.

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle - brake fluid destroys paint.

- Drain the clutch operating system.



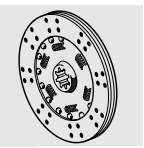
- Remove brake line (1) from the rear frame.

- Remove rear brake fluid reservoir from its holder.
- Loosen the fasteners securing the left footrest plate.
- Remove top screw of left footrest plate.
- Remove rear screw of left footrest plate.
- Remove fasteners securing rear brake master cylinder to footrest plate.
- Remove the right footrest plate (➟ 46.17).
- Remove rear-frame fasteners on left and right at front, but only loosen strut fasteners.
- Carefully lift rear frame approx. 15 mm (approx. 0.5906 in).
- Remove frame tube from gearbox.
- Disconnect the lines from the clutch slave cylinder.
- Remove clutch slave cylinder.
- Installation is the reverse of the removal procedure.

Note:
When installing, fit new sealing rings.

- Fill the clutch operating system (➟ 00.54).

Tightening torque:
Clutch slave cylinder to gearbox ..... 9 Nm
Frame tube to gearbox
Tightening sequence:
Connecting pipe/gearbox
1. To gearbox and left footrest plate
(clean thread + Loctite 2701)..... 42 Nm
2. Clamp block, connecting tube to gearbox.. 9 Nm
3. To gearbox and right footrest plate
(clean thread + Loctite 2701)..... 42 Nm



21 52 005 Filling and bleeding clutch line

See instructions for changing clutch fluid (➟ 00.54).

23 Gearbox

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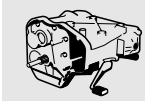

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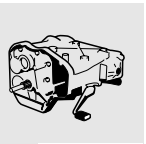
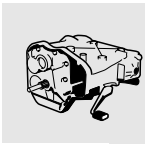
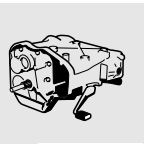
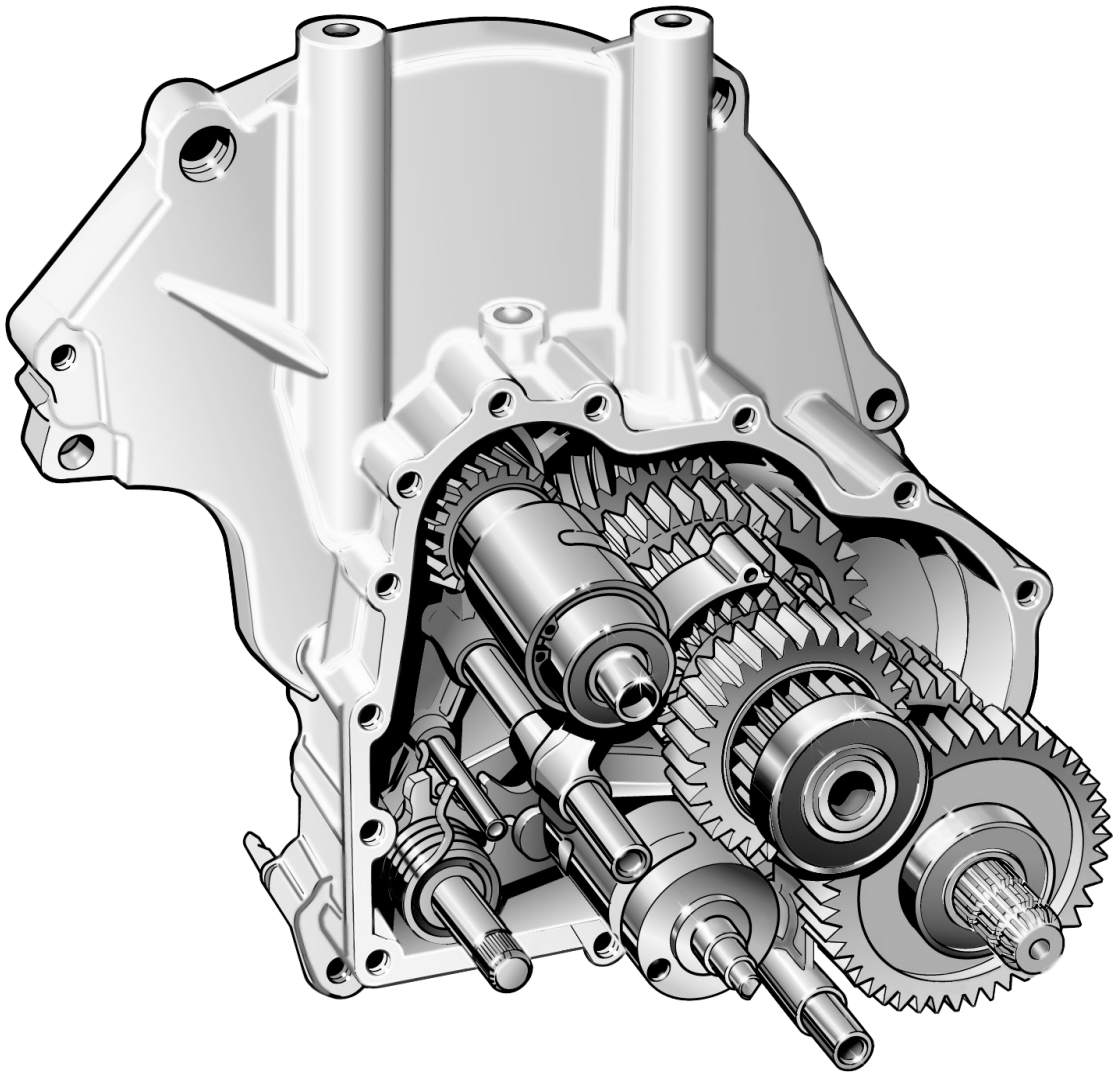


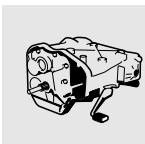
Technical Data 23 Gearbox		R 1150 RT
Type		6-speed gearbox with dog-clutch engagement mechanism and integral vibration damper
Gearshift type		Foot shift lever and gear selector drum with over-shoot detent
Oil grade (all-year)		Brand name SAE 90 API GL5 hypoid oil or Castrol MTX 75W-140 GL 5
Capacity	l (Imp. pint/ US quart)	approximately 0.8 (1.41/0.85) (to the bottom of the filler neck thread)
Gear ratio		
1st gear		3.863
2nd gear		3.022
3rd gear		2.393
4th gear		1.961
5th gear		1.700
6th gear		1.316
Adjustment data		
Selector shaft endplay	mm (in)	0.1...0.3 (0.0039...0.0118)
Endplay of spring segment at input shaft	mm (in)	0.4...0.6 (0.0157...0.0236)
Length of selector drum, fully assembled	mm (in)	111.80...111.90 (4.4015...4.4055)
Output shaft endplay		
Free gearwheel, 1st gear	mm (in)	0.1...0.33 (0.0039...0.0130)
Free gearwheel, 2nd gear	mm (in)	0.1...0.33 (0.0039...0.0130)
Free gearwheel, 3rd and 4th gears (total play)	mm (in)	0.1...0.67 (0.0039...0.0264)
Intermediate shaft endplay		
Free gearwheel, 5th gear	mm (in)	0.1...0.46 (0.0039...0.0181)
Free gearwheel, 6th gear	mm (in)	0.1...0.46 (0.0039...0.0181)





Gearbox - sectional drawing





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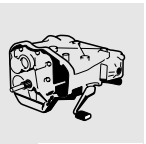
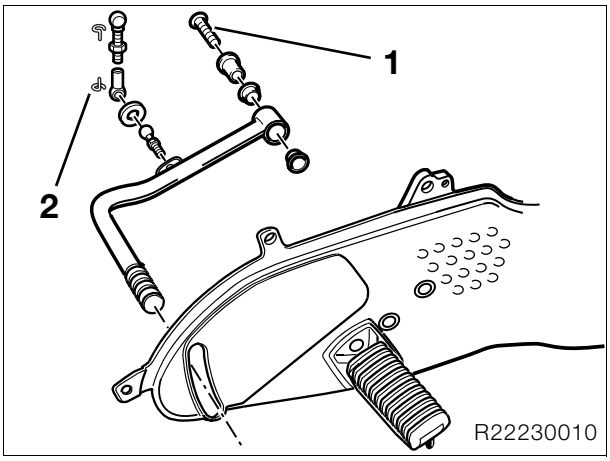


23 41 300 Removing and installing gear-shift lever



- Remove the seat.
- Remove small left fairing panel.
- Remove left side section of fairing (➡ 46.8).
- Remove retainer (2) and remove gearshift linkage.
- Remove the footrest plate.
- Remove retaining screw (1) on gear shift pedal.
- Installation is the reverse of the removal procedure.

Tightening torque:
Gearshift lever to footrest plate ..... 35 Nm

23 00 020 Removing and installing gearbox

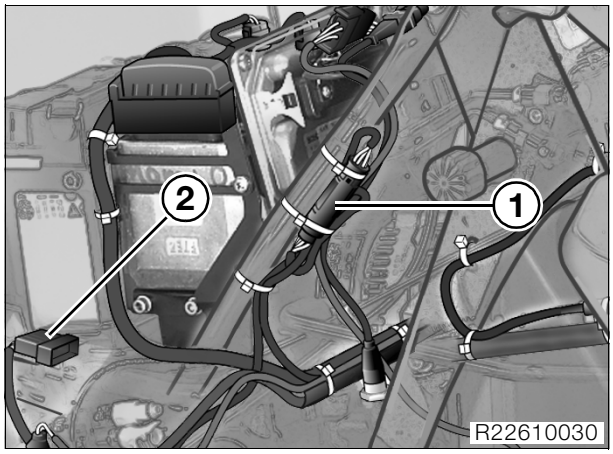
- Remove the seat.
- Remove side panels (➡ 46.8).

Attention:
Fuel is flammable and a hazard to health. Observe all applicable safety regulations.

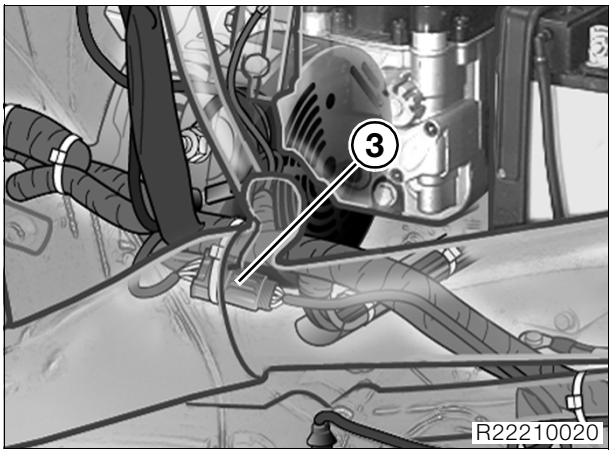
- Remove fuel tank (➡ 16.5).
- Secure stand, **BMW No. 00 1 520**, to motorcycle with spacers, **BMW No. 00 1 529**.
- Disconnect the air temperature sensor plug.
- Remove air filter cover.
- Remove the air filter element.
- Remove the intake air pipe.

Attention:
Disconnect the negative battery terminal first, then the positive terminal. Connect the positive battery terminal first, then the negative terminal.

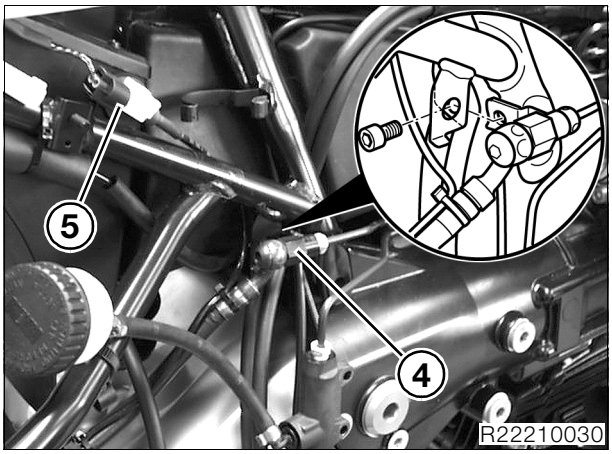
- Remove battery
- Unfasten air filter box at front and rear.



- Disconnect plug for oxygen sensor (1) and remove cable.
- Remove the plug/fuel pump unit (2) from the frame.
- Disconnect hose clamps/throttle stub pipes and push the stubs into the air filter box.
- Disconnect plugs of injection valves.
- Remove holders of injection valves.
- Remove injection valves from throttle stub pipes.
- Remove top screw from spring strut and lower the rear wheel drive.
- Remove the left footrest plate (➡ 46.16).
- Remove securing screws for brake master cylinder from footrest plate.
- Remove the right footrest plate (➡ 46.17).
- Remove rear-frame fasteners on left and right at front, but only loosen strut fasteners.
- Remove rear silencer.
- Disconnect cables from starter motor.
- Remove the starter motor.



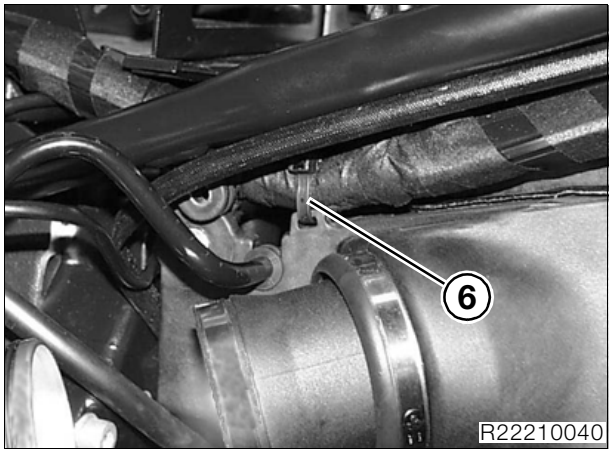
- Disconnect gear-indicator plug (3) and remove the cable.
- Remove hydraulic spring adjuster.
- Remove rear brake fluid reservoir from its holder.



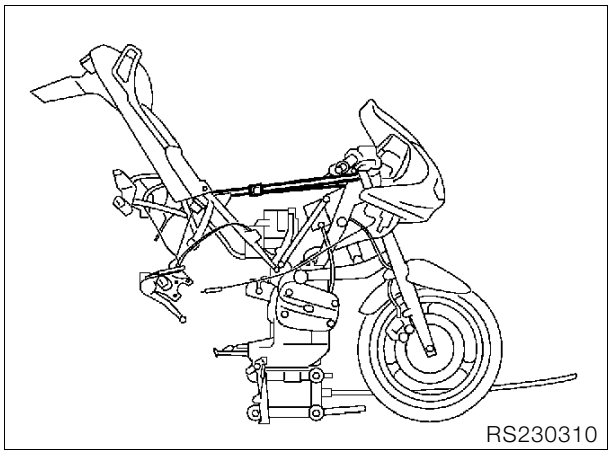
- Remove brake line (4) from the rear frame.
- Remove brake line from swinging arm.
- Disconnect plug (5) of the ABS sensor.
- Remove the rear ABS sensor.

Warning:
Integral ABS When removing and installing the brake calipers, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➟ 00.48).

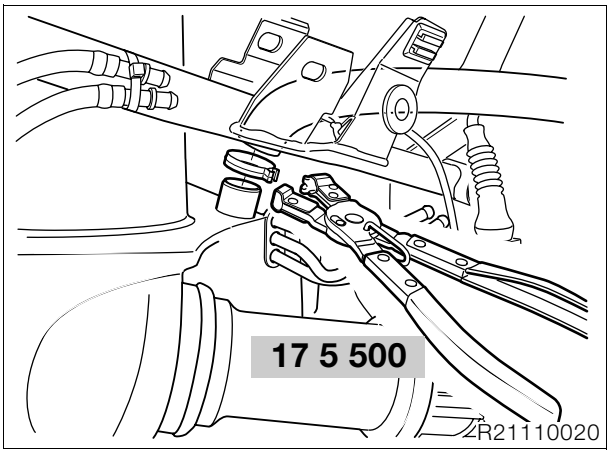
- Remove rear brake caliper.
- Use cable ties to secure the brake caliper to the rear frame.
- Disconnect clutch-system bleed line from rear frame.



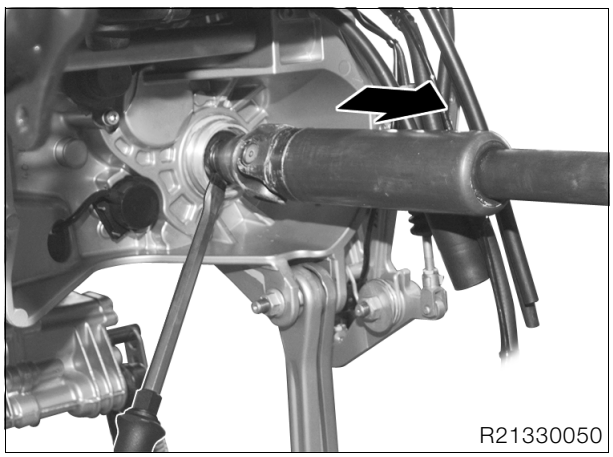
- Remove cable ties (6) from left air filter box.



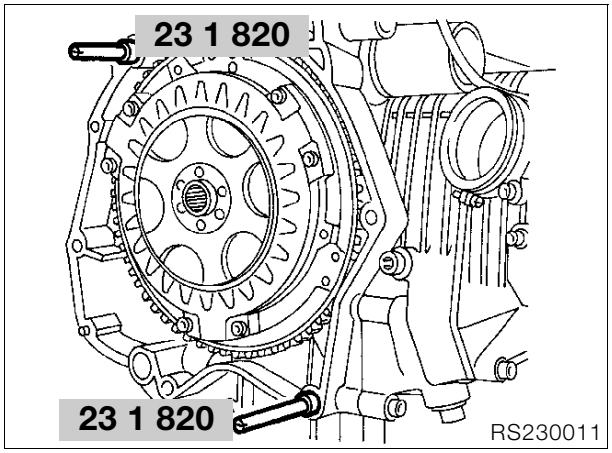
- Tilt the rear frame up and secure it in this position with a strap attached to the handlebars.
- Remove spring strut.



- Use hose clip pliers, **BMW No. 17 5 500**, to disconnect hose for crankcase breather from air-filter box.
- Remove air filter box.
- Remove the fuel distributor.
- Remove rear battery carrier fasteners.
- Remove rear wheel and spacer.
- Place support under rear wheel drive.
- Release fastener securing strut to gearbox.
- Release the retaining strap securing the flexible gaiter to the swinging arm.
- Push the flexible gaiter to the rear.
- Swinging-arm bearing studs are secured with Loctite: heat to max. 120 °C (248 °F) to release.
- Slacken the floating-bearing stud of the rear wheel drive in the swinging arm.
- Slacken the fixed-bearing stud of the rear wheel drive in the swinging arm.
- Remove floating bearing/fixed bearing stud bolts.
- Remove fastener securing strut to gearbox.
- Remove rear-wheel drive from universal shaft.
- Slacken the floating-bearing stud of the swinging arm in the gearbox.
- Slacken the fixed-bearing stud of the swinging arm in the gearbox.
- Remove floating bearing/fixed bearing stud bolts.
- Remove swinging arm.



- Press off drive shaft.
- Remove clutch slave cylinder.
- Remove clutch pushrod.
- Remove the gearbox.



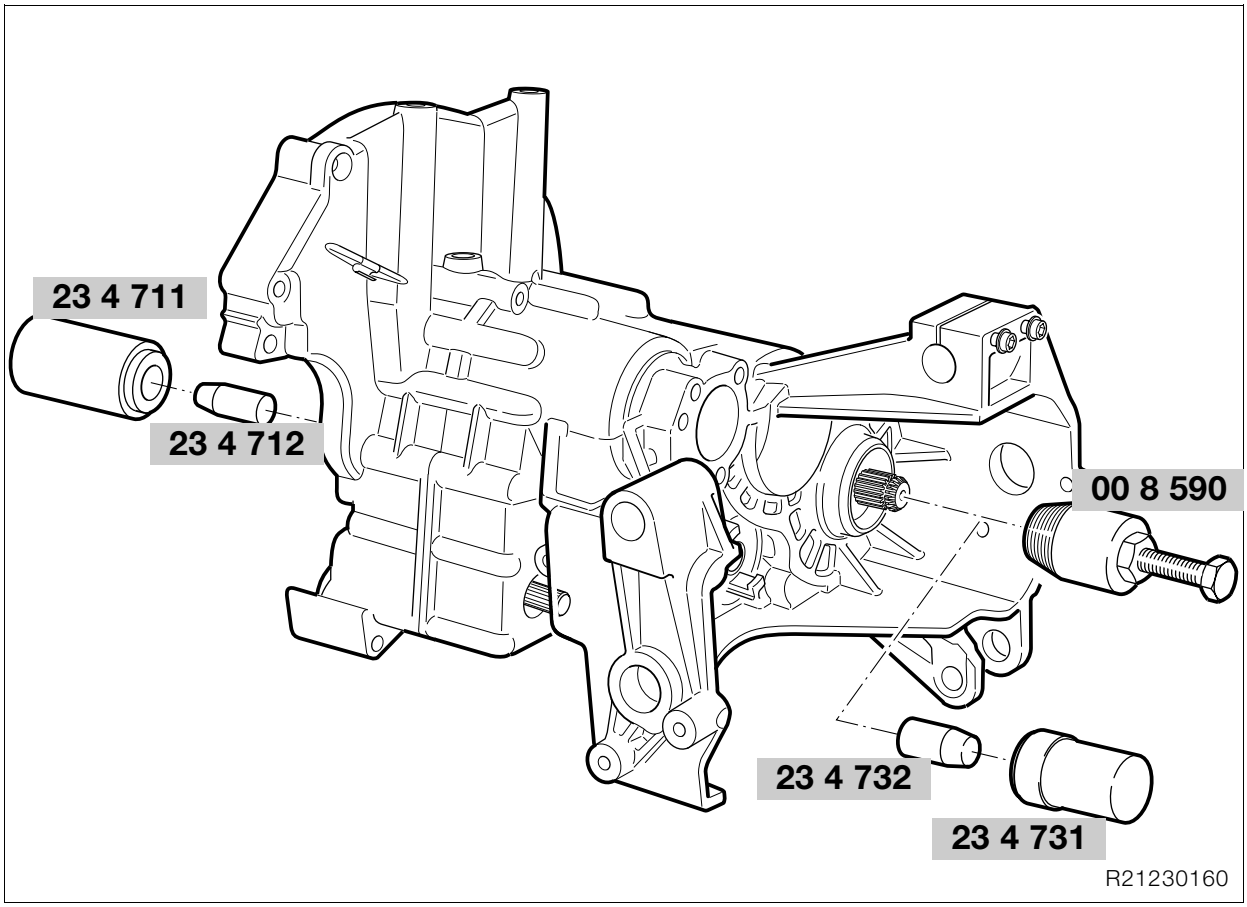
- Always use oiled guide pins, **BMW No. 23 1 820**, when removing or installing the gearbox.
- Installation is the reverse of the removal procedure.
- When installing, fit a new seal on the clutch slave cylinder.

Note:
Do not fully tighten the fasteners securing the rear frame until the footrest plates have been installed.

- 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.

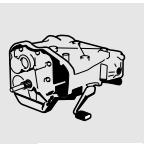
Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

Tightening torque:
Gearbox to engine ..... 22 Nm
Clutch slave cylinder to gearbox ..... 9 Nm



23 12 Replacing shaft sealing rings in gearbox housing and gearbox cover

Note:
All shaft seals except the seal on the drive-side of the input shaft can be installed without removing the gearbox.
Replace all shaft sealing rings if the gearbox is fully disassembled.
Take care not to damage the faces of the housing and the shafts when removing the shaft sealing rings.



Attention:
Replace all shaft sealing rings if the gearbox is fully disassembled.

23 12 Replacing input shaft sealing ring at input end

- Carefully pry out the shaft sealing ring with a screwdriver.
- Drive the new sealing ring in with the sealing lips facing inwards, using slip-over sleeve, **BMW No. 23 4 712**, and drift, **BMW No. 23 4 711**.

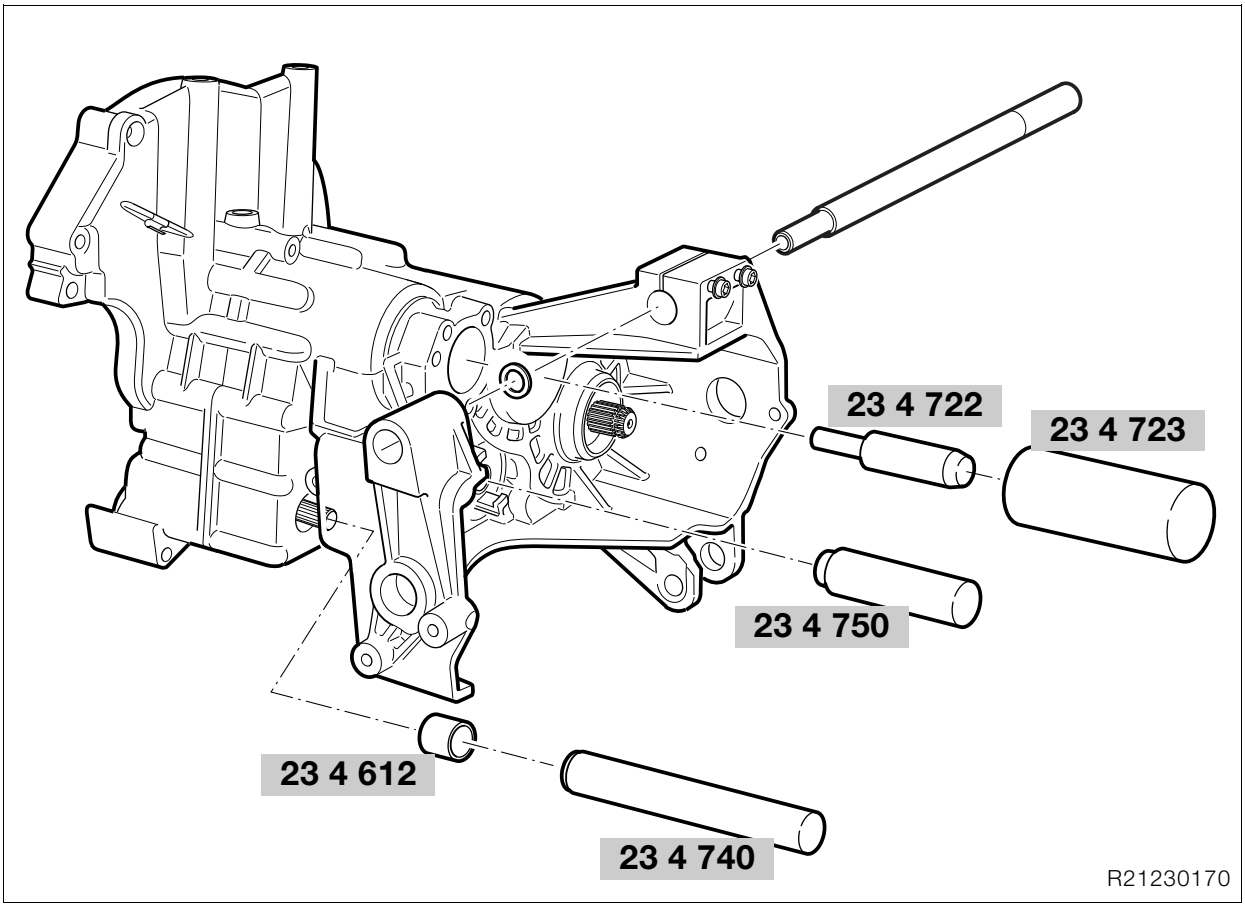
23 12 Replacing output shaft sealing ring

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

- Use puller, **BMW No. 00 8 590**, to remove the shaft sealing ring, or alternatively pry out carefully with a screwdriver.

Attention:
Drive in the output-shaft sealing ring flush with the housing.

- Install the sealing ring with the sealing lips facing inwards, using, **BMW No. 23 4 732**, and drift, **BMW No. 23 4 731**.



23 12 Replacing input shaft sealing ring at output end

Attention:
Take care not to damage the faces of the casing and the shafts when removing the shaft sealing rings.

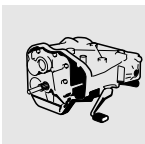
Attention:
Do not use pointed tools to remove the shaft sealing ring of the input shaft, because they could damage the sealing washer of the grooved ball bearing behind the sealing ring.

- Remove the connecting pipe.
- Carefully lever out the shaft sealing ring with a screwdriver.
- Install the new sealing ring with the sealing lips facing inwards, using guide, **BMW No. 23 4 722**, and impact driver, **BMW No. 23 4 723**.

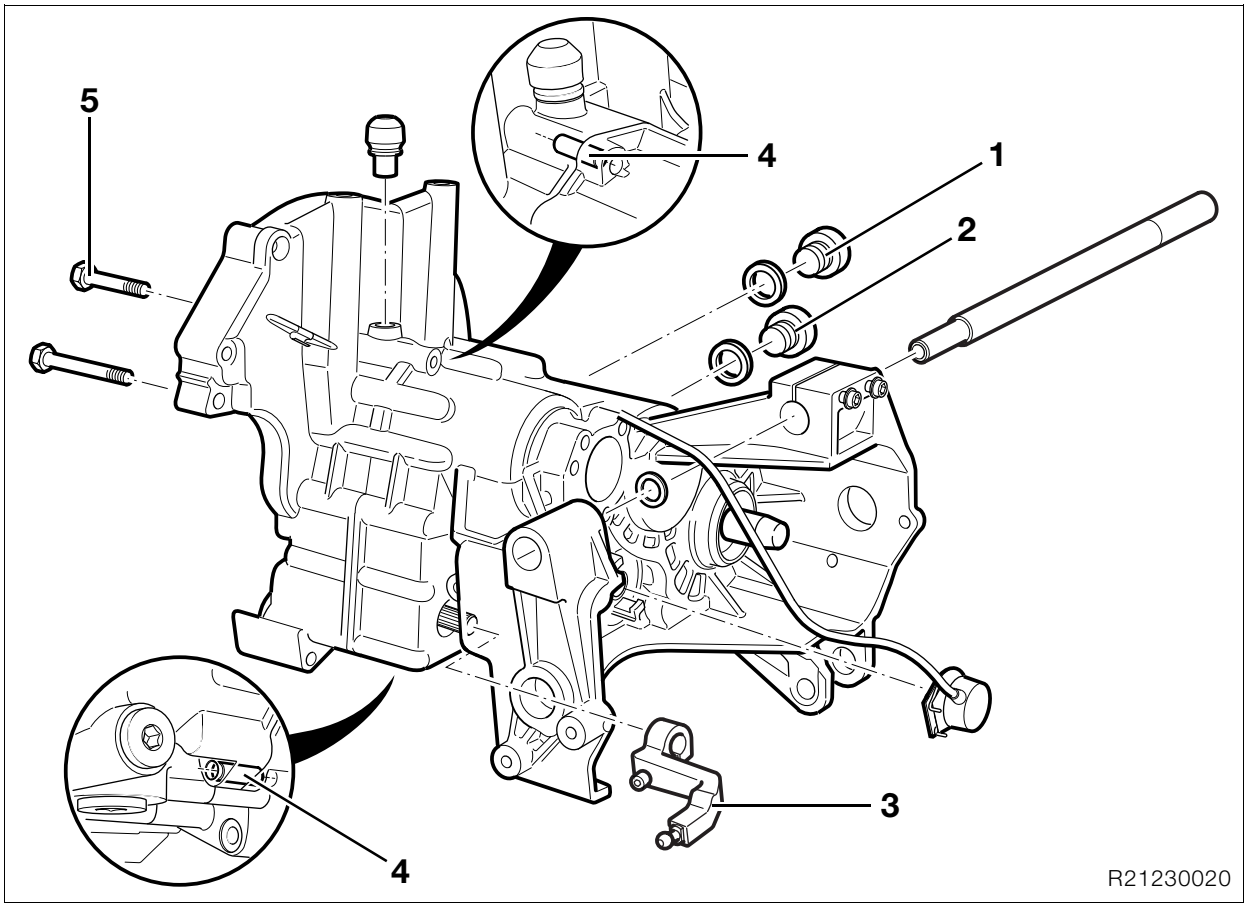
23 31 Replacing shaft sealing ring for selector drum

- Carefully 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**.

23 12 Replacing sealing ring for gearshift shaft

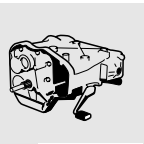


- Carefully lever out the shaft sealing ring with a screwdriver.
- Install the new sealing ring with the sealing lip facing inwards, using assembly sleeve, **BMW No. 23 4 612**, and impact driver, **BMW No. 23 4 740**.

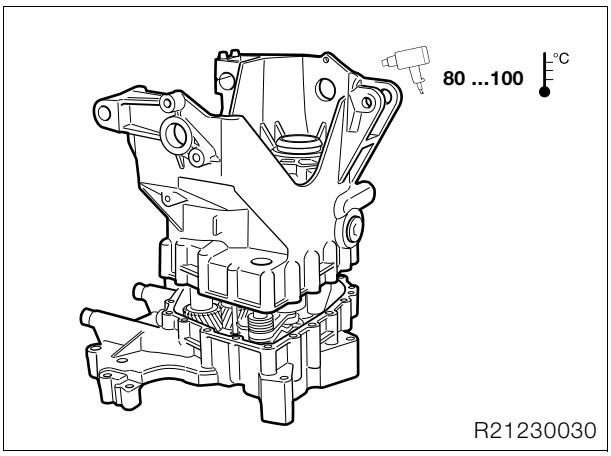


23 00 043 Disassembling gearbox

23 11 Removing gearbox housing



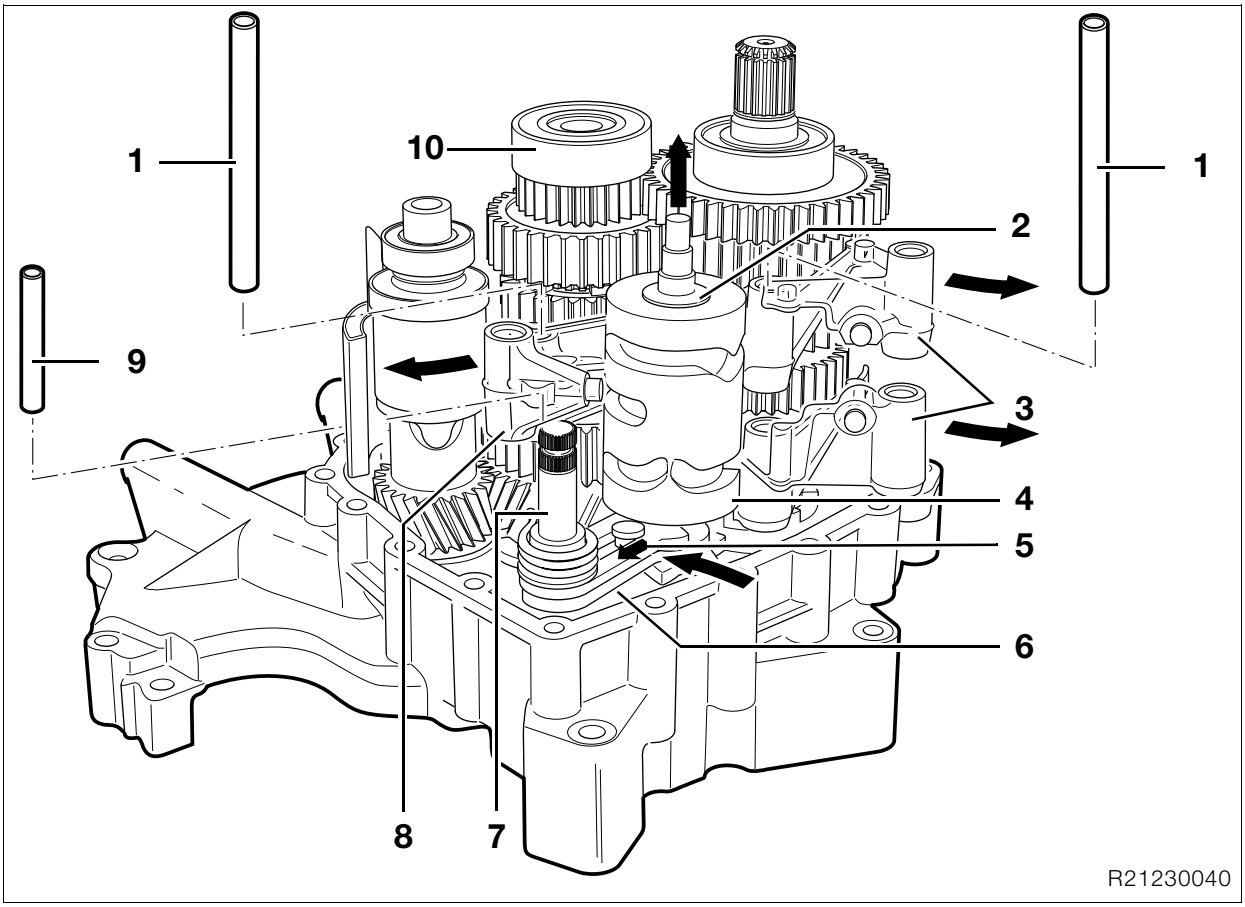
- Remove oil filler/level check screw (1).
- Remove oil drain plug (2) and drain the oil from the gearbox into a suitable tray.
- Remove selector lever (3).
- Carefully drive back centering pins (4), from the cover side or casing side, as applicable.
- Remove screws (5) securing cover to housing.



- Set the gearbox down on its cover.

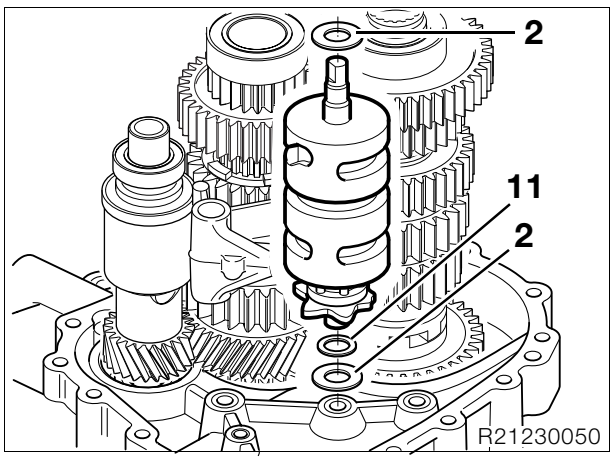
Attention:
Avoid damage to the housing cover and painted surfaces.

- 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.



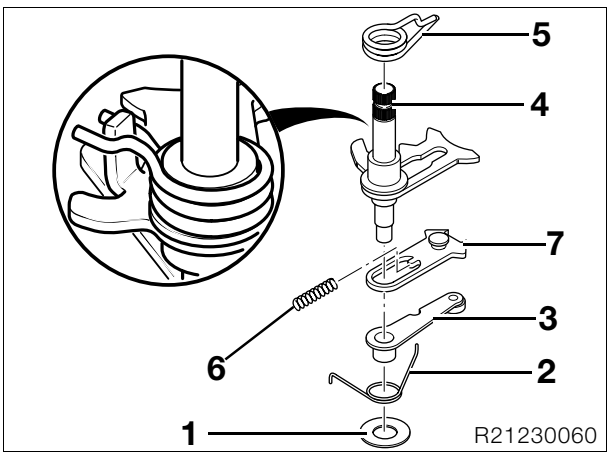
23 31 Removing selector drum

- Pull 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, hold it there and pull out the selector drum (4), turning it slightly at the same time.

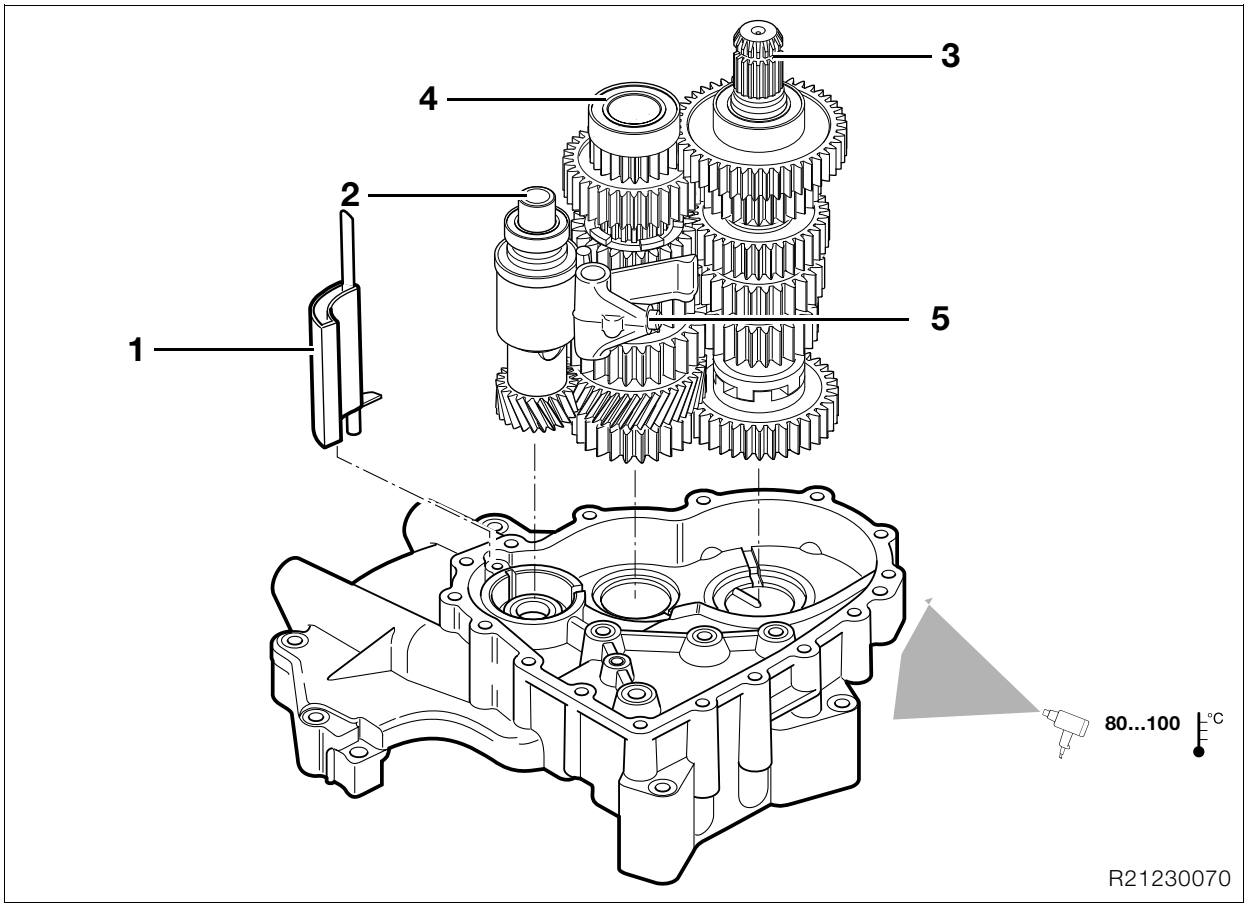


- Remove thrust washers (2) and spacing washer (11).
- Release the locking lever (6).
- Remove selector shaft (7) with spacing washer.
- Remove selector forks (3).
- Selector fork (8) remains in intermediate shaft (10).

23 31 Disassembling and assembling selector shaft



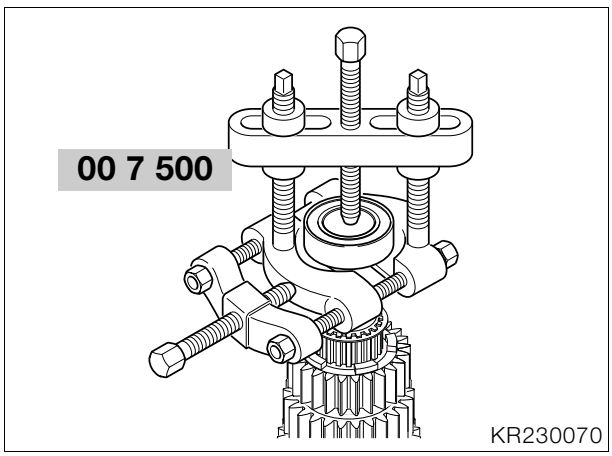
- Remove spacing washer (1).
- Remove torsion spring (2) with locking lever (3) from selector shaft (4).
- Remove torsion spring (5).
- Disengage coil spring (6) and remove together with guide plate (7).
- Assembly is the reverse of the disassembly procedure.



Removing gearbox shafts

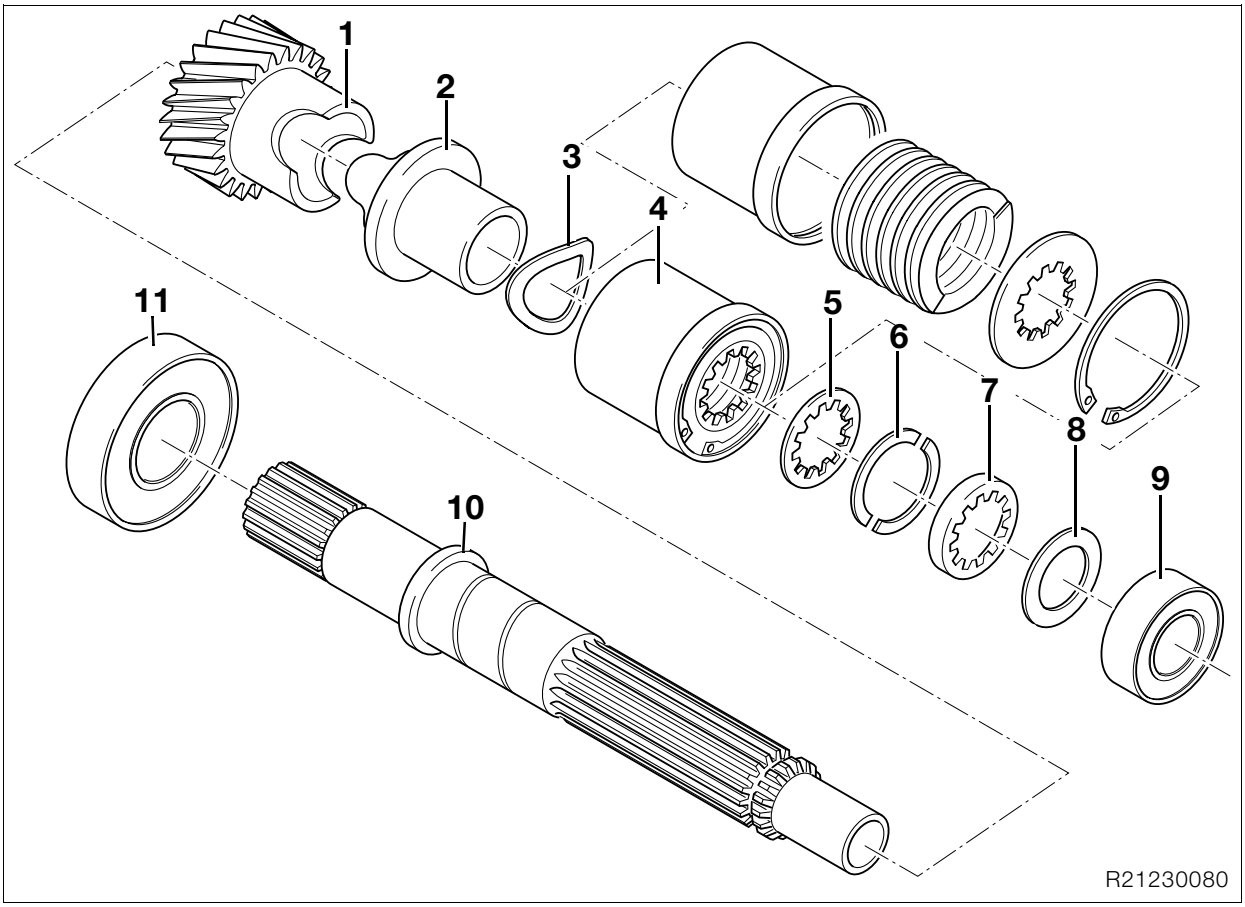
- Remove breather tube (1).
- Heat bearing points in gearbox cover to 80 °C...100 °C (176 °F...212 °F).
- Remove input shaft (2), output shaft (3) and intermediate shaft (4) together from the cover.
- Remove selector fork (5) from intermediate shaft.
- Mark the selector fork with a felt-tipped pen or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

23 12 Replacing grooved ball bearings of intermediate shaft



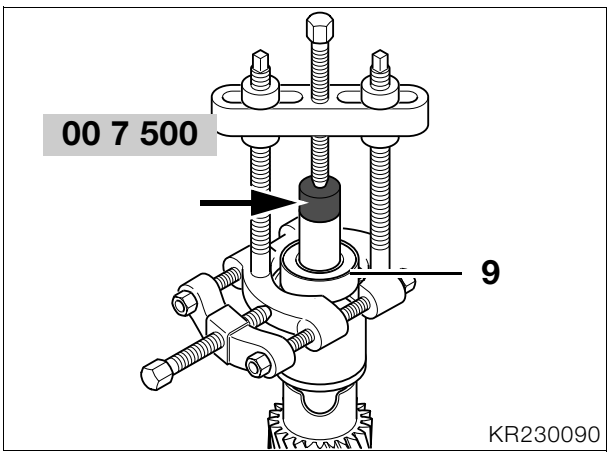
⚠ Attention:
If the grooved ball bearings are replaced, the fully assembled length must be checked.

- Pull off both 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 (➟ 23.20).
- Place spacing washer of calculated thickness in position and press on the input-side grooved ball bearing.

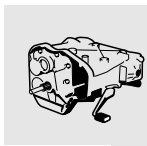


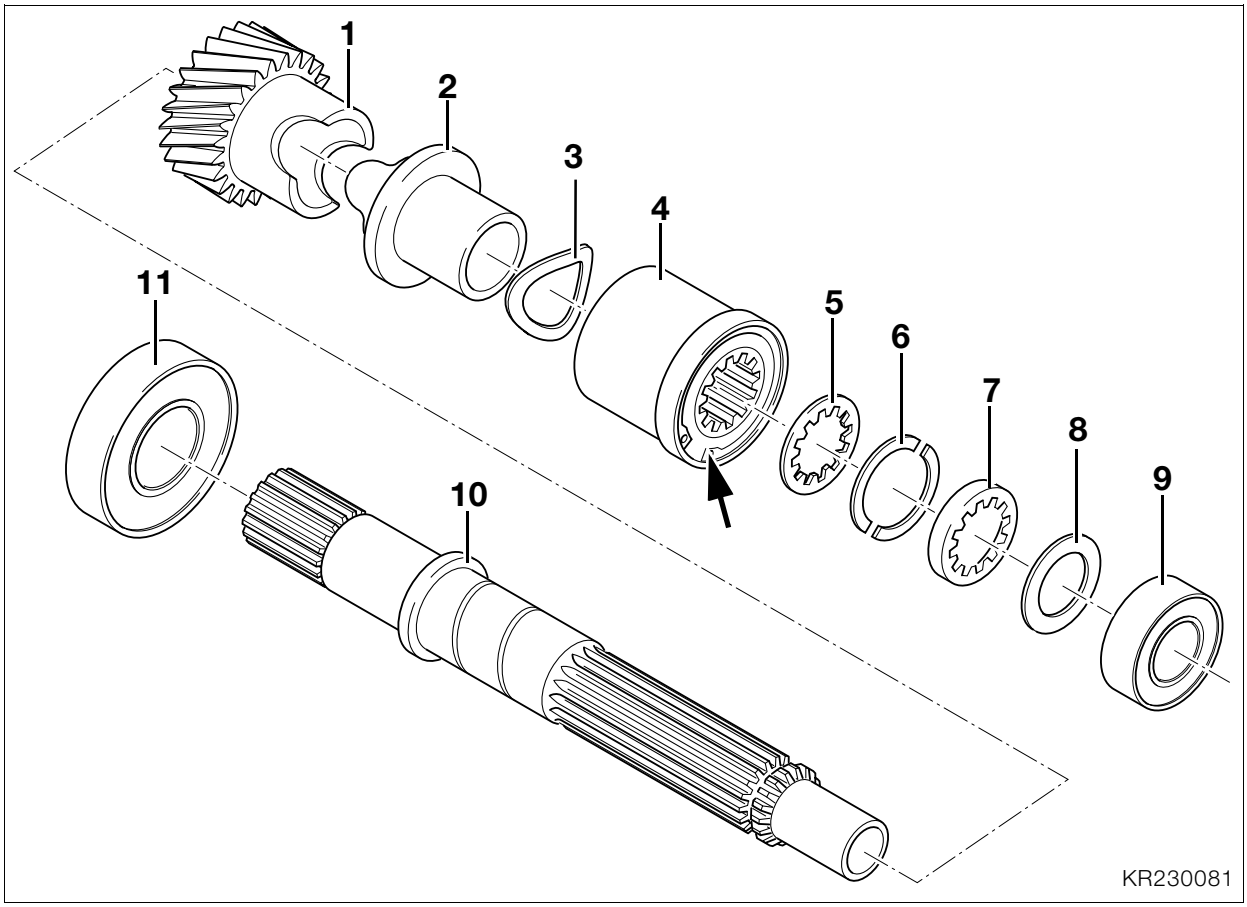
23 12 Disassembling and assembling input shaft

Disassembling input shaft



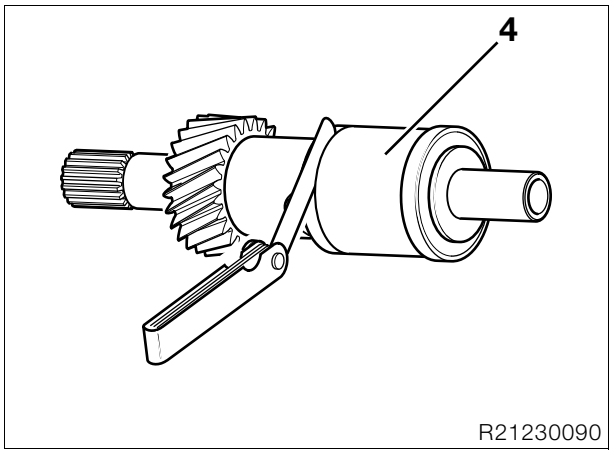
- Clamp the input shaft into a vise with soft jaws.
- Use universal puller, **BMW No. 00 7 500**, and pressure head (arrow) to pull off grooved ball bearing (9) with spacing washer (8).
- Note the thickness of spacing washer (8).
- Remove retaining ring (7).
- Compress spring cluster (4) and remove keepers (6).
- Remove spacer (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).





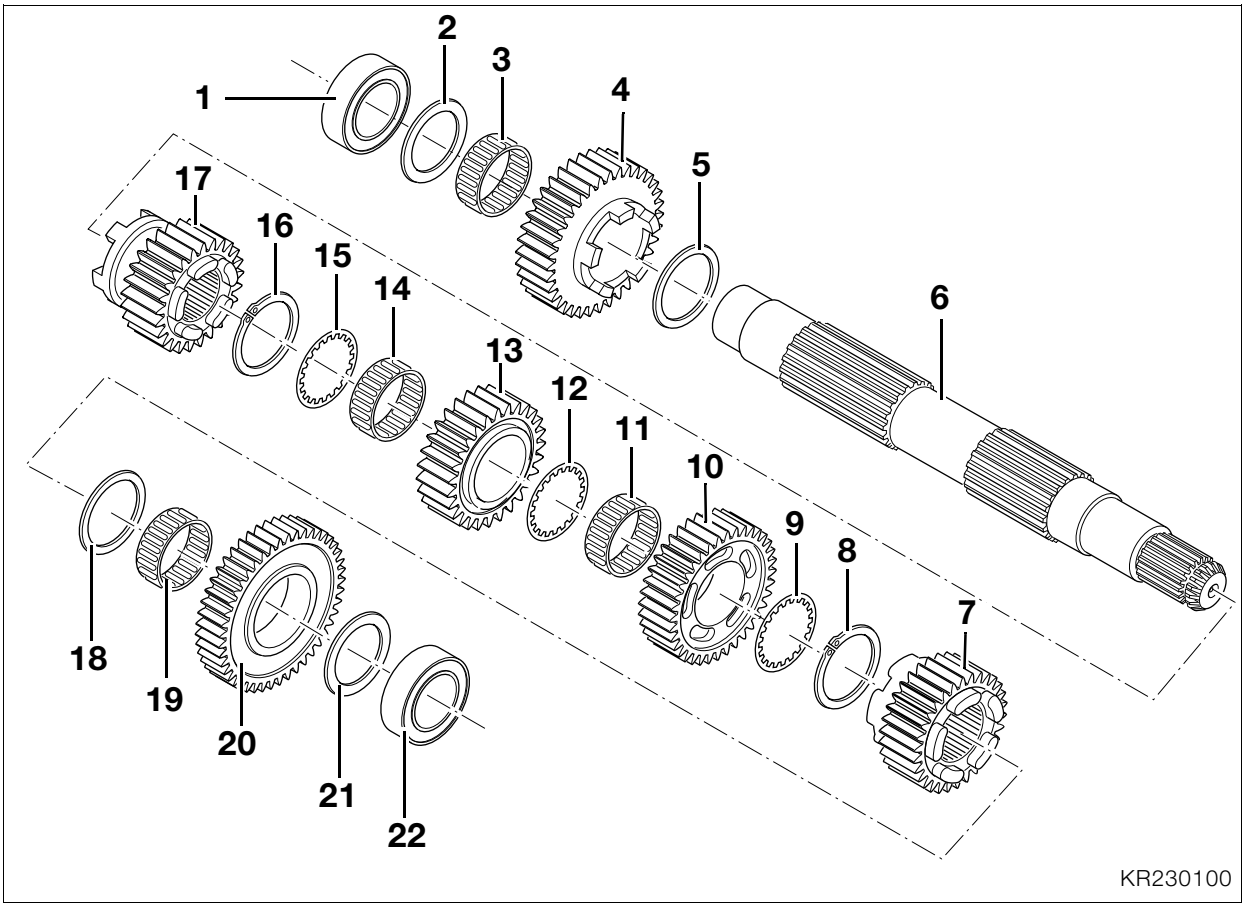
Assembling input shaft/checking and adjusting end float of spring cluster

- 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 spacer (5).
- Compress spring cluster (4) and insert the keepers (6) in the ring groove.
- Install retaining ring (7) with the shoulder facing over keepers (6).



- Check endplay of spring cluster (4); correct if necessary by installing spacer (5) of suitable thickness.
- Check the fully assembled length and adjust if necessary (➠ 23.22).
- Place a spacing washer (8) of the correct thickness in position and press grooved ball bearing (9) into position.

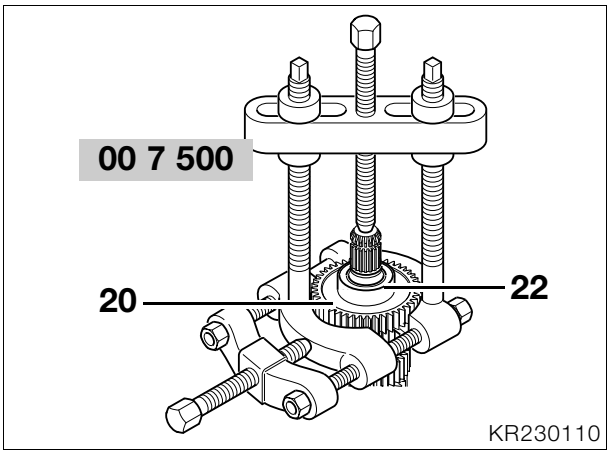
Endplay:
Spring assembly on shaft
..... 0.4...0.6 mm (0.0157...0.0236 in)



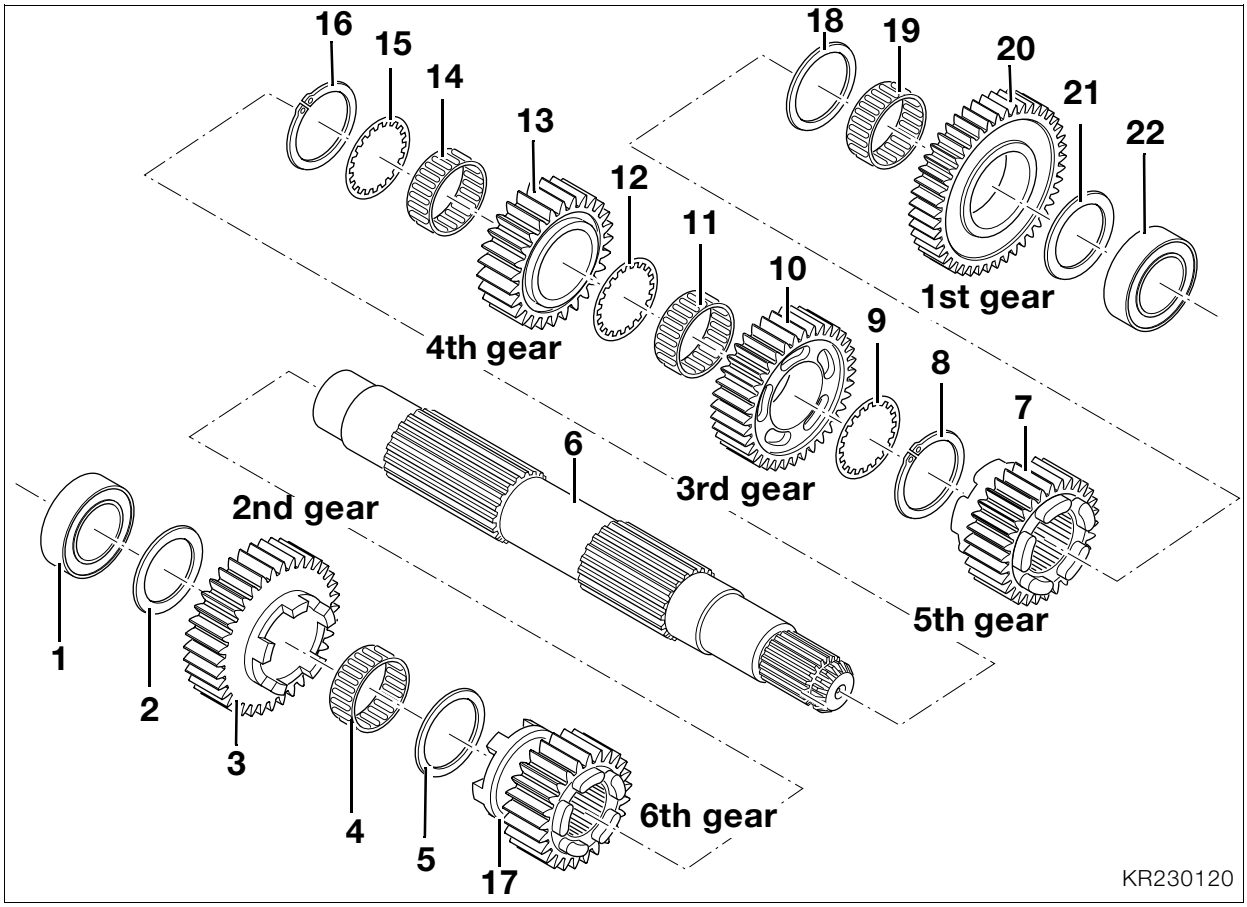
23 12 Disassembling and assembling output shaft

Disassembling output shaft

⚠ **Attention:**
To avoid damaging the needle roller bearing on the splines of the shaft, spread it carefully at the end face when removing.

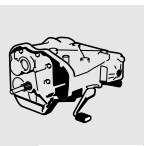


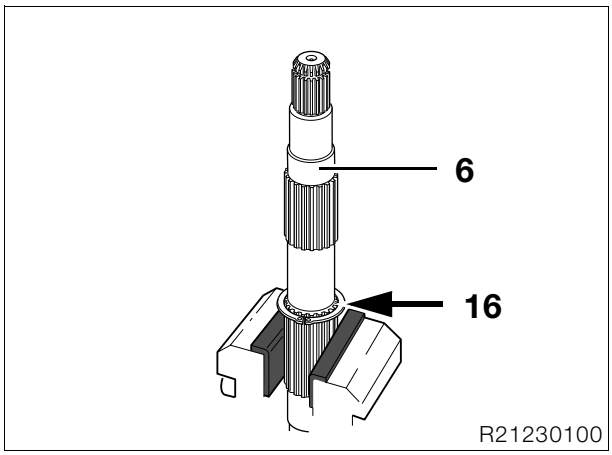
- Using universal puller, **BMW No. 00 7 500**, pull off grooved ball bearing (22) together with 1st gear wheel (20).
- Remove spacing washer (21), shift gearwheel for 1st gear (20), needle roller bearing (19) and spacing washer (18).
- Remove the sliding gearwheel for 5th gear (7).
- Remove circlip (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 6th 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 friction faces lightly with gear oil.

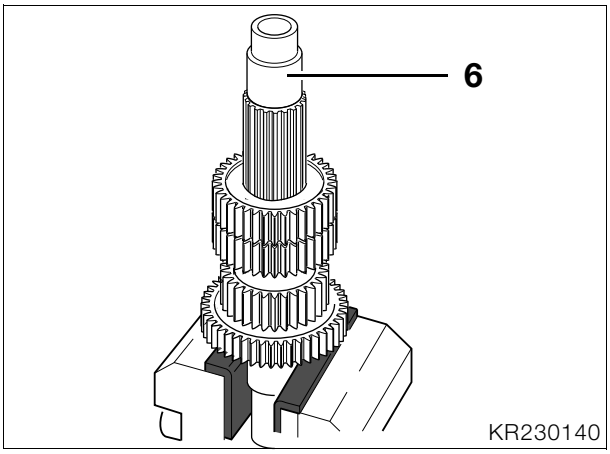




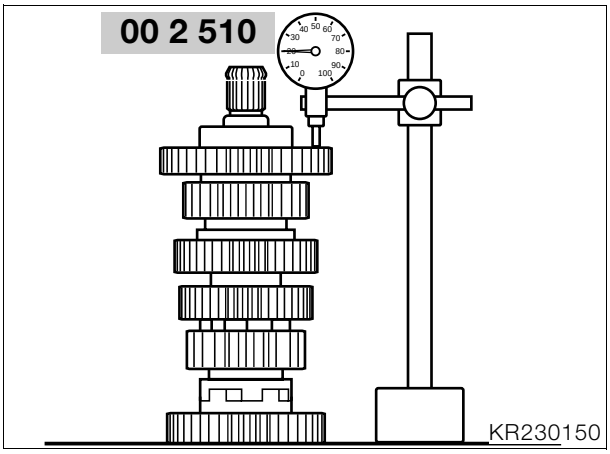
- Clamp output shaft (6) into a vise fitted with jaw protectors, with the splines facing upwards.
- Install circlip (16/arrow).
- Install backup washer (15).

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

- Install needle roller bearing (14).
- 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 (➟ 23.19).
- 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 1st gear shift wheel (➟ 23.19).



- 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 fully assembled length (➡ 23.21).
- Install spacing washer (2) of calculated thickness, and press on grooved ball bearing (1).
- Check 2nd gear endplay.

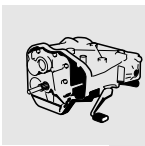


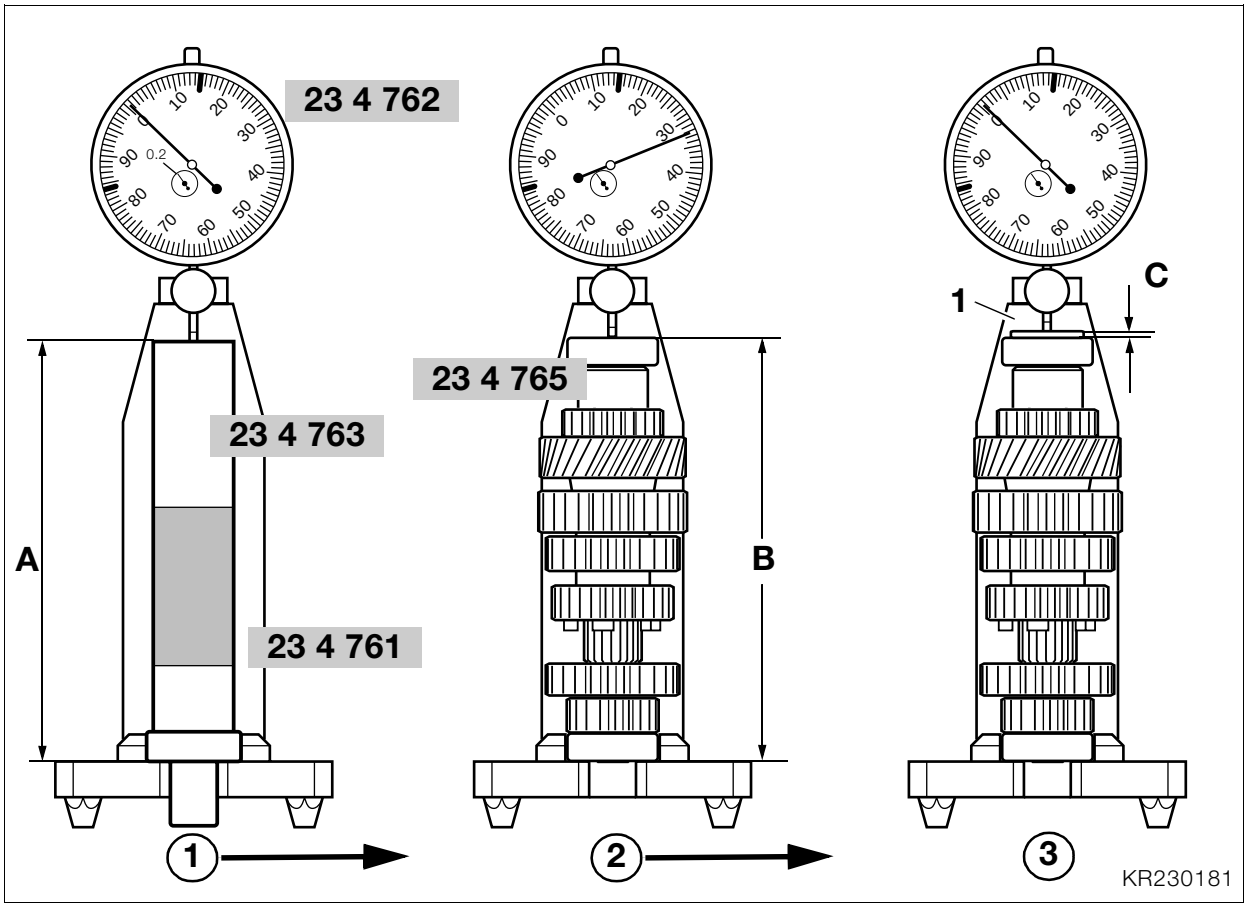
23 11 Checking endplay

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

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

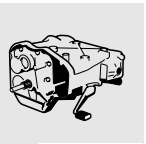
Endplay values:
Endplay, 1st gear
..... 0.1...0.33 mm (0.0039...0.0130 in)
Endplay, 2nd gear
..... 0.1...0.33 mm (0.0039...0.0130 in)
Endplay 3rd/4th gear (total play)
..... 0.1...0.67 mm (0.0039...0.0264 in)





23 11 Checking and adjusting fully assembled length of gearbox shafts and selector drum

Checking and adjusting fully assembled length of intermediate shaft



Attention:
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.

- Position dial gauge, **BMW No. 23 4 762**, in rear locating bore of stand, **BMW No. 23 4 761**, and set to 0.2 mm (0.0078 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 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 spacer (1).

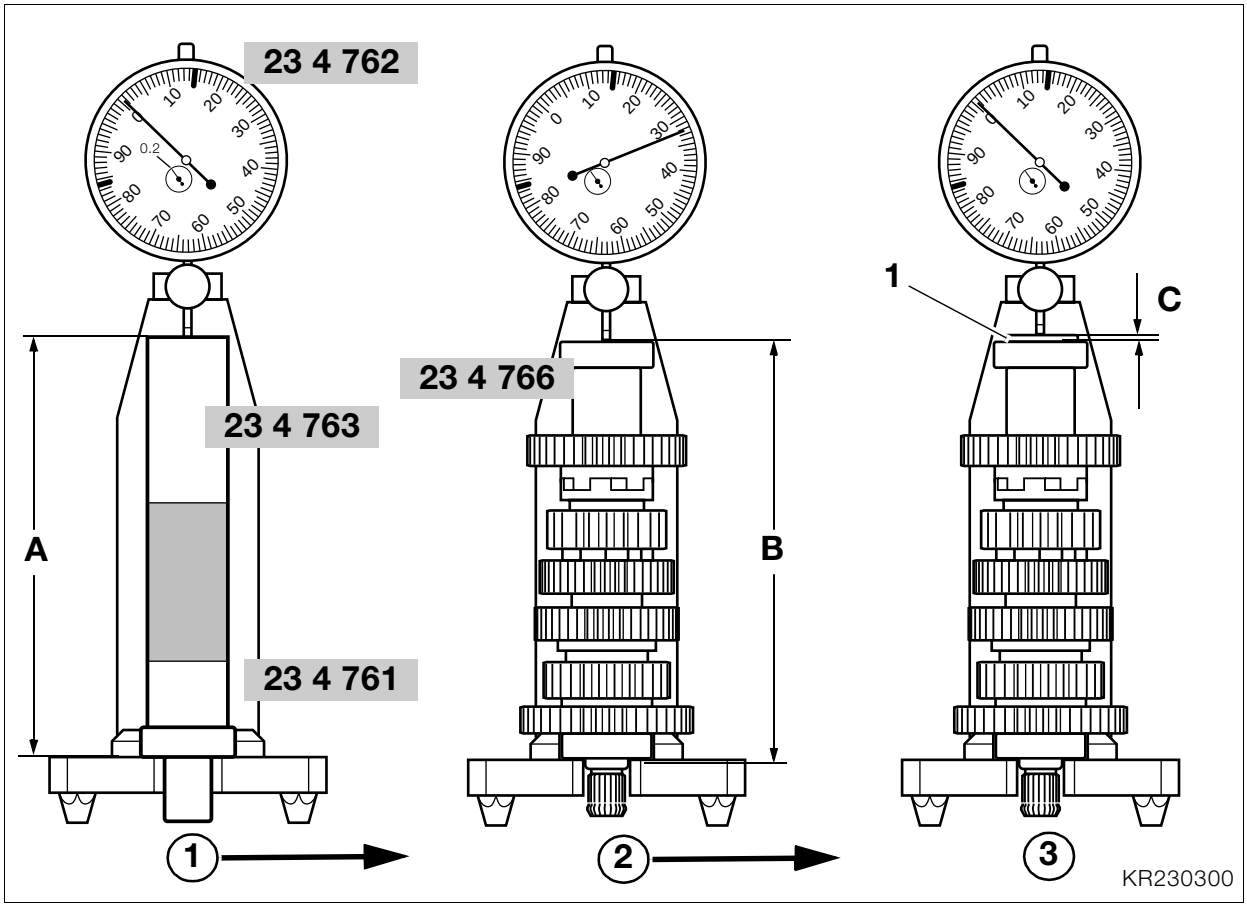
- Place spacer (1) of correct thickness on inner bearing race and check deviation from zero.

A = B + C

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

- Remove the intermediate shaft from the measuring fixture.
- Remove 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:
The maximum permissible deviation from zero is
..... -0.05...0.00 mm (-0.0019...0.00 in)



23 11 Checking and adjusting fully assembled length of output shaft

Attention:
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.

- Position dial gauge, **BMW No. 23 4 762**, in rear locating bore of stand, **BMW No. 23 4 761**, and set to 0.2 mm (0.0078 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 spacer (1).

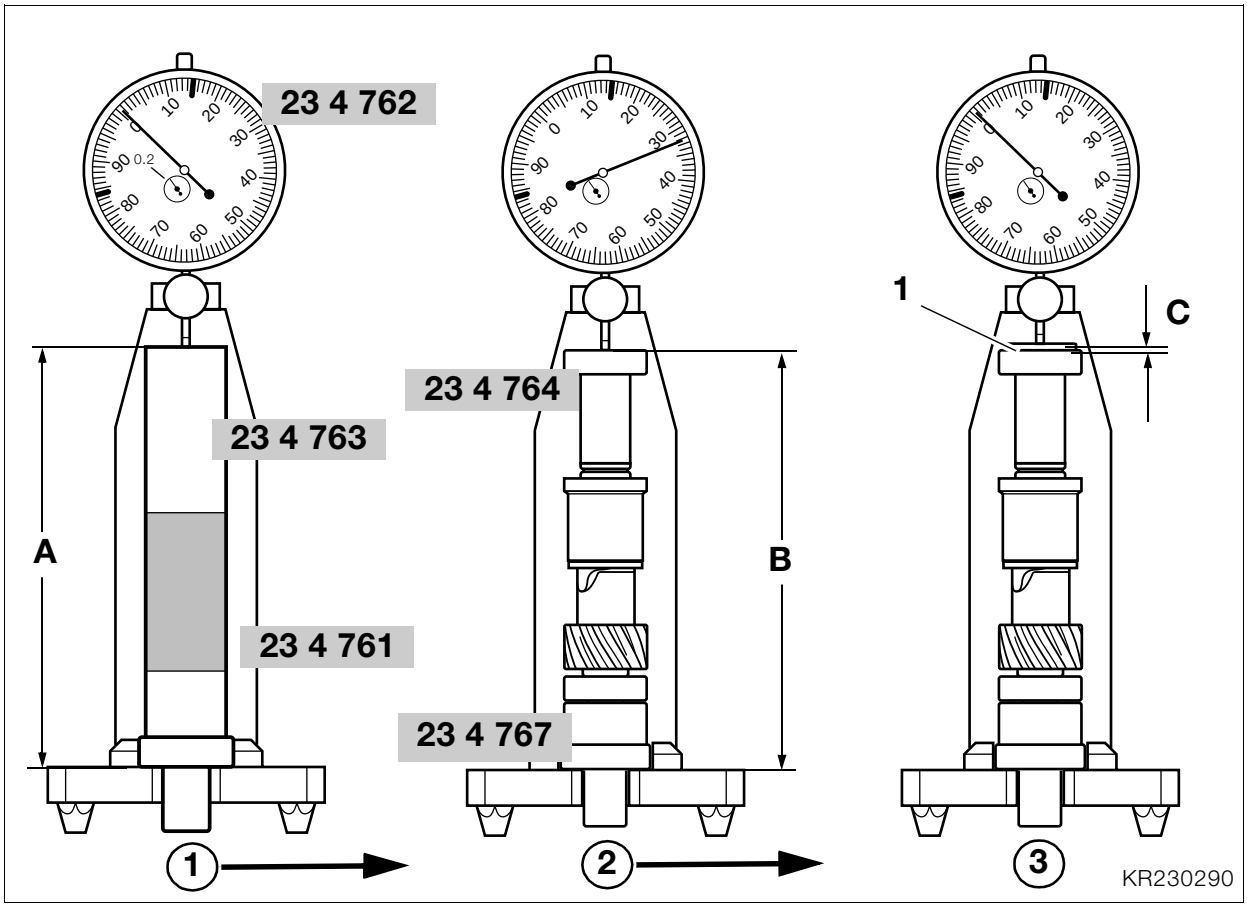
- Place spacer (1) of correct thickness on inner bearing race and check deviation from zero.

A = B + C

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

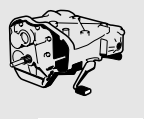
- Remove spacing washer, grooved ball bearing and reference washer.
- Place a spacing washer (1) of the correct thickness on the output shaft and press on the grooved ball bearing.

Reference dimension for output shaft:
The maximum permissible deviation from zero is
..... -0.05...0.00 mm (-0.0019...0.00 in)



23 11 Checking and adjusting fully assembled length of input shaft

Attention:
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.



- Position dial gauge, **BMW No. 23 4 762**, in front locating bore of stand, **BMW No. 23 4 761**, and set to 0.2 mm (0.078 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 spacer (1).

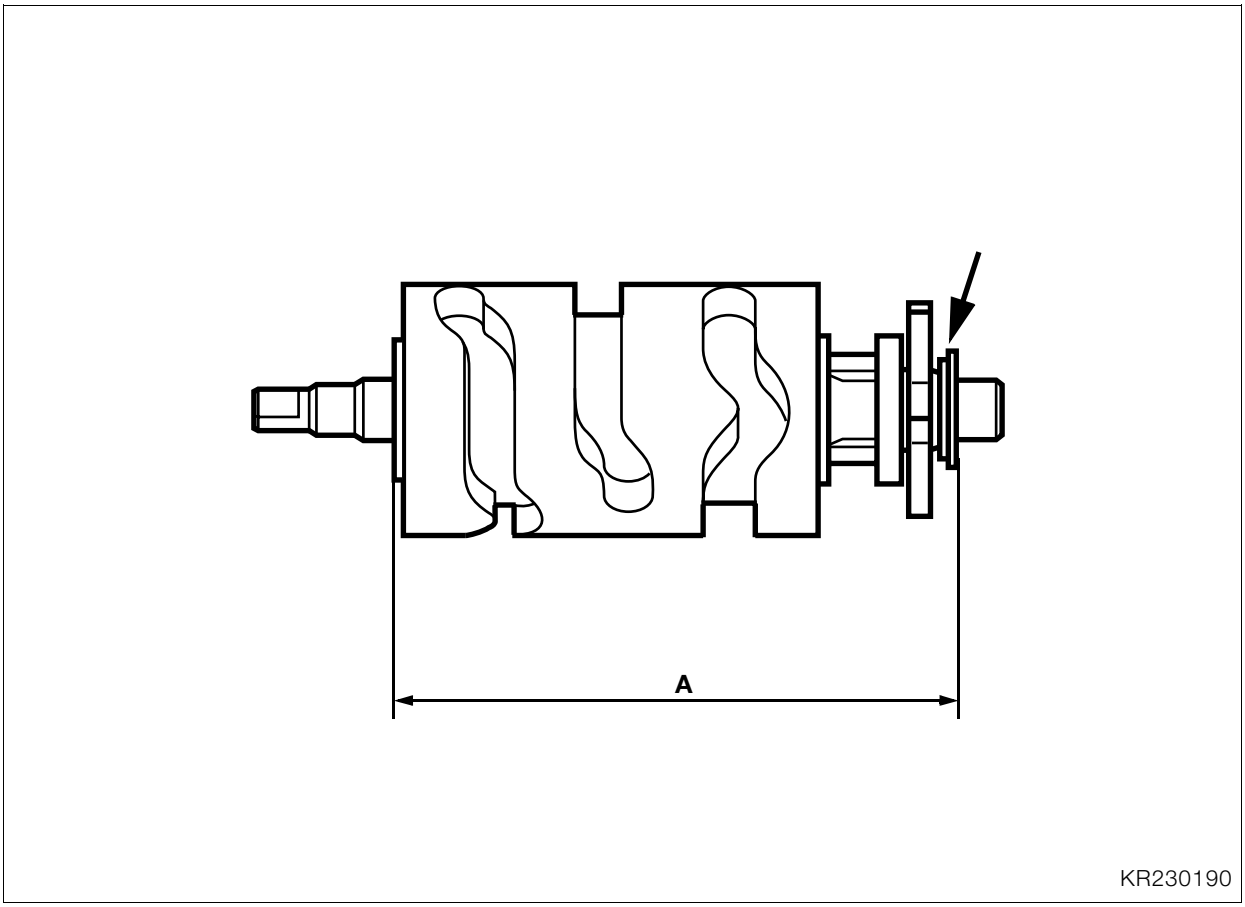
- Place spacer (1) of correct thickness on inner bearing race and check deviation from zero.

A = B + C

Attention:
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 spacer (1) of the correct thickness in position and press the grooved ball bearing onto the input shaft.

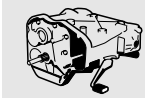
Reference dimension for input shaft:
The maximum permissible deviation from zero is
..... -0.05...0.00 mm



23 11 Checking and adjusting fully assembled length of selector drum

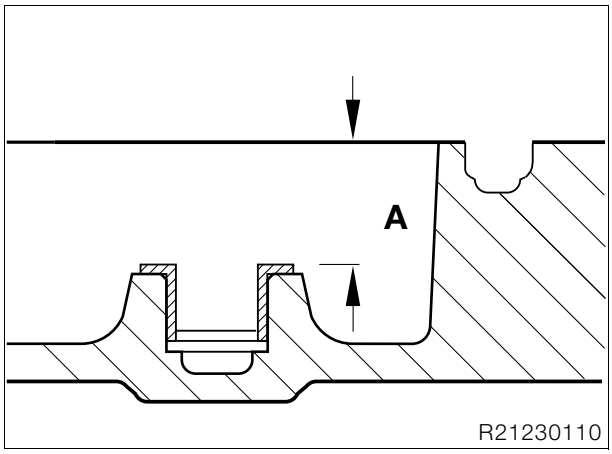
- Place spacing washer and both thrust washers on the selector drum.
- Using slide gauge, determine fully assembled length "**A**".
- If necessary, adjust fully assembled length "**A**" with a shim washer (arrow).

Fully assembled length:
Selector drum
..... 111.80...111.90 mm (4.4015...4.4055 in)

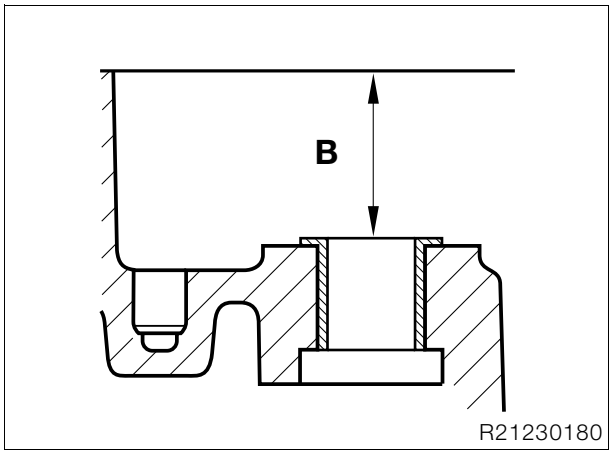


23 31 Shimming selector shaft

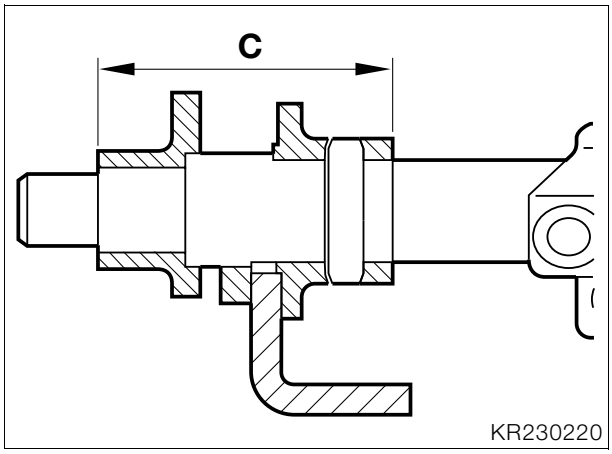
Attention:
If the housing or the complete selector shaft is replaced, the selector shaft must be measured and shimmed.



- Measure distance "**A**" from shouldered bushing to cover mating face.



- Measure distance "**B**" from shouldered bushing to housing mating face.



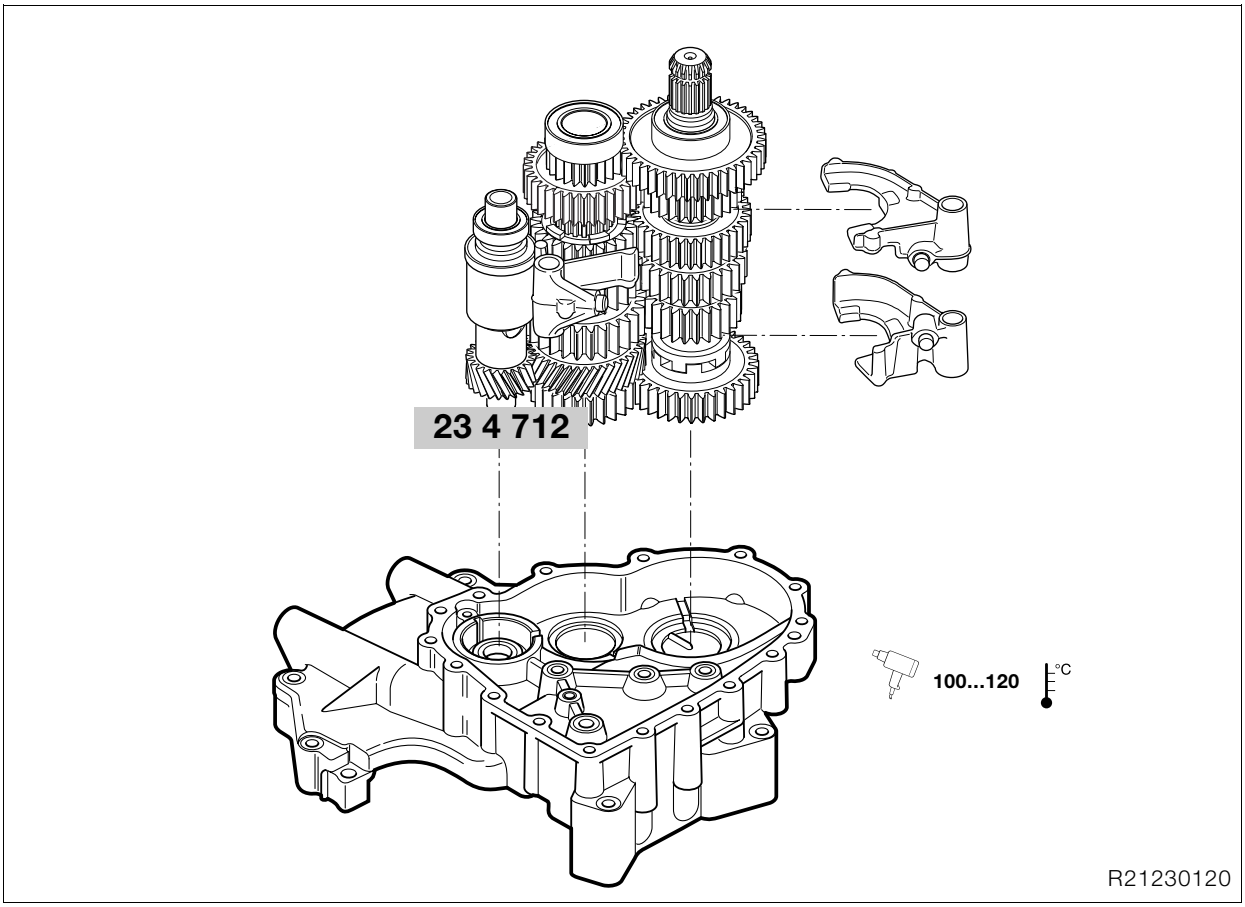
- Measure distance "**C**" from the shoulder on the selector shaft to the back of the sleeve.
- Calculate endplay as follows:

  A + B = D

  D - C = E

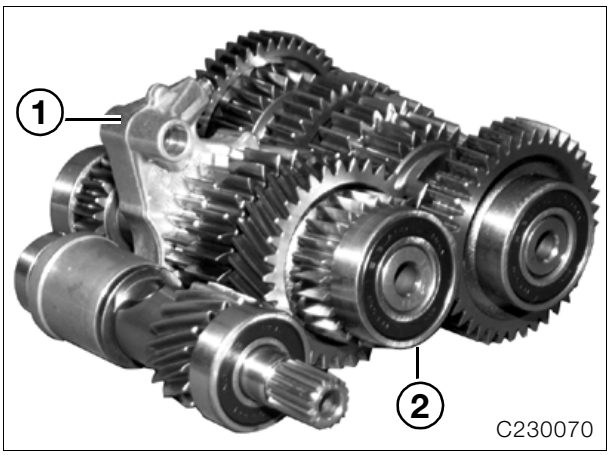
  E - thickness of spacer = endplay.

Endplay:
Selector shaft
..... 0.1...0.3 mm (0.0039...0.0118 in)



23 00 043 Assembling gearbox

23 21 Installing input, output and intermediate shafts



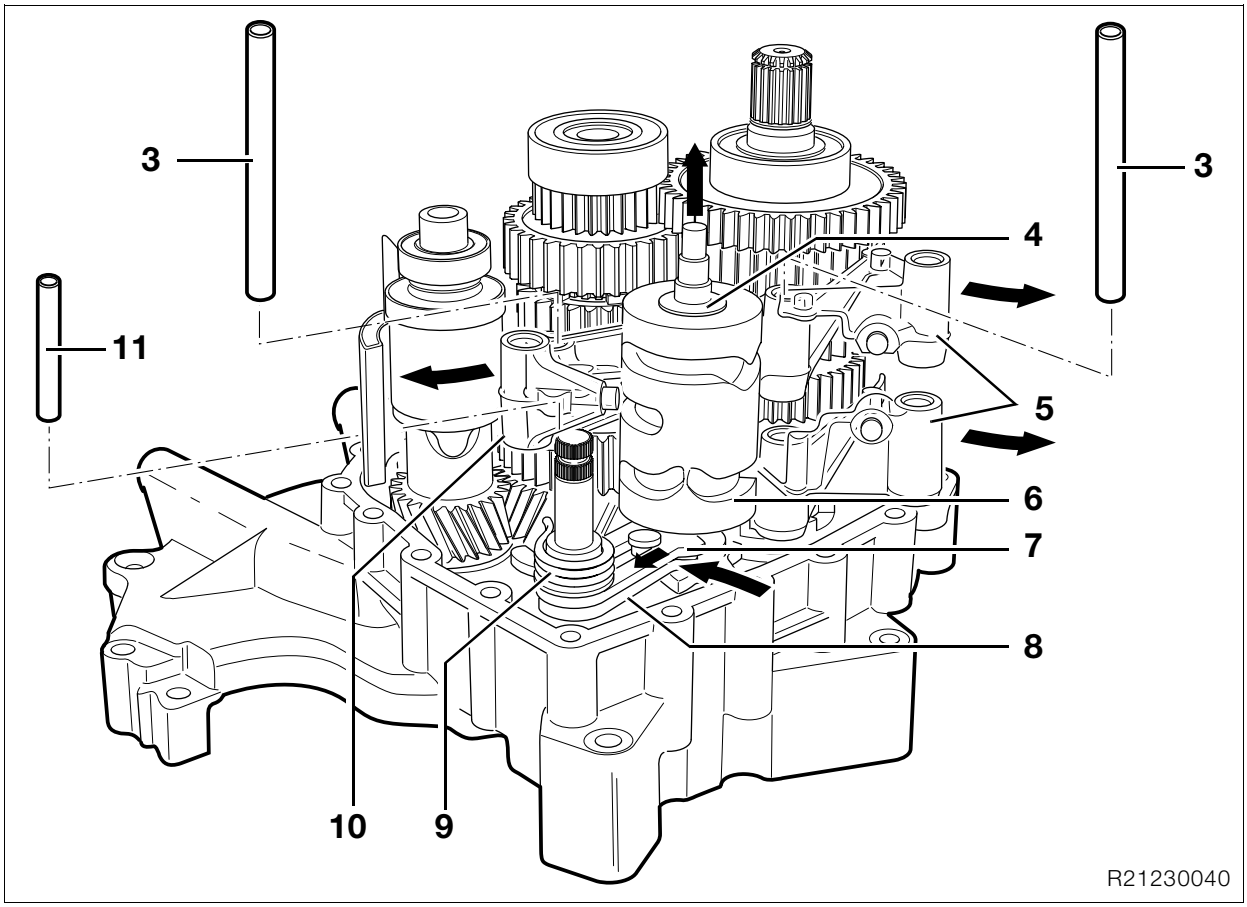
- Insert marked selector fork (1) into intermediate shaft (2).
- Align input, output and intermediate shafts so that their gear teeth mesh and the selector fork is in the position illustrated.

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

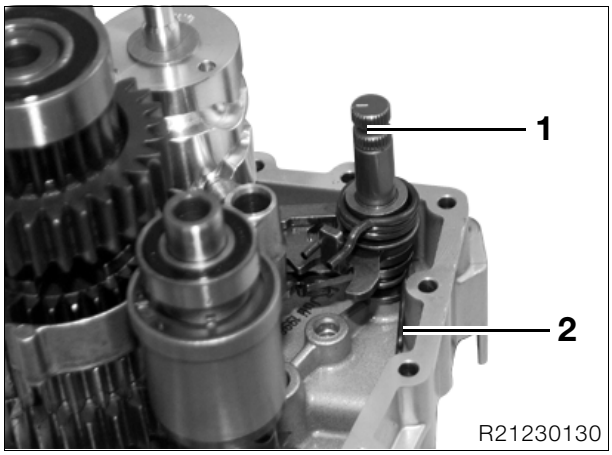
- Push assembly sleeve, **BMW No. 23 4 712**, on to the input shaft splines.
- Heat the bearing points in the cover to 100...120 °C (212... 248 °F).

Attention:
Check that the gearbox shafts are correctly seated.

- Insert the input, output and intermediate shafts together.
- Install the 1st/3rd and 2nd/4th shift forks.



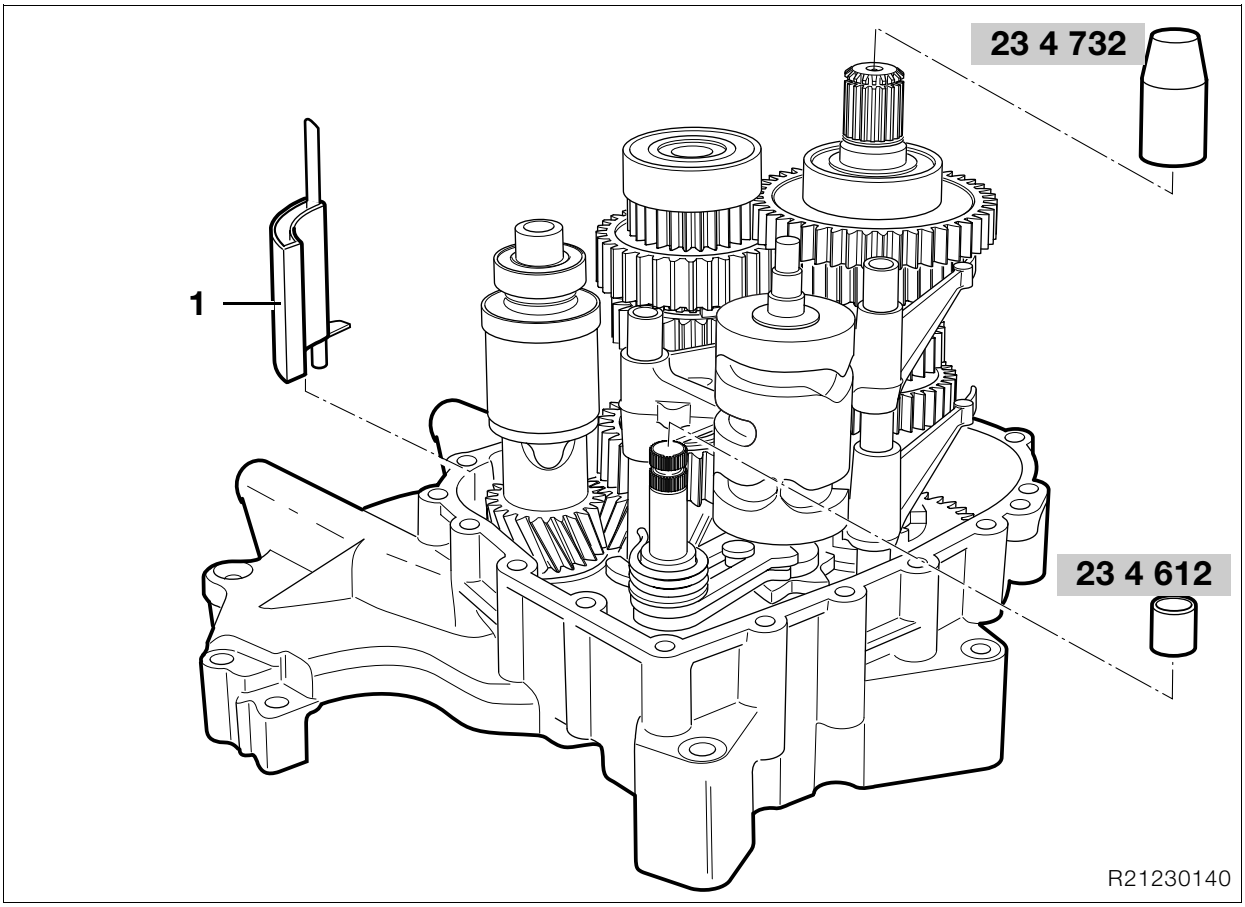
23 31 Installing selector shaft



- Place a spacer of correct thickness on the housing.
- Install selector shaft (1), making sure that spring (2) is correctly positioned.

23 31 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 input shaft and install the selector drum.
- Swing locking lever (8) towards selector drum (6), pull back guide plate (7) and engage it in the selector drum.
- Place shift forks (5, 10) in the guide tracks.
- Install selector shafts (3).
- Install torsion spring (9).
- Install locking pin (11).
- Place thrust washer (4) on the selector drum.

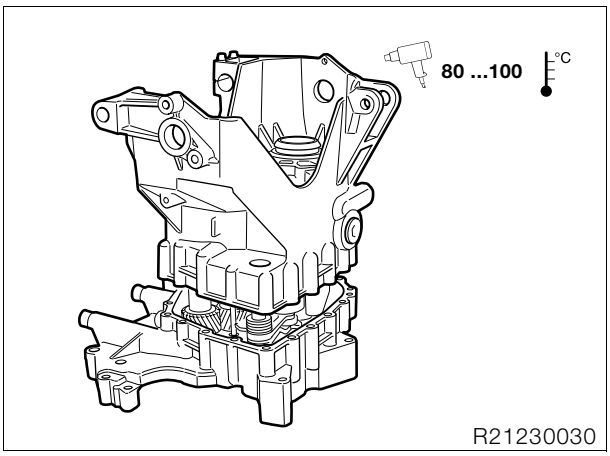


23 11 Installing gearbox housing

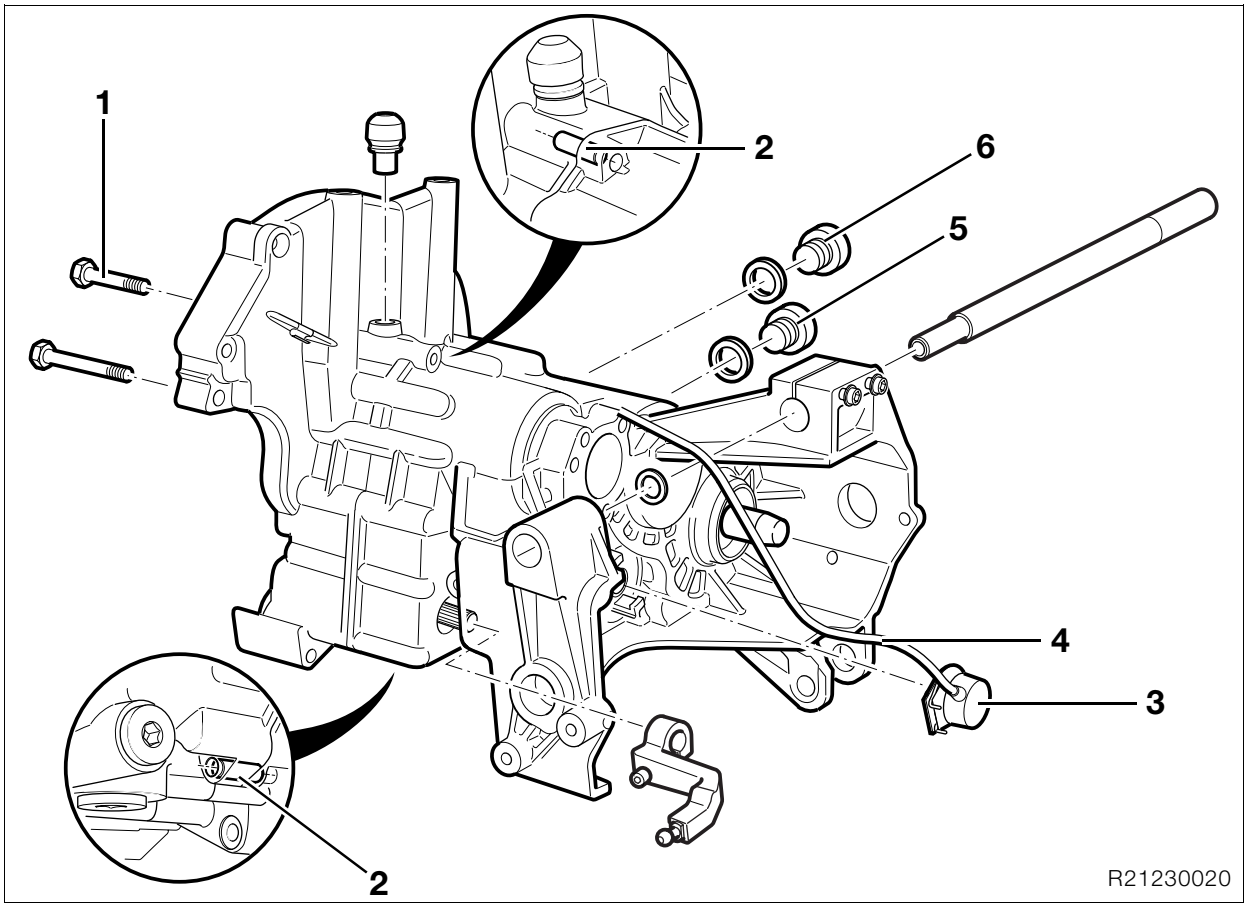
- Install the dowel pins in cover and in housing, but do not drive the pins fully home.
- Install breather tube (1) in housing cover.

Attention:
Clean and degrease the sealing faces.
The sealing compound sets within 30 minutes; within this time, place the housing in position and tighten the securing screws.

- 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 slip-over sleeve, **BMW No. 23 4 612**, on the selector shaft.



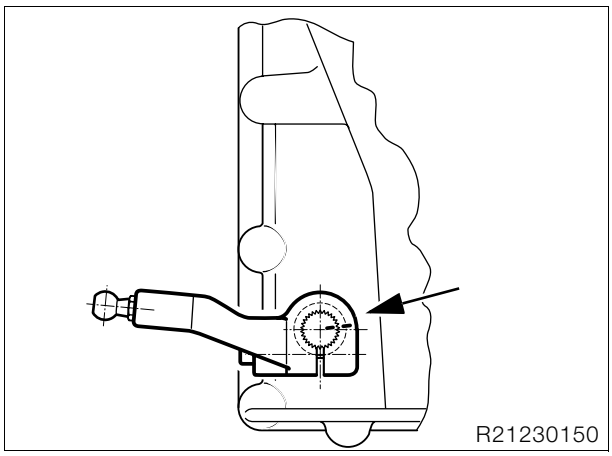
- Heat the bearing seats in the housing to 80…100 °C (176…212 °F) and place the housing on the cover.



- Insert screws (1) and tighten in diagonally opposite sequence.
- Drive home dowel pins (2).
- Install switch of gear indicator (3) and clip cable (4) into position.
- Remove metal particles from the magnet in oil drain plug (5).
- Install the oil drain plug with a new sealing ring.
- Fill with oil.
- Install oil-check and oil filler plug (6) with new sealing ring.

Capacity:
Initial filling/oil change approx. 0.8 l (1.41/0.85 Imp. pint/US quart) (up to bottom of thread in oil filler neck)

Oil grade:
Brand name SAE 90 API GL5 hypoid oil or Castrol MTX 75W-140 GL 5



- Install the shift lever in such a way that the marks (arrow) are aligned.
- After assembling the gearbox, perform a functional check.

Tightening torque:
Gearshift lever to gearshift shaft..... 9 Nm

31 Front forks

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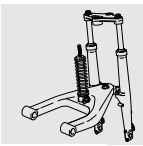
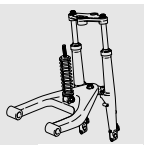
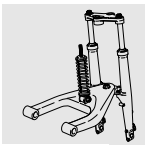
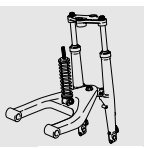
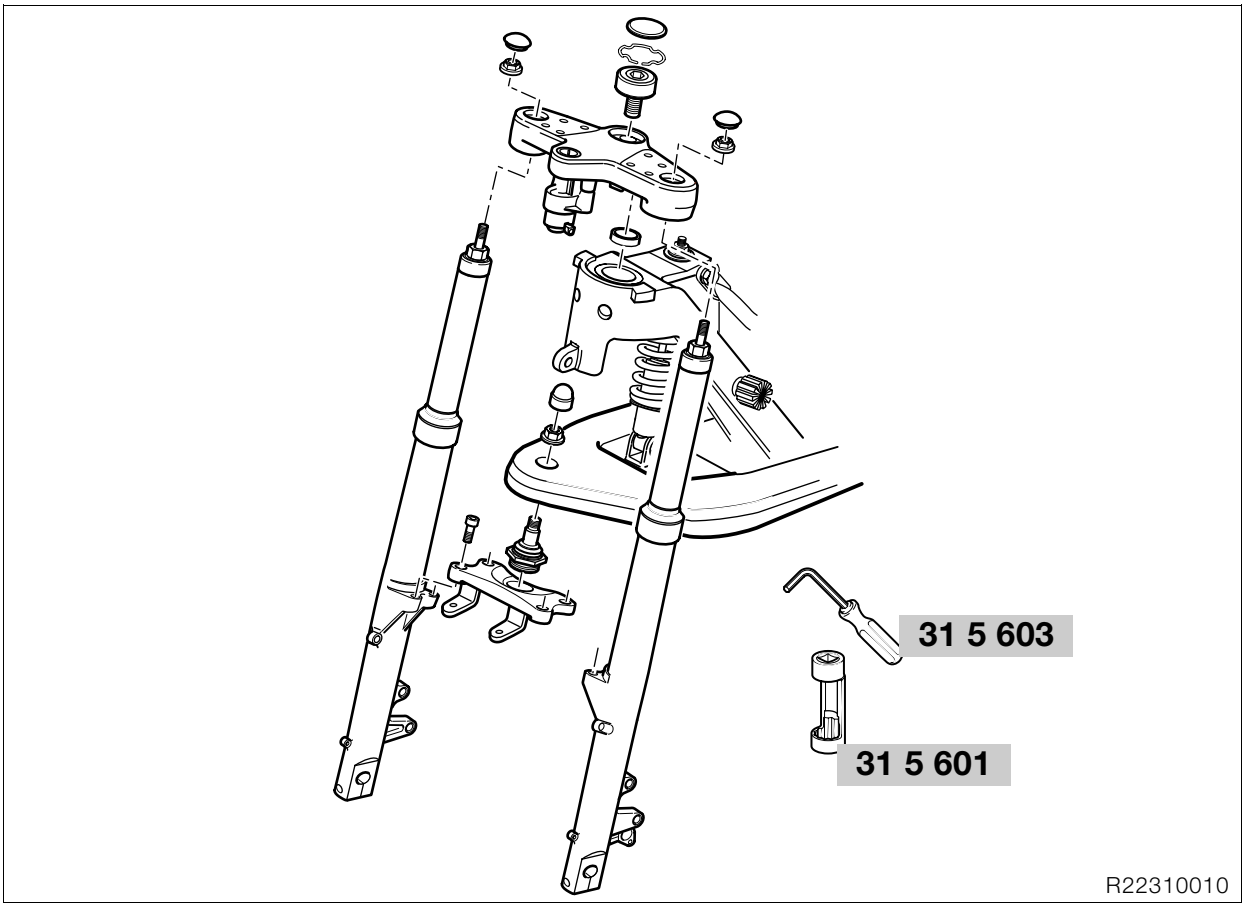




Technical Data 31 Front suspension		R 1150 RT
Type		BMW Telelever with external suspension strut
Running gear		
Total spring travel at wheel	mm (in)	120 (4.7245)
Castor in normal position (full fuel load and 85 kg/187 lbs rider)	mm (in)	122 (4.8032)
Steering lock angle	°	2 X 34
Fixed fork tube		
Fixed tube surface		Hard chrome plated
Extl. dia. of fixed fork tubes	mm (in)	35 (1.3780)
Fixed fork tube runout limit	mm (in)	0.4 (0.0157)
Fork oil		
Approved types		BMW telescopic fork oil
Capacity per fork leg	l (Imp. pint/US quart)	0.45 (0.79/0.47)
Spring strut		
Type		Central spring strut with twin-tube, gas-filled shock absorber







31 42 025 Removing and installing telescopic fork

31 42 Removing and installing telescopic fork without fork bridge

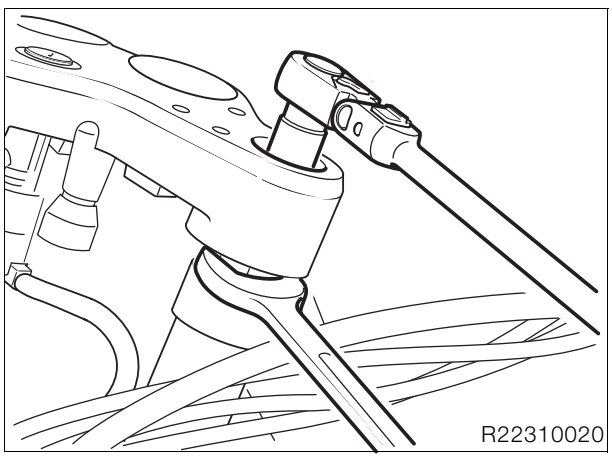
- Place motorcycle on its centre stand.
- Take the load off the front forks and secure the motorcycle so that it cannot topple forward.

Warning:
Integral ABS When removing and installing the brake calipers, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with "Instructions for filling reservoir" (➟ 00.44).

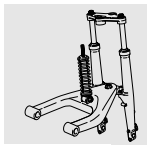
- Remove brake calipers.

Attention:
Integral ABS Do not apply handbrake lever or footbrake lever with brake calipers removed/front wheel removed.

- Remove front wheel.
- Remove rear mudguard.
- **Integral ABS** Remove sensor and cable from slider tube.
- Remove brake line from slider tube.
- Place a support beneath the telescopic fork.
- Heat leading link mount at front to max. 120 °C (248 °F) and remove.
- Remove both handlebars from fork bridge.



- Remove fastener securing fixed tube in upper fork bridge while holding the hexagon of the fixed tube and then pull the telescopic fork down to remove.



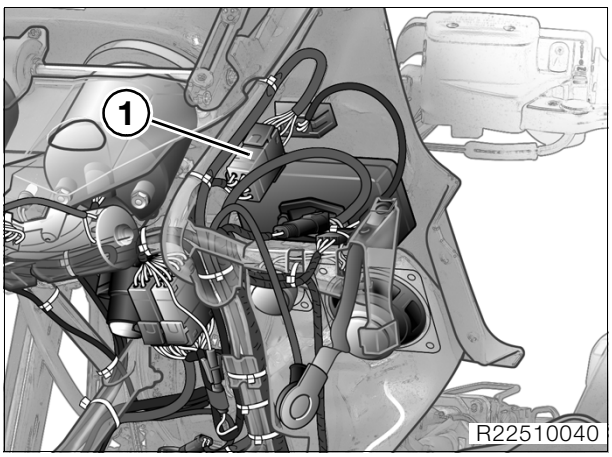
- Installation is the reverse of the removal procedure.
- Tighten the ball joint in the leading link using socket, **BMW No. 31 5 601**, and Allen key, **BMW No. 31 5 603**.

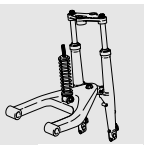
Attention:
To prevent grease from escaping and the ingress of dirt, ensure that sleeve is correctly located on ball joint.
Use the nuts securing the fixed tubes to the fork bridge only once.

Tightening torque:
Leading link to ball joint
(clean thread + Loctite 2701)..... 130 Nm
Fastener securing fixed tube in fork bridge
(free from oil and grease)..... 45 Nm

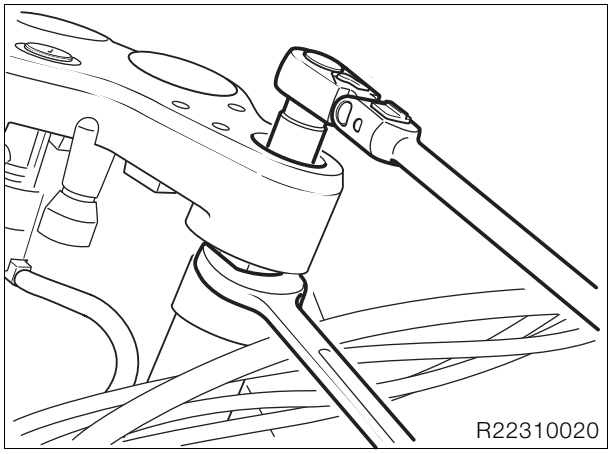
31 42 Removing and installing fork bridge

- Remove inner trim of fairing (➡ 46.7).
- Remove left side section of fairing (➡ 46.8).
- Disconnect ground (earth) cable from battery.
- **[Radio]** Remove left loudspeaker box.





- Disconnect plug (1) for the ignition/steering lock.
- Remove retainers of Bowden cables from handlebar bridge.
- Remove both handlebars from fork bridge.



- Remove fastener securing fixed tube in upper fork bridge while holding the hexagon of the fixed tube.
- Remove threaded stud from frame.

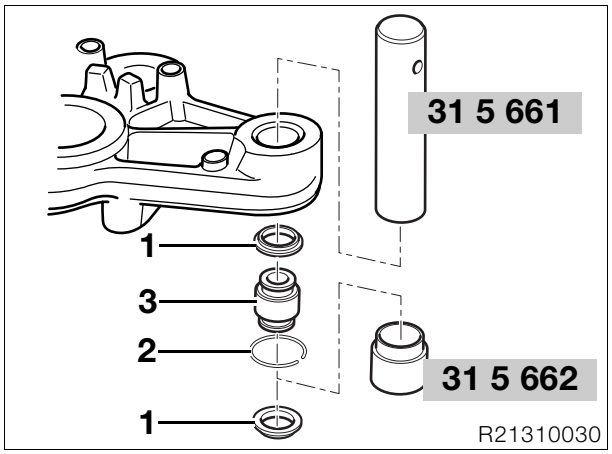
Note:
Stud is a press-fit in angular-contact ball bearing, so remove as a complete unit.

- Remove fork bridge.
- Installation is the reverse of the removal procedure.

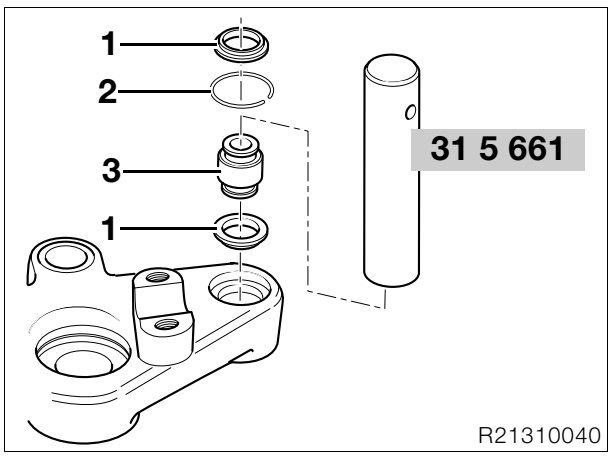
Attention:
Use the nuts securing the fixed tubes to the fork bridge only once.

Tightening torque:
Threaded stud to frame
(clean thread + Loctite 243)..... 130 Nm
Threaded fastener, fixed tube to fork bridge
(free from oil and grease)..... 45 Nm
Handlebar to fork bridge ..... 21 Nm

Removing and installing pot-type joints

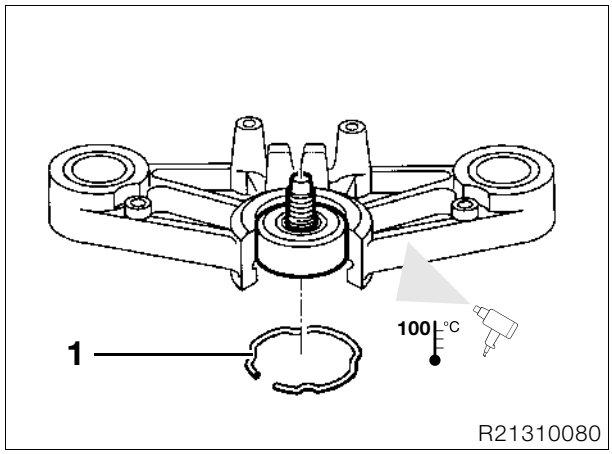


- Remove dust covers (1).
- Remove snap ring (2).
- Press out pot-type joint (3) with mandrel, **BMW No. 31 5 661,** and sleeve, **BMW No. 31 5 662**.

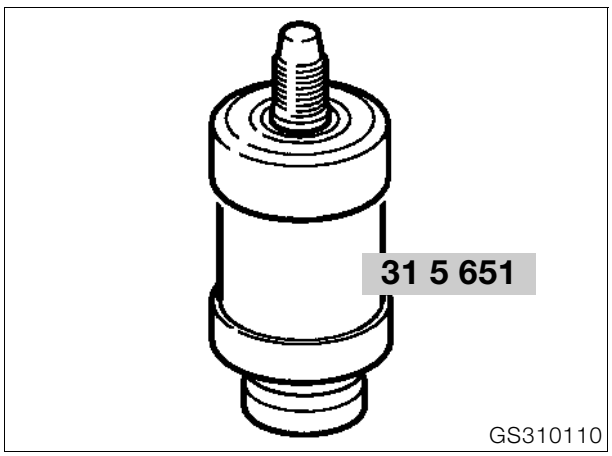


- Press in pot-type joint (3) with mandrel, **BMW No. 31 5 661**.
- Install snap ring (2).
- Install dust covers (1).

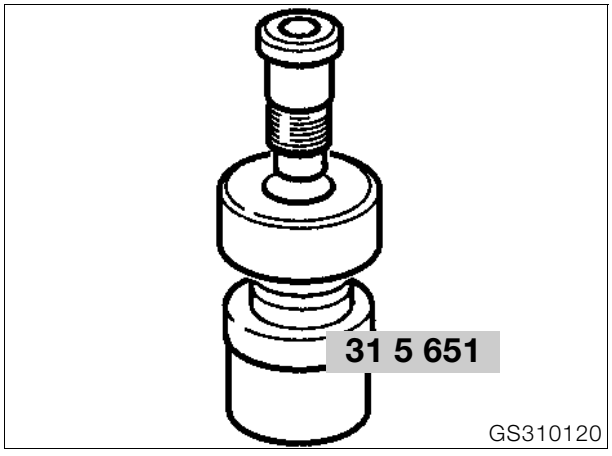
Removing and installing angular-contact ball bearing



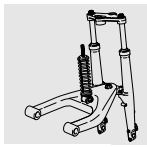
- Remove retaining ring (1).
- Heat fork bridge to approx. 100 °C (212 °F).
- Remove angular-contact ball bearing, if necessary striking lightly with a plastic-faced hammer.

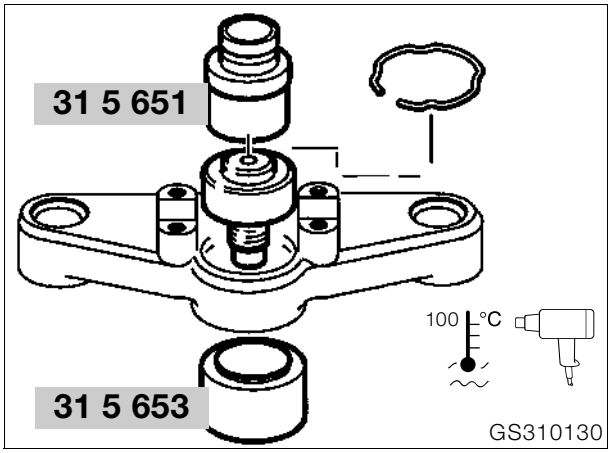


- Press out the threaded stud using mandrel, **BMW No. 31 5 651**, as a support.



- Press the threaded stud into the angular-contact ball bearing using mandrel, **BMW No. 31 5 651**, as a support.





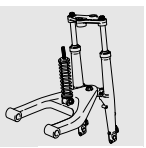
- Heat the fork bridge to 100 °C (212 °F) and press in the angular-contact ball bearing with pin, **BMW No. 31 5 651**, and bushing, **BMW No. 31 5 653**.
- Install retaining ring.

31 42 Removing and installing slider tube bridge

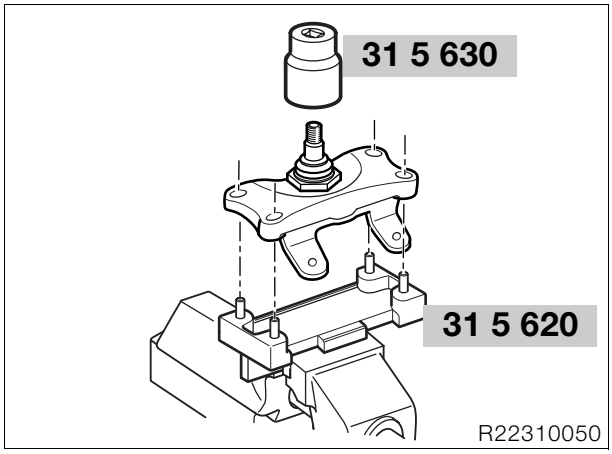
- Remove mudguard.
- Heat leading link mount at front to max. 120 °C (248 °F) and unscrew.
- Remove fastener securing slider tube bridge.
- Installation is the reverse of the removal procedure.

Attention:
Comply with assembly instructions for telescopic fork.

Tightening torque:
Leading link to ball joint
(clean thread + Loctite 2701)..... 130 Nm
Slider tube bridge to slider tube
(clean thread + Loctite 243)..... 25 Nm



Removing and installing ball joint in slider tube bridge



- Mount the slider tube bridge in retaining fixture, **BMW No. 31 5 620**.
- Loosen and tighten ball joint with 46 mm socket, **BMW No. 31 5 630** .

Tightening torque:
Ball joint to slider tube bridge
(coat threads with Optimoly TA)..... 230 Nm

31 42 Checking friction at ball joint/ angular-contact ball bearing

- Raise the motorcycle on its main (centre) stand, make sure front wheel is clear of the ground.

Note:
To determine the friction value, increase torque very slowly.

- Measure the breakaway moment to left and right from the central position of the handlebars using friction meter, **BMW No. 00 2 570**.

Friction value:
Measure at room temperature (above 20 °C/68 °F)
Specified value:..... 1.0...2.0 Nm

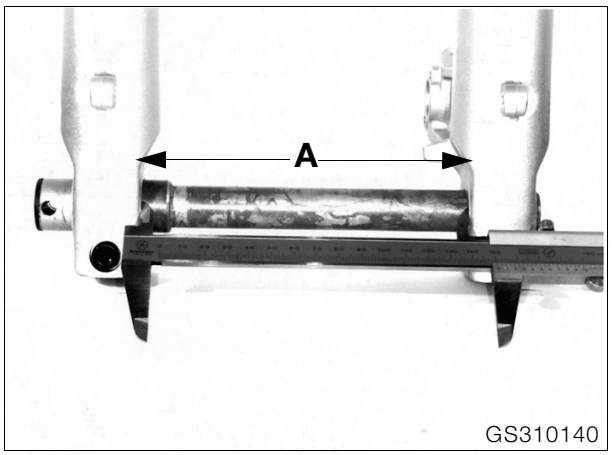
Assembly instructions for telescopic fork

Attention:
To ensure that the forks are installed without trapped stresses, follow the instructions below to the letter and in particular, proceed exactly in accordance with the sequence as specified.

- The front suspension strut is removed.

Attention:
Protect painted parts from scratching: apply adhesive masking tape if necessary.

- Secure fork bridge to frame.



- Pre-assemble fork legs with quick-release axle/ adjust distance "**A**".

Distance "A":..... 165 $^{\pm 0.5}$ mm (6.4961 $^{\pm 0.0197}$ in)

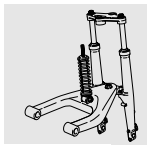
Note:
If the quick-release axle was not removed, for instance when only the fork slider tube bridge was removed/installed, omit the step described above.

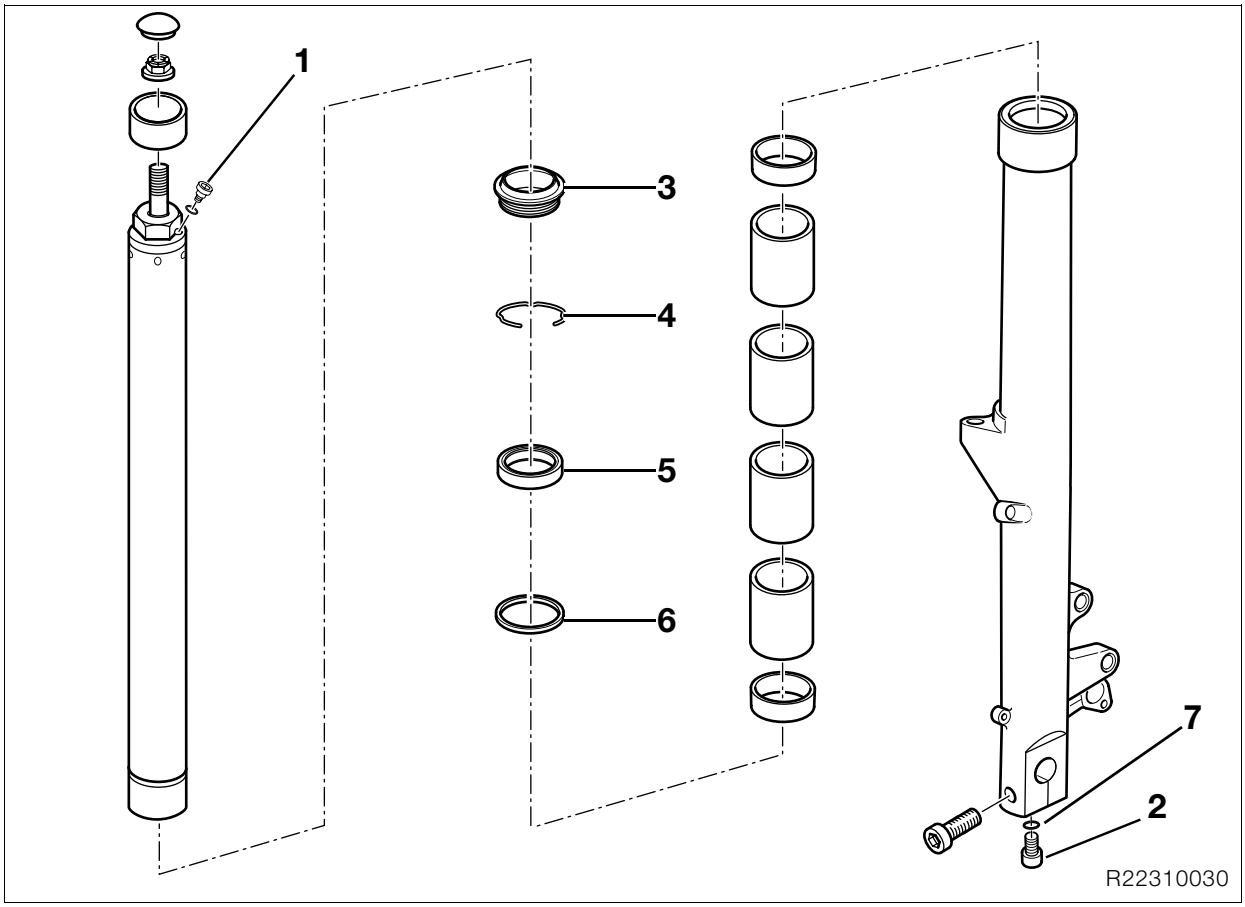
- Secure slider tube bridge/do not tighten to specified torque at this point.
- Secure slider tube bridge to leading link.
- Using a strap or similar, pull fork towards frame until the fully retracted fixed tubes only need to be pulled out slightly to secure them to the fork bridge.
- Secure fixed tubes to the fork bridge.
- Tighten slider tube bridge.
- Check that the system moves freely by compressing and extending the suspension (but without the suspension strut) in the straight-ahead and left/right steering lock positions.
- Remove quick-release axle.

Attention:
When being reassembled, the quick-release axle must be correctly aligned; it should be possible to install it by rotating it slightly.

- Install suspension strut.

Tightening torque:
Threaded stud to frame
(clean thread + Loctite 243)..... 130 Nm
Clamp of front quick-release axle..... 22 Nm
Leading link to ball joint
(clean thread + Loctite 2701)..... 130 Nm
Threaded connection, fork fixed tube to fork bridge
(free from oil and grease)..... 45 Nm
Slider tube bridge to slider tube
(clean threads + Loctite 243)..... 25 Nm
Spring strut to frame ..... 43 Nm
Spring strut to leading link..... 50 Nm



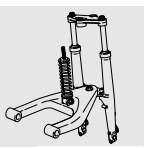


31 42 Disassembling and assembling telescopic fork

31 42 Disassembling telescopic fork

- Remove vent screw (1).
- Remove oil drain plug (2) and allow the oil to drain out.
- Remove the fixed tube.
- Remove wiper (3) and retaining ring (4).

Attention:
Do not damage fork slider tube.



- Lever out shaft seal (5).
- Remove washer (6).

31 42 Assembling telescopic fork

- Position new O-ring (7) on screw (2).
- Install oil drain plug (2).
- Fill with oil.

Capacity per fixed tube:
..... 0.45 l (0.79/0.47 Imp. pint/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 (6).

- Push the lightly oiled shaft sealing ring fully up to the stop on the slider tube, then press home by tapping lightly and using threaded bush, **BMW No. 31 5 611**, expander, **BMW No. 31 5 612**, and reducing adapter, **BMW No. 31 5 613**.
- Install retaining ring and dust wiper.
- Insert vent screw.
- Bleed telescopic forks under zero load.

Tightening torque:
Screw plug to fixed fork tube
..... Press-fit - do not remove!

31 42 020 Measuring telescopic fork

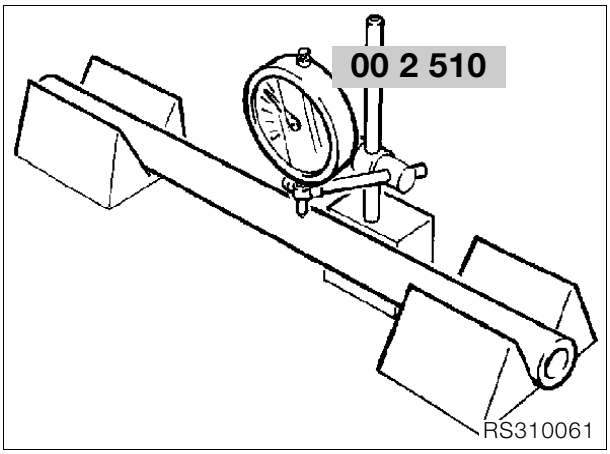
Attention:
Following accidents the telescopic fork should always be inspected for signs of fractures and other damage.

31 42 Examining slider tube bridge and fork bridge

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

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

31 42 Checking runout of fixed tube



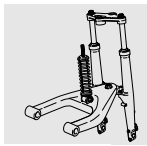
- Place both ends of fixed tube in V-blocks.
- Turn fixed fork tube slowly and measure it with a dial gauge, **BMW No. 00 2 510**.

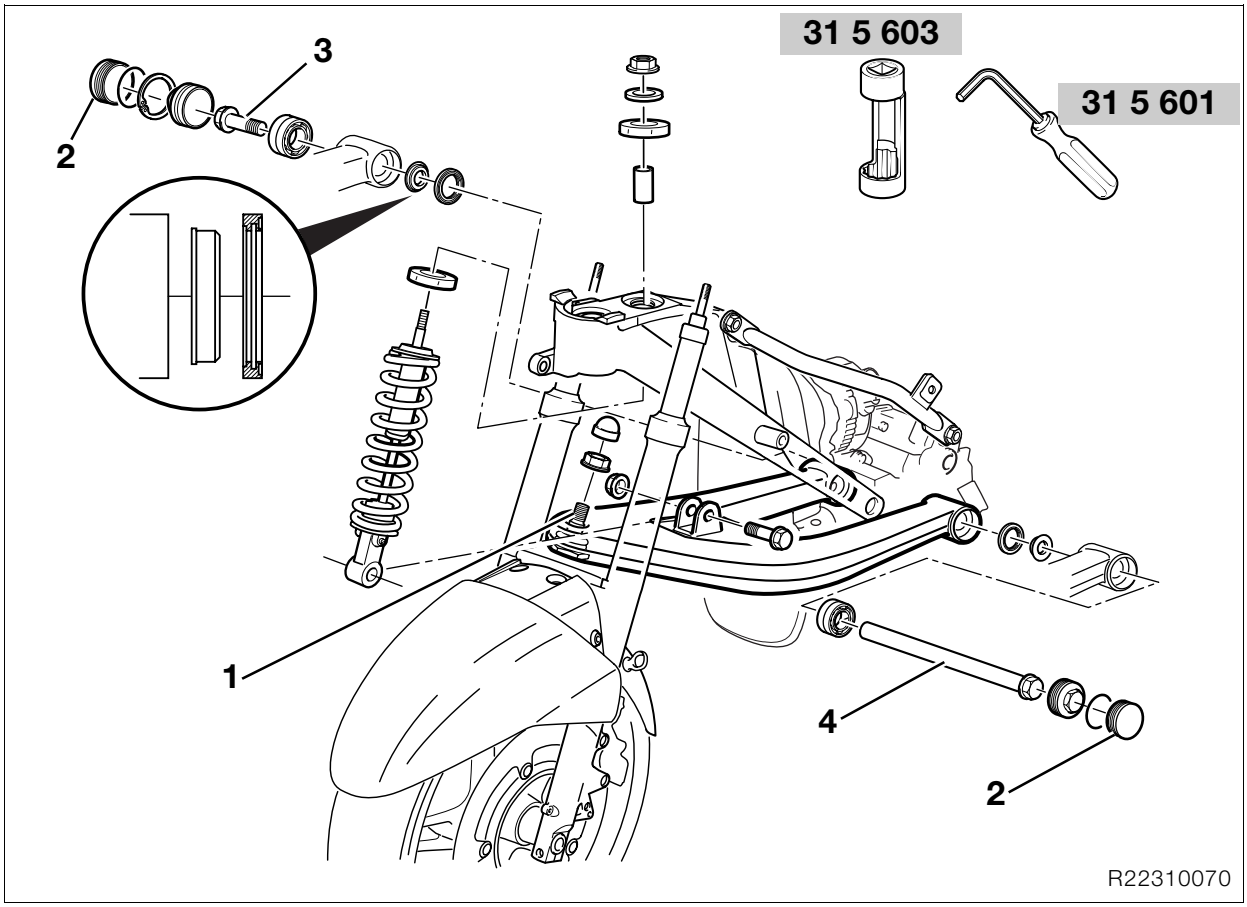
Attention:
Do not straighten distorted fixed tubes: always replace them.

Permissible runout: ..... 0.4 mm (0.0157 in)

31 42 Checking runout of slider tube

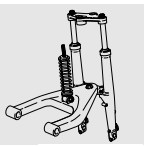
- New fixed tube must slide freely into slider tube and turn without catching.





31 42 405 Removing and installing leading link

- Remove side panels (➡ 46.8).
- Remove the intake air pipe.
- Disengage suspension strut at bottom.
- Heat ball joint mount (1) at leading link to max. 120 °C (248 °F) and remove it.
- Remove caps (2).
- Slacken and turn flange of the left throttle valve stub.
- Remove screw (3).
- Slacken fasteners of leading link pivot shaft (4).



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

- Pull telescopic fork forwards and carefully remove leading link by pulling forwards.
- Installation is the reverse of the removal procedure.
- Apply a light coating of grease to the shaft before installing.
- Tighten the ball joint in the leading link using socket, **BMW No. 31 5 601**, and Allen key, **BMW No. 31 5 603**.

Tightening torque:
Leading link to ball joint
(clean thread + Loctite 2701)..... 130 Nm
Leading link to engine:
right ..... 73 Nm
Screw cap, left
(lightly coat threads with Optimoly TA)..... 42 Nm
Spring strut to leading link..... 50 Nm

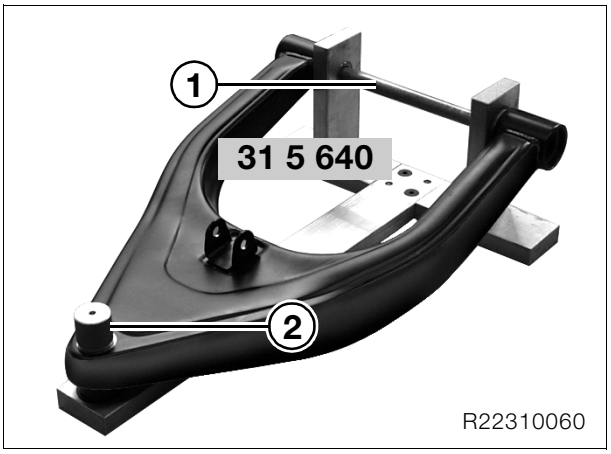
31 42 Disassembling and assembling leading link

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

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

31 42 851 Measuring the leading link

- Remove the leading link (➡ 31.12).



Note:

Shaft (1) must slide into the leading link without resistance.
Check runout of shaft (1).

- Secure the leading link with shaft (1) to leading link gauge, **BMW No. 31 5 640**.
- Tighten the shaft until the leading link is located in the gauge with no end float.

Note:

Check the leading link for signs of the paint flaking.

- Insert test mandrel (2) all the way into the bore.

Interpreting result of measurement:
Test mandrel slides all the way into the bore without resistance
.....OK

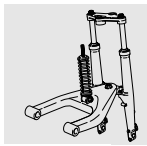
Test mandrel sticks, force is required to slide it into the bore or it cannot be inserted
..... Replace leading link

- Install the leading link (➡ 31.12).

31 42 420 Removing and installing front suspension strut

- Remove side panels (➡ 46.8).
- Remove fuel tank (➡ 16.5).
- Remove the horn, if necessary.
- Remove spring strut.
- Installation is the reverse of the removal procedure.

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



32 Steering

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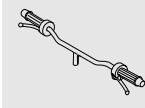
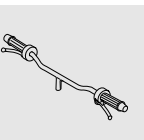
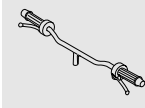
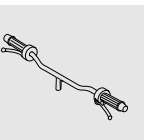
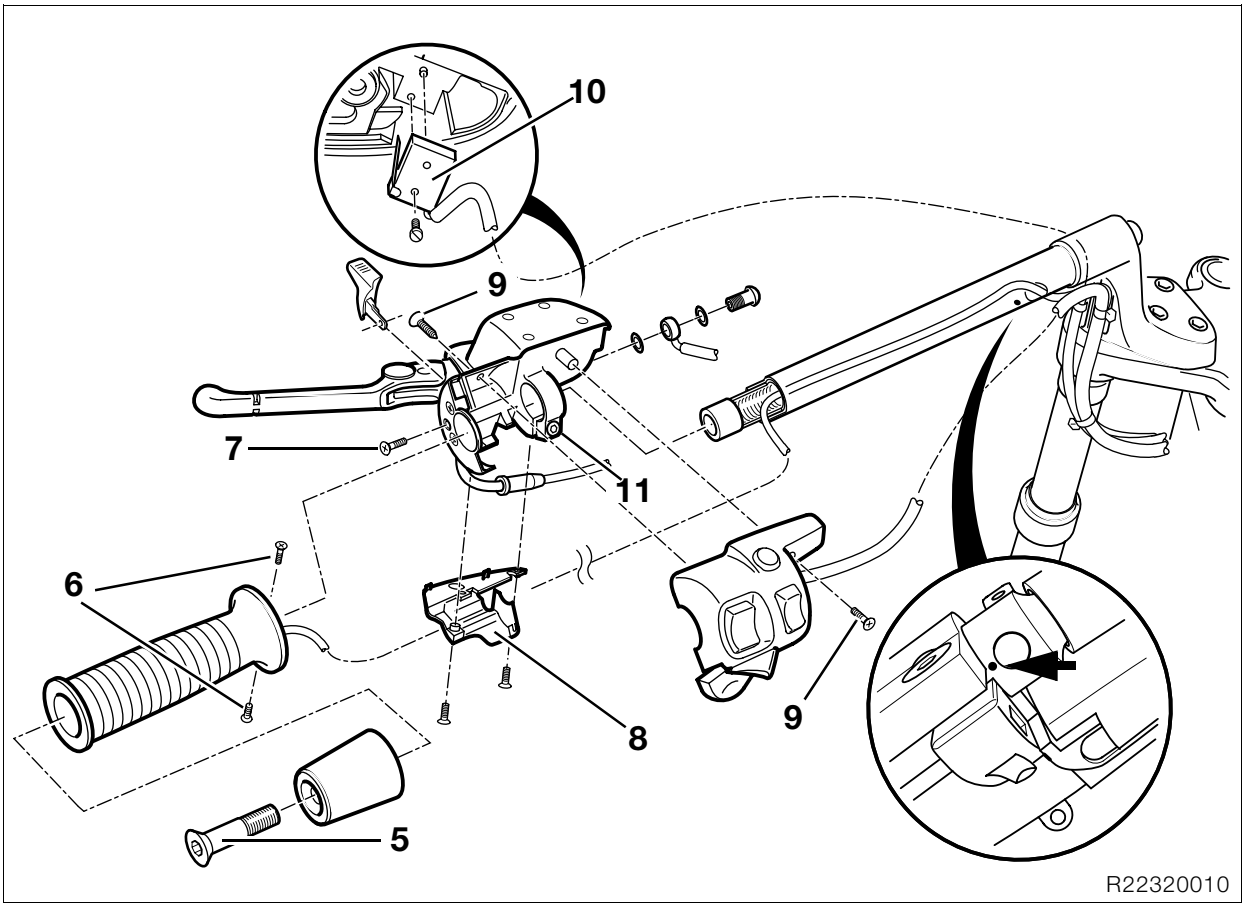




Technical Data 32 Steering		R 1150 RT
Type		Forged handlebar
Steering lock angle	°	2 X 34
Handlebar width with weights	mm (in)	773 (30.433)

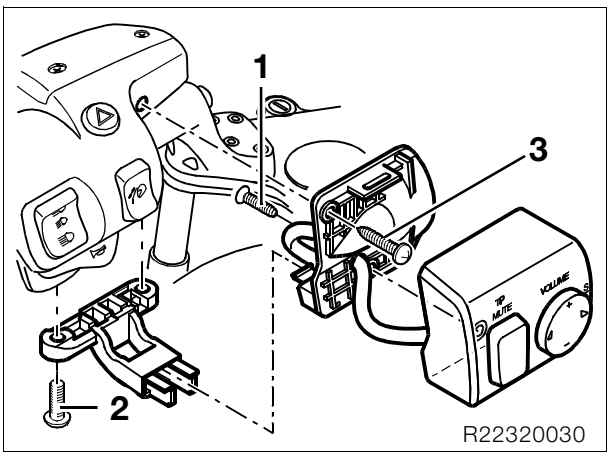




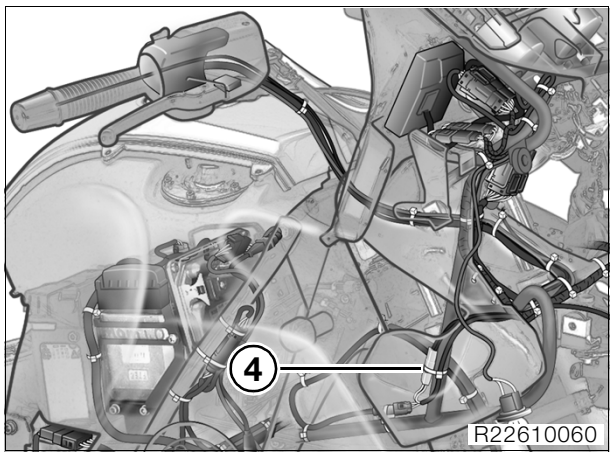


32 72 Removing and installing handlebar grip unit

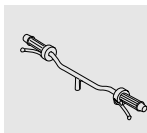
32 72 065 Removing and installing left handlebar grip unit



- **[Radio]** Remove screw (1) at handlebar remote-control unit.
- **[Radio]** Remove housing cover of handlebar remote-control unit.
- **[Radio]** Remove screws (2) and screw (3) and remove housing of handlebar remote-control unit.



- **[Heated grips]** Open cable ties of left heated grip up to plug (4).
- **[Heated grips]** Disconnect plug from heated grip.
- **[Heated grips]** Release cable shoe in connection and pull out the cable.



- Remove securing screw (5) and remove handlebar weight.
- Remove screws (6) securing handlebar grip.

Note:
[Heated grips] When removing the heated grip, attach a wire to the end of the cable and pull the wire into the hole in the handlebar.

- Pull off the grip.
- Remove securing screw (7) and remove lever for starting-speed increase.
- Disengage Bowden cable for starting-speed increase.
- Remove the lower section (8) of the clutch lever fitting.
- If necessary, remove screws (9) securing multi-function switch.
- Remove clutch switch (10).

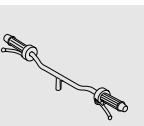
Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle - brake fluid destroys paint.

- Drain the clutch operating system (➟ 00.54).
- Disconnect clutch line from handlebar fitting.
- Loosen securing screw (11) for the clutch fitting and remove the fitting.
- Installation is the reverse of the removal procedure.

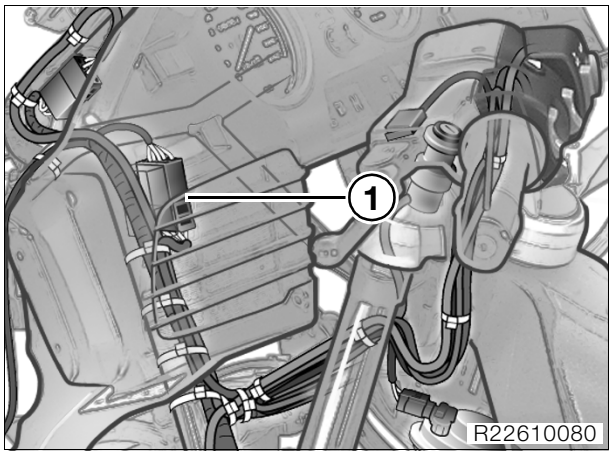
Attention:
Make sure that all lines and cables are correctly routed.
Align the punch mark (arrow) on the handlebar with the gap between the clamp blocks.

- Fill and bleed the clutch operating system (➟ 00.54).

Tightening torque:
Clutch line to clutch handlebar fitting ..... 14 Nm
Handlebar weight to handlebar..... 21 Nm

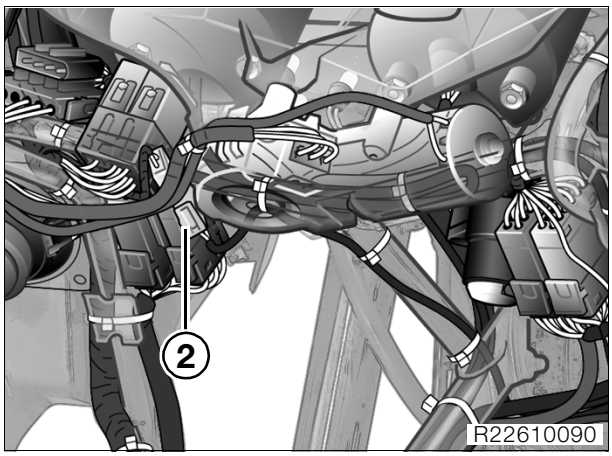


61 31 063 Removing and installing left multi-function switch

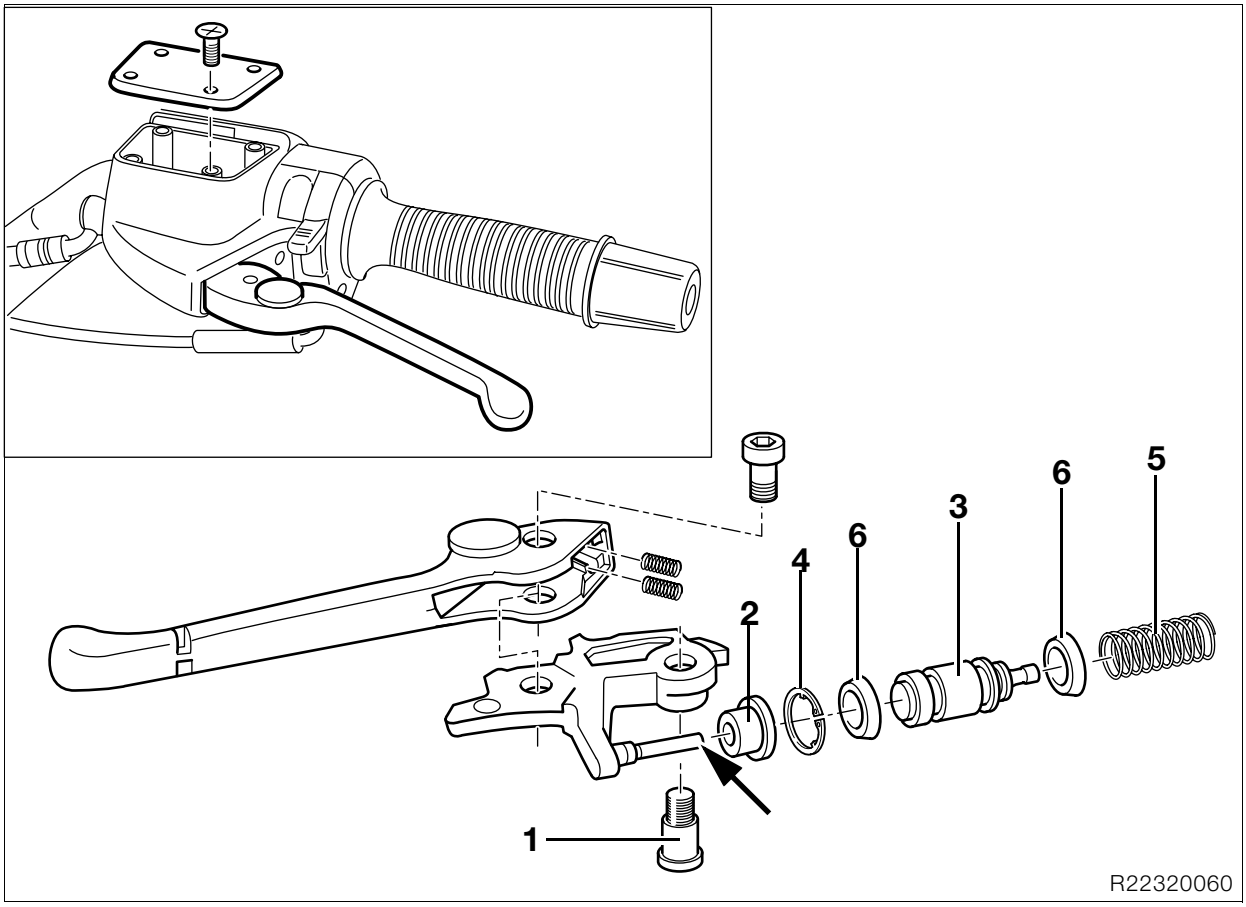


- Release left multi-function switch from grip unit.
- Release cable for left multi-function switch.
- Disconnect plug for left multi-function switch (1).
- Installation is the reverse of the removal procedure.

61 31 295 Removing and installing clutch switch



- Remove right side panel.
- Remove inside trim.
- **[Radio]** Remove right loudspeaker.
- Release cable for clutch switch.
- Disconnect plug for clutch switch (2).
- Remove the lower section of the clutch lever fitting.
- If necessary, remove screws securing multi-function switch.
- Remove clutch switch.
- Installation is the reverse of the removal procedure.



32 72 Removing and installing clutch piston in handlebar fitting

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle - brake fluid destroys paint.

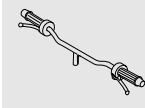
- Drain the clutch operating system (➟ 00.54).
- Release the cable from the left handlebar.
- **[Radio]** Release housing of handlebar remote-control unit from grip unit.
- Remove the lower section of the clutch lever fitting.
- Remove the handlebar weight.

Attention:
[Heated grips] Make sure there is no tensile strain on the cable of the heated grip.

- **[Heated grips]** Release the grip and pull it slightly out.
- **[Without heated grips]** Remove grip.
- Disengage Bowden cable for starting-speed increase.
- Release housing for starting speed increase from grip unit, pull grip slightly out and turn it.
- Remove pivot screw (1) of lever and remove the lever.
- Remove rubber boot (2).

Attention:
Note that clutch piston (3) is spring-loaded.

- Carefully press back clutch piston (3) using an Allen key with T-bar handle, for example, and remove retaining ring (4).
- Remove clutch piston (3) with spring (5).



- Installation is the reverse of the removal procedure: pay particular attention to the following.
- Prior to installation, coat the piston and the boots (6) with brake fluid.

Attention:
Sealing lips of the boots (6) toward the pressure chamber.

- Prior to installation, carefully press back the clutch piston using an Allen key with T-bar handle, for example.
- Use cranked-tip snap-ring pliers to install the retaining ring, and check that the ring is seated correctly.
- Apply a light coat of **Optimoly MP 3** to the pressure pin (arrow) on the lever.

Attention:
When installing the clutch lever, make sure that the metal tab on the microswitch is correctly positioned (otherwise switch will not work).

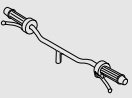
- Fill and bleed the clutch operating system (➠ 00.54).
- Adjust blow-by clearance at handlebar fitting for clutch.
- Fully assemble the fitting.

Tightening torque:
Hand lever bearing screw..... 11 Nm
(Tuflok Blue thread-locking compound; screw can be released and tightened a number of times)

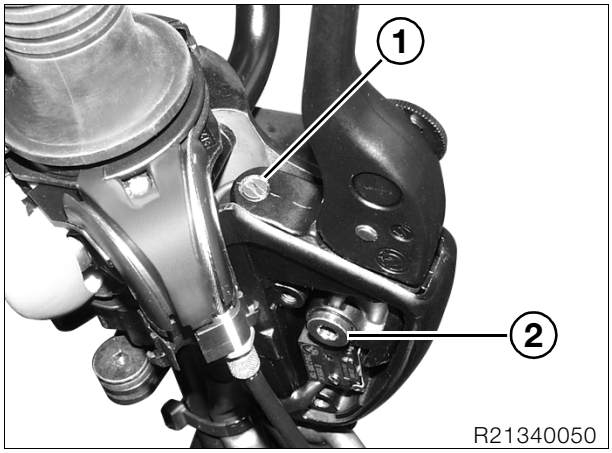
Adjusting blow-by clearance at handlebar fitting for clutch

- Release the cable from the left handlebar.
- **[Radio]** Release housing of handlebar remote-control unit from grip unit.
- Remove the lower section of the clutch lever fitting.
- Remove the handlebar weight.

Attention:
[Heated grips] Make sure there is no tensile strain on the cable of the heated grip.



- **[Heated grips]** Release the grip and pull it slightly out.
- **[Without heated grips]** Remove grip.
- Disengage Bowden cable for starting-speed increase.
- Release housing for starting speed increase from grip unit, pull grip slightly out and turn it.

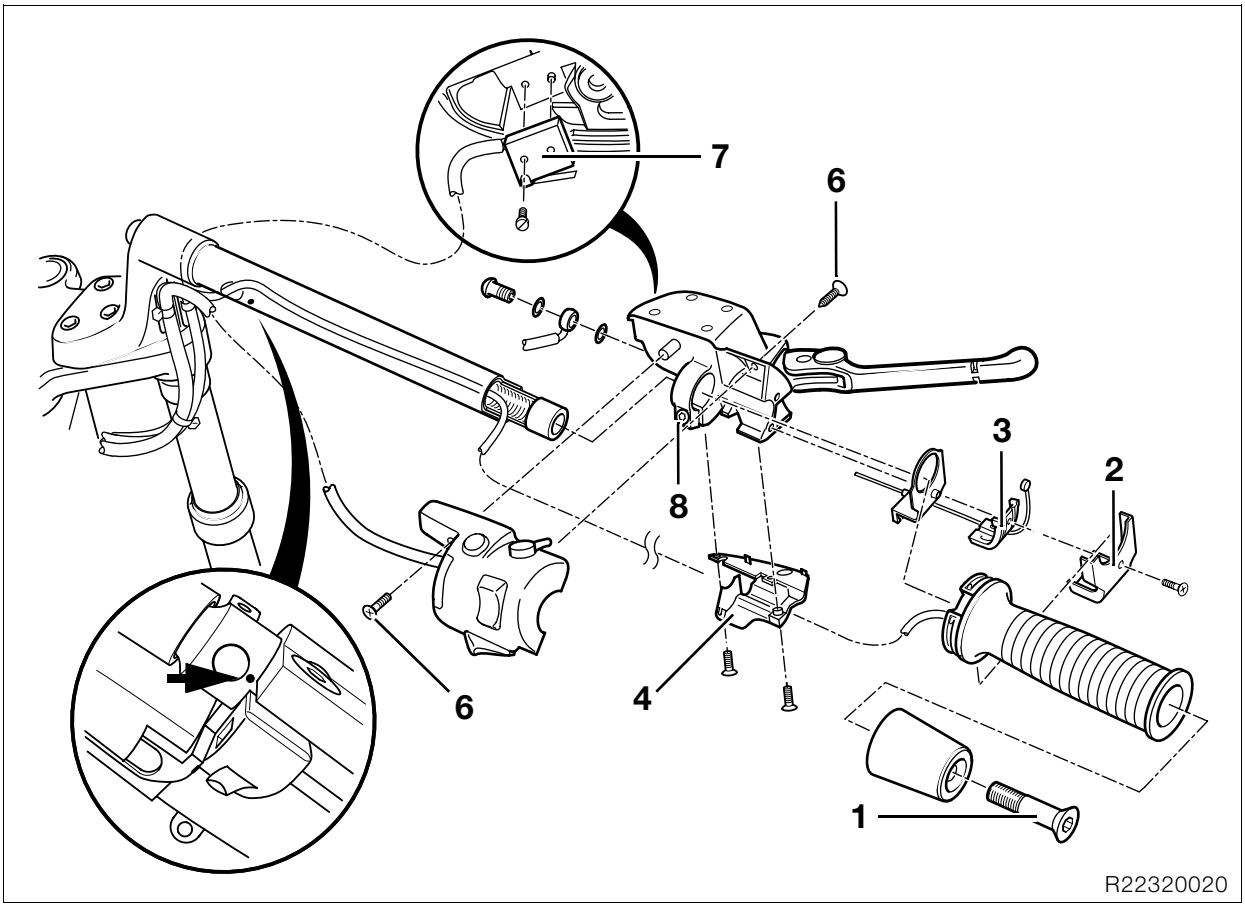


- Back off adjusting screw (1).

Note:
Thread is secured with Loctite, if necessary heat slightly prior to facilitate removal.

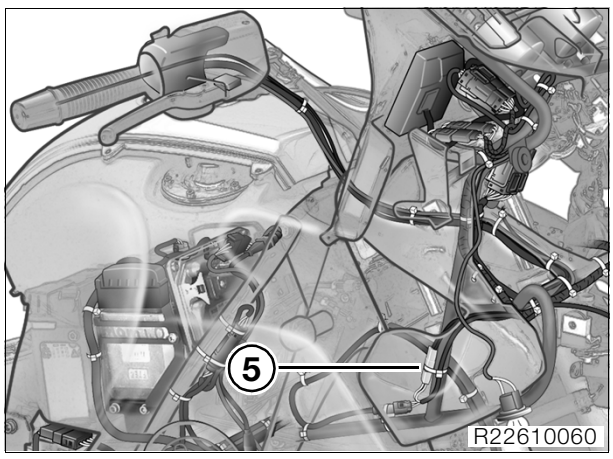
- Remove pivot screw (2) of lever and remove the lever.
- Clean and degrease the threads of the adjusting screw.
- Coat the threads of the adjusting screw with **Loctite 648** or **Loctite 270** and screw it a few turns into the lever.
- Apply a light coat of **Optimoly MP 3** to the pressure pin of the adjusting screw.
- Install the lever, making sure that the metal tab on the microswitch is correctly positioned.
- Tighten the adjusting screw until the lever has zero play.
- Tighten the adjusting screw **another half turn**.
- Apply sealing lacquer to the adjusting screw.
- Fully assemble the fitting.

Tightening torque:
Hand lever screw bearing (2) ..... 11 Nm
(Tuflok Blue thread-locking compound; screw can be released and tightened a number of times)



32 72 110 Removing and installing right handlebar grip unit

- 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 cable.
- Remove guide (3) of throttle cable.
- Remove the lower section (4) of the brake lever fitting.



- **[Heated grips]** Open cable ties of right heated grip up to plug (5).
- **[Heated grips]** Disconnect plug from heated grip.
- **[Heated grips]** Release cable shoe in connection and pull out the cable.
- Remove securing screws (6) and remove multifunction switch.

Note:
[Heated grips] When removing the heated grip, attach a wire to the end of the cable and pull the wire into the hole in the handlebar.

- Turn the throttle twistgrip all the way forward and remove.
- Remove brake-light switch (7).

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle - brake fluid destroys paint.

- **Integral ABS** Drain front control circuit (➟ 34.19).
- Disconnect brake line from handlebar fitting.
- Loosen securing screw (8) and remove the grip unit.
- Installation is the reverse of the removal procedure.

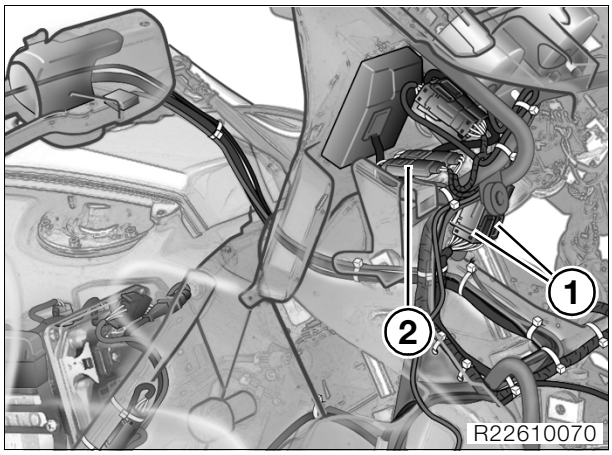
Note:
There must always be a gap of at least 1 mm (0.0394 in) between throttle twistgrip and handlebar weight (clearance for movement).

Attention:
Make sure that all lines and cables are correctly routed.
Align the punch mark (arrow) on the handlebar with the gap between the clamp blocks.

- **Integral ABS** Fill and bleed front control circuit (➟ 34.20).

Tightening torque:
Brake hose to brake lever assembly..... 18 Nm
Handlebar weight to handlebar..... 21 Nm

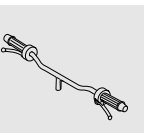
61 32 073 Removing and installing right multi-function switch

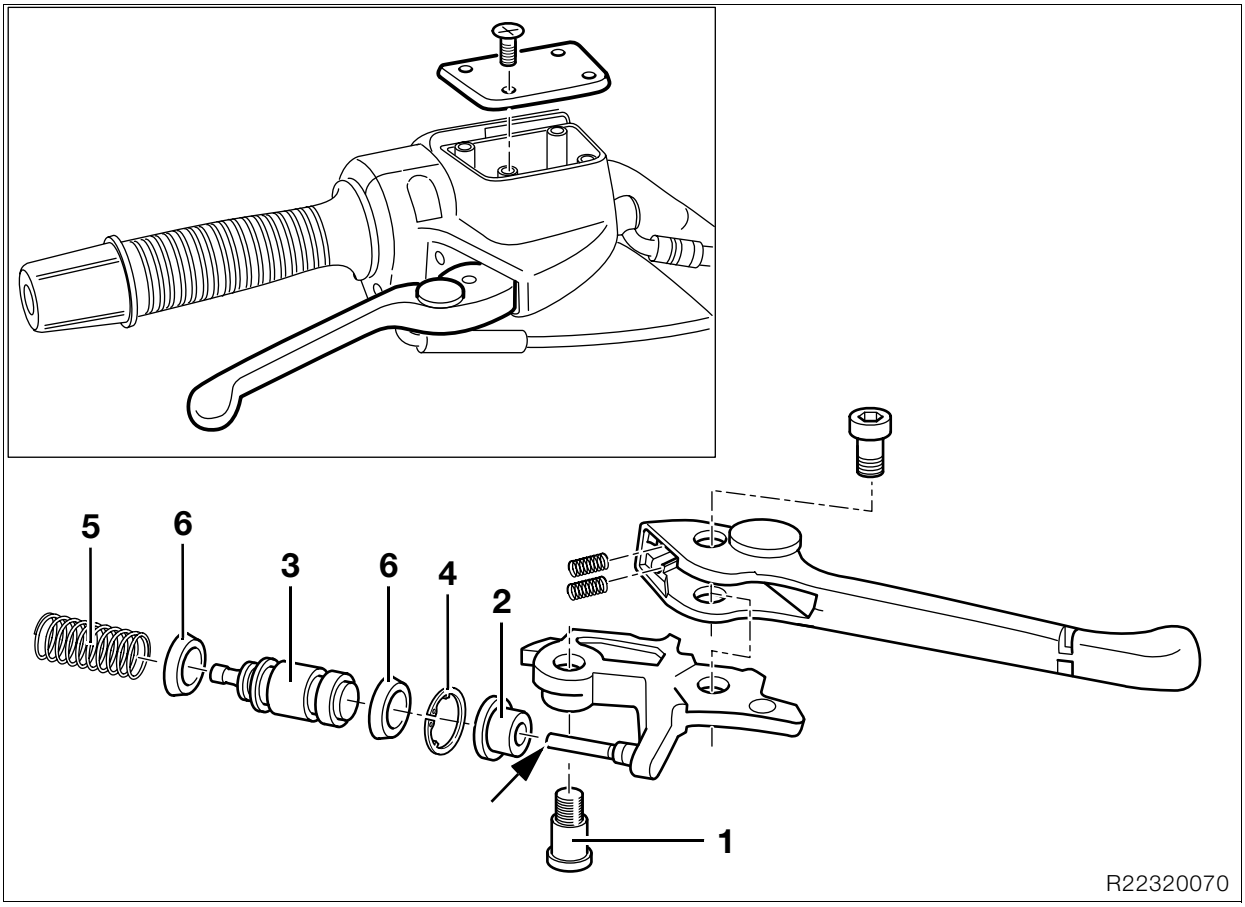


- Release right multi-function switch from grip unit.
- Release cable for right multi-function switch.
- Disconnect both plugs for right multi-function switch (1).
- Installation is the reverse of the removal procedure.

61 31 300 Removing and installing front-brake switch for brake light

- Remove right side panel.
- Remove inside trim.
- **[Radio]** Remove right loudspeaker.
- Release cable for front-brake switch for brake light.
- Disconnect plug for brake-light switch (2).
- Remove the lower section of the brake lever fitting.
- Remove brake light switch.
- Installation is the reverse of the removal procedure.





32 72 Removing and installing brake piston in handlebar fitting

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle - brake fluid destroys paint.

- **Integral ABS** Drain front control circuit (➡ 34.19).
- Remove throttle twistgrip cover.
- Back off the adjuster screw for the throttle cable and disengage the cable.
- Remove guide of throttle cable.
- Remove the lower section of the grip unit.
- Release multi-function switch from grip unit.
- Remove the handlebar weight.
- **[Heated grips]** Release cable from right handlebar.

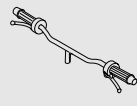
Attention:
[Heated grips] Make sure there is no tensile strain on the cable of the heated grip.

- **[Heated grips]** Turn throttle twistgrip all the way forward and pull the grip slightly out.
- **[Without heated grips]** Turn throttle twistgrip all the way forward and remove.
- Release throttle-cable relay from grip unit, pull grip slightly out and turn it.
- Remove pivot screw (1) for lever.
- Remove rubber boot (2).

Attention:
Note that brake piston (3) is spring-loaded.

- Carefully press back brake piston (3) using an Allen key with T-bar handle, for example, and remove retaining ring (4).
- Remove brake piston (3) with spring (5).
- Installation is the reverse of the removal procedure: pay particular attention to the following.
- Prior to installation, coat the piston and the boots (6) with brake fluid.

Attention:
Sealing lips of the boots (6) toward the pressure chamber.



- Prior to installation, carefully press back the brake piston using an Allen key with T-bar handle, for example.
- Use cranked-tip snap-ring pliers to install the retaining ring, and check that the ring is seated correctly.
- Apply a light coat of **Optimoly MP 3** to the pressure pin (arrow) on the lever.

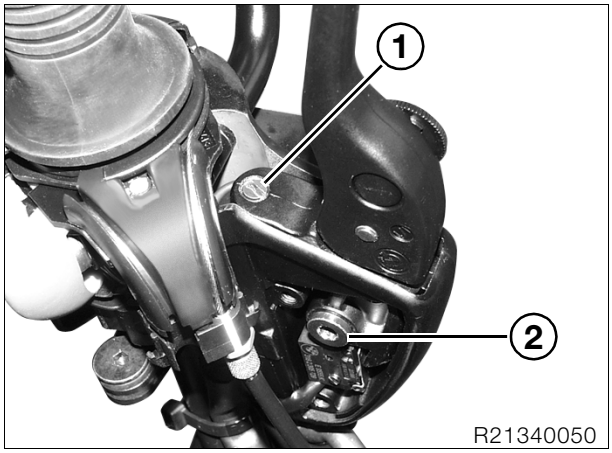
Attention:
When installing the brake lever, make sure that the metal tab on the brake-light switch is correctly positioned (otherwise switch will not work).

- **Integral ABS** Fill and bleed front control circuit (➠ 34.20).
- Adjust blow-by clearance at handlebar fitting for brake.
- Fully assemble the fitting.

Tightening torque:
Hand lever bearing screw..... 11 Nm
(Tuflok Blue thread-locking compound; screw can be released and tightened a number of times)

Adjusting blow-by clearance at handlebar fitting for brake

- Remove cover from throttle-cable relay.
- Remove the lower section of the brake lever fitting.

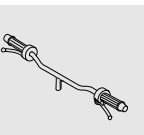


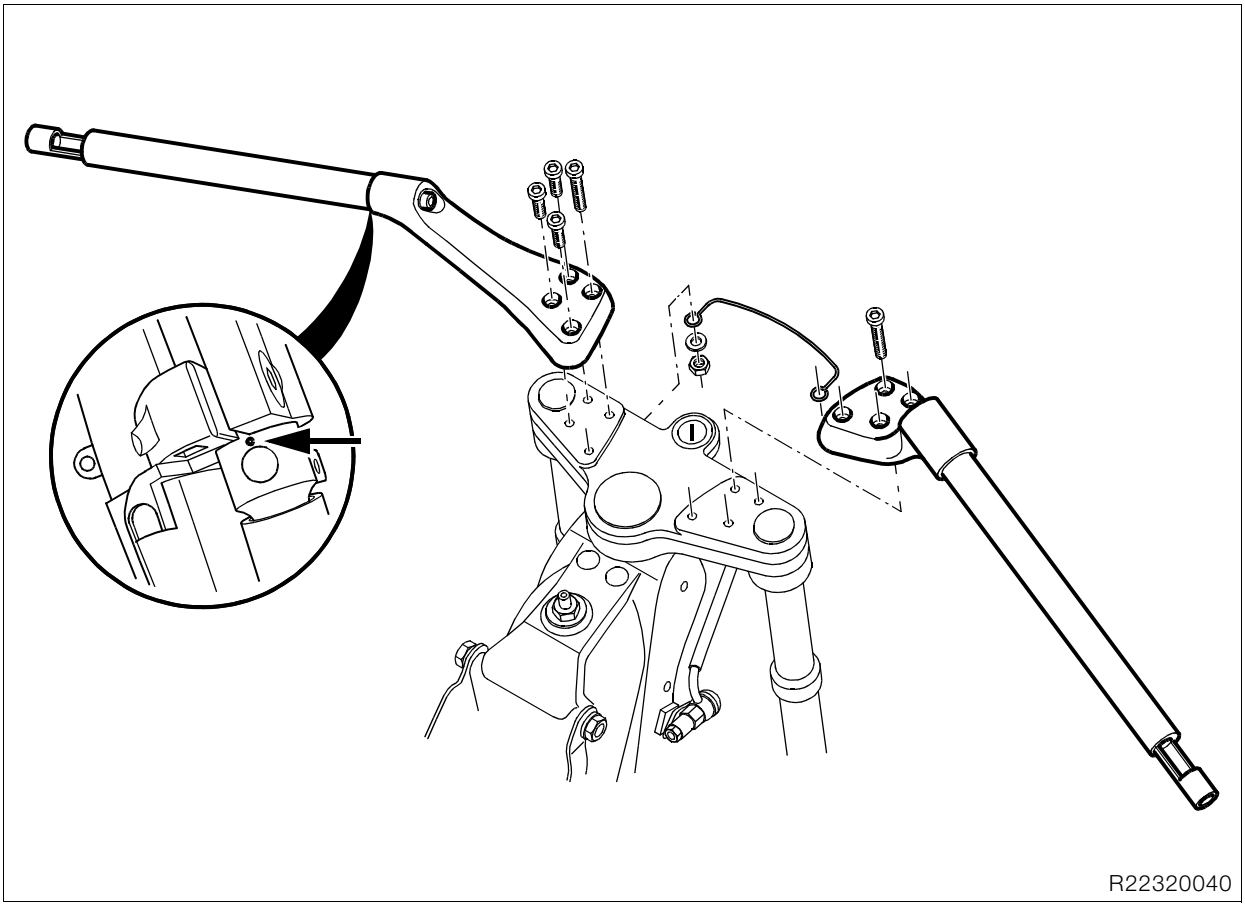
- Back off adjusting screw (1).

Note:
Thread is secured with Loctite, if necessary heat slightly prior to facilitate removal.

- Remove pivot screw (2) of lever and remove the lever.
- Clean and degrease the threads of the adjusting screw.
- Coat the threads of the adjusting screw with **Loctite 648** or **Loctite 270** and screw it a few turns into the lever.
- Apply a light coat of **Optimoly MP 3** to the pressure pin of the adjusting screw.
- Install the lever, making sure that the metal tab on the microswitch is correctly positioned.
- Tighten the adjusting screw until the lever has zero play.
- Tighten the adjusting screw **another full turn**.
- Apply sealing lacquer to the adjusting screw.
- Fully assemble the fitting.

Tightening torque:
Hand lever screw bearing (2) ..... 11 Nm
(Tuflok Blue thread-locking compound; screw can be released and tightened a number of times)





32 71 165 Removing and installing handlebars

32 71 150 Removing and installing left handlebar

Warning:
Do **not** disassemble the handlebars.

- Remove the lower section of the left grip unit.
- **[Radio]** Remove handlebar remote-control unit.
- Release left multi-function switch from grip unit.
- **[Heated grips]** Remove left heated grip.
- Release fastener securing left handlebar to fork bridge.

Attention:
To prevent air from entering the hydraulic system, keep the grip unit horizontal.

- Slacken left handlebar grip unit.
- Remove left handlebar, remove grip unit and keep it horizontal.
- Installation is the reverse of the removal procedure.
- Align the grip unit with the punch mark (arrow) on the handlebar.

Attention:
Make sure that all lines and cables are correctly routed.

Tightening torque:
Handlebar weight to handlebar ..... 21 Nm
Handlebars to fork bridge..... 21 Nm

32 71 160 Removing and installing right handlebar

Warning:
Do **not** disassemble the handlebars.

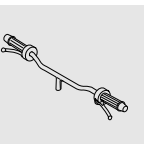
- Remove the lower section of the right grip unit.
- Release right multi-function switch from grip unit.
- **[Heated grips]** Remove right heated grip.
- Release fastener securing right handlebar to fork bridge.

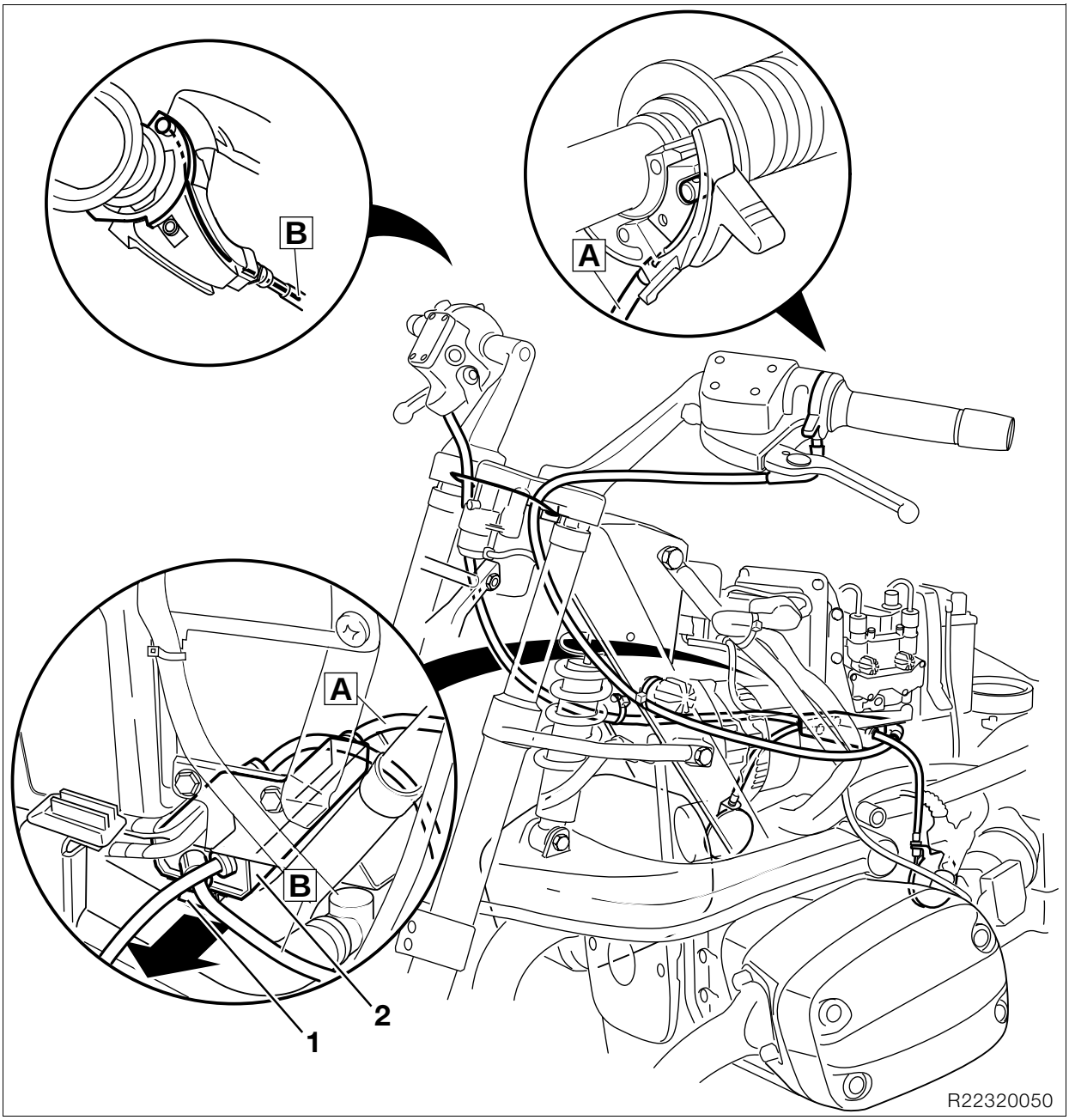
Attention:
To prevent air from entering the hydraulic system, keep the grip unit horizontal.

- Slacken right handlebar grip unit.
- Remove right handlebar, remove grip unit and keep it horizontal.
- Installation is the reverse of the removal procedure.
- Align the grip unit with the punch mark (arrow) on the handlebar.

Attention:
Make sure that all lines and cables are correctly routed.

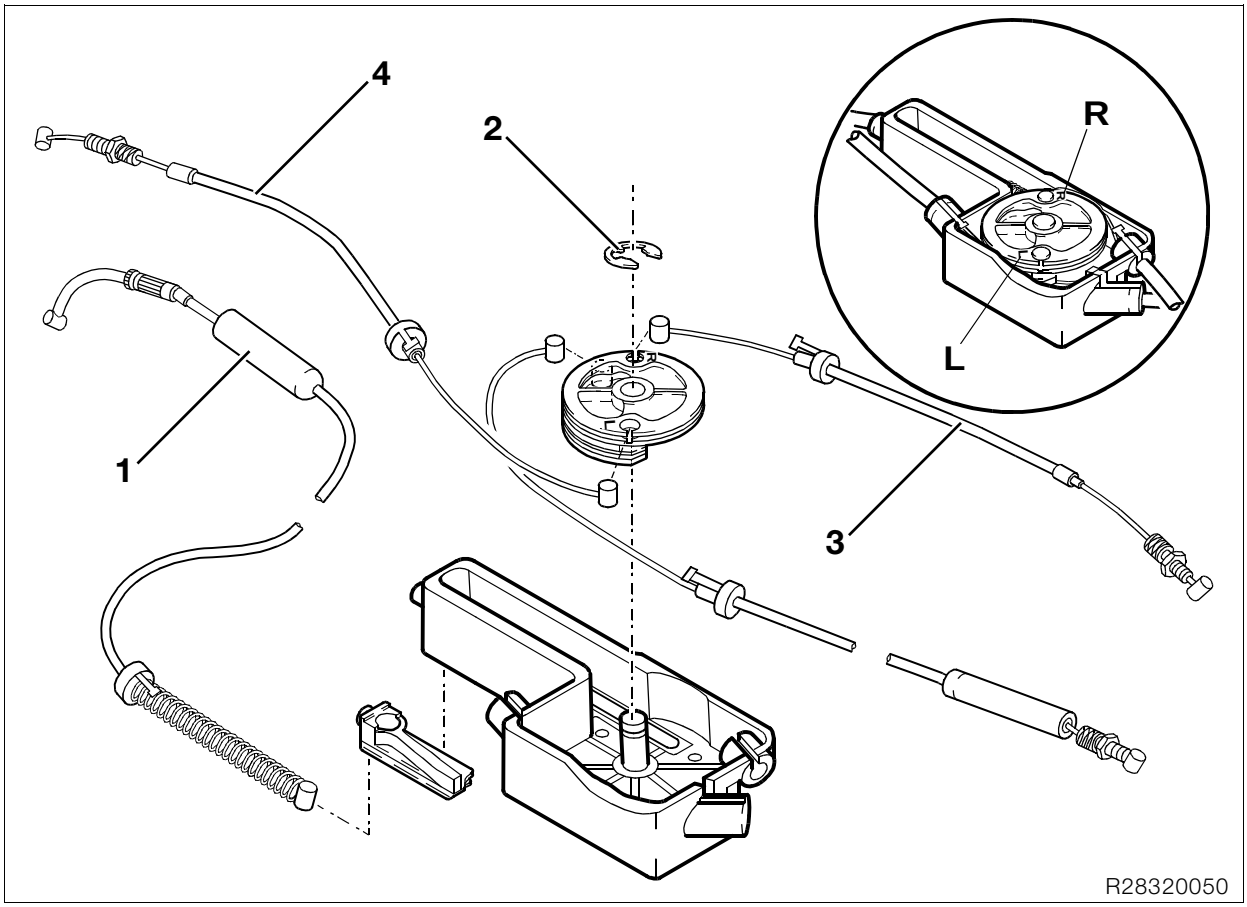
Tightening torque:
Handlebar weight to handlebar..... 21 Nm
Handlebars to fork bridge..... 21 Nm





32 73 056 Removing and installing Bowden-cable divider, Bowden cable for throttle actuation and starting-speed increase

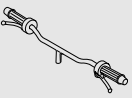
- Remove side panels.
- Remove fuel tank.
- Remove actuating cable for starting-speed increase.
- Disengage cable (A) from grip unit.
- Remove Bowden-cable shroud from fitting for throttle actuation.
- Release cable (B) and disengage it from grip unit.
- Disengage throttle cables from right and left throttle flap stubs.
- Remove cable ties securing Bowden cables.
- Release the plug for the fuel pump from the frame.
- Press down tab (1) and pull cable divider (2) out of its retainer in direction indicated by arrow.
- Installation is the reverse of the removal procedure.
- Adjust Bowden cables (➟ 00.59).



32 73 Disassembling Bowden-cable divider

- Remove fasteners of Bowden cables at entry to Bowden-cable divider.
- Remove Bowden cable for starting-speed increase (1).
- Remove retainer (2) and remove roller of Bowden-cable divider.
- Remove Bowden cables.
- Prior to installation, clean housing of Bowden cable divider, pulley, and wedge for starting-speed increase, and **do not grease**.
- Installation is the reverse of the removal procedure.

Note:
The Bowden cable to the right throttle valve (3) is shorter than the cable to the left throttle valve (4).



Attention:
Make sure that Bowden cables are free of kinks. Do not kink the strands of the Bowden cables when installing.

- Adjust Bowden cables (➟ 00.59).

33 Rear wheel drive

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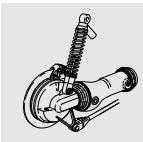

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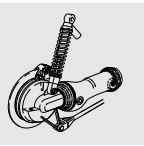
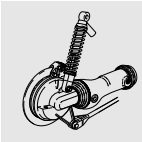
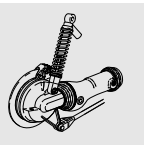
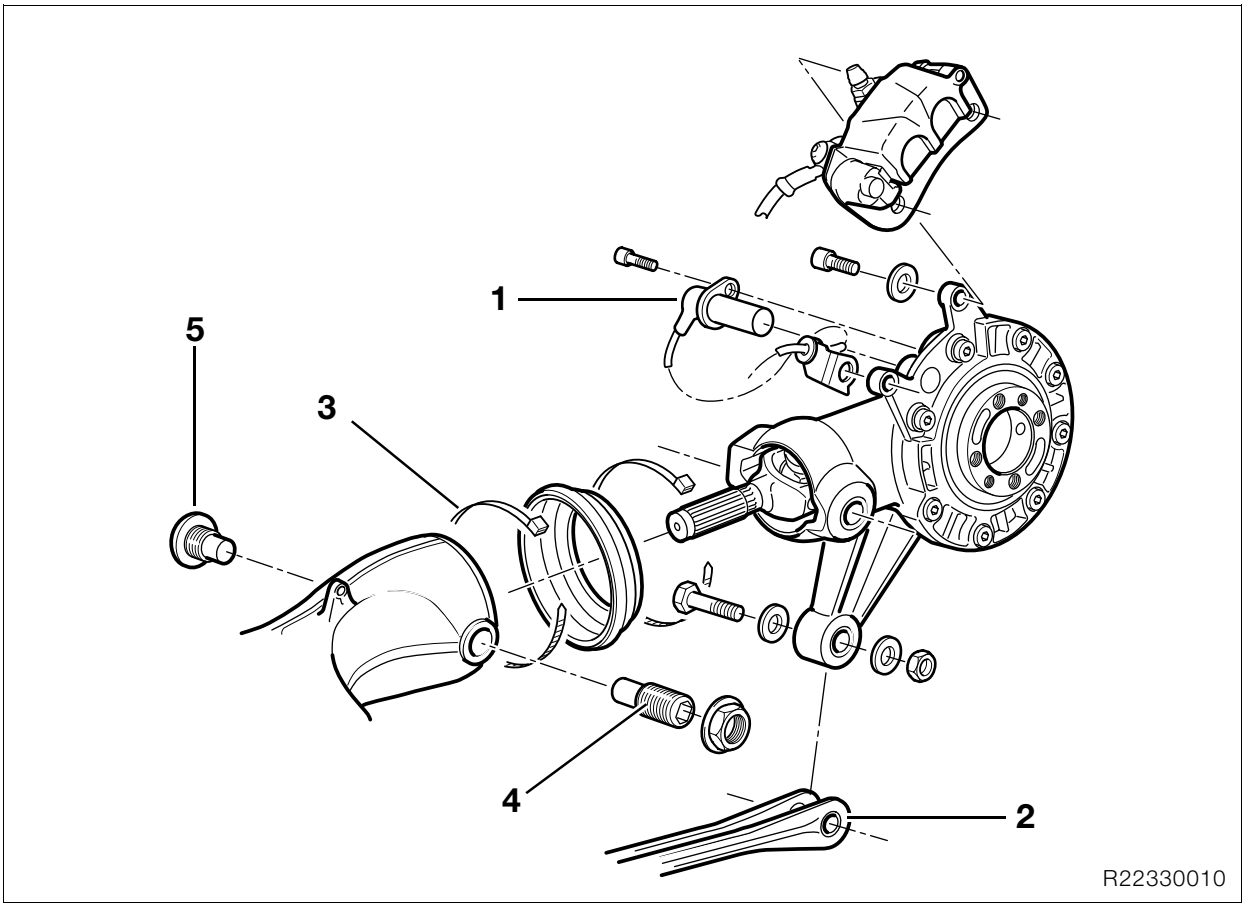


Technical Data 33 Rear wheel drive		R 1150 RT
Rear wheel drive		
Type		Bevel gears
Oil grades		Brand name hypoid-gear lubricant SAE 90 API GL 5
Capacity	l (Imp. pint/US quart)	approximately 0.25 (0.44/0.27) (to the bottom of the filler neck thread)
Gear tooth pattern		Klingenberg-Palloid helical gearing
Gear ratio		2.91 : 1
Number of teeth		32 : 11
Backlash	mm (in)	0.07...0.16 (0.0028...0.0063)
Taper roller bearing preload	mm (in)	0.05...0.1 (0.0020...0.0039)
Drive shaft		
Type		Drive shaft with integrated torsional vibration damper and two universal joints
Swinging arm		
Type		BMW Paralever
Swinging arm length	mm (in)	506 (19.9216) (swinging arm pivot to wheel centre)
Rear suspension		
Type		Central spring strut with single-tube gas-filled damper (shock absorber), adjustable rebound damping and hydraulically adjustable spring preload
Total spring travel at wheel	mm (in)	135 (5.3150)







33 10 Removing, disassembling, reassembling and installing rear wheel drive

33 10 Removing rear wheel drive

- If necessary, drain the oil from the rear wheel drive.

Warning:
Integral ABS When removing and installing the brake calipers, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➟ 00.44).

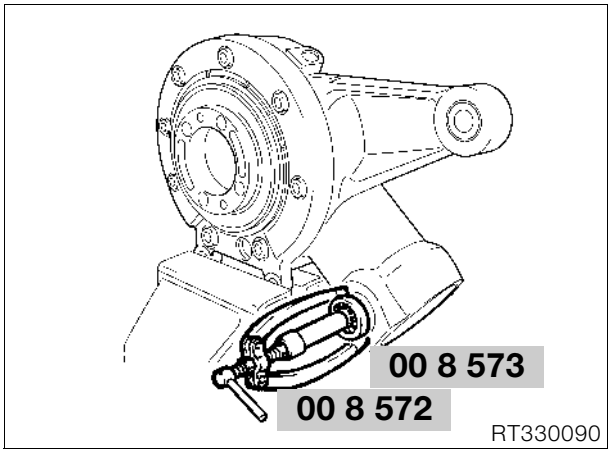
- Remove the brake caliper and secure it to the rear frame with a cable strap.
- **Integral ABS** Remove sensor (1).
- Remove rear wheel.
- Loosen reaction link (2) at the rear wheel drive.
- Remove retainer (3).
- Push the flexible gaiter to the rear.
- Swinging-arm bearing studs are secured with Loctite: heat to max. 120 °C (248 °F) to release.
- Loosen floating bearing stud bolt (4).
- Loosen fixed bearing stud bolt (5).
- Remove fastener securing reaction link (2) to rear wheel drive.
- Remove floating bearing/fixed bearing stud bolts.

Note:
Do not damage the inner races of the needle roller bearings; remove separately if necessary.

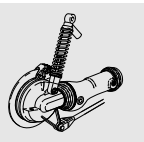
- Remove rear wheel drive from universal shaft.

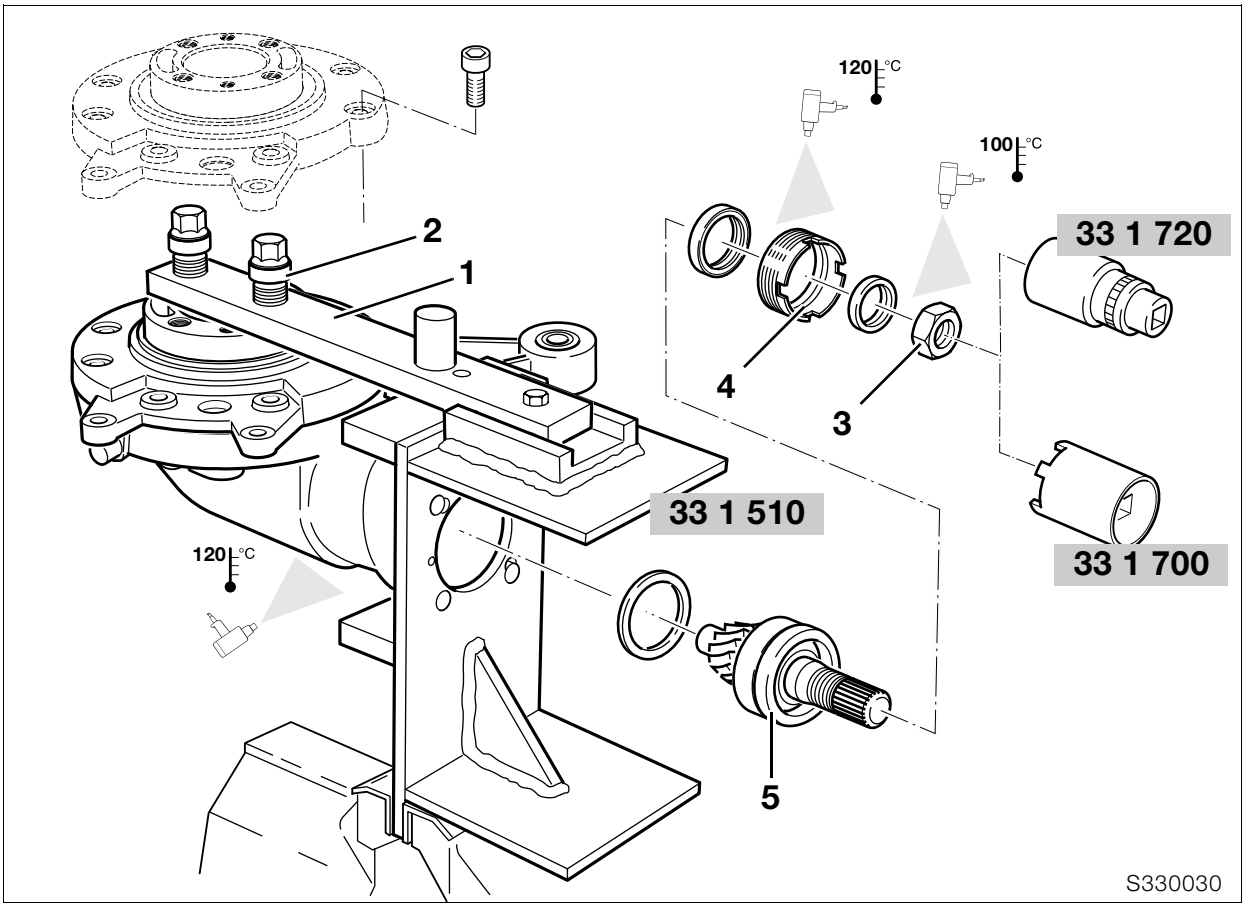
Note:
Do not lay oil-filled rear wheel drive on its side before installing, or else oil will escape when the motorcycle is ridden (suction effect).

33 17 Removing and installing taper roller bearing in rear wheel drive

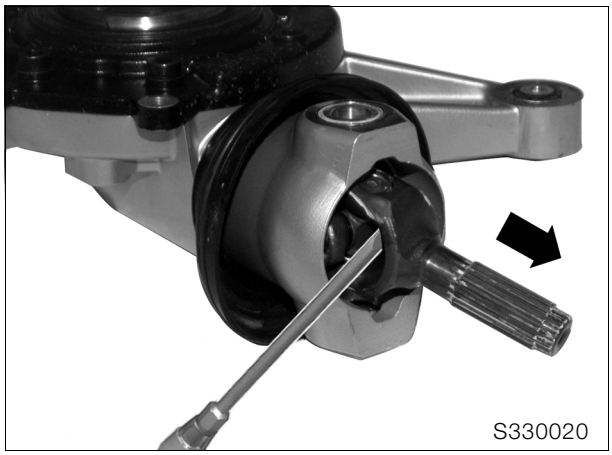


- Remove needle roller bearing with counter-support 22/1, **BMW No. 00 8 572**, and internal puller 21/4, **BMW No. 00 8 573**, with ring support.
- Heat neck of housing to 120 °C (248 °F).
- Press in needle roller bearing with inner race with driver, **BMW No. 36 3 700**.





33 12 Removing input bevel pinion



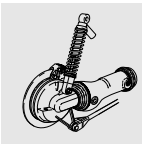
- Press out splined section of shaft.
- If necessary, remove/install circlip.
- Remove retaining strap and pull off the flexible gaiter.
- Bolt the final-drive unit to the assembly stand, **BMW No. 33 1 510/511**.
- Bolt the locking arm (1) to the retaining fixture.
- Tighten grub screws until they are seated.

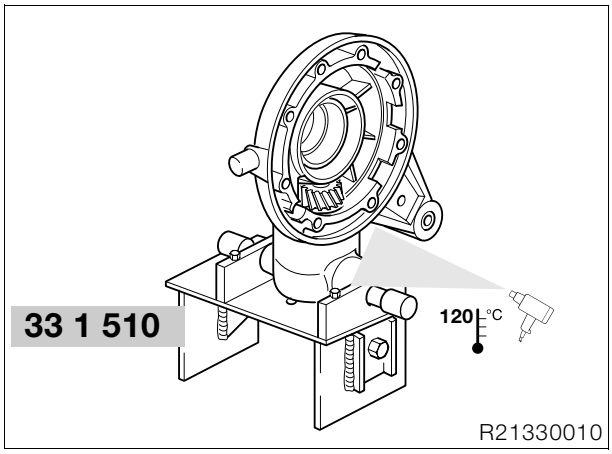
Attention:
The grub screws must not project, or the neck of the housing could be damaged.

- Screw home threaded sleeves (2) in rear wheel drive unit, then tighten with wheel studs.
- Heat hex nut (3) on the input bevel gear to 100 °C (212 °F), and unscrew with 36 mm socket wrench insert and reducing adapter, **BMW No. 33 1 720**.

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

- Heat the housing to max. 120 °C (248 °F) and remove threaded ring (4) with pin wrench, **BMW No. 33 1 700**.
- To remove input bevel pinion (5), remove the crown wheel (➟ 33.12).



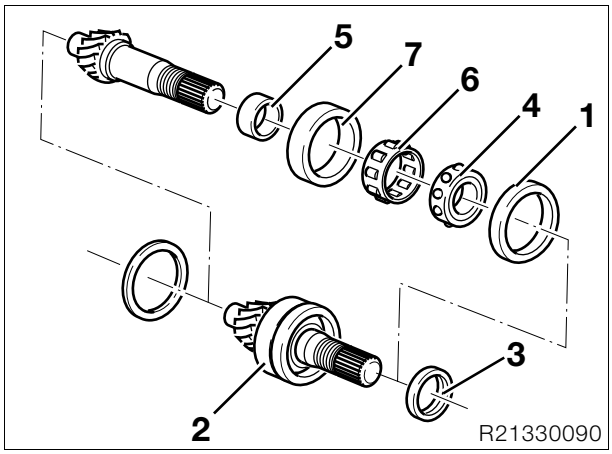


- Position rear wheel drive upright with retaining fixture, **BMW No. 33 1 510**.

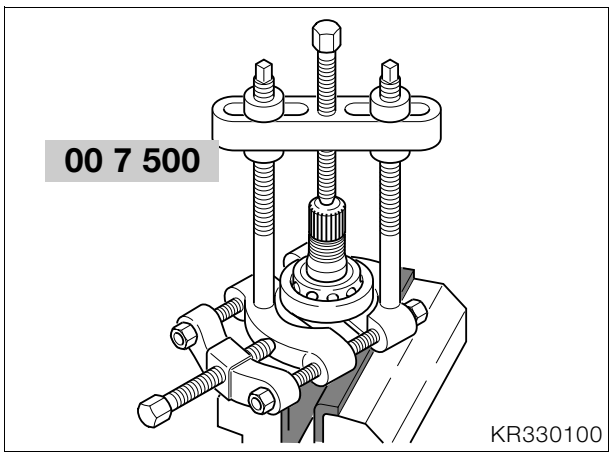
Attention:
To prevent the input bevel pinion from being damaged when it falls out, use a soft underlay.

- Heat the housing until the input bevel pinion is released (max. 120 °C/248 °C) and drops out.
- Remove the input bevel pinion and the spacer.

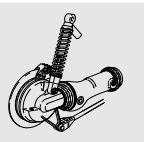
33 12 Disassembling input bevel pinion

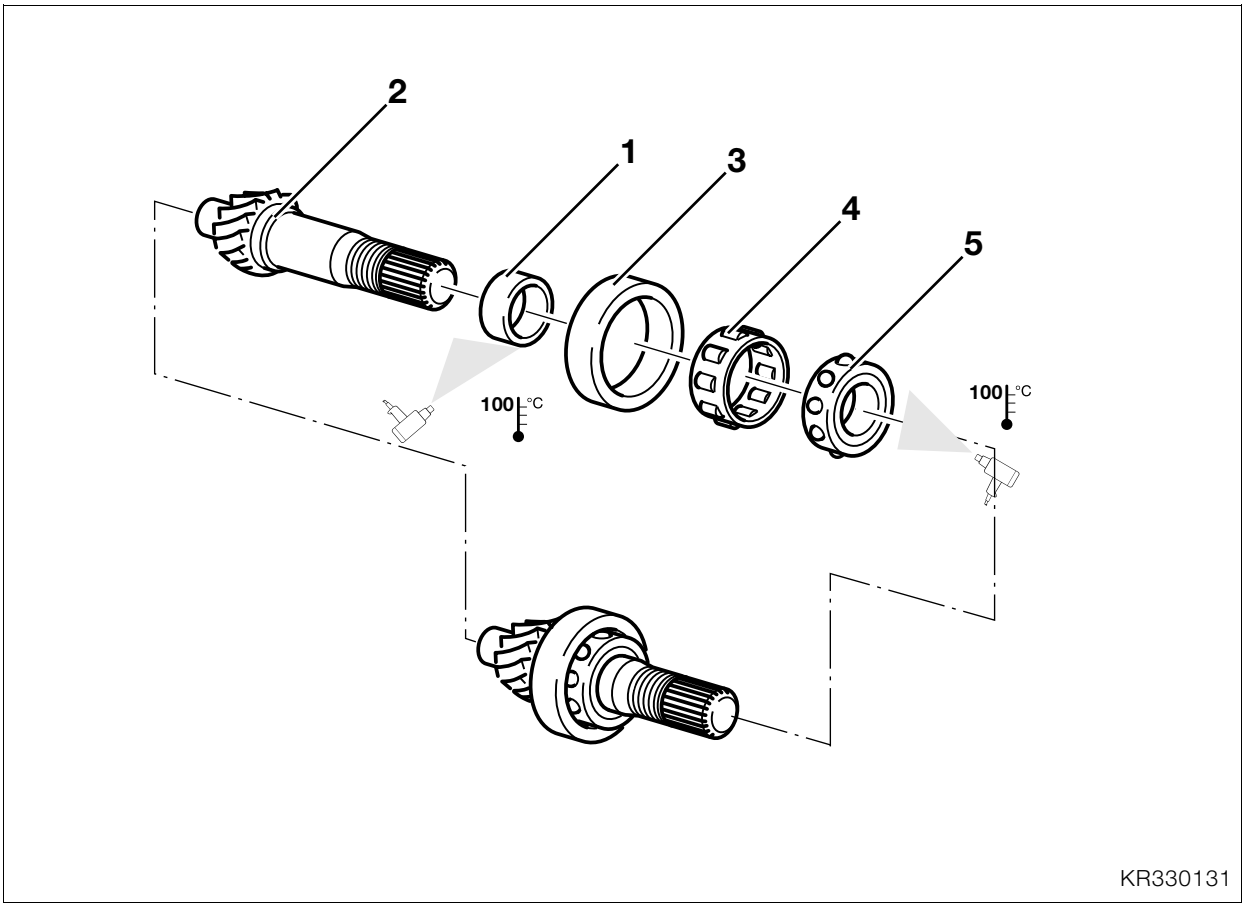


- Remove outer bearing race (1).
- Clamp input bevel pinion (2) into vise with protective jaws (splines facing upwards).

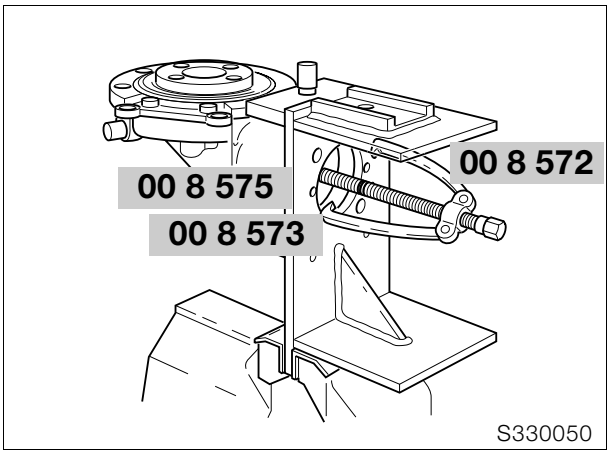


- Using puller, **BMW No. 00 7 500**, pull off both bearings at the same time.
- Remove thrust ring (3).
- Remove ball thrust bearing (4), inner race (5), roller bearing cage (6) and outer race (7).





33 12 Removing needle roller bearing for input bevel pinion



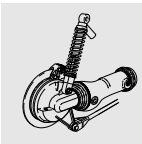
- Heat the housing to 120 °C (248 °F).
- Remove the outer ring of the needle roller bearing using
  internal puller, **BMW No. 00 8 573**, threaded extension, **BMW No. 00 8 575**, and counter-support, **BMW No. 00 8 572**.

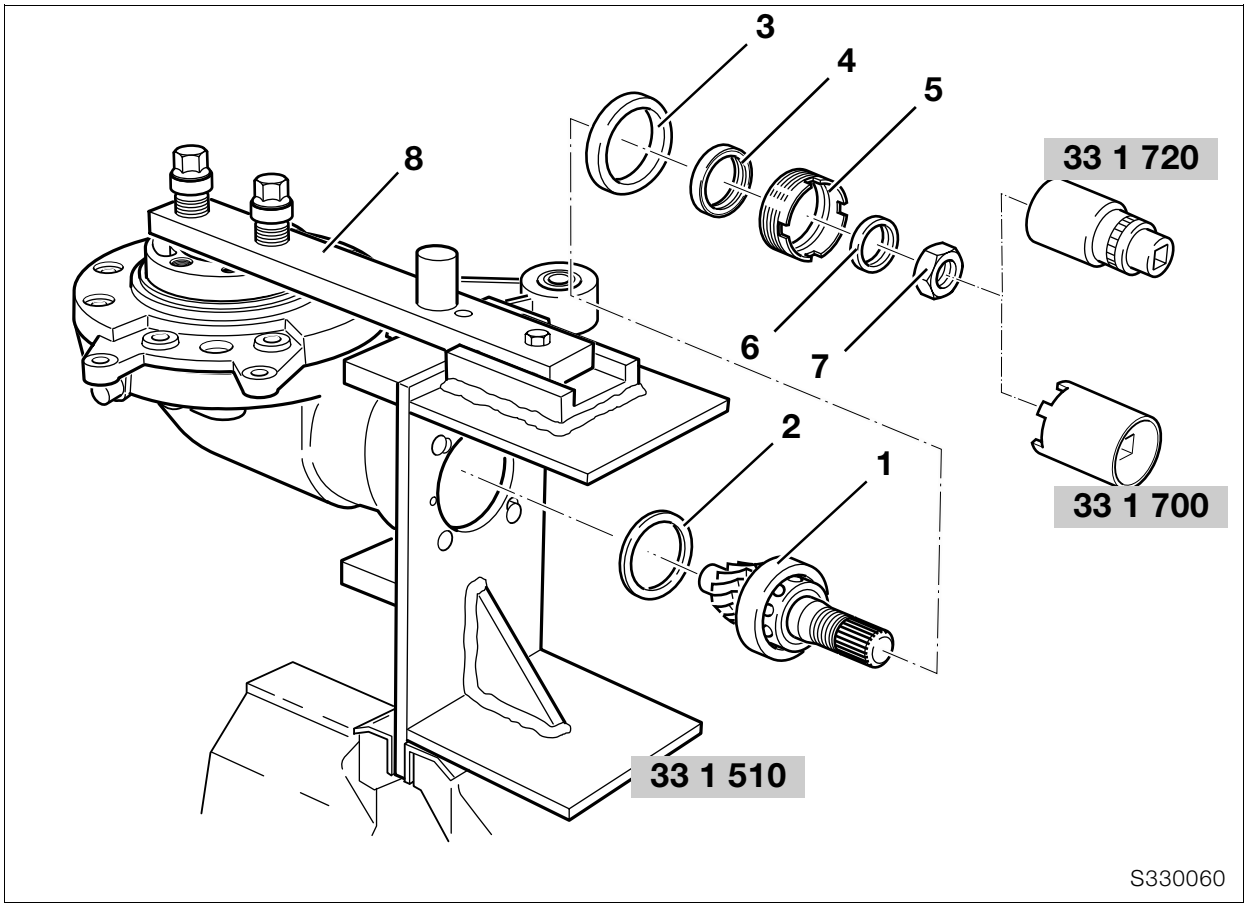
33 12 Installing needle roller bearing for input bevel pinion

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

33 12 Assembling input bevel pinion

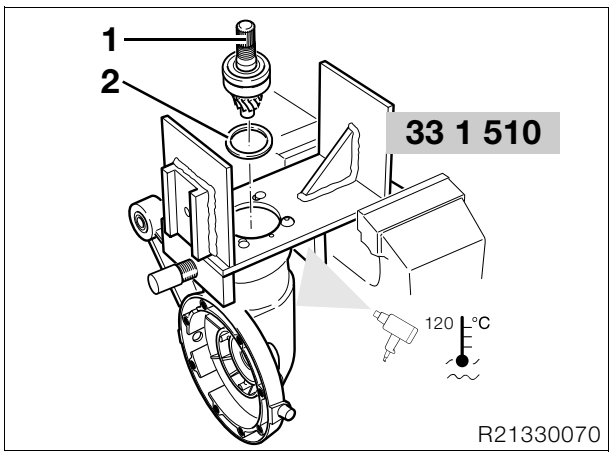
- Clean the threads of the input bevel pinion.
- Heat the inner race (1) to 100 °C (212 °F) and push onto input bevel pinion (2) as far as the stop.
- Push the outer race (3) together with the roller cage (4) on to the inner race.
- Heat ball thrust bearing (5) to 100 °C (212 °F) and push fully on to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





33 12 Installing input bevel pinion

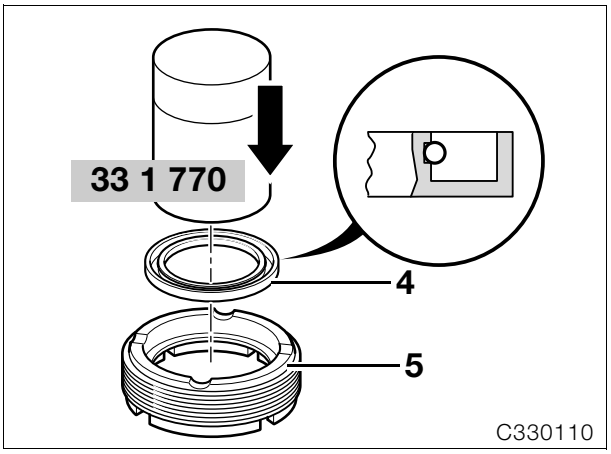
- Clean threads in the housing.



- Clamp holder, **BMW No. 33 1 510**, in the vise in such a way that the input neck of the housing is pointing vertically upward.
- Heat the neck of the housing to max. 120 °C (248 °F).

Note:
Chill input bevel pinion prior to installation in refrigerator/freezer or similar, or use cooling spray.

- Install spacer (2).
- Install input bevel pinion (1) from above.
- Clamp on the retainer, **BMW No. 33 1 510**, with the drive-side housing extension toward the front.
- To secure the input bevel pinion, install the crown gear with housing cover.
- Secure locking arm (8) to holder, **BMW No. 33 1 510**.
- Insert outer race (3).



- Lightly oil the sealing ring (4) at the sealing lip and round the outer edge.
- Press/drive sealing ring into threaded ring (5) with drift, **BMW No. 33 1 770**.
- Coat the cleaned threaded ring with **Loctite 577** and tighten with pin wrench, **BMW No. 33 1 700**.
- Install thrust ring (6).

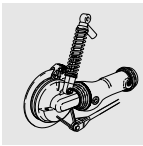
Note:
Make sure that the lip of the shaft seal is seated correctly on the thrust ring.

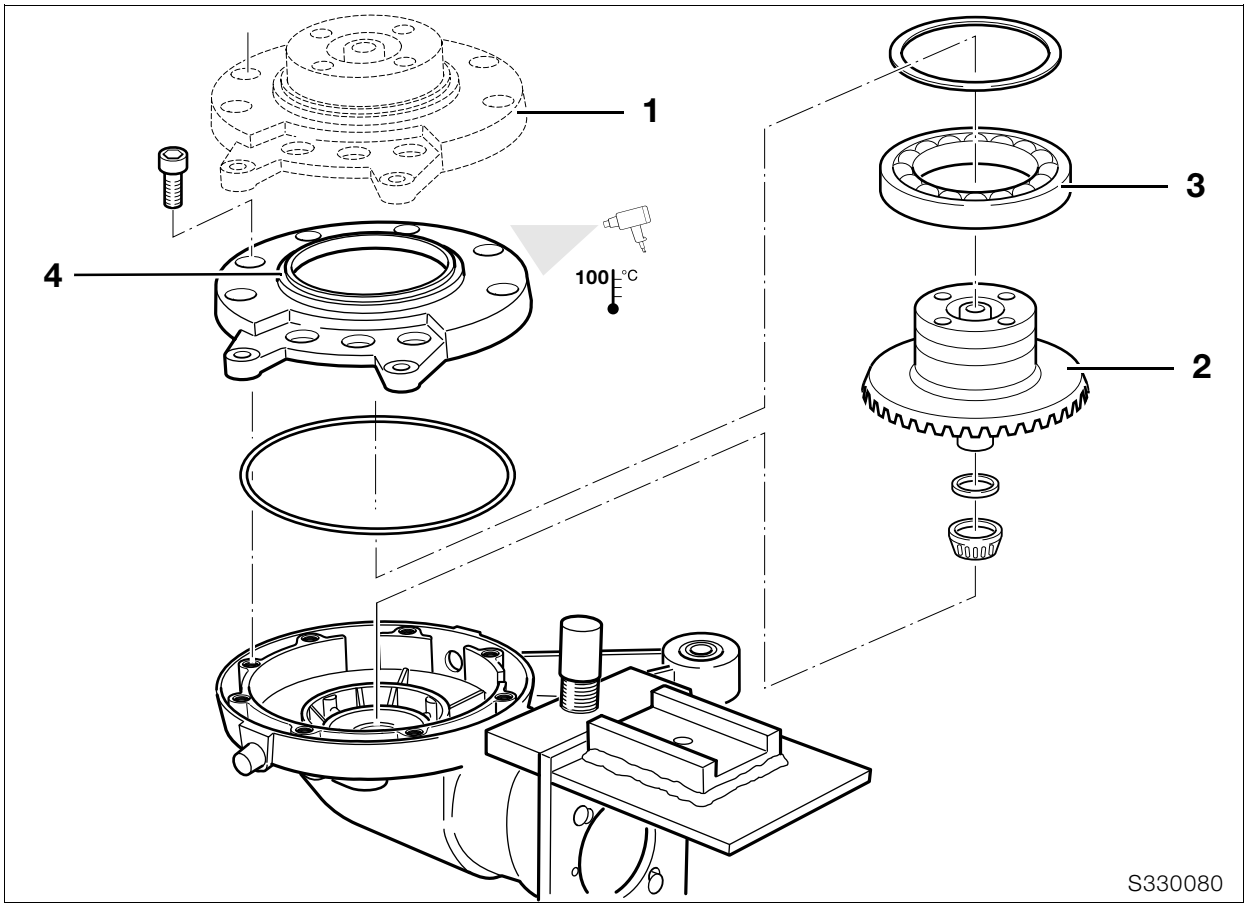
- Tighten hex nut (7) with 36 mm socket wrench insert and reducing adapter, **BMW No. 33 1 720.**

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

Tightening torque:

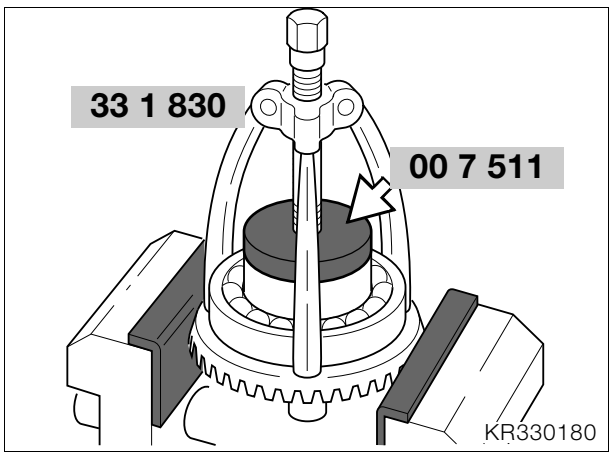
Housing cover	35 Nm
Threaded ring (clean thread + Loctite 577)	160 Nm
Nut for input bevel gear (clean thread + Loctite 2701)	200 Nm



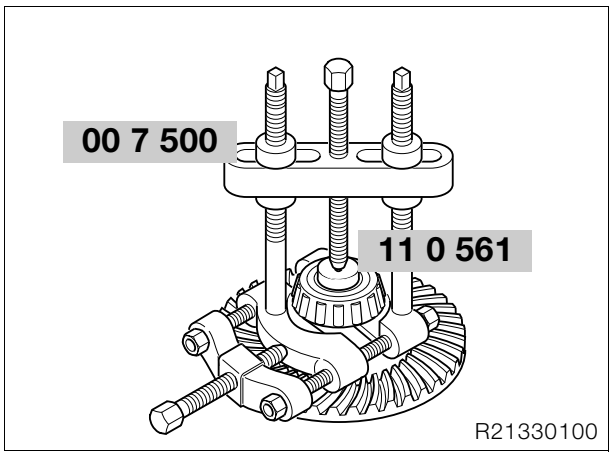


33 12 Removing and disassembling crown wheel

- 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.

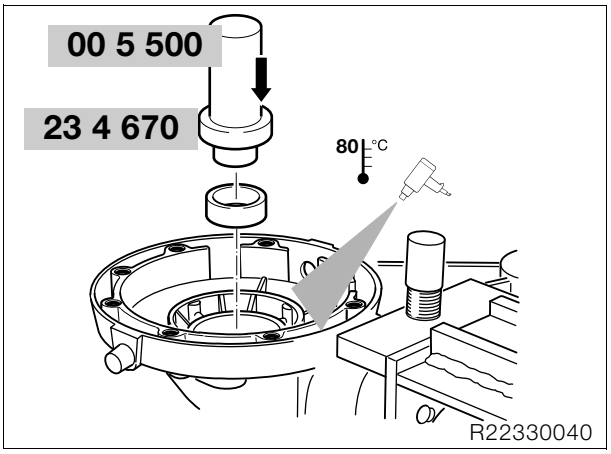


- Clamp crown wheel in vise with protective jaws.
- Insert thrust block (arrow), **BMW No. 00 7 511**.
- Using puller, **BMW No. 33 1 830**, pull off deep-groove ball bearing.



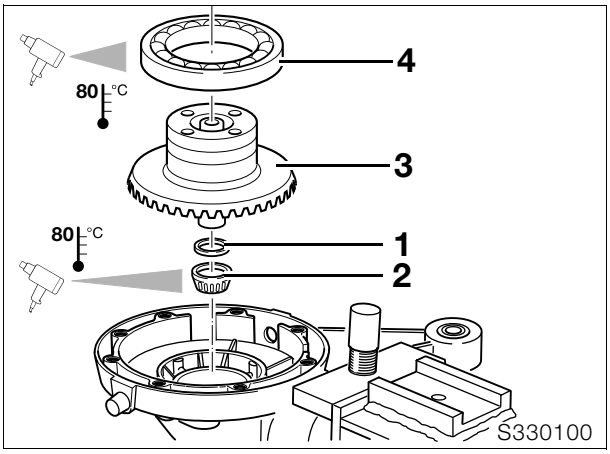
- Insert thrust block, **BMW No. 11 0 561**.
- Using puller, **BMW No. 00 7 500**, pull taper roller bearing off crown wheel.
- Turn the housing upside down and heat it until the outer ring is released and drops out (max. 100 °C/212 °F).

33 12 Assembling and 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 it gently.

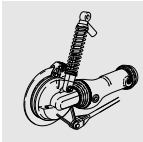
Note:
If new parts are installed (e.g. taper roller bearing), check tooth backlash and adjust if necessary.



- Place original spacer (1) or spacer measuring 2.25 mm (0.0885 in) in thickness on crown wheel (for provisional backlash).

Note:
Install spacer with bevel on inside diameter toward crown wheel.

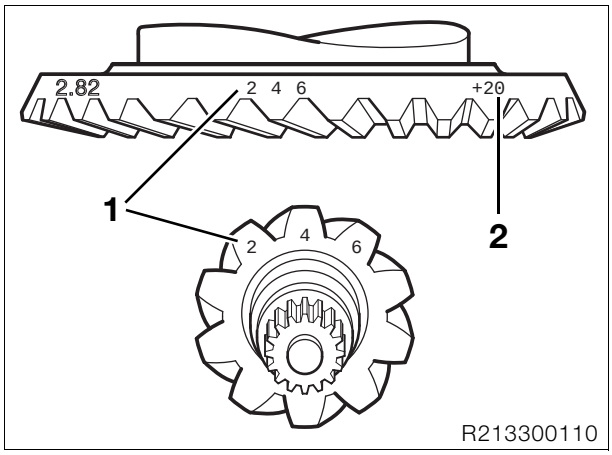
- Heat taper roller bearing (2) to 80 °C (176 °F) and push it on.
- Install crown wheel (3).
- Heat grooved ball bearing (4) to 80 °C (176 °F) and place it in position.



Shimming input bevel pinion and crown wheel

- It is important to shim the input bevel pinion and the crown wheel if the gear set or housing has been replaced.

Note:
The set number (1) for the gearset on the crown-wheel and pinion gears must always match!

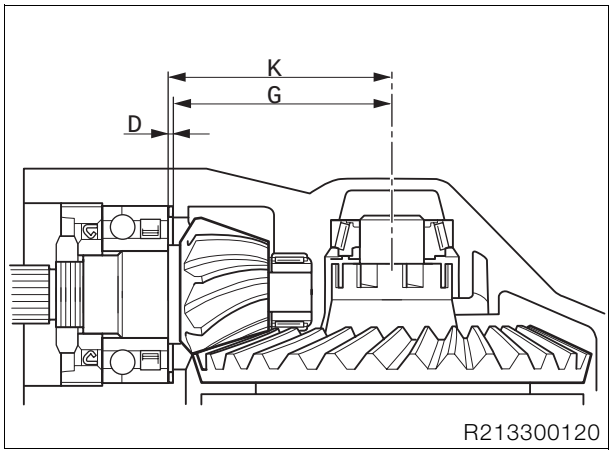


- Measure dimension **K** at the input bevel pinion, taking into account the deviation (2) with sign as stated on the crown wheel from the basic dimension of 77.50 mm (3.0512 in):

  e.g.: **K** = 77.50 mm + 0.20 mm = 77.70 mm
  (3.0512 in + 0.0079 in = 3.0590 in)

- Measure housing dimension **G**:
  If G deviates from the housing basic dimension of 75.50 mm (2.9724 in)
  the two places after the decimal point are stated on the housing neck:

  e.g.: **G** = 75.45 mm (2.9705 in)

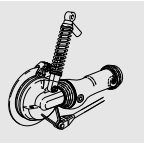


- Calculate required thickness of spacer **D**:

  D = K - G

  e.g.: **D** = 77.70 mm - 75.45 mm = **2.25 mm**
  (3.0590 in - 2.9705 in = **0.0886 in**)

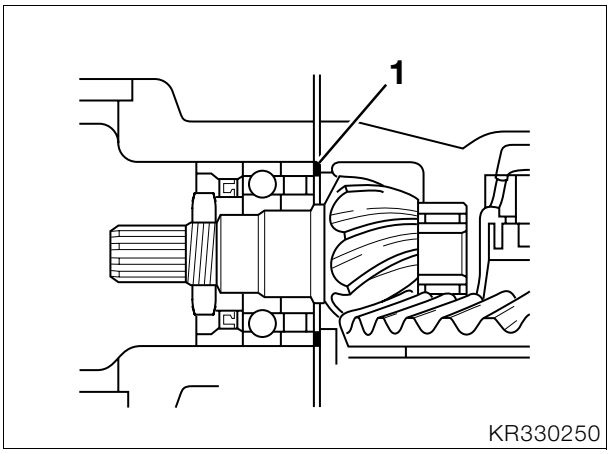
Note:
If no deviation is indicated on the crownwheel and no dimension is indicated on the housing, then the unit conforms to the baseline dimensions, meaning that the required shim thickness is 2 mm (0.0787 in) (77.5 mm-75.5 mm/3.0512 in-2.9724 in) .



Checking tooth contact pattern

- The contact pattern must be checked whenever the gearset, the housing or the drive pinion bearing is replaced.

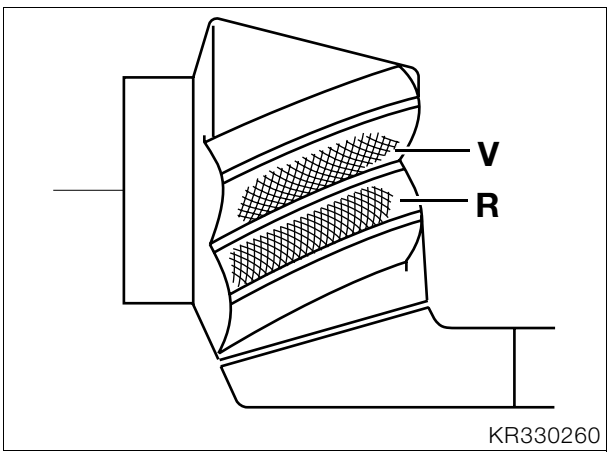
Note:
Before checking the contact pattern, make sure that tooth backlash (provisional, if necessary) is correct.



KR330250

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

- Clean and degrease tooth flanks of crown wheel and bevel gear.
- Coat three tooth flanks of the crown wheel 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.

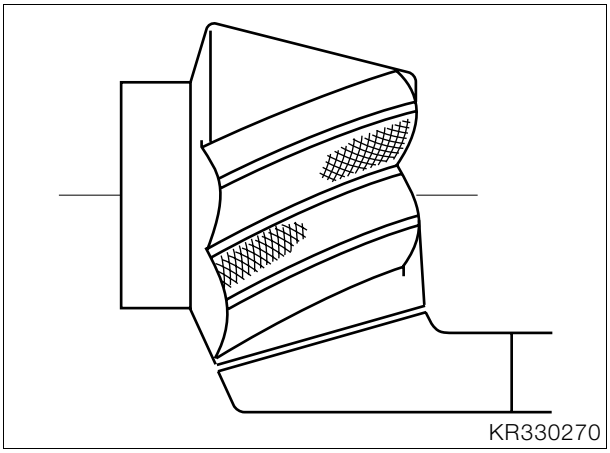


KR330260

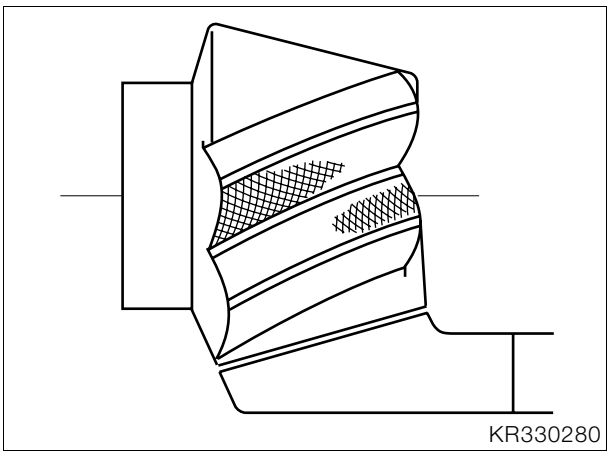
- If the correct shim is installed, the following contact pattern appears with no load applied.

Note:
The contact point is central on front flank “V”.
The contact pattern is closer to the larger diameter on trailing flank “R”.

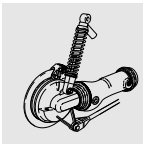
Attention:
Teeth should never make contact at the smaller diameter.


KR330270

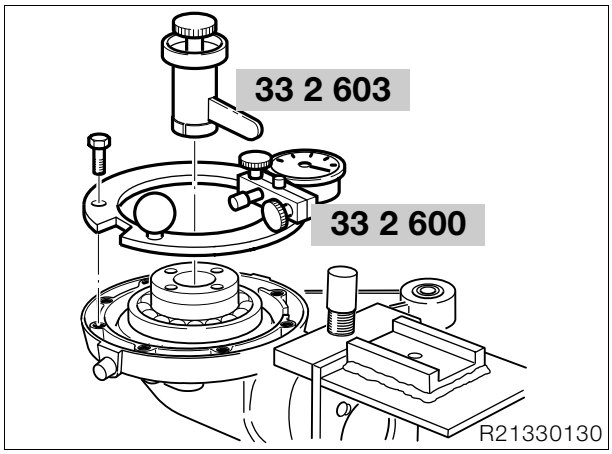
- This contact pattern indicates that a thinner spacer shim should be installed.


KR330280

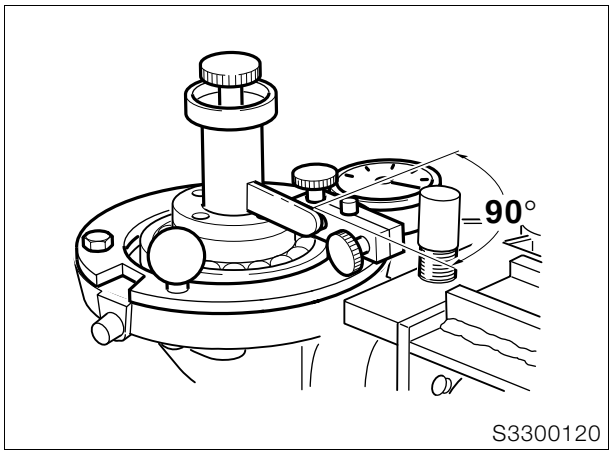
- This contact pattern indicates that a thicker spacer shim should be installed.
- Clean the tooth flanks.



33 12 Checking and adjusting backlash

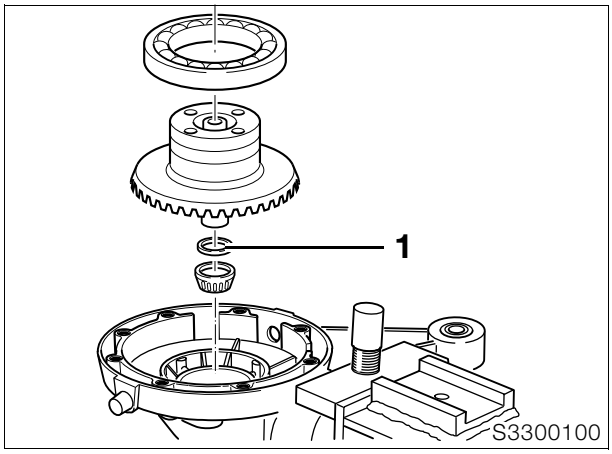


- Secure measuring device, **BMW No. 33 2 600**, with dial gauge to crown wheel and secure to housing with the knurled screw.
- Secure measuring arm, **BMW No. 33 2 603**, centrally to crown wheel.



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

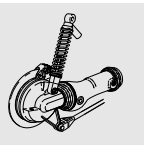
Note:
Check tooth backlash at three points 120 degrees apart; turn the bevel pinion with the crown wheel.



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

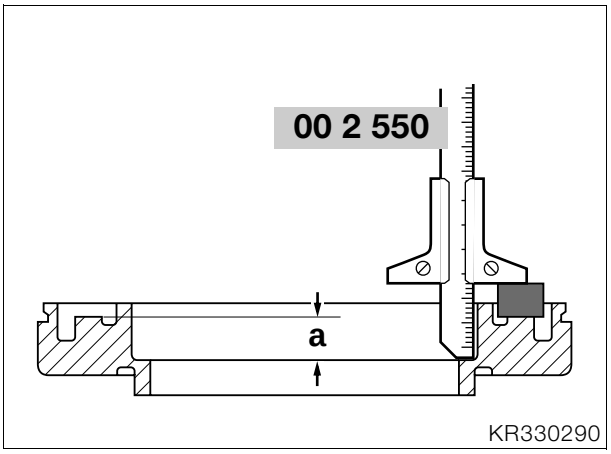
Note:
Install spacer with bevel on inside diameter toward crown wheel.

Backlash:
(Oil-free adjustment)
..... 0.07...0.16 mm (0.0028...0.0063 in)
Preliminary tooth backlash
..... 0.1...0.5 mm (0.0039...0.0197 in)

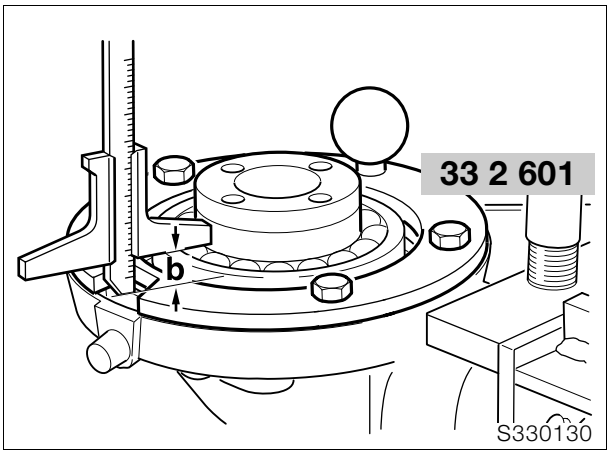


Shimming housing cover

- In order to obtain the correct taper roller bearing preload, the housing cover must be correctly shimmed.



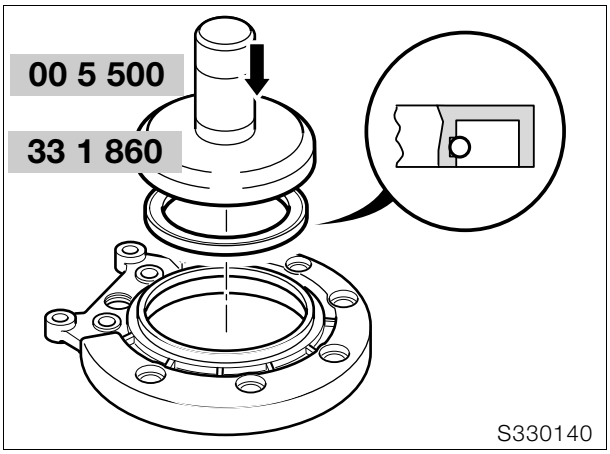
- Using depth gauge, **BMW No. 00 2 550**, measure distance “a”.



- Place measuring ring, **BMW No. 33 2 601**, in position and secure it.
- Measure the distance from the ball bearing’s outer race through the window in the measurement disc to the housing flange surface to determine dimension “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)

33 11 032 Installing housing cover



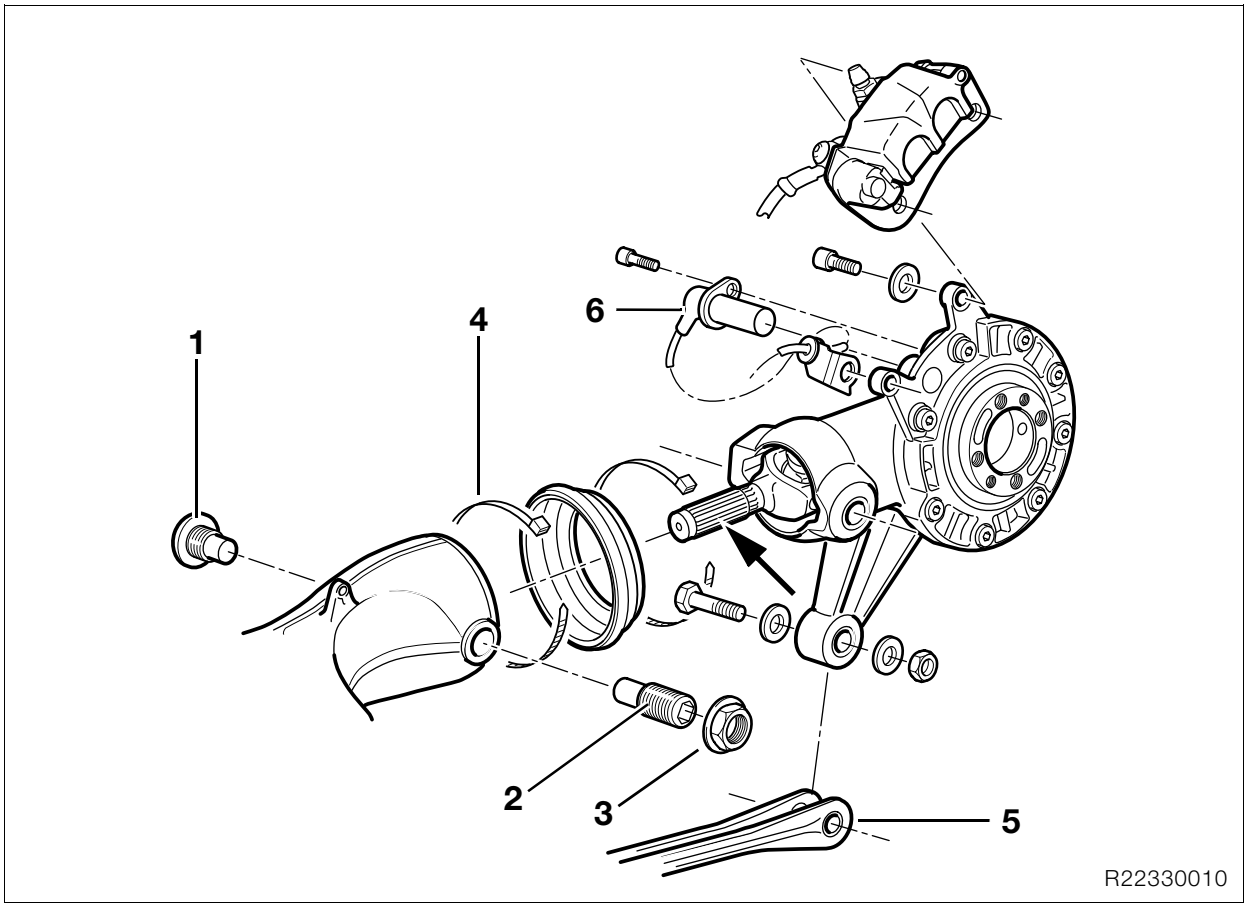
- Lightly oil the lip and outer edge of the sealing ring.
- Using drift, **BMW No. 33 1 860**, and handle, **BMW No. 00 5 500**, drive in the sealing ring.
- Heat housing cover to 80 °C (176 °F) and install.
- Tighten securing screws in diagonally opposite sequence.

Tightening torque:

Housing cover..... 35 Nm

33 12 Installing splined element

- Push the flexible gaiter on to the housing and secure it with the clamping strap.
- Coat splines on input pinion with **Staburags NBU 30 PTM**.
- Fit sliding element to drive pinion.
- Seat the retaining ring by tapping it gently (plastic hammer).



33 10 050 Installing rear-wheel drive unit

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).

- Coat splines of sliding element (arrow) with **Staburags NBU 30 PTM**.
- Install the inner races of the needle roller bearings with a small quantity of **Staburags NBU 30 PTM**.
- Place rear-wheel drive with flexible gaiter in position and introduce sliding element into universal shaft.
- Install fixed-bearing stud bolt (1) with **Loctite**.

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

Note:
Use an acetone-based cleaning agent such as
Loctite quick cleaner 706
Loctite Order No. 70636-AC

- Screw in floating bearing stud (2) with **Loctite**.

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

- Tighten fixed bearing stud (1).
- Tighten floating bearing stud (2).
- Tighten locknut (3).
- Tighten clamping strap (4) on gaiter.
- Engage strut (5).
- If necessary, fill with oil.
- Install the rear wheel.

Warning:
Integral ABS When removing and installing the brake caliper, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➟ 00.48).

- Install brake caliper.

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

- **Integral ABS** Install sensor (6).
- Load approx. 85 kg (187 lbs) onto motorcycle and tighten loose reaction link (5).

Tightening torque:

Fixed bearing stud bolt (threads cleaned + Loctite 2701)	160 Nm
Floating bearing stud bolt (threads cleaned + Loctite 2701)	7 Nm
Locknut	160 Nm
Reaction link to rear-wheel drive unit	43 Nm
Wheel studs	105 Nm
Brake caliper to rear-wheel drive unit	40 Nm

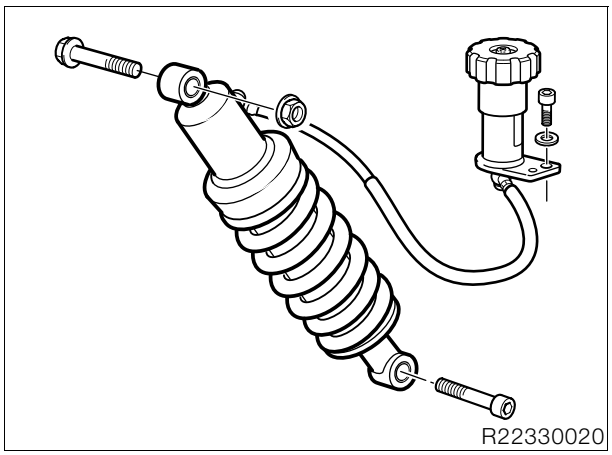
Capacity:
Initial fill/oil change ..... approximately 0.25 l ..... (0.44 Imp. pint/0.27 US quart)

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

33 53 Removing and installing spring strut

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

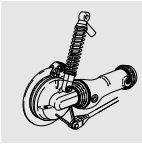
- Remove the seat.
- Slacken the fasteners of the silencer, if necessary.
- Remove rear brake caliper.
- Remove rear wheel.

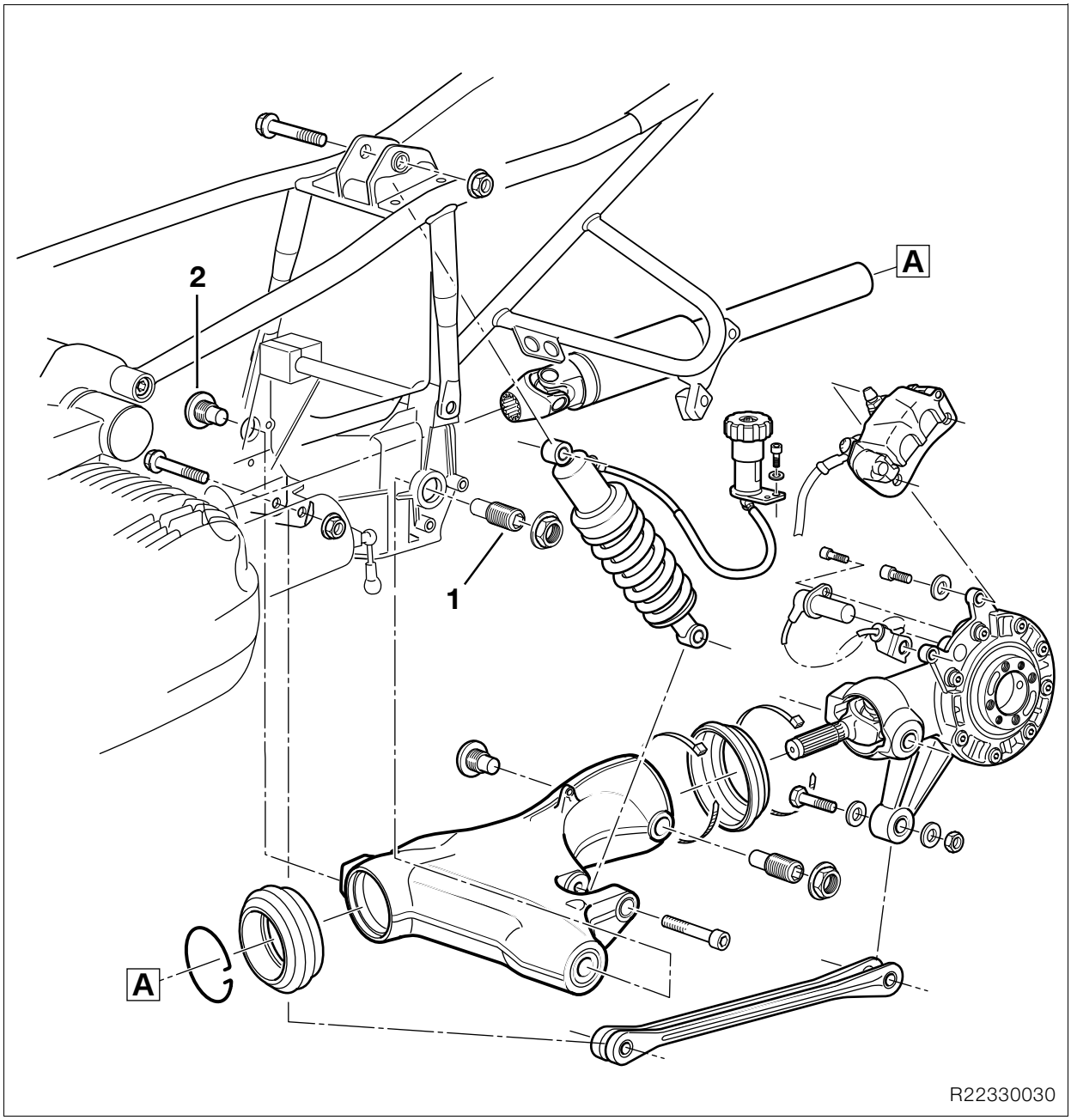

R22330020

- Remove the seat adjuster.
- Remove hydraulic spring adjuster.
- Remove spring strut.
- Installation is the reverse of the removal procedure.

Tightening torque:

Spring strut to rear frame	50 Nm
Spring strut to swinging arm (clean thread + Loctite 243)	58 Nm
Hydraulic spring preload adjuster to rear frame section	22 Nm



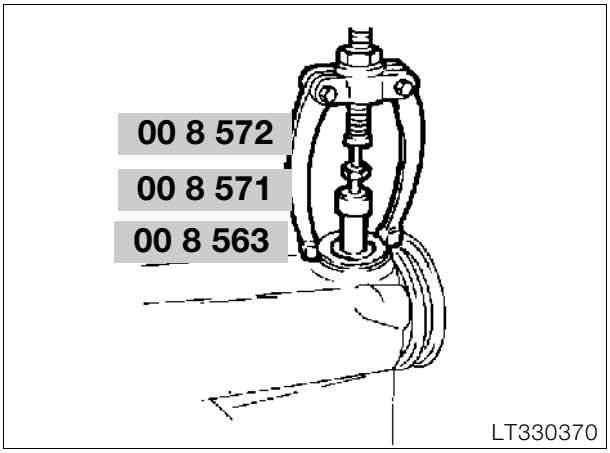


33 17 350 Removing and installing rear swinging arm

33 17 Removing rear swinging arm.

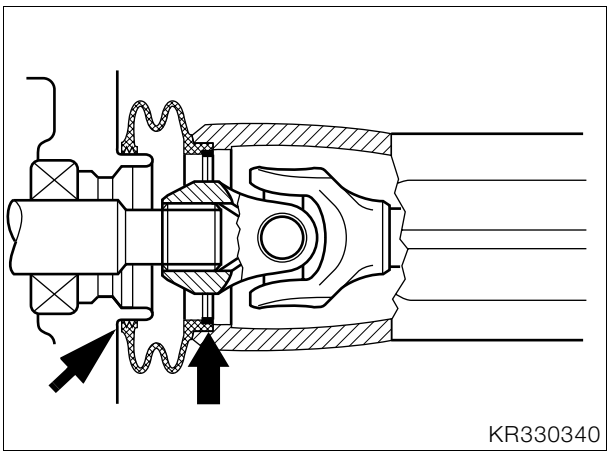
- Remove side panels (➟ 46.8).
- Remove final-drive unit.
- Remove rear spring strut.
- Remove the footrest plates.
- Remove holder for brake hose on the swinging arm.
- Swinging-arm bearing studs are secured with Loctite: heat to max. 120 °C (248 °F) to release.
- Loosen floating bearing stud bolt (1).
- Loosen fixed bearing stud bolt (2).
- Remove floating bearing/fixed bearing stud bolts.
- Remove swinging arm with gaiter.

33 17 381 Removing and installing taper roller bearing



- Remove taper roller bearing with counter-support, **BMW No. 00 8 572**, and internal puller 21/2, **BMW No. 00 8 571**, with support for ring.
- 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**.

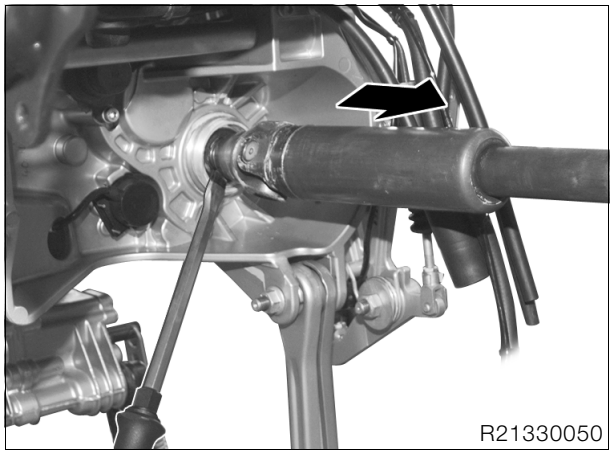
33 17 465 Removing and installing flexible gaiter



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

⚠ **Attention:**
Drive shaft clearance when suspension is compressed:
The gap in the circlip must be in the horizontal plane.

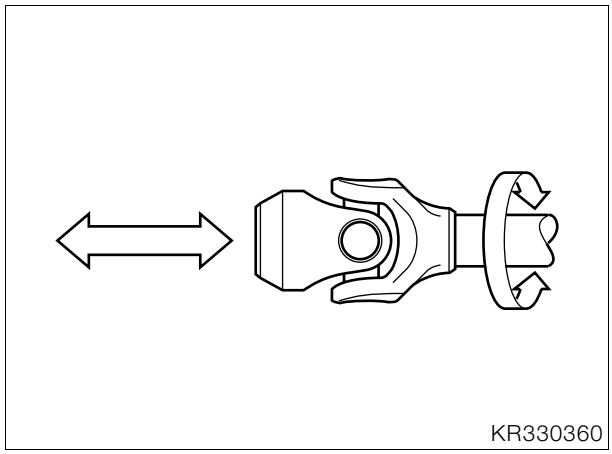
26 11 Removing drive shaft



⚠ **Attention:**
Avoid scratching painted parts; use an underlay if necessary.

- Press off drive shaft.

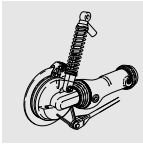
Checking universal joint for wear

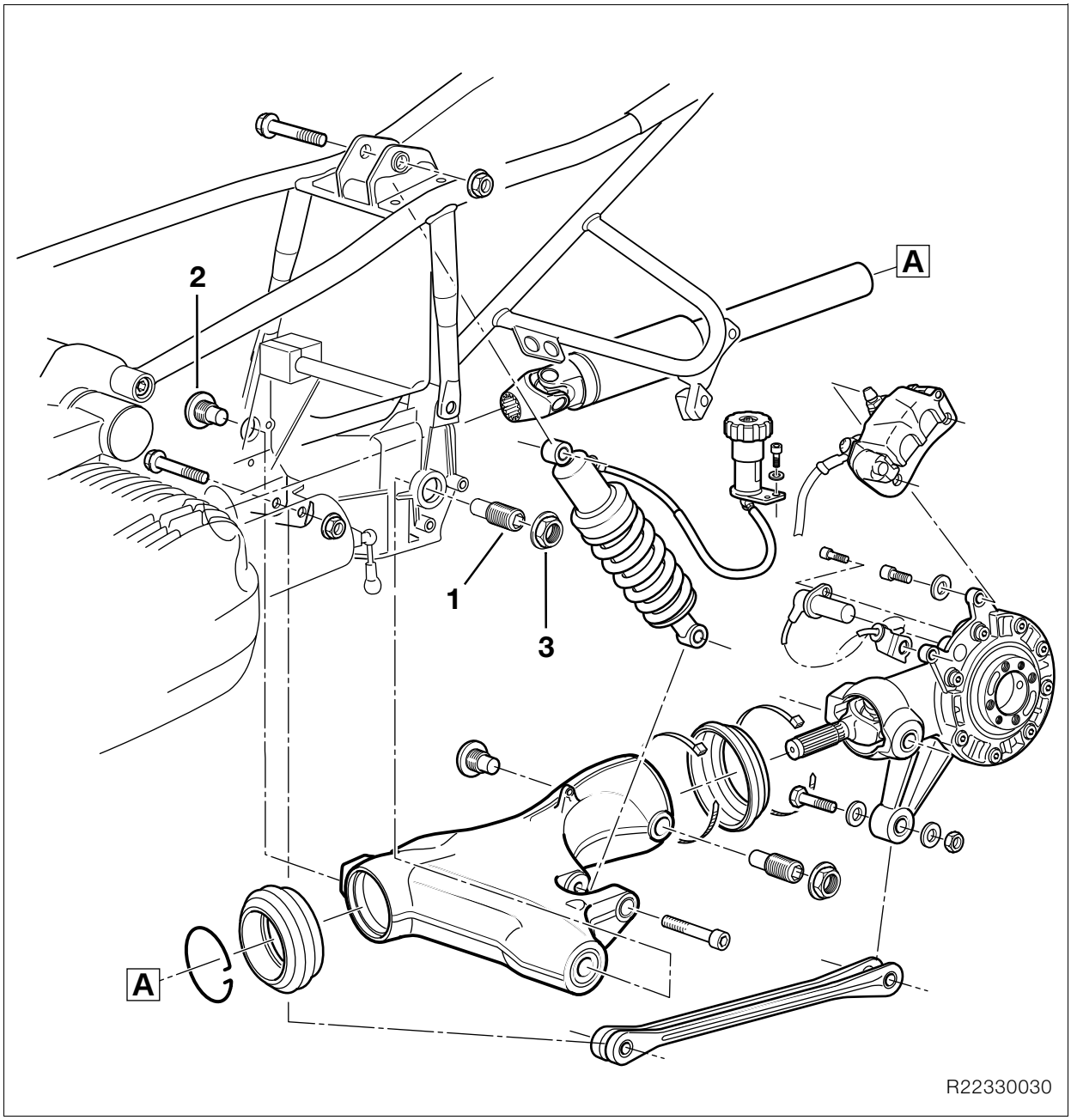


- Determine axial and radial play.

26 11 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 by tapping it gently (plastic hammer).





33 17 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 (2) with **Loctite**.

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

- Screw in floating bearing stud (1) with **Loctite**.
- Tighten the fixed bearing stud (2).
- Tighten floating bearing stud (1).
- Tighten locknut (3).
- Secure spring strut.
- Secure holder for brake hose on the swinging arm.
- Install footrest plates.
- Install the rear wheel drive.
- Install fairing side sections.

Tightening torque:

Fixed bearing stud bolt (clean thread + Loctite 2701)	160 Nm
Floating bearing stud (clean thread + Loctite 2701)	7 Nm
Locknut	160 Nm
Spring strut to swinging arm (clean thread + Loctite 243)	58 Nm
Spring strut to rear frame	50 Nm

34 Brakes

Contents

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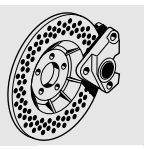
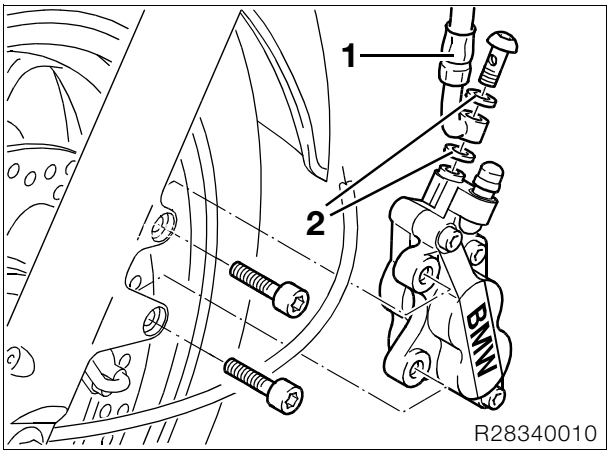
Technical Data 34 Brakes		R 1150 RT
Brake fluid		DOT 4
Front wheel		
Type		Hydraulically operated twin disc brake with 4-piston fixed calipers and floating brake discs
Colour of identification mark on brake calipers/brake pads		white
Brake pad lining		Sintered metal
Minimum lining thickness	mm (in)	1.0 (0.0393 in)
Brake pad surface area	cm^2 (sq in)	86 (13.33)
Brake disc dia.	mm (in)	320 (12.5987)
Brake disc thickness	mm (in)	5.0 (0.1969)
Minimum thickness of brake discs	mm (in)	4.5 (0.1771)
Permissible lateral runout	mm (in)	0.15 (0.0059)
Piston dia. in brake caliper	mm (in)	32/36 (1.2599/1.4173)
Piston dia. in handlebar lever cylinder	mm (in)	16 (0.6299)
Rear wheel		
Type		Hydraulically operated disc brake with 2-piston floating caliper and fixed disc
Brake pad lining		Sintered metal
Minimum lining thickness	mm (in)	1.0 (0.0393) (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)
Brake pad surface area	cm^2 (sq in)	33.8 (5.23)
Brake disc dia.	mm (in)	276 (10.8661)
Brake disc thickness	mm (in)	5.0 (0.1968)
Minimum thickness of brake discs	mm (in)	4.5 (0.1772)
Permissible lateral runout	mm (in)	0.15 (0.0059)
Piston dia. in brake caliper	mm (in)	26/28 (1.0236/1.1023)
Piston dia. in actuating cylinder	mm (in)	13 (0.5118)
BMW Integral ABS		
Type		Active fully integral system
Sensor gap, front	mm (in)	0.2...1.7 (0.0079...0.0670) (active sensor)
Sensor gap, rear	mm (in)	0.2...1.7 (0.0079...0.0670) (active sensor)



34 11 Removing and installing front brake caliper

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle as brake fluid destroys paint.

- **Integral ABS** Drain front wheel circuit (➡ 34.17).



- Disconnect brake line (1).
- Remove the brake caliper securing screws.
- Carefully remove the brake caliper.

Attention:
Replace the sealing rings (2) in the brake line.
Do not damage the brake pads when installing.

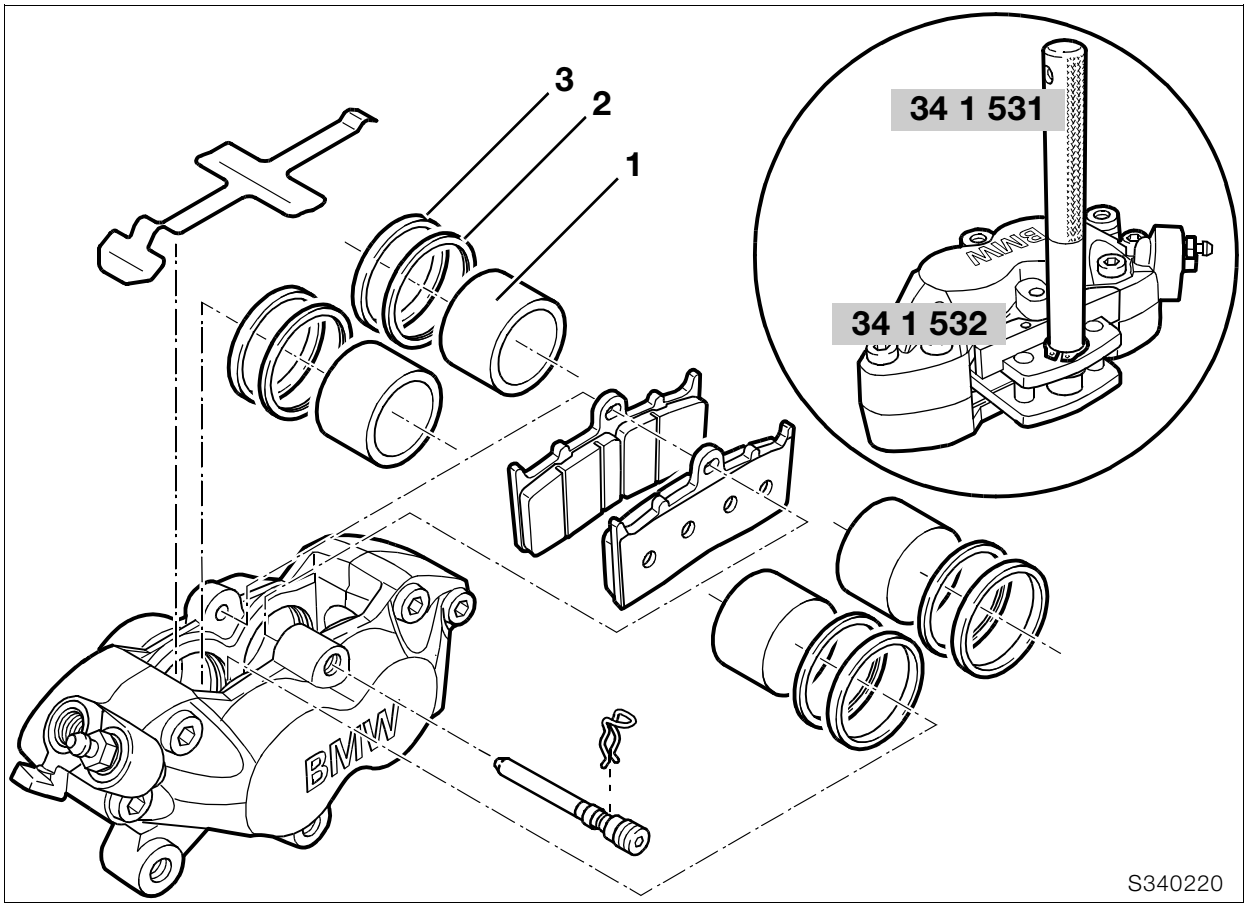
- Installation is the reverse of the removal procedure.
- **Integral ABS** Fill and bleed front wheel circuit (➡ 34.24).

Tightening torque:

Brake caliper to fork slider	30 Nm
Brake hose to brake caliper	18 Nm
Bleed screw to brake caliper	7 Nm
Grub screw in front brake caliper	7 Nm

Colour code:

Brake pads/brake calipers	white



34 11 521 Disassembling and assembling front brake caliper

Attention:
Do not separate the brake caliper halves!

– **Integral ABS** Drain front wheel circuit (➡ 34.17).
– Remove the brake caliper.

- Remove the brake pads.
- Close the bleed screw.
- Secure two opposing brake pistons with spacer, **BMW No. 34 1 520**.
- Insert a piece of cloth between the two brake pistons not secured by the resetting tool.

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

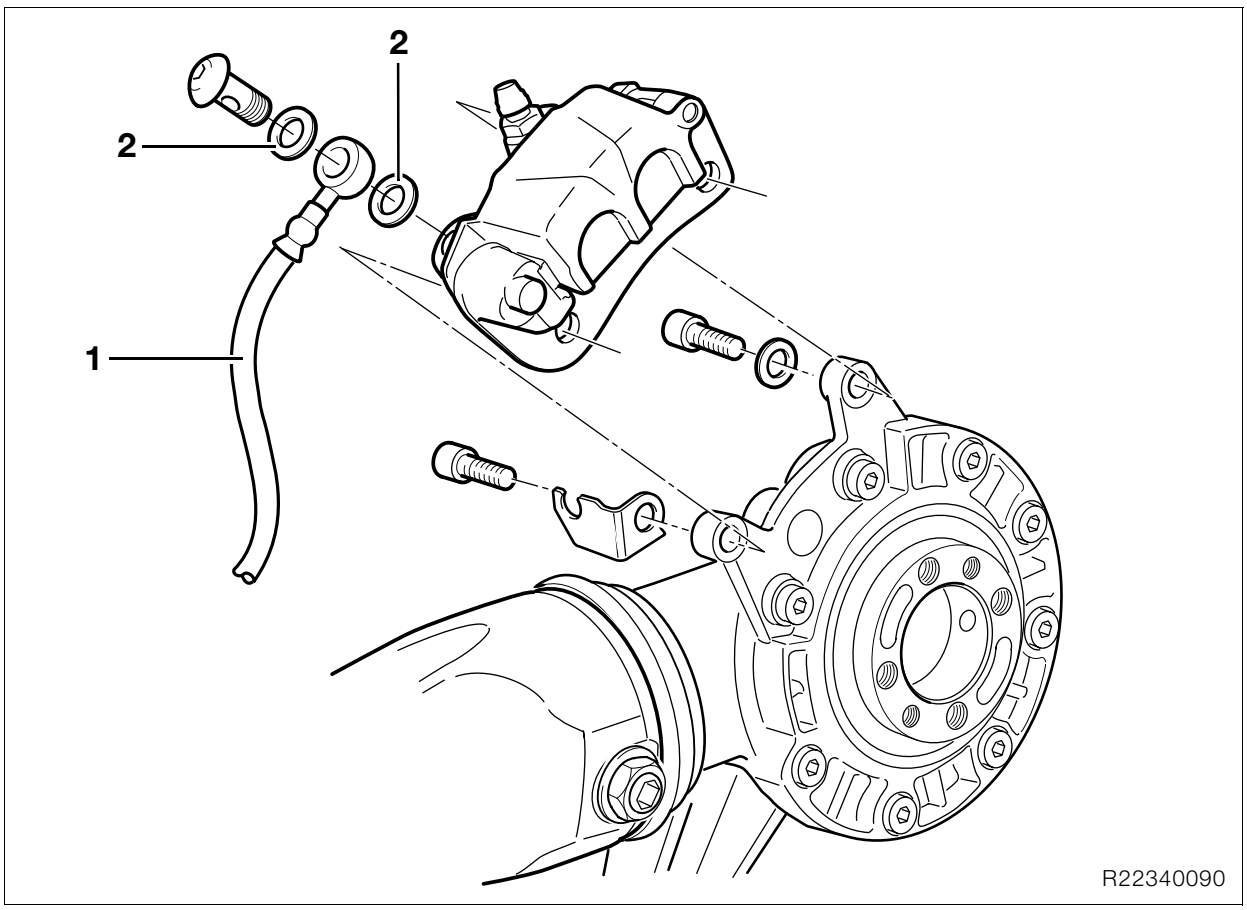
- **Carefully** press out brake pistons (1), using a compressed air gun at the brake line connection.
- Remove the two sealing rings from each brake cylinder bore.
- Inspect the brake caliper piston for hairline cracks, score-marks and other damage.
- Coat new sealing rings (2, 3) with brake fluid and install.
- Coat brake caliper pistons (1) with brake fluid and insert.

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

- Remove and install the other two brake pistons in the same way.
- Press back the pistons fully using the resetting tool, **BMW No. 34 1 531**.
- Install brake caliper.
- **Integral ABS** Fill and bleed front wheel circuit (➡ 34.24).

Tightening torque:
Bleed screw to brake caliper ..... 7 Nm
Grub screw in front brake caliper ..... 7 Nm

Colour code:
Brake pads/brake calipers .....white



34 21 Removing and installing rear brake caliper

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle as brake fluid destroys paint.

- **Integral ABS** Drain rear wheel circuit (➟ 34.18).
- Disconnect brake line (1) from brake caliper.
- Remove the brake caliper.

Attention:
Replace the sealing rings (2) in the brake line.
Do not damage the brake pads.

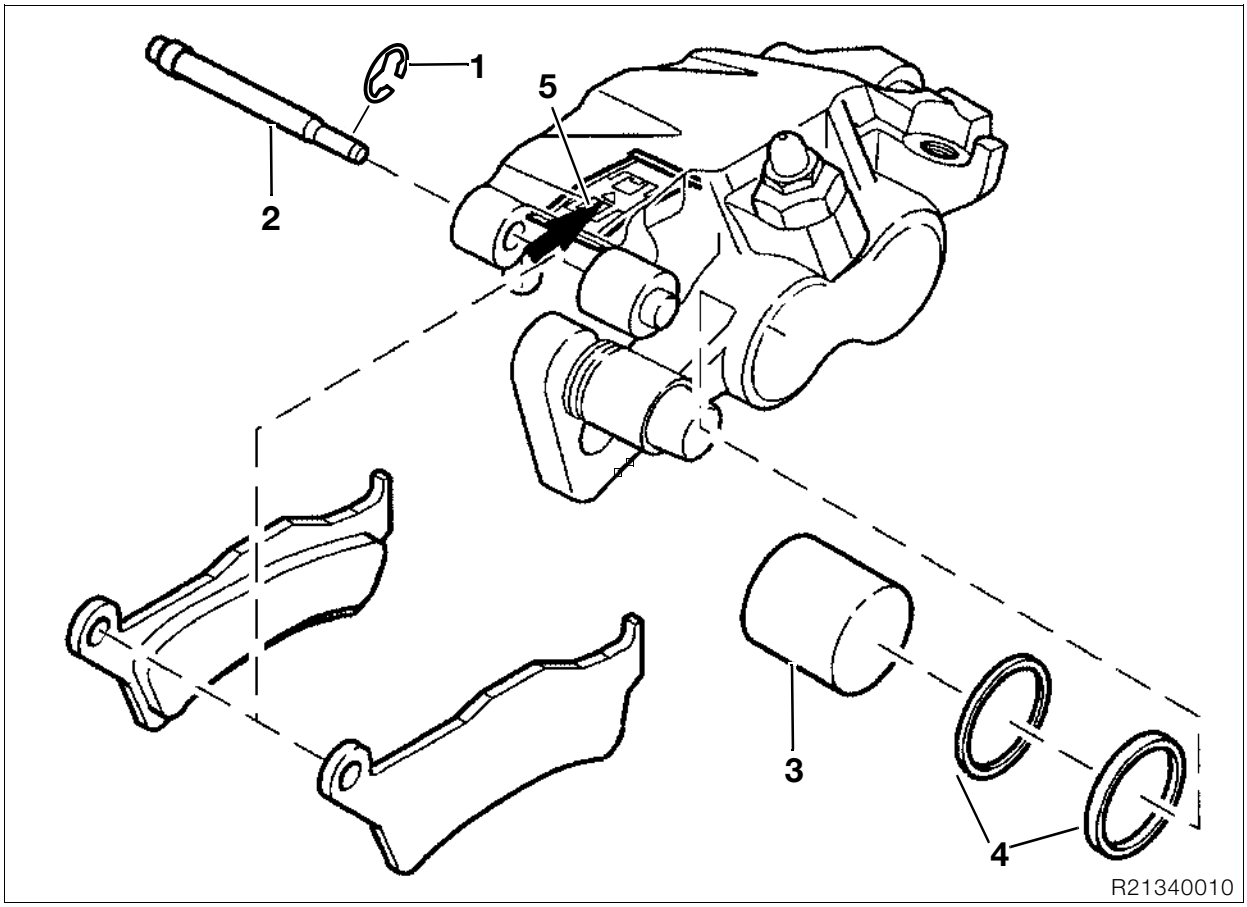
- Installation is the reverse of the removal procedure.

Note:
To bleed, position the brake caliper with the bleed nipple at the highest point.

- **Integral ABS** Fill and bleed rear wheel circuit (➟ 34.27).

Tightening torque:

Brake caliper to rear wheel drive	40 Nm
Brake hose to brake caliper	18 Nm
Bleed screw to brake caliper	5 Nm



34 21 Disassembling and assembling rear brake caliper

Disassembling rear brake caliper

– **Integral ABS** Drain rear wheel circuit (➟ 34.18).
– Remove the brake caliper.

- Close the bleed screw.
- 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.

Attention:
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.

Tightening torque:
Bleed screw to brake caliper ..... 5 Nm

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.

Attention:
Keep the brake pistons parallel with 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).

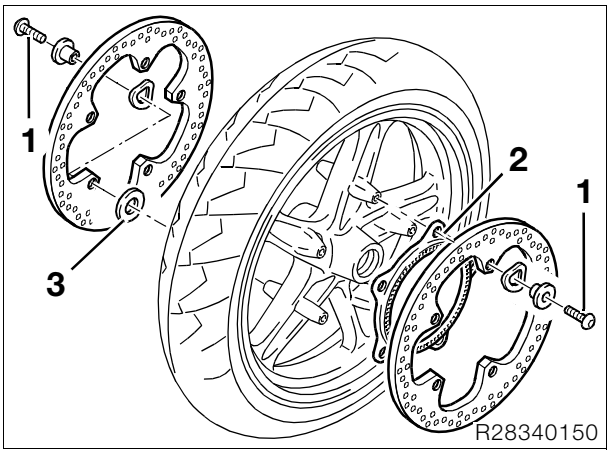
- Press back the pistons fully using the resetting tool, **BMW No. 34 1 531**.
- **Integral ABS** Fill and bleed rear wheel circuit (➟ 34.27).

Tightening torque:
Brake caliper to rear wheel drive ..... 40 Nm
Brake hose to brake caliper ..... 18 Nm
Bleed screw to brake caliper ..... 5 Nm

34 11 Removing and installing front brake discs

Warning:
When removing and installing the brake calipers, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➟ 34.26).

- Remove the brake calipers.
- Remove front wheel.



Note:
Retaining screws (1) are secured with thread-locking compound and should be heated if necessary before removal.

- Remove brake discs.

Attention:
Note thrust washers between right brake disc and front wheel, and note ABS sensor ring between left brake disc and front wheel.

- Install ABS sensor ring (2) on left and thrust washers (3) on right beneath brake disc.
- Degrease brake discs before installing.

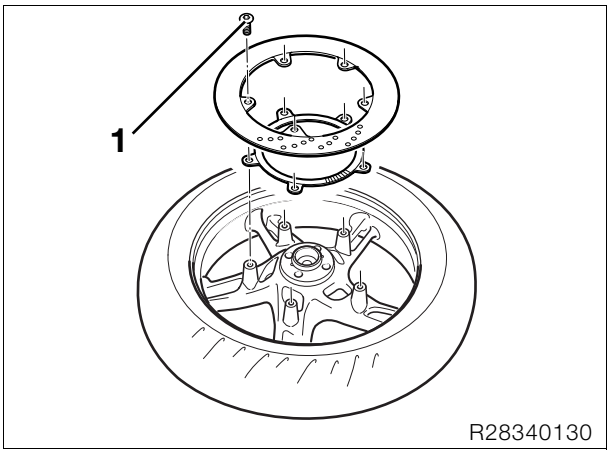
Attention:
Install brake discs right way round (inscriptions on brake discs facing toward the outside).

Tightening torque:
Brake disc to front wheel
(clean thread + Loctite 2701)..... 21 Nm

34 21 Removing and installing rear brake disc

Warning:
When removing and installing the brake caliper, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➟ 34.29).

- Remove the brake caliper.
- Remove rear wheel.

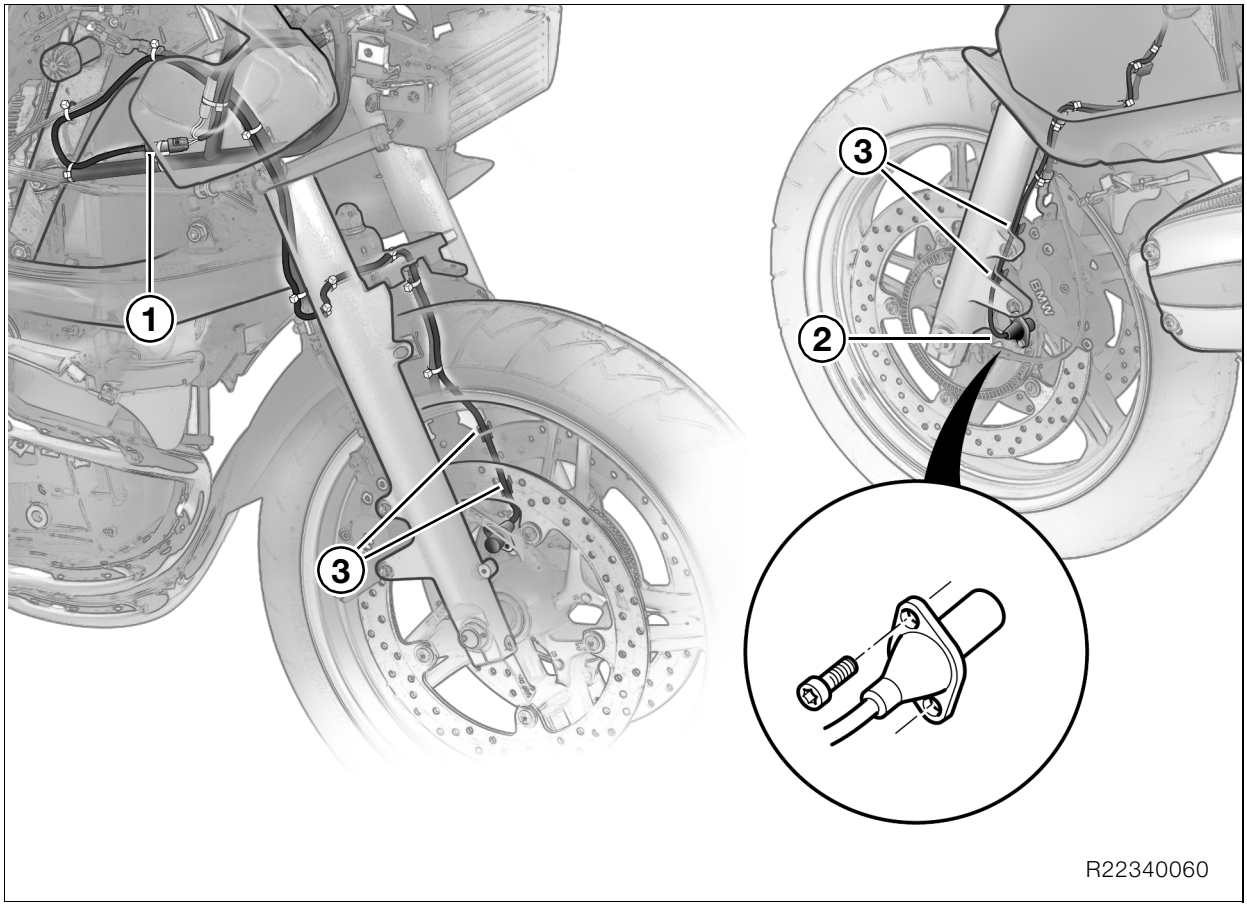


Note:
Retaining screws (1) are secured with thread-locking compound and should be heated if necessary before removal.

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

Attention:
Make sure the spacer is fitted when the rear wheel is installed.

Tightening torque:
Brake disc to rear wheel drive
(clean thread + Loctite 2701)..... 21 Nm



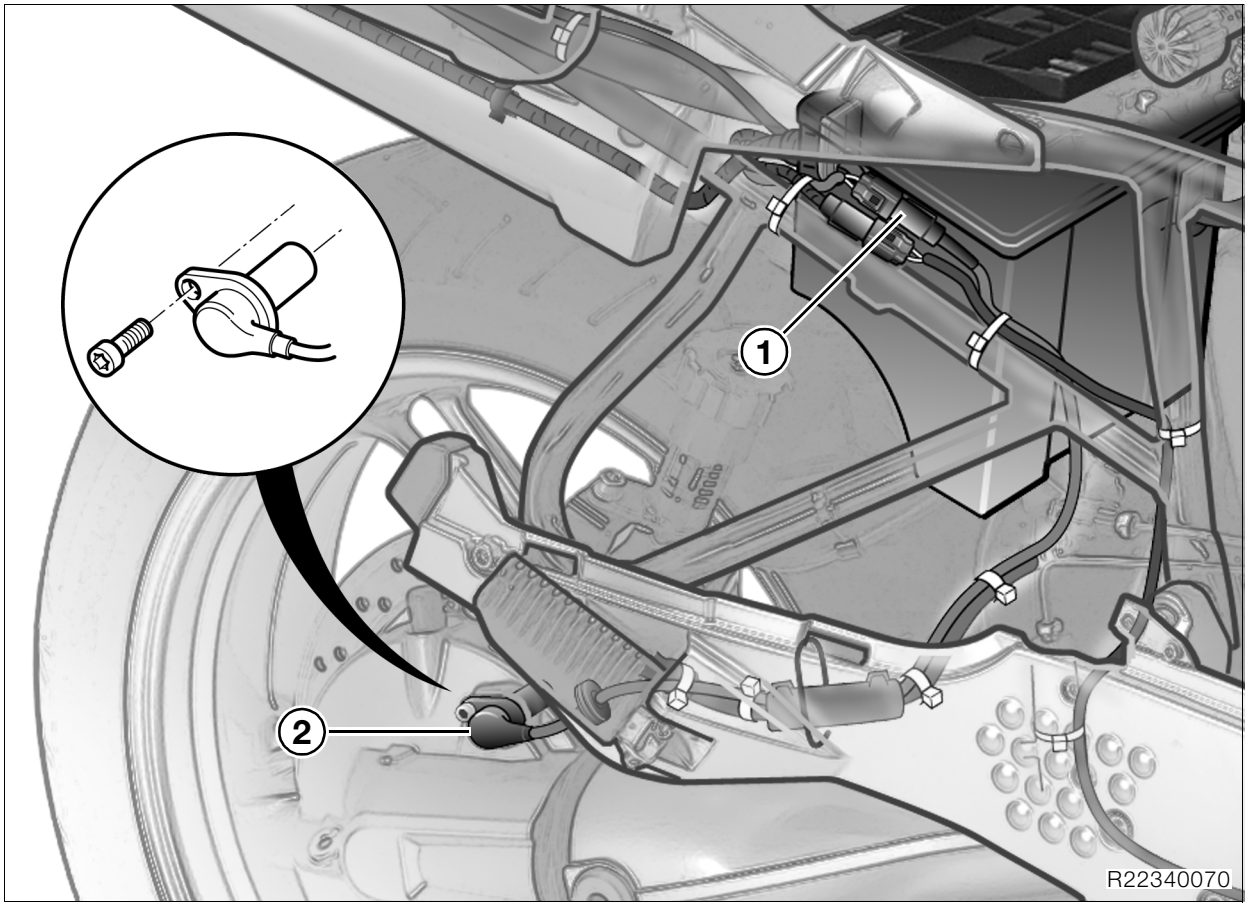
Removing and installing Integral ABS sensor

34 52 044 Removing and installing front Integral ABS sensor

- Remove the cable ties securing the sensor cable.
- Disconnect plug (1) of sensor cable.
- Guide the sensor cable down until clear.
- Remove sensor (2).
- Installation is the reverse of the removal procedure.

Attention:
Route the sensor cable correctly.
Ensure that clips (3) are correctly seated.

Tightening torque:
Sensor ..... hand-tight, 4 Nm

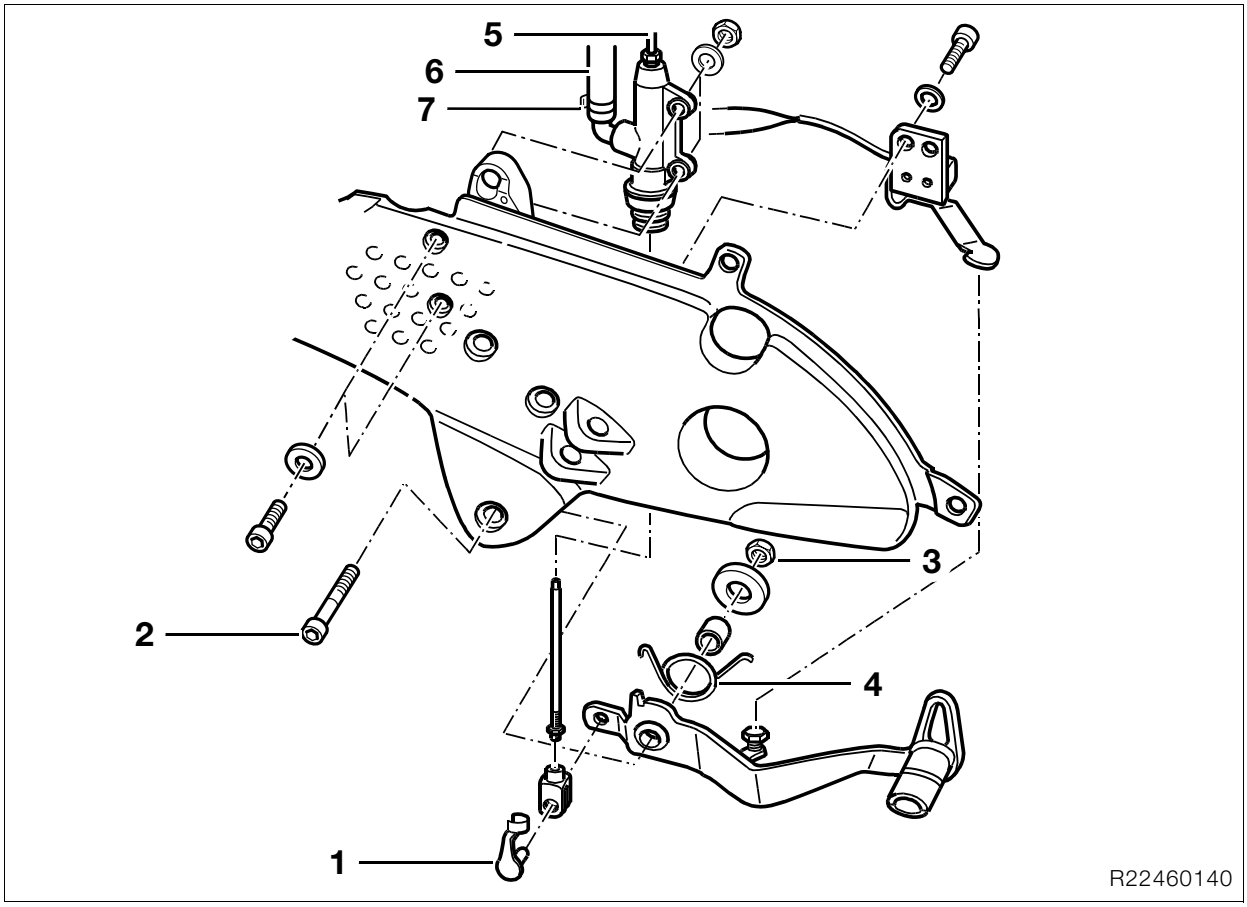


34 52 111 Removing and installing rear Integral ABS sensor

- Remove front and rear seats.
- Remove right case, if necessary.
- Remove small right side fairing panel.
- Remove the cable ties securing the sensor cable.
- Disconnect plug (1) of sensor cable.
- Before removing/installing, clean the sensor bore.
- Remove sensor (2).
- Installation is the reverse of the removal procedure.
- Coat O-rings with oil before installing.

Attention:
Route the sensor cable correctly.

Tightening torque:
Sensor ..... hand-tight, 4 Nm



35 21 Removing and installing foot-brake lever

- Release and remove stud (1).
- Remove screw (2) of footbrake lever with nut (3).
- Remove footbrake lever with torsion spring (4).
- Installation is the reverse of the removal procedure.
- Lubricate pivot bushing with **Shell Retinax A**.

Attention:
Check and, if necessary, adjust the blow-by clearance of the piston rod and the setting of the brake-light switch (➡ 34.13).

Tightening torque:
Footbrake lever to footrest plate
(clean thread + Loctite 2701)..... 21 Nm

34 31 Removing and installing rear brake master cylinder

- Remove right side panel.

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle as brake fluid destroys paint.

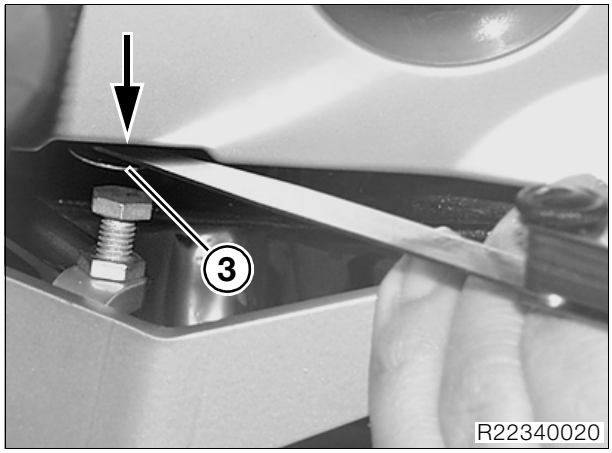
- **Integral ABS** Drain rear control circuit (➡ 34.19).
- Disconnect brake line (5) and hose (6).
- Release and remove stud (1).
- Remove brake master cylinder.
- Installation is the reverse of the removal procedure.
- Tighten non-reusable hose clip (7) with pliers, **BMW No. 13 1 500**.
- **Integral ABS** Fill and bleed rear control circuit (➡ 34.22).

Attention:
Bleed the brake system carefully.
Check and, if necessary, adjust the blow-by clearance of the piston rod and the setting of the brake-light switch (➡ 34.13).

Tightening torque:
Master brake cylinder to footrest..... 9 Nm

Checking and adjusting blow-by clearance of piston rod

Checking blow-by clearance of piston rod

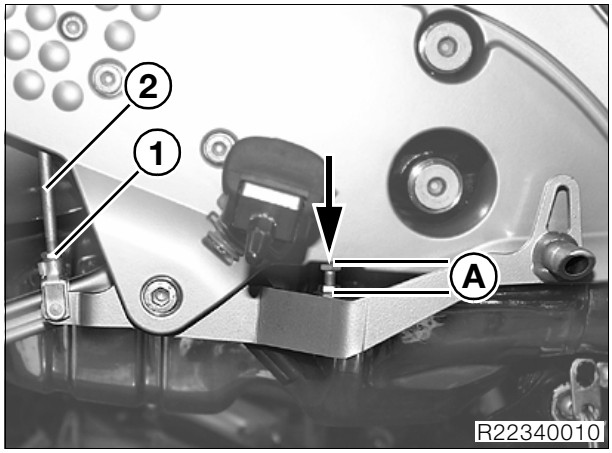


- Press the footbrake lever.
- Insert feeler gauge at right angles to direction of travel between the brake-light switch lever (3) and the stop on the footrest plate (arrow).
- Slowly release the footbrake lever and check play.

Play must be perceptible
Feeler gauge thickness:..... 0.15 mm (0.0059 in)

No play perceptible
Feeler gauge thickness:..... 0.35 mm (0.0137 in)

Adjusting blow-by clearance at piston rod



- Set the adjusting screw of the footbrake lever to distance A.

Distance A: . 13.6 +/- 0.5 mm (0.5354+/-0.1969 in) (Top edge of footbrake lever to top edge of adjusting screw.)

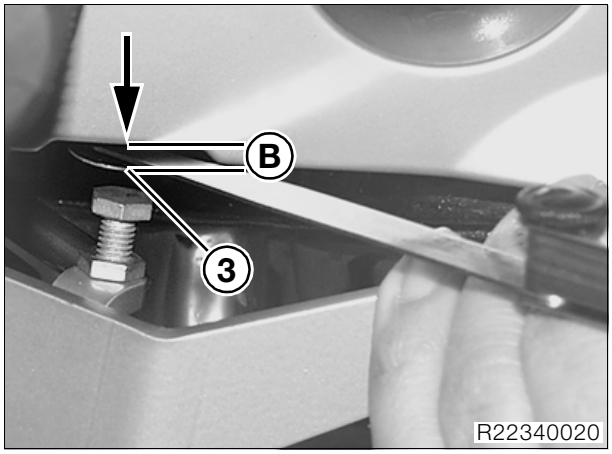
- Insert feeler gauge at right angles to direction of travel between the brake-light switch lever and the stop on the footrest plate (arrow).

Feeler gauge thickness:..... 0.2 mm (0.0078 in)

- Slacken locknut (1).
- Turn piston rod (2) clockwise toward the footbrake lever to obtain play.
- Carefully back off piston rod to take up play and tighten locknut.
- Remove the feeler gauge.
- Recheck play.
- Apply coloured sealing lacquer to the locknut.

Checking and adjusting setting of rear brake light switch

Checking setting of brake light switch, rear



- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.

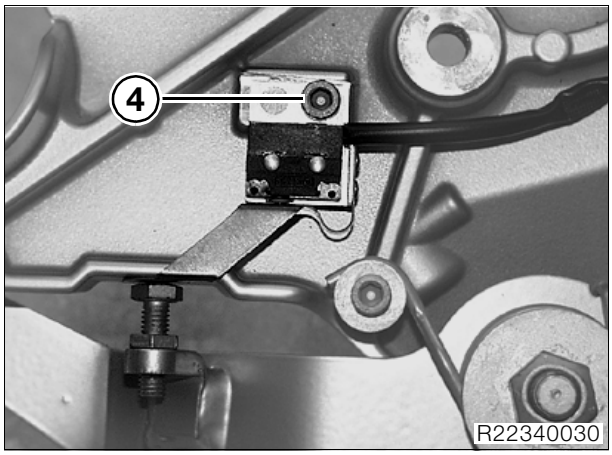
- Depress the footbrake lever (brake light comes on and pump starts up).
- Insert feeler gauge at right angles to direction of travel between the brake-light switch lever (3) and the stop on the footrest plate (arrow).
- Slowly release the footbrake lever and check the point at which the switch trips.

Brake light switch must switch off
Feeler gauge thickness: ..... 0.90 mm (0.0354 in)

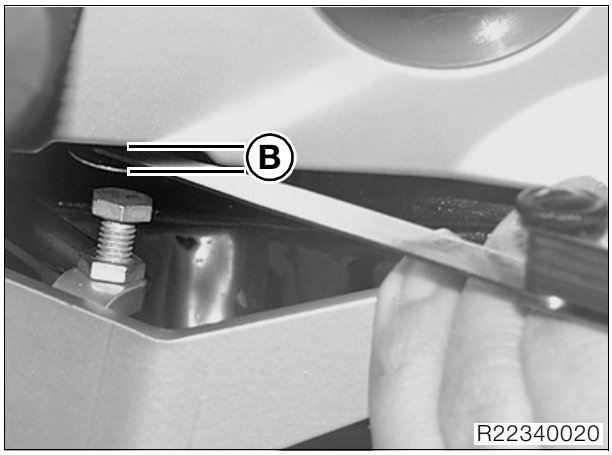
Brake light switch must remain on
Feeler gauge thickness: ..... 1.60 mm (0.0629 in)

- Switch off the ignition.

Adjusting brake light switch, rear



- Depress the footbrake lever and secure it in this position.
- Slacken screw (4).

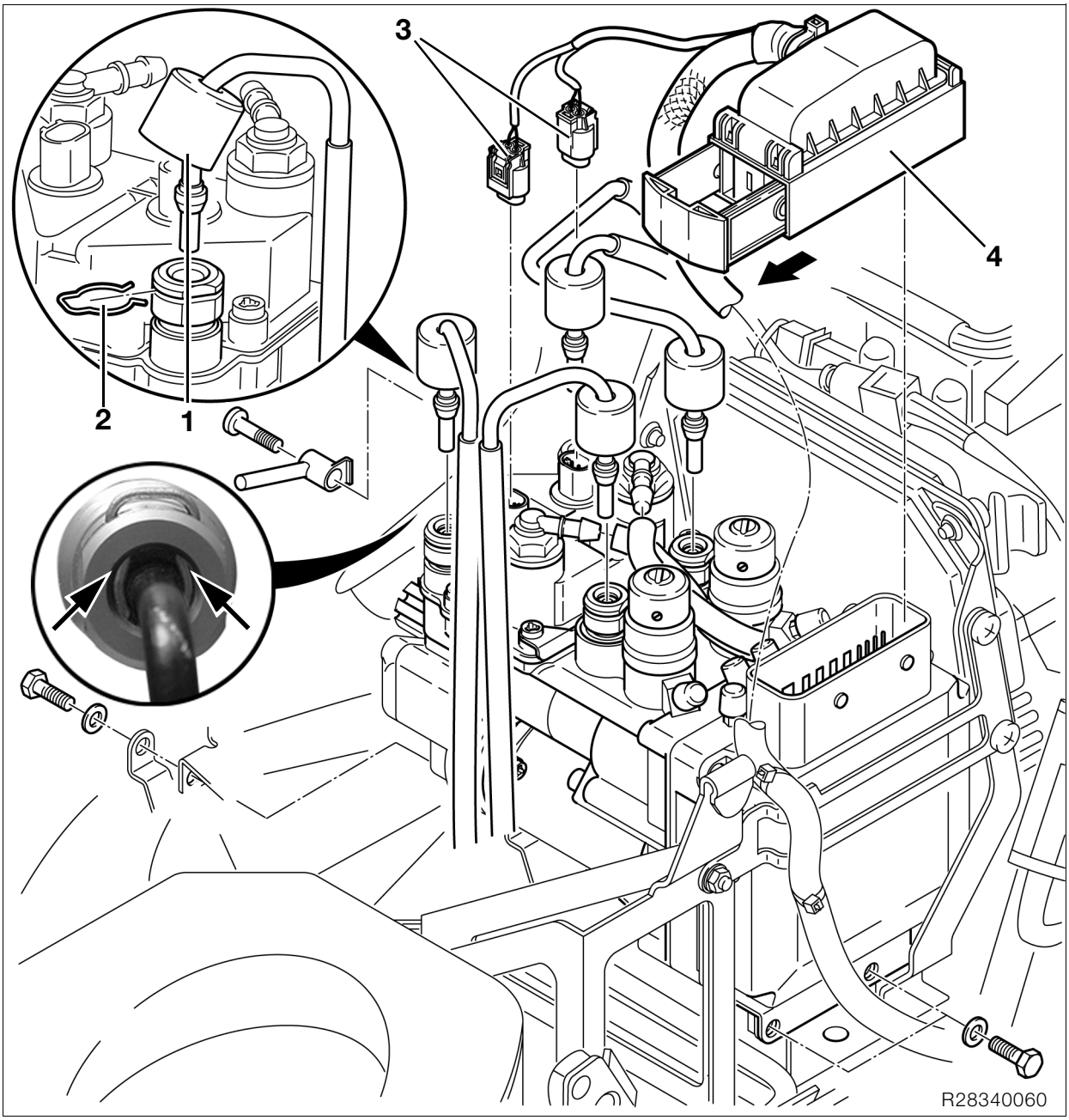


- Turn the brake light switch until the switch trips at distance (B).
- Hold the brake light switch and tighten the screw.
- Recheck the setting.

Distance B:..... 1 + 0.5 mm (0.0393 + 0.1968 in) (clearance at switching point between brake-light switch lever and footrest plate).

Removing and installing piston in brake-lever fitting

➟ See the section on the steering system (➟ 32.11).



34 00 Removing and installing Integral ABS pressure modulator

Warning:
All repair and maintenance work on the BMW Integral ABS must be performed by trained, qualified specialists.
Comply with all maintenance and repair instructions and always work through the various steps in the correct order.
Use only new brake fluid from freshly opened containers.

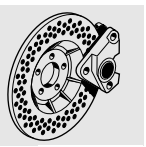
Removing Integral ABS pressure modulator

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle as brake fluid destroys paint.

- Drain the brake system (➡ 34.17).
- Disconnect ground lead from battery and insulate.
- Push protective caps (1) up.
- Remove spring clips (2).

Attention:
Do not bend the brake lines.

- Disconnect the brake lines from the ABS pressure modulator.



Attention:
Do not permit brake fluid to enter the plugs.

- Disconnect plugs (3) of the front and rear wheel circuit reservoirs.
- Unlock plug (4) (arrow) and disconnect the plug.
- Disconnect plug from Hall transmitter.
- Remove Motronic control unit.
- Release ABS pressure modulator and pull it carefully to the left to remove.

Installing Integral ABS pressure modulator

- Installation is the reverse of the removal procedure: pay particular attention to the following.

Note:
Always replace the seals (square-section rings) between the brake lines and the pressure modulator **when you replace the brake lines**.

Warning:
Always fit new spring clips each time the plugs are disconnected. Ensure correct positioning.

- Install new spring clips.
- Slip the protective caps up the brake lines.
- Clip in brake lines.
- Check that spring clips are correctly positioned (arrows).
- Seat the protective caps on the connectors.
- Connect the battery.
- Fill and bleed the brake system (➟ 34.20).
- After all the work on the brake system has been completed, run a bleed test using the **BMW** MoDiTeC (➟ 34.30).

Note:
Disconnecting the battery means that the entries in the fault memory of the Motronic MA2.4 control unit are deleted and the adaptation values are reset. This can temporarily impair the operating characteristics when the engine is restarted.

- 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.

Tightening torque:
ABS pressure modulator to battery carrier ... 10 Nm
ABS pressure modulator to holder ..... 7 Nm

34 00 Draining the Integral ABS brake system

Warning:
All repair and maintenance work on the BMW Integral ABS must be performed by trained, qualified specialists.
Comply with all maintenance and repair instructions and always work through the various steps in the correct order.
Use only new brake fluid from freshly opened containers.

Note:
This description applies for the brake filling and bleeding unit with extraction of the brake fluid by partial vacuum.
If other devices are used, comply with their manufacturers' instructions.

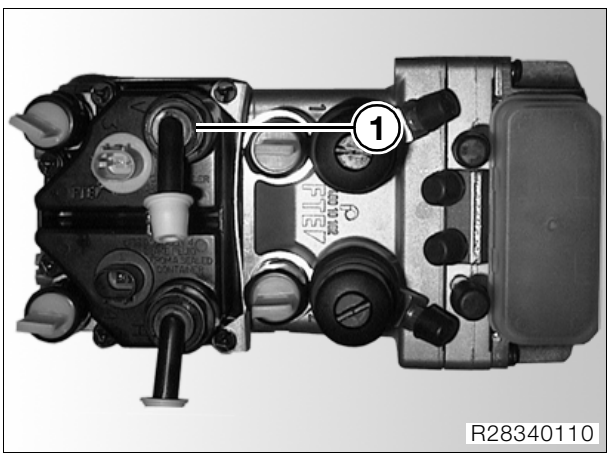
- Remove front and rear seats.
- Remove fuel tank.

Drain both wheel circuits

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle as brake fluid destroys paint.

Draining front wheel circuit

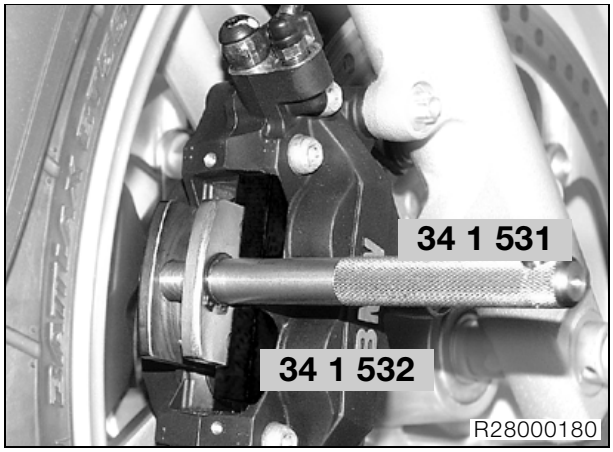
Attention:
Integral brakes, the rear brake must be ready for use.



- Open front wheel-circuit reservoir (1).

Attention:
To prevent brake fluid entering plugs, do not disconnect plugs from the ABS pressure modulator.

- Draw off the old brake fluid from the wheel-circuit reservoir and reinstall the cap.
- Remove front brake pads.



Attention:
Do not scrape the wheel – mask it off if necessary.

- Use resetting tool, **BMW No. 34 1 531**, and locator, **BMW No. 34 1 532**, to force the pistons in the left and right brake calipers all the way back and hold them in this position.
- Wrap cloths around the left and right brake calipers.
- Connect the brake bleeding device to the bleed screw of the left brake caliper, but **do not switch on** the device.
- Switch on the ignition.

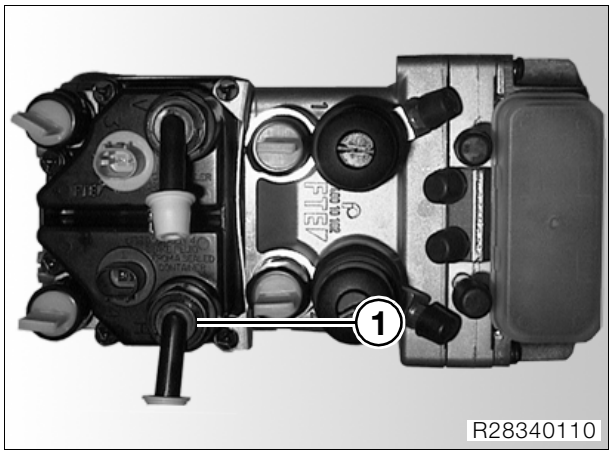
Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.

- Gently pull the handbrake lever until the pump just starts up.
- Open the bleed screw.
- Drain the wheel circuit with the pump.
- Close the bleed screw.
- Release the brake.
- Disconnect the brake bleeding device from the bleed screw.
- The procedure for draining the right brake caliper is the same as that for the left caliper.
- Close the bleed screw.
- Release the brake and switch off the ignition.
- Disconnect the brake bleeding device from the bleed screw.

Draining rear wheel circuit

Attention:
Integral brakes, the rear brake must be ready for use.

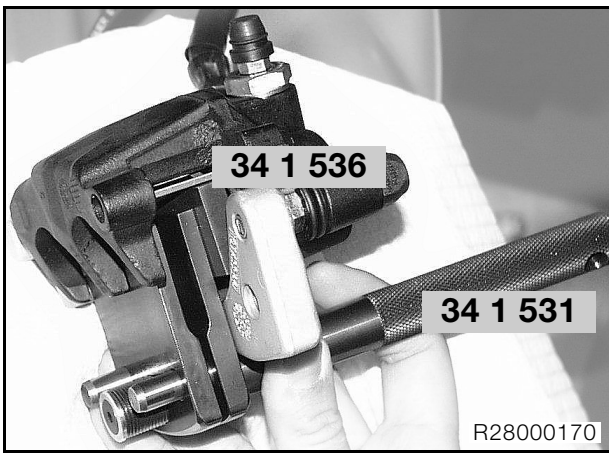
– Install front brake pads, if applicable.



- Open rear wheel-circuit reservoir (1).

Attention:
To prevent brake fluid entering plugs, do not disconnect plugs from the ABS pressure modulator.

- Draw off the old brake fluid from the wheel-circuit reservoir and reinstall the cap.
- Remove rear brake pads.



- Install adapter, **BMW No. 34 1 536**, instead of the outboard brake pad.
- Install resetting tool, **BMW No. 34 1 531**, with the handle toward the outside in the rear brake caliper, press the pistons fully back and secure them in this position.
- Wrap a cloth around the brake caliper.
- Connect the brake bleeding device to the bleed screw, but do not switch on the device.
- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.

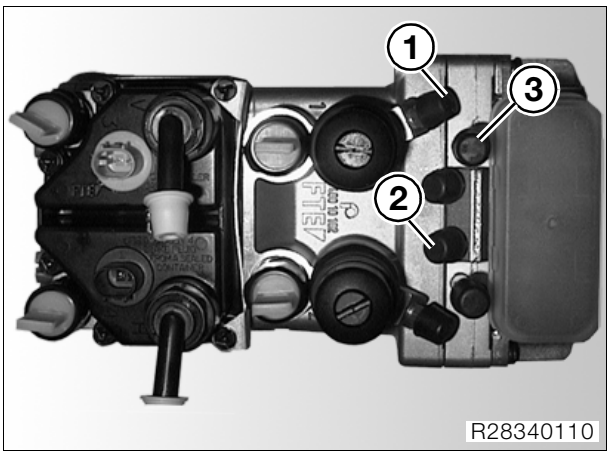
- Gently press the footbrake lever until the pump just starts up.
- Open the bleed screw.
- Drain the wheel circuit with the pump.
- Close the bleed screw.
- Release the brake and switch off the ignition.
- Disconnect the brake bleeding device from the bleed screw.

Draining control circuits

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle as brake fluid destroys paint.

Draining front control circuit

- Turn the front wheel to a position in which the brake fluid reservoir is horizontal and secure the handlebars in this position.
- Wrap cloths around the reservoir.
- Remove front reservoir cap with rubber diaphragm.
- Draw off old brake fluid and clean the reservoir.

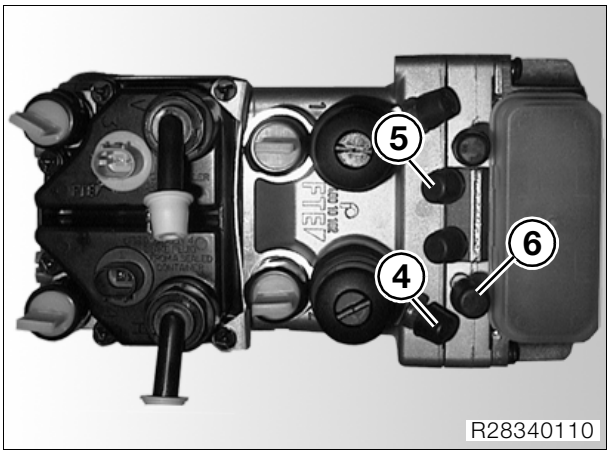


- Draw off the brake fluid from the circuits in the correct sequence, using ring spanner, **BMW No. 34 2 532**:

– front metering cylinder (1),
– front integral circuit (2) and
– front control circuit (3).

Draining rear control circuit

- Remove rear reservoir cap with rubber diaphragm, draw off the old brake fluid and clean the reservoir.



- Draw off the brake fluid from the circuits in the correct sequence, using ring spanner, **BMW No. 34 2 532**:

– rear metering cylinder (4),
– rear integral circuit (5) and
– rear control circuit (6).

34 00 Filling and bleeding Integral ABS system

Warning:
All repair and maintenance work on the BMW Integral ABS must be performed by trained, qualified specialists.
Comply with all maintenance and repair instructions and always work through the various steps in the correct order.
Use only new brake fluid from freshly opened containers.

Note:
This description applies for the brake filling and bleeding unit with extraction of the brake fluid by partial vacuum.
If other devices are used, comply with their manufacturers' instructions.

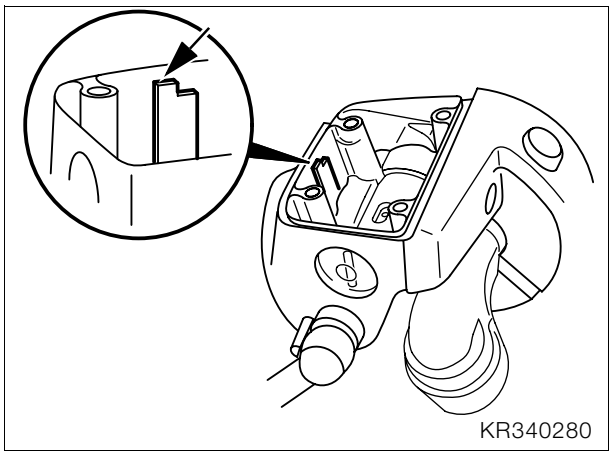
- Place motorcycle on its centre stand.
- Remove front and rear seats.
- Remove fuel tank.

Filling and bleeding control circuits

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle as brake fluid destroys paint.

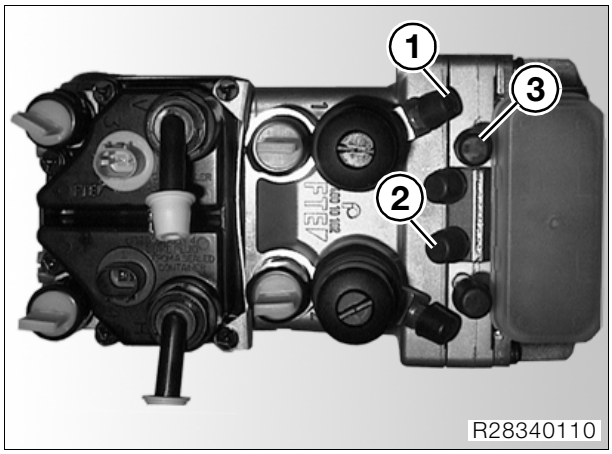
Filling the front control circuit

- Turn the front wheel to a position in which the brake fluid reservoir is horizontal and secure the handlebars in this position.
- Wrap cloths around the reservoir.
- Remove front reservoir cap with rubber diaphragm.


KR340280

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

Attention:
During the filling and bleeding procedure, make sure that the fluid replenishing hole is always below the level of the brake fluid, or else air will be drawn into the brake system.



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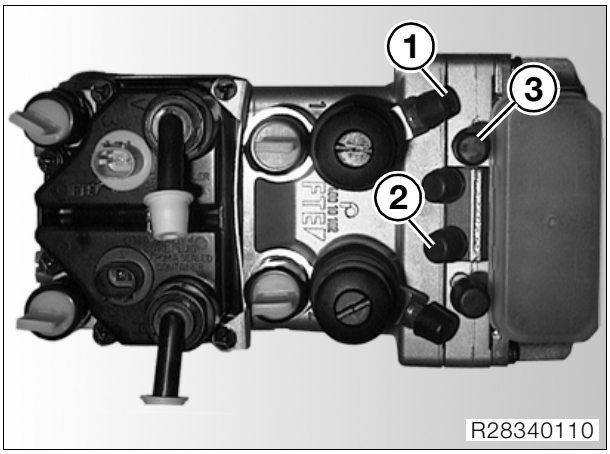
- Draw off the brake fluid from the circuits in the correct sequence while topping up continuously with fresh brake fluid and using ring spanner, **BMW No. 34 2 532**:
- front metering cylinder (1),
- front integral circuit (2),
- front control circuit (3) and
- front metering cylinder (1) for the second time.

Attention:
On account of the vacuum extraction process, it is not possible to tell whether there is brake fluid in the hose of the brake bleeding device when it is free of bubbles.
Consequently, **the system must be bled again manually in the specified sequence and in accordance with the instructions for bleeding the brakes**.

Bleeding front control circuit

- Seal the reservoir by installing the rubber diaphragm and the reservoir cap.
- Turn the handlebars to full left lock.
- Repeatedly pull front brake lever lightly to expel air from brake master cylinder.
- Switch off the brake bleeding device.
- Set the handbrake lever to position 4.

Warning:
When performing maintenance and repair work on BMW Integral ABS, never pump quickly or vigorously.



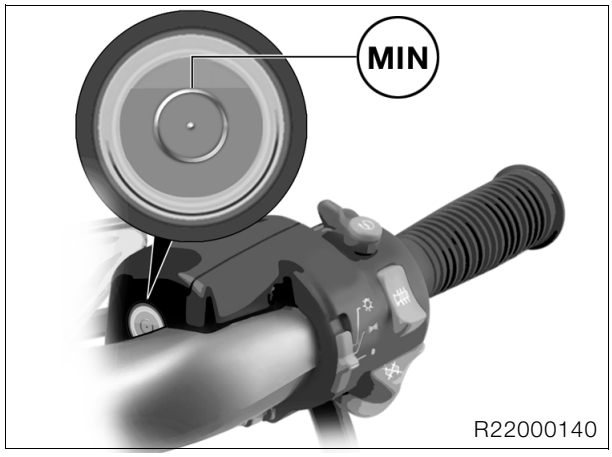
- Remove reservoir cap with rubber diaphragm.
- In the following sequence, bleed:

– front metering cylinder (1),
– front integral circuit (2),
– front control circuit (3) and
– front metering cylinder (1) for the second time

using ring spanner, **BMW No. 34 2 532**, in accordance with instructions for bleeding.

Instructions for bleeding:
1. Slowly pull brake lever until brake-light switch clicks (blow-by bore closed).
2. Open the bleed screw.
3. Slowly pull brake lever to full extent of its travel and close the bleed screw.
4. Slowly release the brake lever.
5. Repeat steps 1 to 4 until the bake fluid is clear and free of bubbles.

- Fit the protective caps on the bleed screws.
- Add brake fluid up to the “MAX” mark.
- Wipe the rim of the reservoir, the rubber diaphragm and the cover to remove brake fluid, and carefully re-assemble the components.
- Recheck the brake-fluid level.
- Place the motorcycle on its centre stand.
- Turn the handlebars fully to the **left**.



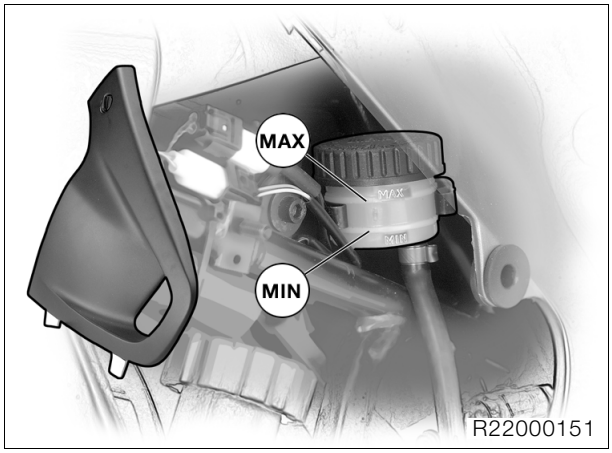
Specified level
not below ..... MIN
(top edge of the marking ring)

Attention:
After all the work on the brake system has been completed, run a bleed test using the **BMW** MoDiTeC.

Brake fluid .....DOT 4

Filling the rear control circuit

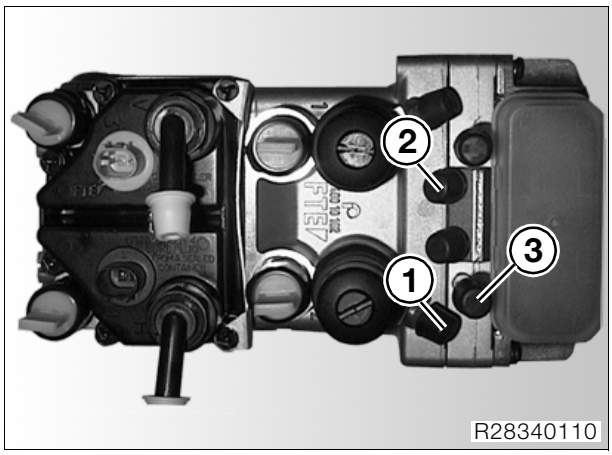
- Remove rear reservoir cap with rubber diaphragm.



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

Attention:
While filling and bleeding the system, do not allow the brake fluid level to drop below the “MIN” mark, as otherwise air will be drawn into the brake system.

Warning:
When performing maintenance and repair work on BMW Integral ABS, never pump quickly or vigorously.



- Draw off the brake fluid from the circuits in the correct sequence while topping up continuously with fresh brake fluid and using ring spanner, **BMW No. 34 2 532**:

– rear metering cylinder (1),
– rear integral circuit (2),
– rear control circuit (3) and
– rear metering cylinder (1) for the second time.

Attention:
On account of the vacuum extraction process, it is not possible to tell whether there is brake fluid in the hose of the brake bleeding device when it is free of bubbles.
Consequently, **the system must be bled again manually in the specified sequence and in accordance with the instructions for bleeding the brakes**.

Bleeding the rear control circuit

- Switch off the brake bleeding device.
- In the following sequence, bleed:

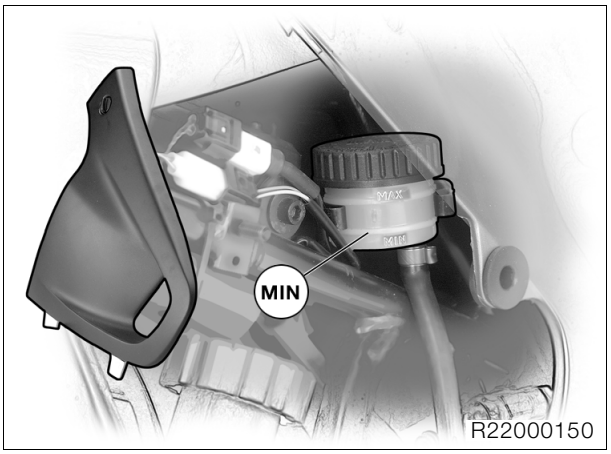
– rear metering cylinder (1),
– rear integral circuit (2),
– rear control circuit (3) and
– rear metering cylinder (1) for the second time

using ring spanner, **BMW No. 34 2 532**, in accordance with instructions for bleeding.

Instructions for bleeding:
1. Slowly depress brake lever until brake-light switch clicks (blow-by bore closed).
2. Open the bleed screw.
3. Slowly depress brake lever to full extent of its travel and close the bleed screw.
4. Slowly release the brake lever.
5. Repeat steps 1 to 4 until the bake fluid is clear and free of bubbles.

- Fit the protective caps on the bleed screws.
- Top up the brake fluid at least until the level reaches the “MIN” mark.
- Wipe the rim of the reservoir, the rubber diaphragm and the cover to remove brake fluid, and carefully re-assemble the components.
- Recheck the brake-fluid level.

– Place the motorcycle on its centre stand.



Specified level
not below ..... MIN

Attention:
After all the work on the brake system has been completed, run a bleed test using the **BMW** MoDiTeC.

Brake fluid.....DOT 4

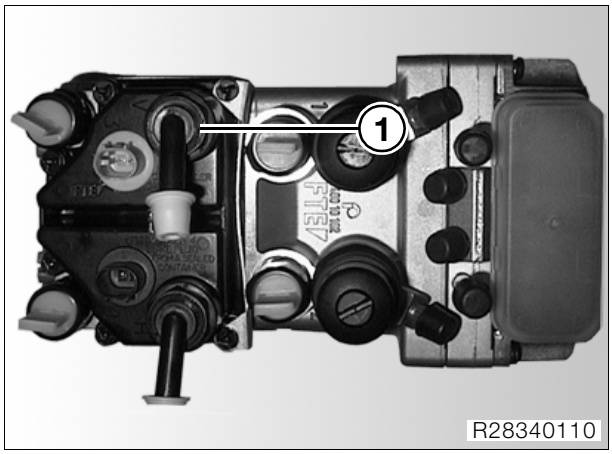
Filling and bleeding wheel circuits

Attention:
Do not allow brake fluid to come into contact with painted parts of the motorcycle as brake fluid destroys paint.

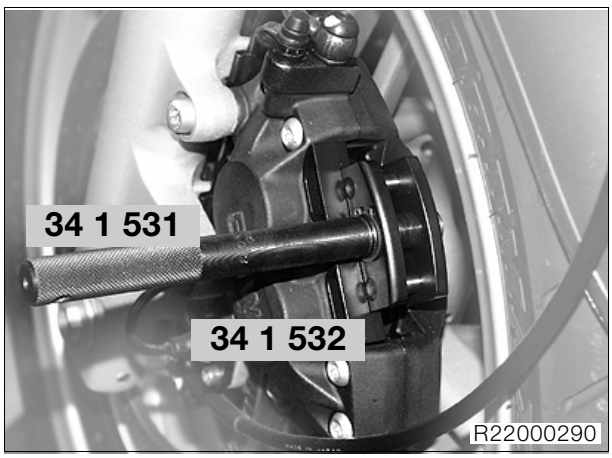
Filling and bleeding front wheel circuit

Attention:
Integral brakes, the rear brake must be ready for use.

– Install rear brake pads and brake caliper, if applicable.
– Place the motorcycle on its centre stand.



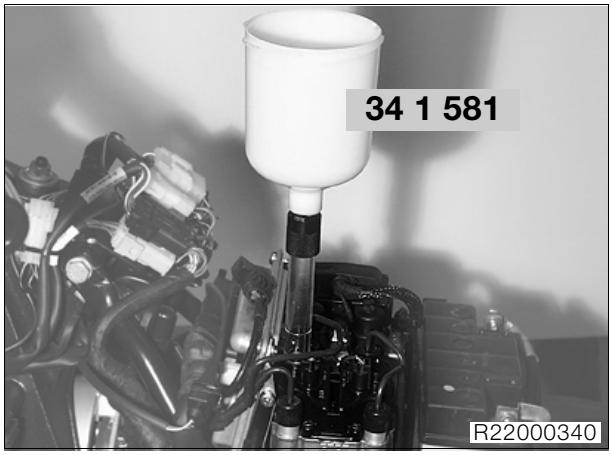
- Open front wheel-circuit reservoir (1).
- Remove front brake pads.
- Wrap cloths around the left and right brake calipers.



Attention:
Do not scrape the wheel – mask it off if necessary.

- Use resetting tool, **BMW No. 34 1 531**, and locator, **BMW No. 34 1 532**, to force the pistons in the left and right brake calipers all the way back and hold them in this position.

Attention:
To prevent brake fluid entering plugs, do not disconnect plugs from the ABS pressure modulator.

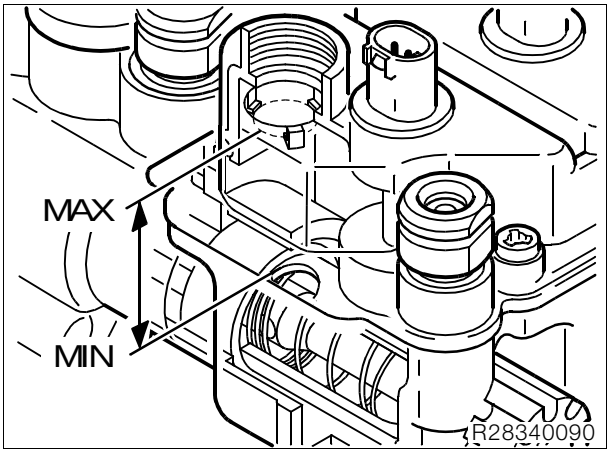


- Screw container, **BMW No. 34 1 581**, onto front wheel circuit reservoir.
- Slowly fill container, **BMW No. 34 1 581**, with new brake fluid until it is approximately 1/2 full.
- Connect the brake bleeding device to the bleed screw of the left brake caliper, but **do not switch on** the device.

Note:
If necessary, use a cable tie to secure the bleed hose to the bleed screw.

- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.



Attention:
The brake fluid must always be visible in the container, because the piston in the base of the wheel-circuit reservoir must always be covered by the fluid. The procedure must be repeated if the fluid drops below the “min” level.

- Gently pull the handbrake lever until the pump just starts up.
- Open the bleed screw, while topping up the container with new brake fluid if necessary.
- Pump out the brake fluid with virtually no pressure to begin with, then vary the brake pressure.

Note:
The higher the brake pressure the faster the fluid is pumped through the system, which means that the level in the wheel-circuit reservoir drops all the more rapidly.

- Pump off brake fluid until it emerges clear and free from air bubbles.
- Close the bleed screw.
- Release the brake.
- Disconnect the brake bleeding device from the bleed screw.
- Connect the brake bleeding device to the bleed screw of the right brake caliper, but **do not switch on** the device.

Note:
If necessary, use a cable tie to secure the bleed hose to the bleed screw.

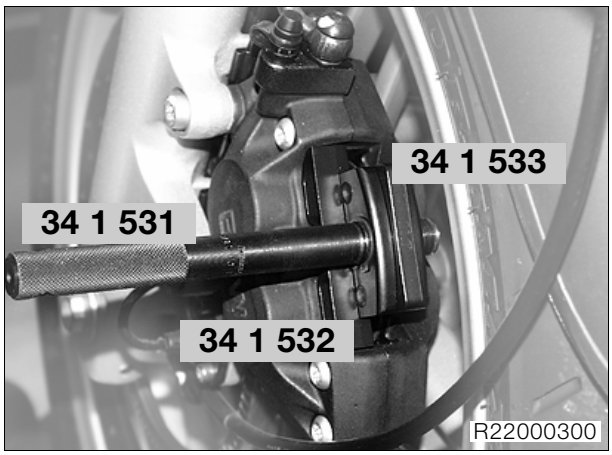
- The procedure for changing the brake fluid in the right brake caliper is the same as that for the left caliper.
- When the brake fluid is clear and free of bubbles, continue pumping until the fluid in the container just disappears from view.
- Close the bleed screw.
- Release the brake and switch off the ignition.
- Disconnect the brake bleeding device from the bleed screw.
- Disconnect the container from the wheel-circuit reservoir.

Attention:
After changing and/or bleeding the brakes, always top up the fluid in the wheel-circuit reservoir to the correct level in accordance with the instructions.

Instructions for filling front wheel circuit reservoir

Attention:
Integral brakes, the rear brake must be ready for use.

– Install rear brake pads, if applicable.



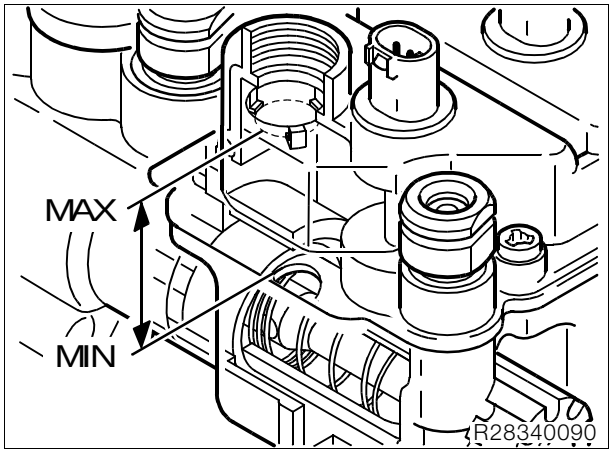
- Top up fluid in front wheel-circuit reservoir to “MAX” if necessary
- Install adapters 22, **BMW No. 34 1 533**, in resetting tool, **BMW No. 34 1 531/532**, for both front brake calipers, and tighten the resetting tool until the adapters are secure.

Attention:
The piston in the base of the wheel-circuit reservoir must always be covered by the fluid, as otherwise air can be drawn into the brake system.
Bleed the system again if this happens.

- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.

- Pull handbrake lever until the pistons of the front brake calipers are in contact with resetting tool, **BMW No. 34 1 531**.



- Top up the fluid in the wheel-circuit reservoir until one of the three protrusions in the filler neck just touches the surface of the fluid (arrow).
- Screw container, **BMW No. 34 1 581**, onto front wheel circuit reservoir.
- Remove adapter, **BMW No. 34 1 533**, and force back pistons far enough to allow the brake pads to be fitted.
- Install front brake pads.
- With the ignition switched on, bed in the brake pads against the brake discs.
- Disconnect the container from the wheel-circuit reservoir.
- Hand-tighten cap of front wheel-circuit reservoir.
- Check operation of the brake system with the ignition switched on.

Attention:
After all the work on the brake system has been completed, run a bleed test using the **BMW** MoDiTeC and check the fault code memory!

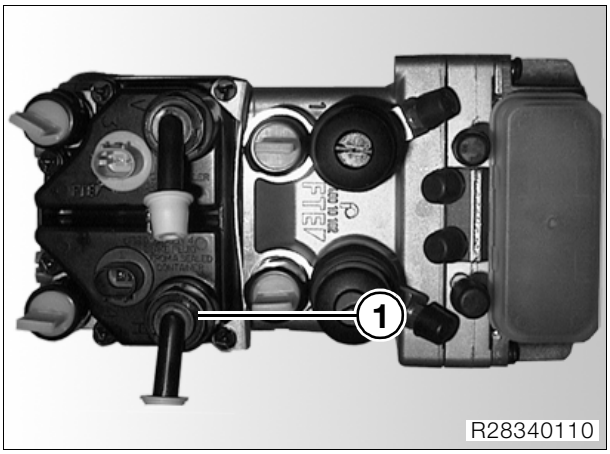
Brake fluid .....DOT 4

Tightening torque:
Bleed screw in front brake caliper ..... 7 Nm

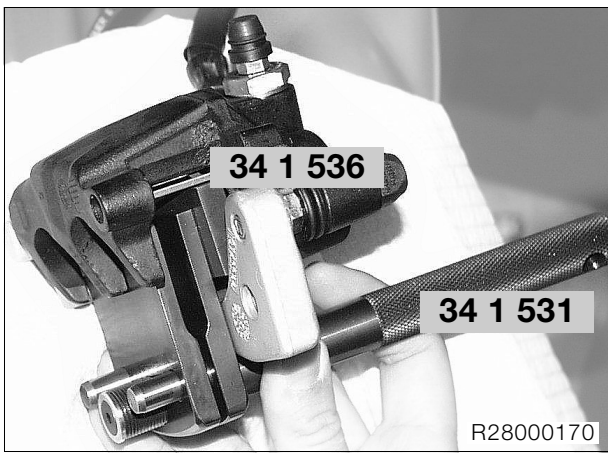
Filling and bleeding rear wheel circuit

Attention:
Integral brakes, the front brake must be ready for use.

– Place the motorcycle on its centre stand.

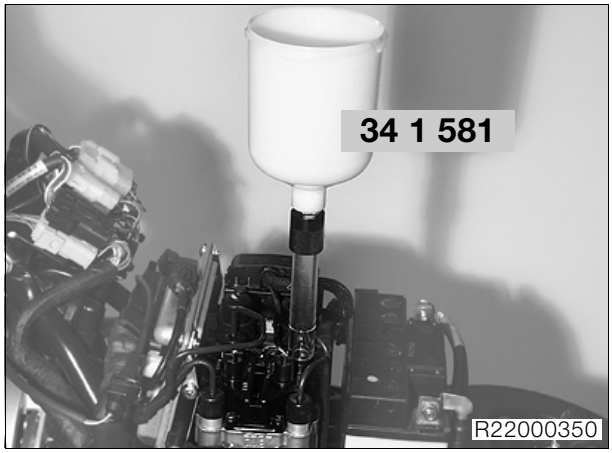


- Open rear wheel-circuit reservoir (1).
- Remove rear brake pads.



- Install adapter, **BMW No. 34 1 536**, instead of the outboard brake pad.
- Install resetting tool, **BMW No. 34 1 531**, with the handle toward the outside in the rear brake caliper, press the pistons fully back and secure them in this position.

Attention:
To prevent brake fluid entering plugs, do not disconnect plugs from the ABS pressure modulator.

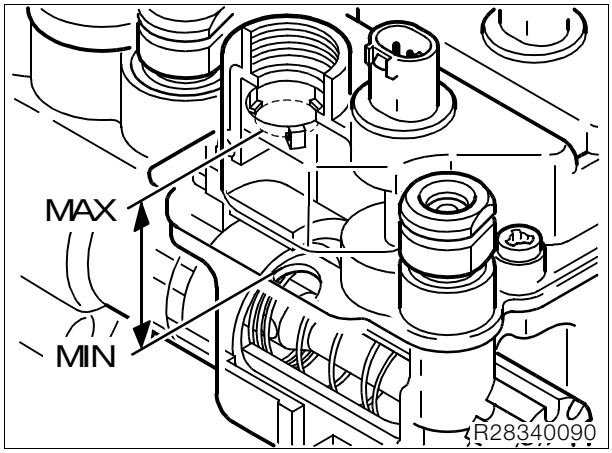


- Screw container, **BMW No. 34 1 581**, onto rear wheel circuit reservoir.
- Slowly fill container, **BMW No. 34 1 581**, with new brake fluid until it is approximately 1/3 full.
- Connect the brake bleeding device to the bleed screw, but **do not switch on** the device.

Note:
If necessary, use a cable tie to secure the bleed hose to the bleed screw.

- Switch on the ignition

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.



Attention:
The brake fluid must always be visible in the container, because the piston in the base of the wheel-circuit reservoir must always be covered by the fluid. The procedure must be repeated if the fluid drops below the “min” level.

- Very gently press the footbrake lever until the pump just starts up.
- Open the bleed screw, while topping up the container with new brake fluid if necessary.
- Pump out the brake fluid with virtually no pressure to begin with, then vary the brake pressure.

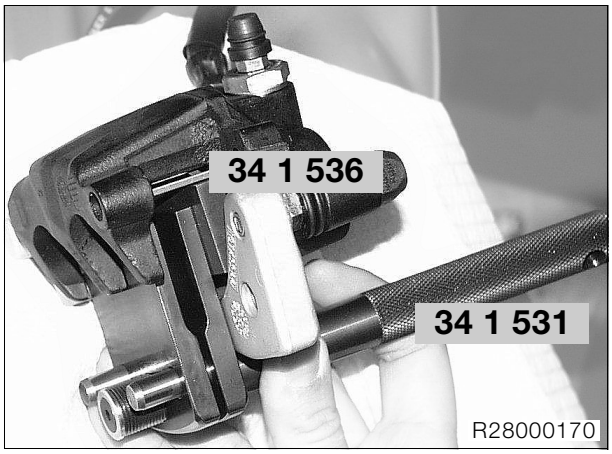
Note:
The higher the brake pressure the faster the fluid is pumped through the system, which means that the level in the wheel-circuit reservoir drops all the more rapidly.

- When the brake fluid is clear and free of bubbles, continue pumping until the fluid in the container just disappears from view.
- Close the bleed screw.
- Release the brake and switch off the ignition.
- Disconnect the brake bleeding device from the bleed screw.
- Disconnect the container from the wheel-circuit reservoir.

Attention:
After changing and/or bleeding the brakes, always top up the fluid in the wheel-circuit reservoir to the correct level in accordance with the instructions.

Instructions for filling rear wheel circuit reservoir

Attention:
Integral brakes, the front brake must be ready for use.



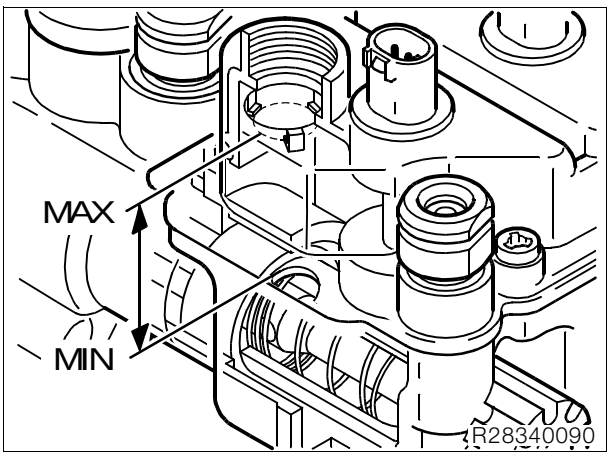
- Top up fluid in rear wheel-circuit reservoir to "MAX" if necessary.
- Fully tighten resetting tool, **BMW No. 34 1 531**, and adapter, **BMW No. 34 1 536**.

Attention:
The piston in the base of the wheel-circuit reservoir must always be covered by the fluid, as otherwise air can be drawn into the brake system.
Bleed the system again if this happens.

- Switch on the ignition.

Note:
After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until self-diagnosis has completed.

- Operate the footbrake lever until the pistons of the rear brake caliper are in contact with resetting tool, **BMW No. 34 1 531**, and adapter, **BMW No. 34 1 536**.

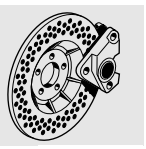


- Top up the fluid in the wheel-circuit reservoir until one of the three protrusions in the filler neck just touches the surface of the fluid (arrow).
- Remove resetting tool, **BMW No. 34 1 531**, and adapter, **BMW No. 34 1 536**.

Warning:
Make sure that the wheel-circuit reservoir does not overflow when the brake pads/brake calipers are installed.

- Install rear brake pads and brake caliper.
- Hand-tighten cap of rear wheel-circuit reservoir.
- Check operation of the brake system with the ignition switched on.

Attention:
After all the work on the brake system has been completed, run a bleed test using the **BMW** MoDiTeC.



- Perform bleed test with **BMW** MoDiTeC.
- Install fuel tank.

Brake fluid.....DOT 4

Tightening torque:
Bleed screw in rear brake caliper ..... 5 Nm
Brake caliper to rear wheel drive ..... 40 Nm

34 00 Integral ABS
Reading fault memory with **BMW** MoDiTeC

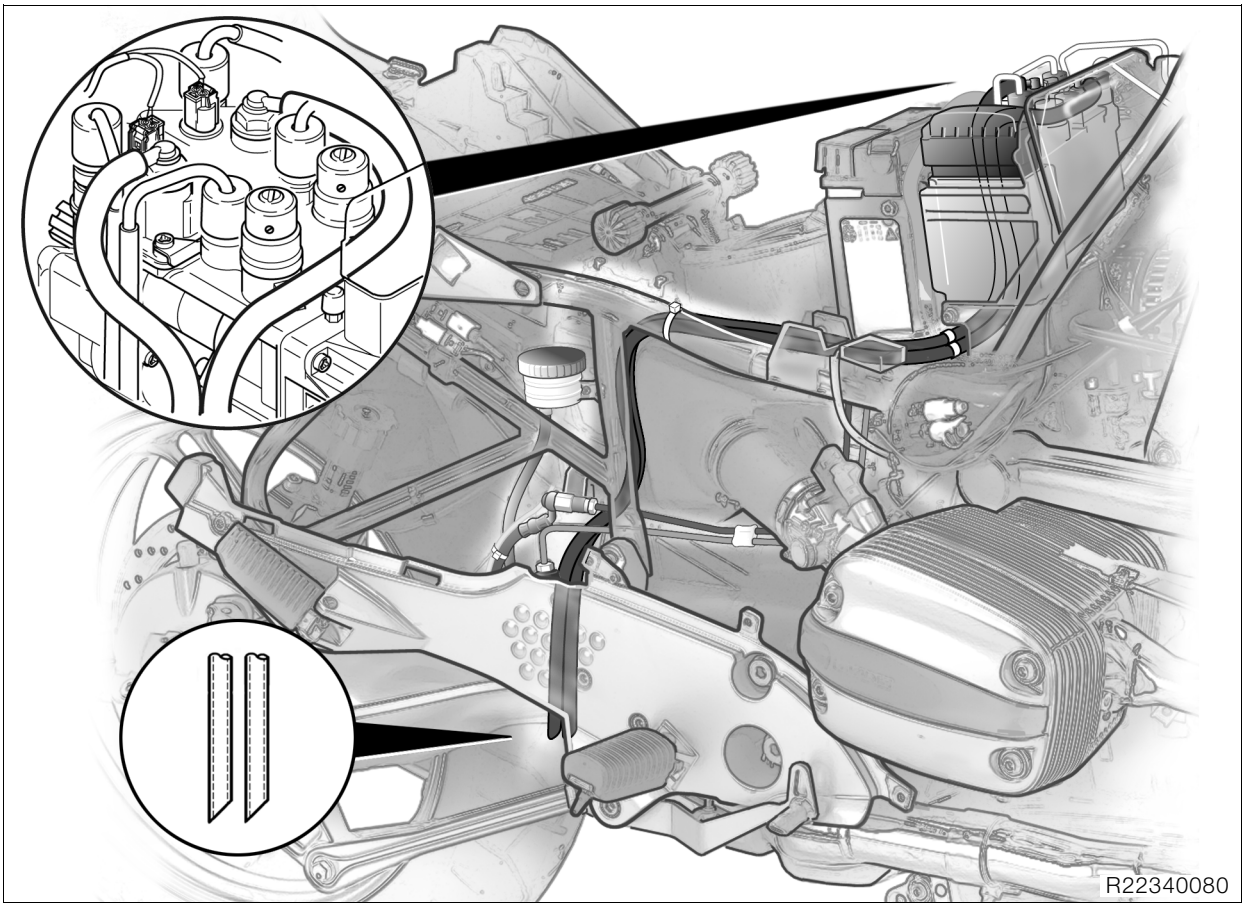
- Remove front and rear seats.
- Connect the **BMW** MoDiTeC to the diagnosis connector.
- Read out the fault memory.
- Clear the fault memory if applicable, or perform all requisite repair work.

34 00 Integral ABS
Performing bleed test with **BMW** MoDiTeC

- Remove front and rear seats.
- Connect the **BMW** MoDiTeC to the diagnosis connector.

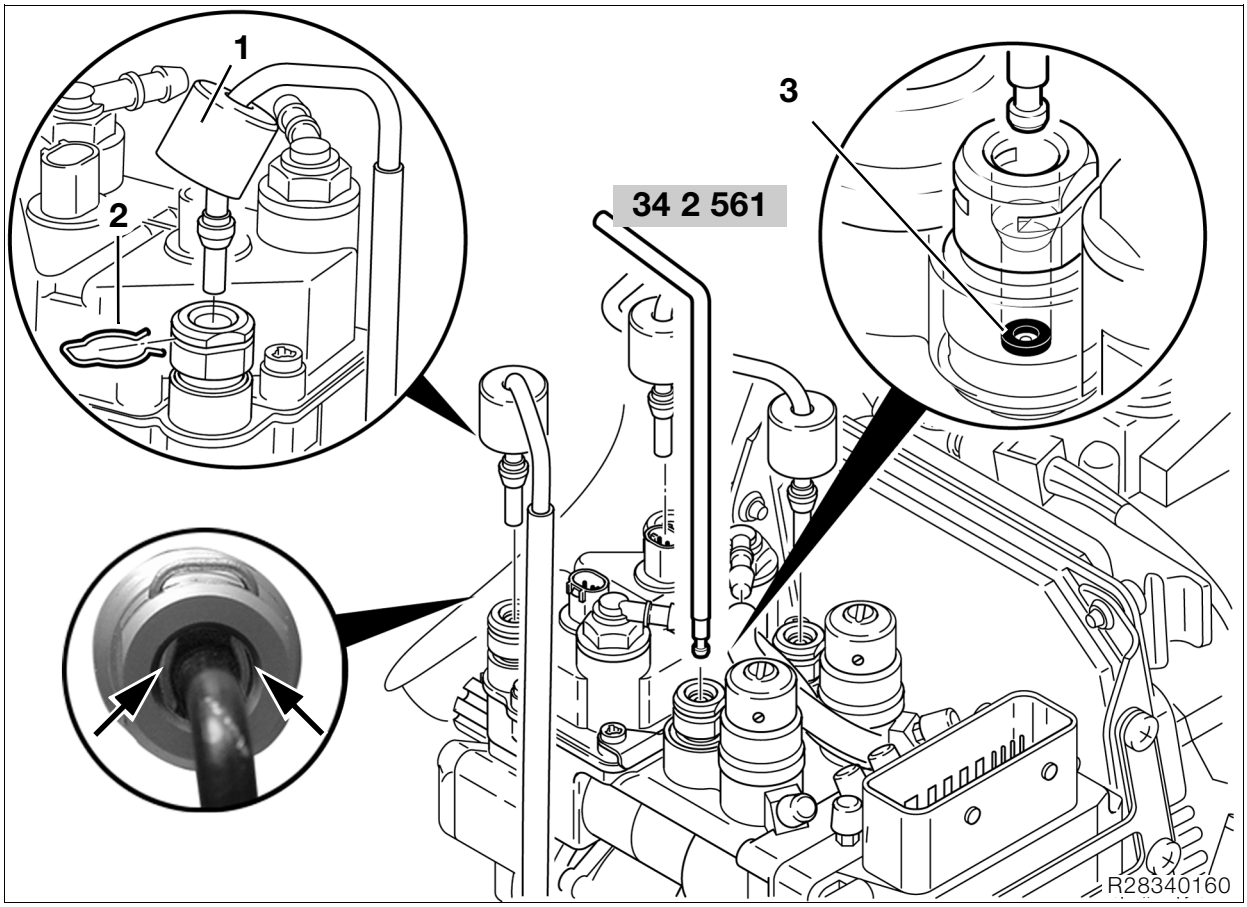
Warning:
When performing maintenance and repair work on BMW Integral ABS, never pump quickly or vigorously.

- Perform bleed test.
- Perform all requisite repair work.



34 51 Integral ABS
Removing and installing bleed lines, wheel circuit reservoirs

- Remove caps of wheel circuit reservoirs complete with bleed lines.
- Installation is the reverse of the removal procedure. Pay particular attention to the following:
- Make sure the bleed lines are free of kinks.
- Cut the bleed lines to length if necessary, and cut the ends at an angle.



Integral ABS: Removing and installing brake lines

- Drain the brake system (➟ 34.17).
- Push protective caps (1) up.
- Remove spring clips (2).
- Remove brake lines.
- Installation is the reverse of the removal procedure: pay particular attention to the following.

Warning:
Always fit new spring clips each time the plugs are disconnected. Ensure correct positioning.

Attention:
Fit new sealing rings for brake line.
Secure brake line to master cylinder so that it cannot become kinked or abraded when the handlebars are turned.

Note:
Always replace the seals (square-section rings) between the brake lines and the pressure modulator when you replace the brake lines.

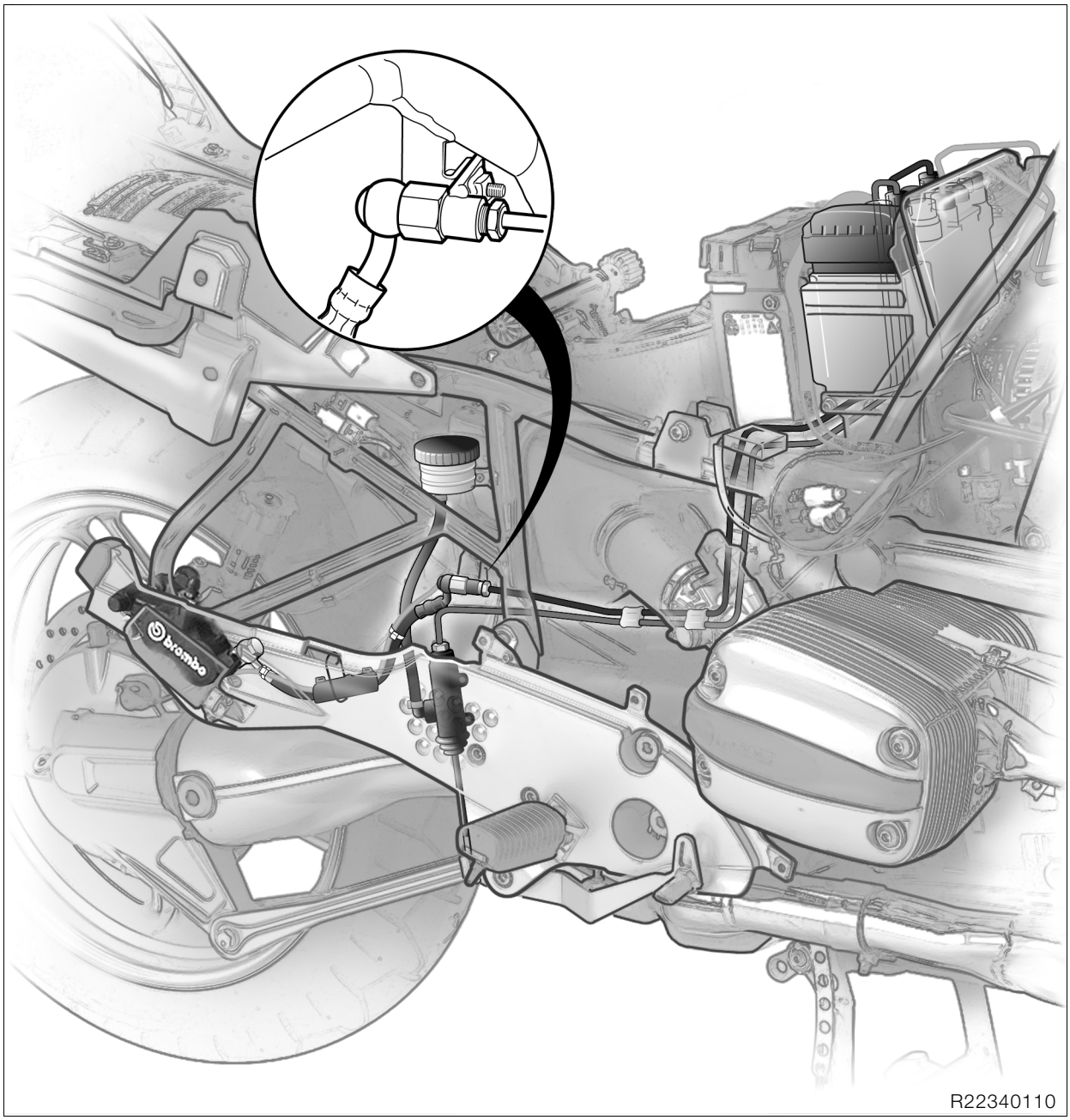
- Carefully remove square-section rings (3) using disassembly tool, **BMW No. 34 2 561**.
- Install square-section rings with brake lines.
- Check that square-section rings are correctly seated.
- Install new spring clips.
- Slip the protective caps up the brake lines.
- Clip in brake lines.
- Check that spring clips are correctly positioned (arrows).
- Seat the protective caps on the connectors.
- Fill and bleed the brake system (➟ 34.20).

Tightening torque:

Brake hose and brake line	18 Nm
Bleed screws in front brake calipers	7 Nm
Bleed screw in rear brake caliper	5 Nm

Installed position of front brake line

Installed position of rear brake line



36 Wheels and tyres

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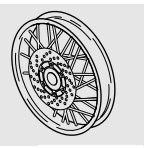
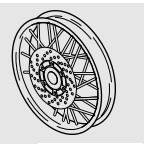
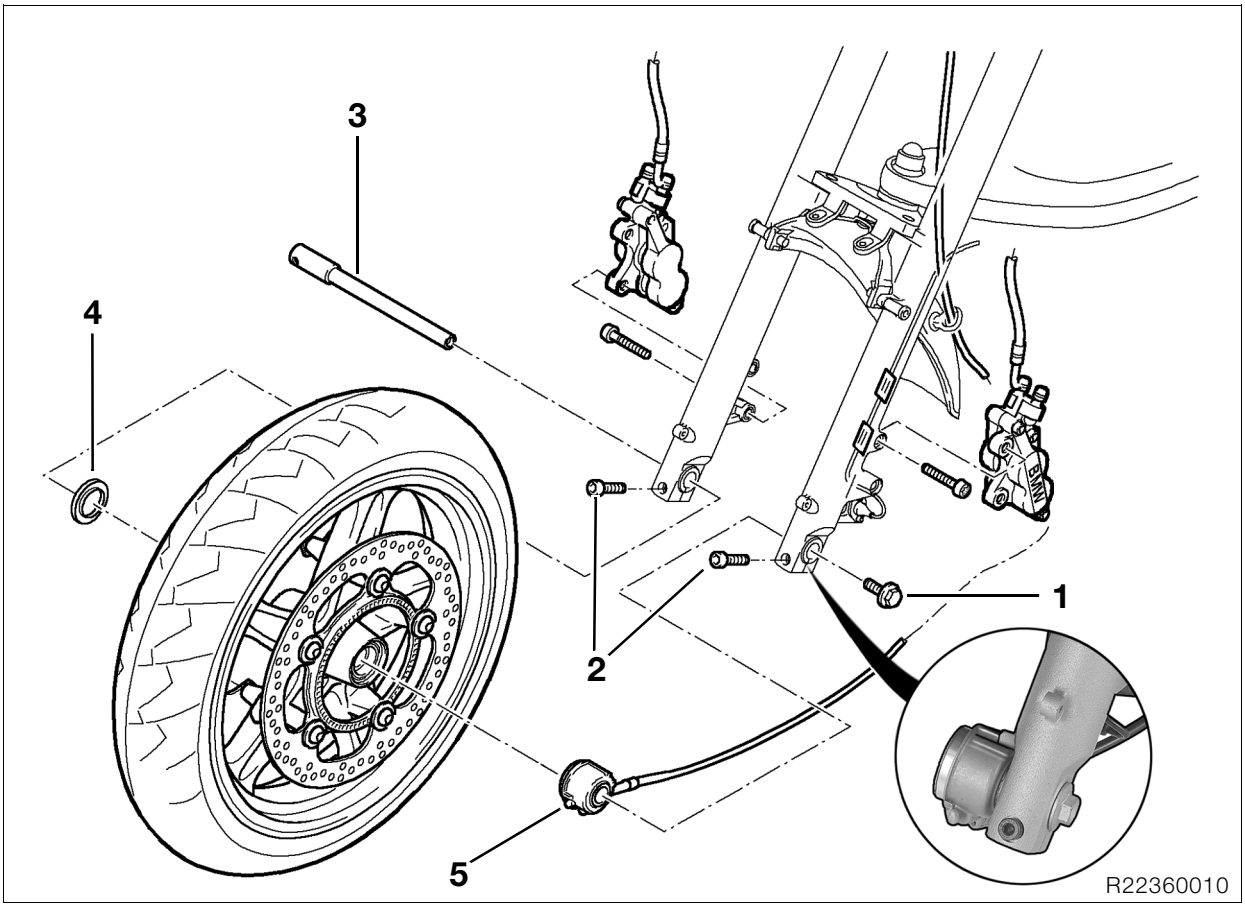


Technical Data 36 Wheels		R 1150 RT
Front wheel		
Type		Cast aluminium wheel with 5 double spokes
Tyre size		120/70 ZR 17 tubeless
Tyre pressure (cold)		
one-up	bar (psi)	2.20 (31.30)
two-up	bar (psi)	2.50 (35.57)
two-up + luggage	bar (psi)	2.50 (35.57)
Maximum permissible imbalance	g (oz.)	60 (2.118 oz.)
Rim size		3.50X17 MT H2
Maximum vertical runout	mm (in)	0.5 (0.0197)
Maximum lateral runout	mm (in)	0.5 (0.0197)
Rear wheel		
Type		Cast aluminium wheel with 5 double spokes
Tyre size		170/60 ZR 17 tubeless
Tyre pressure (cold)		
one-up	bar (psi)	2.50 (35.57)
two-up	bar (psi)	2.90 (41.26)
two-up + luggage	bar (psi)	2.90 (41.26)
Maximum imbalance	g (oz.)	60 (2.118 oz.)
Rim size		5.00X17 MT H2
Maximum vertical runout	mm (in)	0.3 (0.0118)
Maximum lateral runout	mm (in)	0.3 (0.0118)





36 30 300 Removing and installing front wheel

36 30 Removing front wheel

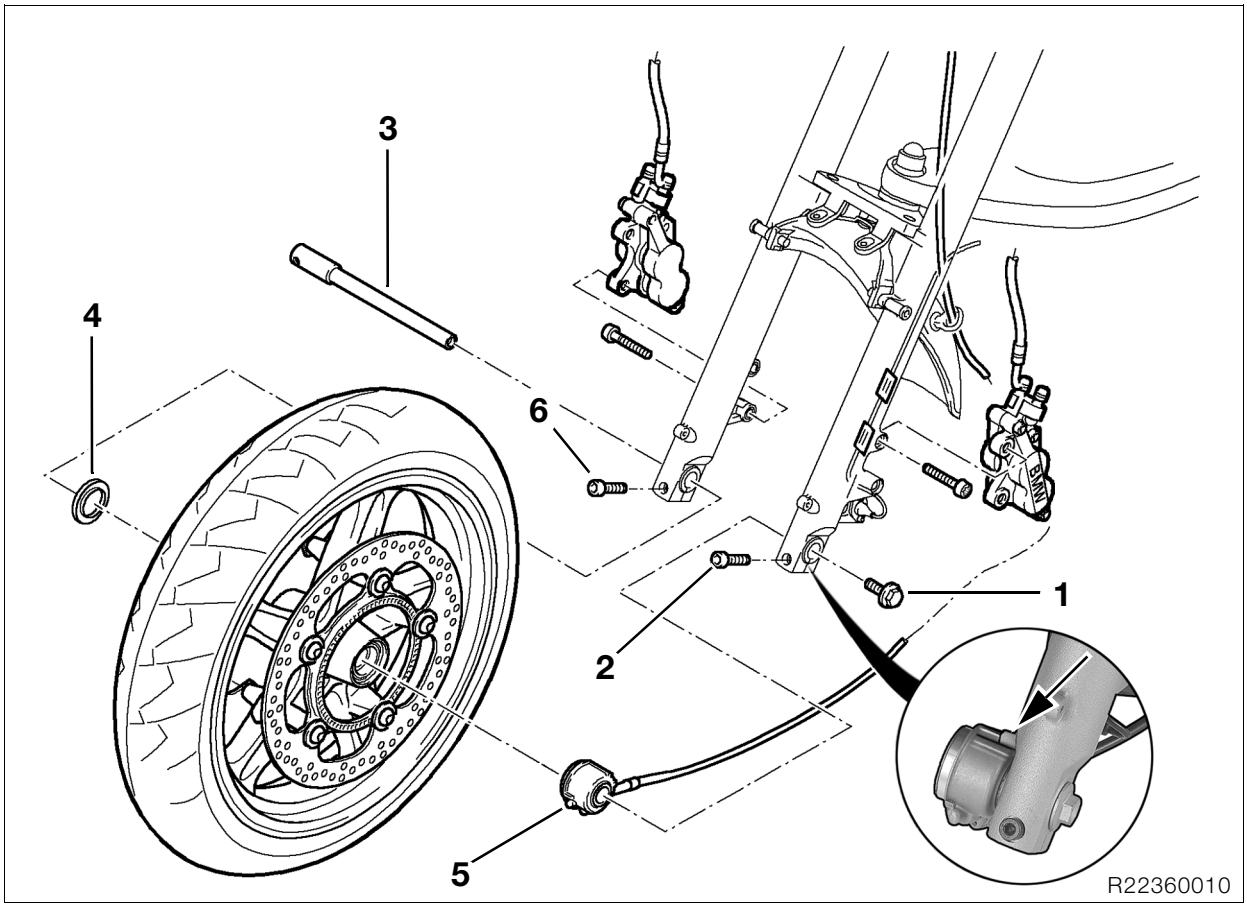
- Remove front wheel cover.

Warning:
Integral ABS When removing and installing the brake calipers, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➟ 00.44).

- Remove brake calipers.

Attention:
Integral ABS Do not apply handbrake lever or foot-brake lever with brake calipers removed/front wheel removed.

- Remove retaining screw (1).
- Loosen clamping screws (2).
- Remove quick-release axle (3).
- Remove cap (4) and speedometer drive (5).
- Remove front wheel.



36 30 Installing front wheel

Attention:
When installing the wheel, make sure that the driver is located in the guide of speedometer drive (5). Make sure that the reaction peg (arrow) on the fork slider tube engages in the recess in the speedometer drive.

- Install the front wheel with cap (4) and speedometer drive (5).
- Apply a thin coat of **Optimoly TA** or similar to the quick-release axle (3) and install.
- Tighten the retaining screw (1).

Warning:
Integral ABS When removing and installing the brake calipers, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➡ 00.44).

- Install the brake calipers.
- Tighten the left clamping screw (2).
- Compress the front fork firmly several times.
- Tighten the right clamping screw (6).

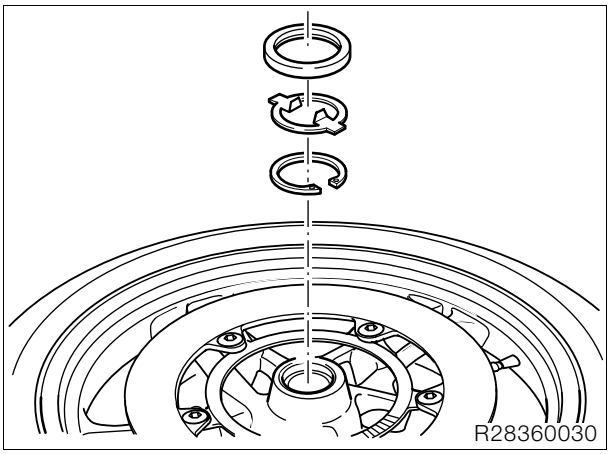
Note:
Integral ABS After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis. Do not operate the brake lever until the self-diagnosis routine has been completed.

- Check operation of the brake system with the ignition switched on.

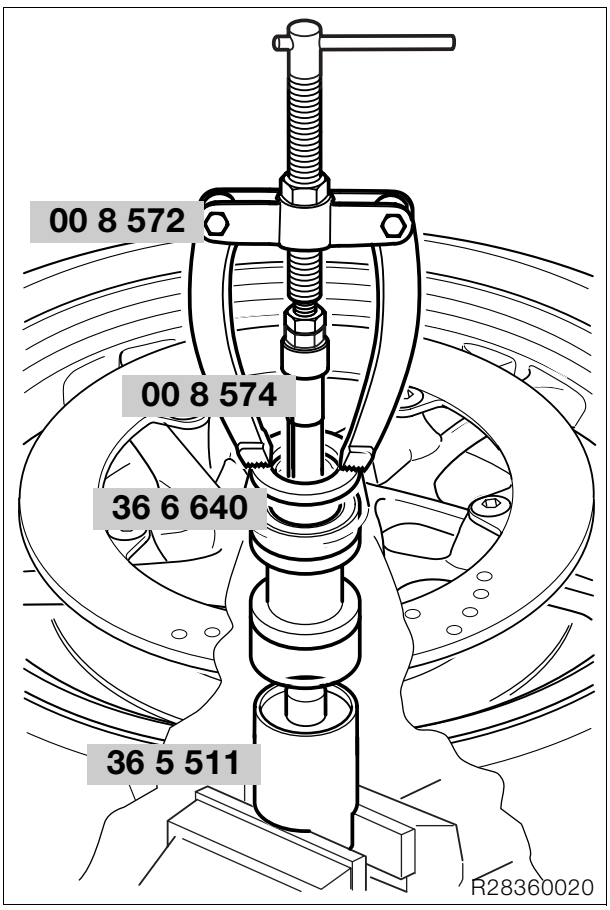
Tightening torque:
Fastener of quick-release axle ..... 30 Nm
Clamping screws of quick-release axle ..... 22 Nm
Brake caliper to fork slider ..... 30 Nm

36 31 396 Removing and installing wheel bearings

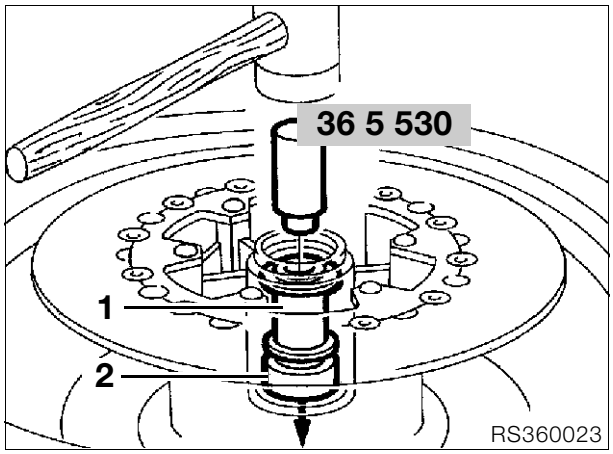
36 31 Removing wheel bearings



- Carefully lever out the shaft sealing ring with a screwdriver.
- Remove driver and retaining ring.



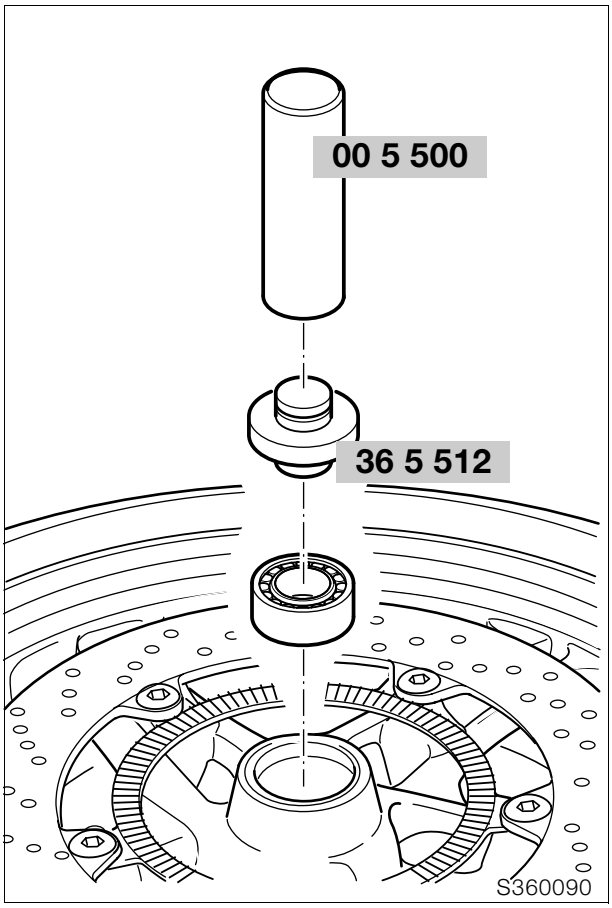
- Clamp a drift, **BMW No. 36 5 511**, into the vise and place the wheel on it with the wide bearing down.
- Place a spacing ring, **BMW No. 36 6 640**, between the wheel hub at the right and the claws of the internal puller.
- Heat the bearing seat to approx. 60 °C (140 °F).
- Pull out the wheel bearing with counter-support 22/1, **BMW No. 00 8 572**, and internal puller 21/3, **BMW No. 00 8 574**.
- Remove wheel from drift, **BMW No. 36 5 511**.



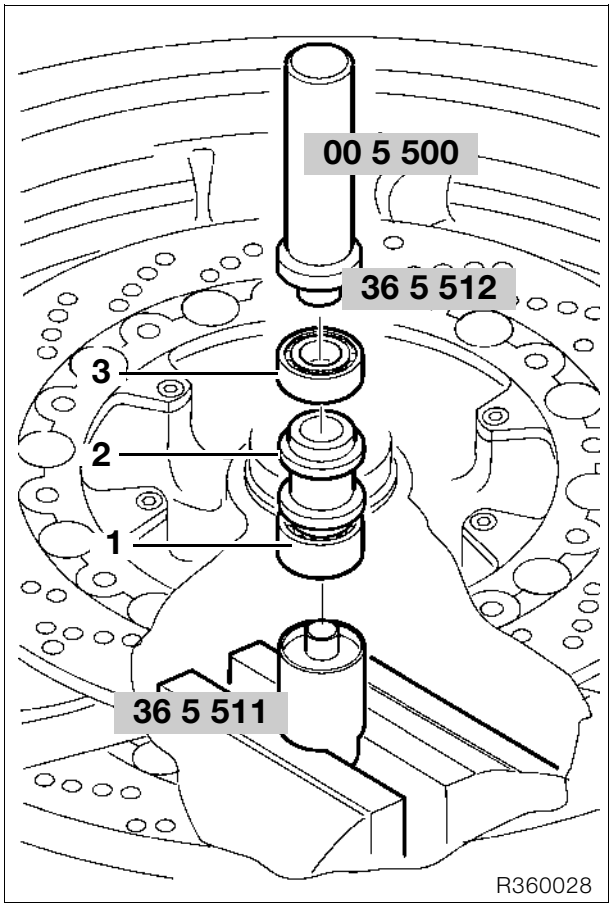
- Press out spacing bushing (1) and wheel bearing (2) with drift, **BMW No. 36 5 530**.

36 31 Installing wheel bearings

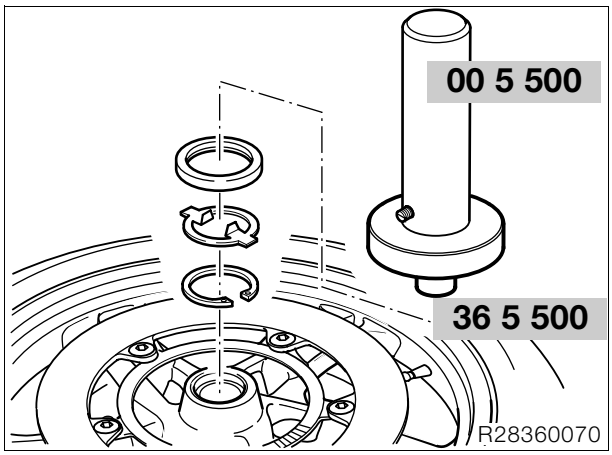
- Degrease bearing seats.
- Heat the bearing seat to approx. 60 °C (140 °F).



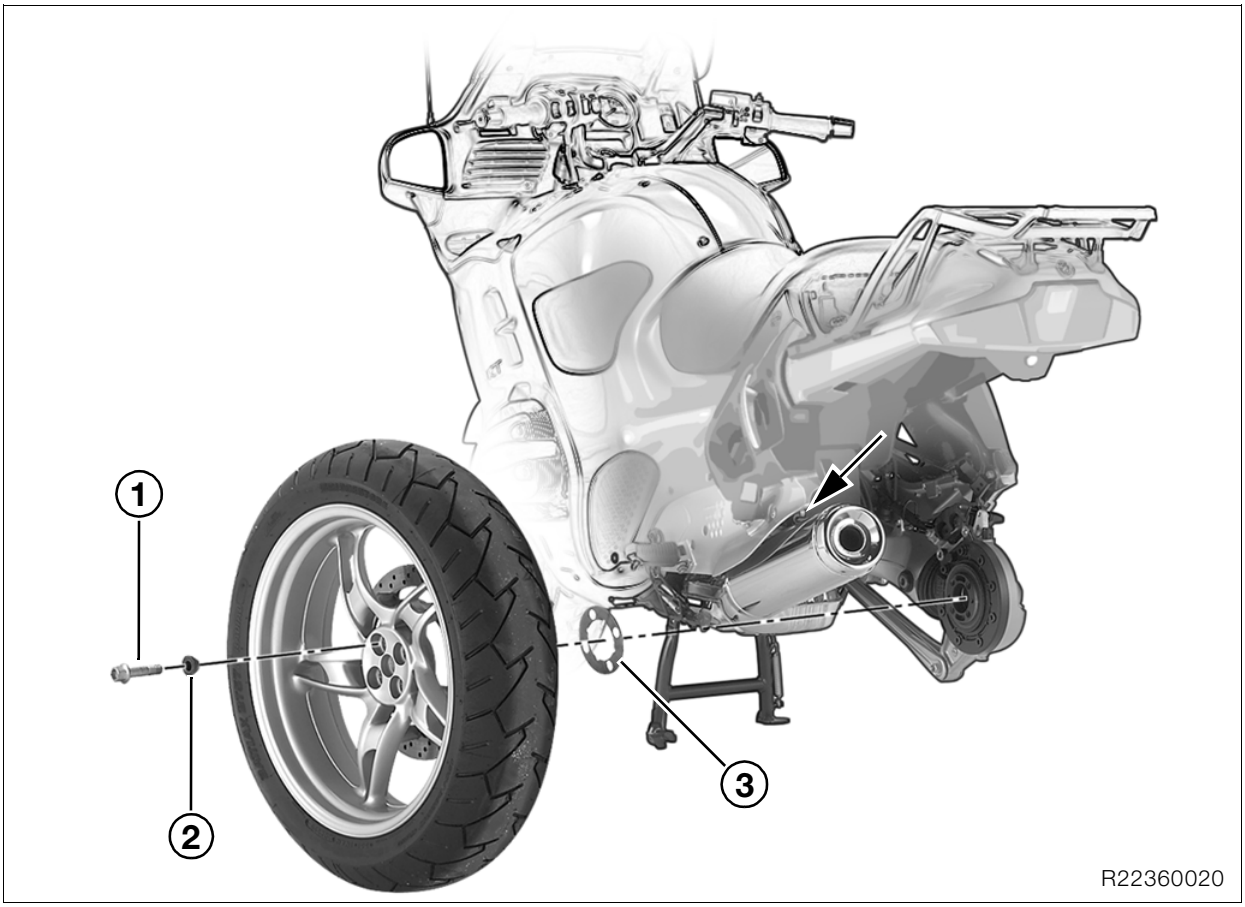
- **First** insert wide bearing using drift, **BMW No. 36 5 512** , and handle, **BMW No. 00 5 500**.



- Clamp a drift, **BMW No. 36 5 511**, into the vise and place the wheel on it with the wide bearing (1) down.
- Install spacer tube (2).
- Bearing seat temperature 60 °C (140 °C).
- 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.
- Install driver.
- Drive in shaft sealing ring with drift, **BMW No. 36 5 500**, and handle, **BMW No. 00 5 500**.



36 30 320 Removing and installing rear wheel

36 20 Removing rear wheel

Warning:
Integral ABS When removing and installing the brake caliper, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➟ 00.48).

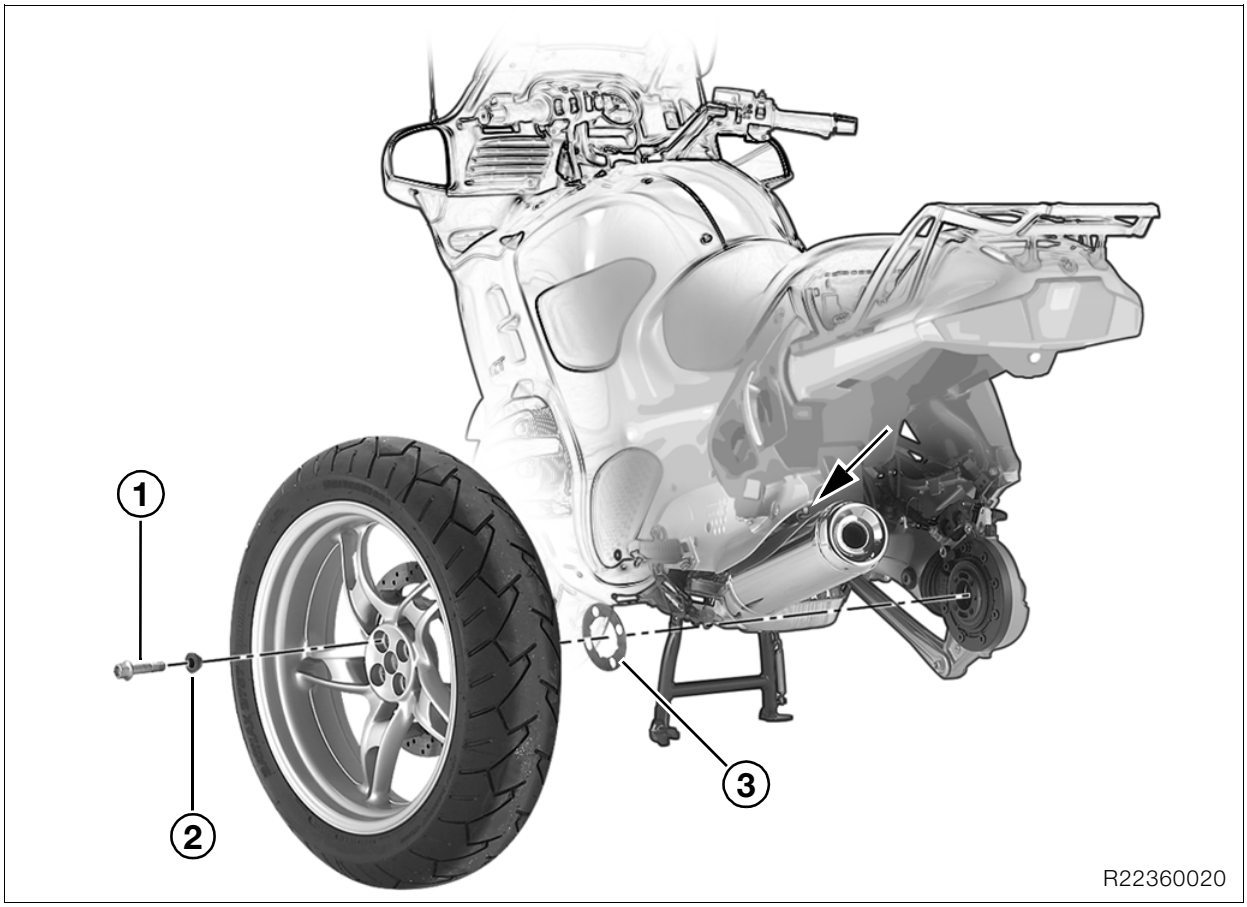
- Remove brake caliper.

Attention:
Integral ABS Do not actuate handbrake lever or footbrake lever with brake calipers removed.

- Remove rear wheel cover.
- Remove wheel studs (1) with taper rings (2).
- If necessary, slacken the screw (arrow) securing the exhaust to the rear frame.

Note:
Do not scrape the wheel – mask it off if necessary.

- Remove the rear wheel.
- Remove spacer (3).



36 20 Installing rear wheel

Attention:
The contact faces on the spacer (3), the rear wheel drive and the wheel hub must be free from grease and clean.
Do not scrape the wheel – mask it off if necessary.

- Place the rear wheel in position with spacer (3).

Attention:
Only use wheel studs with length code 55. Do not oil or grease wheel studs!

- Hand-tighten wheel studs (1) with taper rings (2).
- Tighten the wheel studs (1) in diagonally opposite sequence.

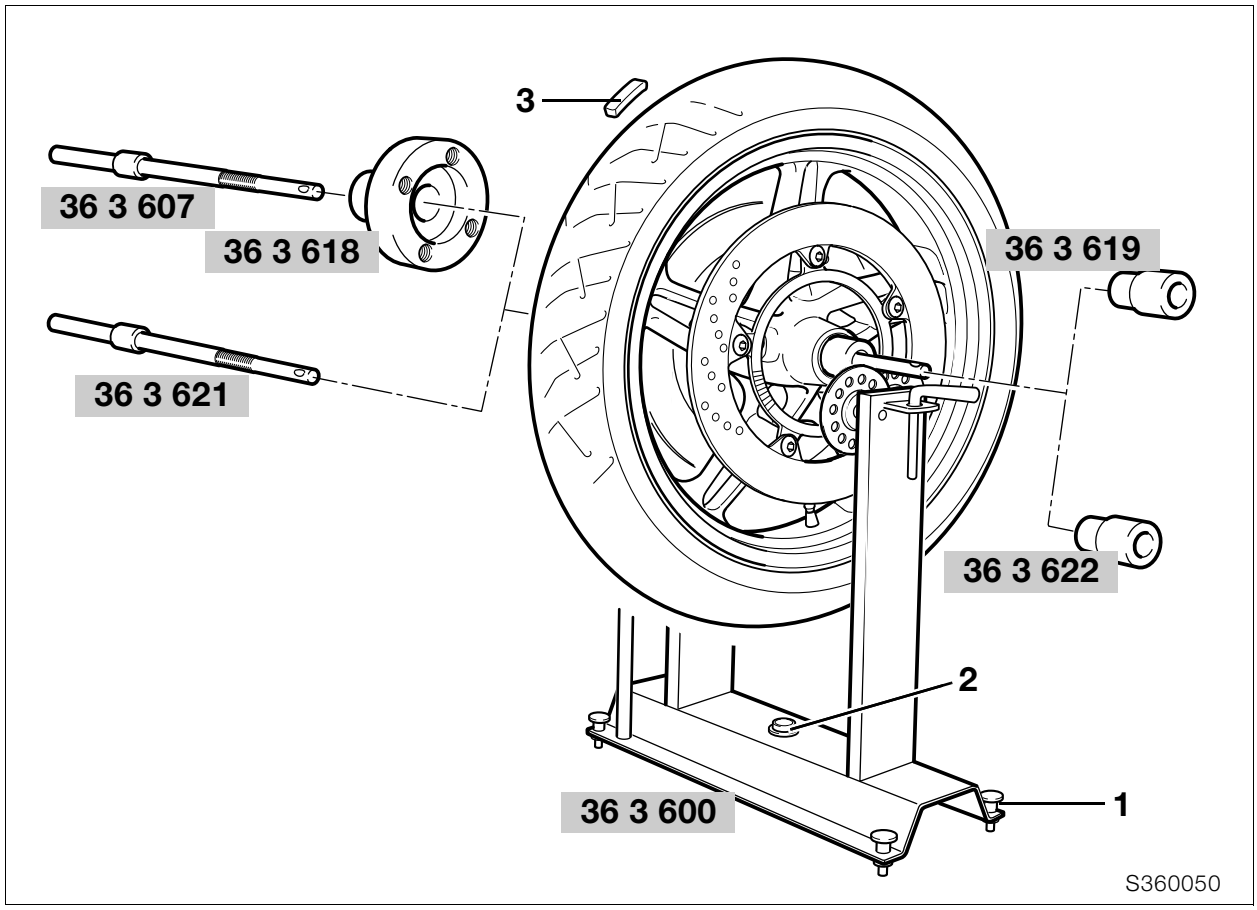
Warning:
Integral ABS When removing and installing the brake caliper, force back the pistons carefully to ensure that the wheel-circuit reservoir does not overflow.
If fluid escapes, proceed in accordance with “Instructions for filling reservoir” (➟ 00.48).

- Install brake caliper.
- If applicable, tighten the screw (arrow) securing the exhaust to the rear frame.
- Install rear wheel cover.

Note:
Integral ABS After switching on the ignition, always wait for the BMW Integral ABS to complete its self-diagnosis.
Do not operate the brake lever until self-diagnosis has been completed.

- Check operation of the brake system with the ignition switched on.

Tightening torque:
Wheel studs ..... 105 Nm
Brake caliper to rear wheel drive ..... 40 Nm

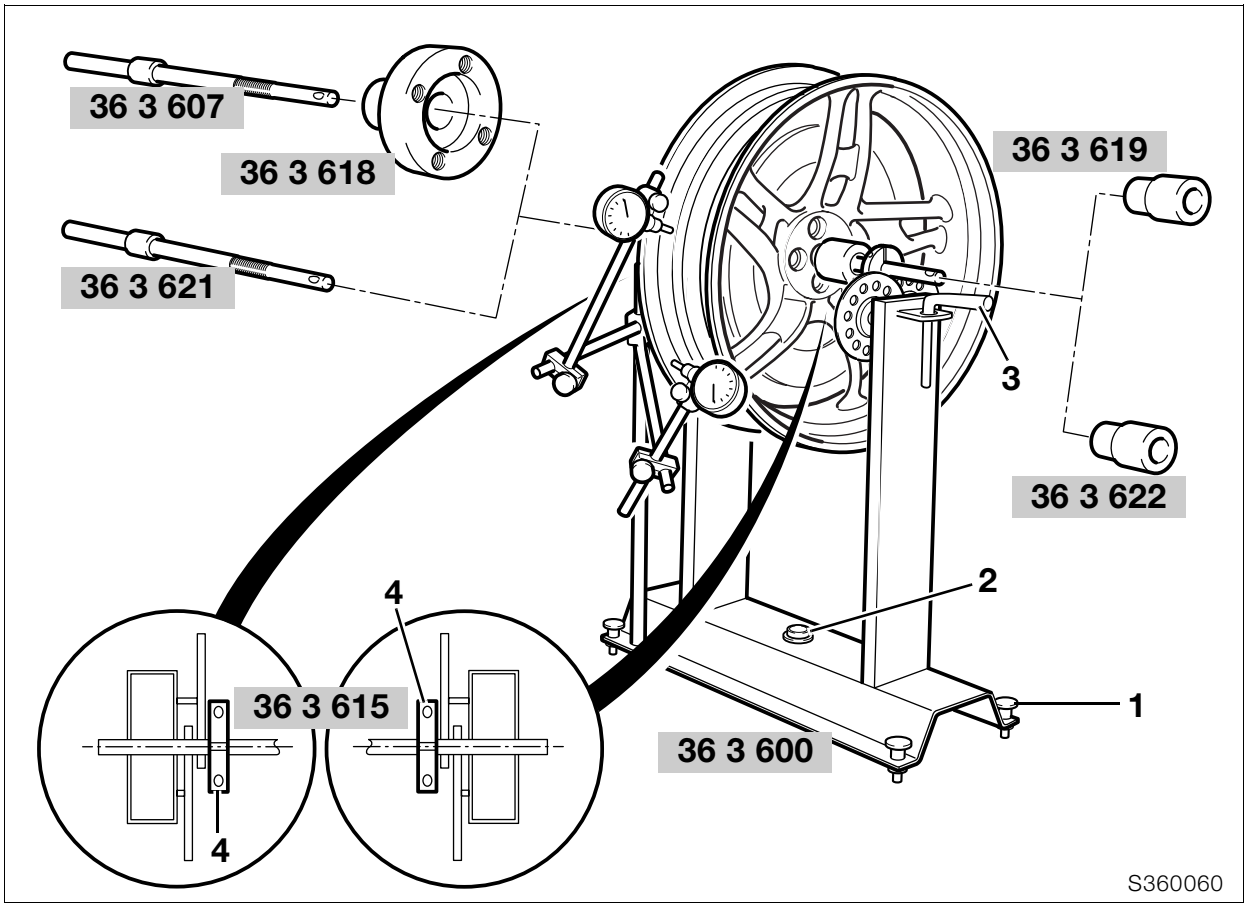


36 30 028 Static balancing of front wheel/rear wheel

- Level balancing stand, **BMW No. 36 3 600**, using knurled-head screws and bubble gauge (1/2).
- Install balancing shaft, **BMW No. 36 3 621**, and nut, **BMW No. 36 3 622**, in front-wheel bearing.
- Slightly tighten nut to preload bearing.
- At the rear wheel, secure mounting device, **BMW No. 36 3 618**, to the centering collar side with wheel studs and taper rings.
- Install balancing shaft, **BMW No. 36 3 607**, and nut, **BMW No. 36 3 619**.
- 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.

⚠ **Attention:**
Maximum balancing weight 60 g (2.118 oz.).

- Repeat the balancing procedure as a check.



36 32 Checking front/rear wheel rim for runout

- Remove tyre.
- Level balancing stand, **BMW No. 36 3 600**, using knurled-head screws and bubble gauge (1/2).
- Install balancing shaft, **BMW No. 36 3 621**, and nut, **BMW No. 36 3 622**, in front-wheel bearing.
- Slightly tighten nut to preload bearing.
- Use pin (3) to lock the balancing shaft against the balancing stand to prevent the shaft from turning.
- At the rear wheel, secure mounting device, **BMW No. 36 3 618**, to the centering collar side with wheel studs and taper rings.
- Install balancing shaft, **BMW No. 36 3 607**, and nut, **BMW No. 36 3 619**.
- Clamp locating discs (4), **BMW No. 36 3 615**, to the balancing shaft at left and right in such a way that the shaft cannot wander.
- Check radial/axial runout.

⚠ **Attention:**
Always position the dial gauge probe against the machined section of the wheel's inner surface.

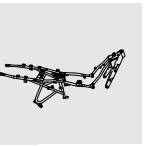
Max. radial runout/lateral runout
Front wheel ..... 0.5 mm (0.0197 in)
Rear wheel ..... 0.3 mm (0.0118 in)

46 Frame

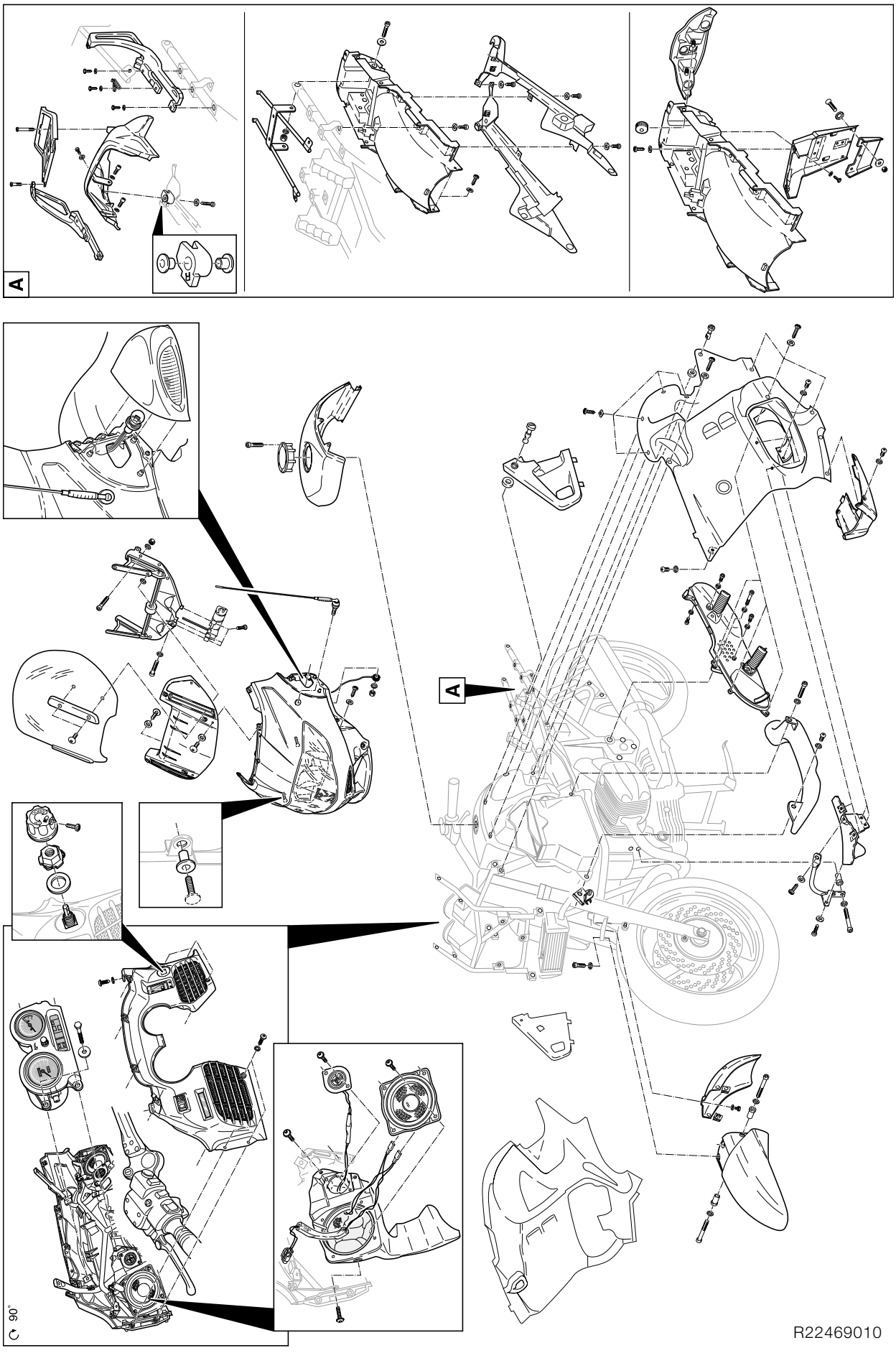
Contents

Page

Technical Data 46 Frame		R 1150 RT
Frame		
Type		Cast aluminium front frame with tubular steel rear frame, load-bearing drive unit
Data plate location		Front frame, on right
Vehicle identification number location		Front frame, on right
Vehicle dimensions		
Maximum length	mm (in)	2,230 (87.7968)
Overall height in normal position (full fuel load and 85 kg/187 lbs rider)	mm (in)	1,380 (54.3316)
Maximum width (across mirrors)	mm (in)	898 (35.3549)
Seat height without rider	mm (in)	805/825/845 (31.6935/32.4809/33.2683)
[OE] low seat	mm (in)	780/800/820 (30.7092/31.4966/32.2840)
Ground clearance in normal position (full fuel load and 85 kg/187 lbs rider)	mm (in)	153 (6.0237)
Vehicle weight		
Unladen weight, ready for road, tank full (without optional extras)	kg (lbs)	279 (615) (without cases)
Dry weight	kg (lbs)	255.1 (562.39)
Permitted gross weight	kg (lbs)	490 (1080)
Maximum payload	kg (lbs)	211 (465)
Running-gear data		
Wheelbase in normal position (full fuel load and 85 kg/187 lbs rider)	mm (in)	1,485
Castor in normal position (full fuel load and 85 kg/187 lbs rider)	mm (in)	122 (4.8032)
Steering head angle in normal position (full fuel load and 85 kg/187 lbs rider)	°	62.9
Steering lock angle	°	34
Axle load split in normal position (f/r) (full fuel load and 85 kg/187 lbs rider)	%	49.1 / 50.9
Wheel track offset		
normal	mm (in)	+ 3.5 (0.1378) (= to right)
Max	mm (in)	± 9 (± 0.3543); datum is + 3.5 (+ 0.1378)



Exploded view of fairing sections and trim panels



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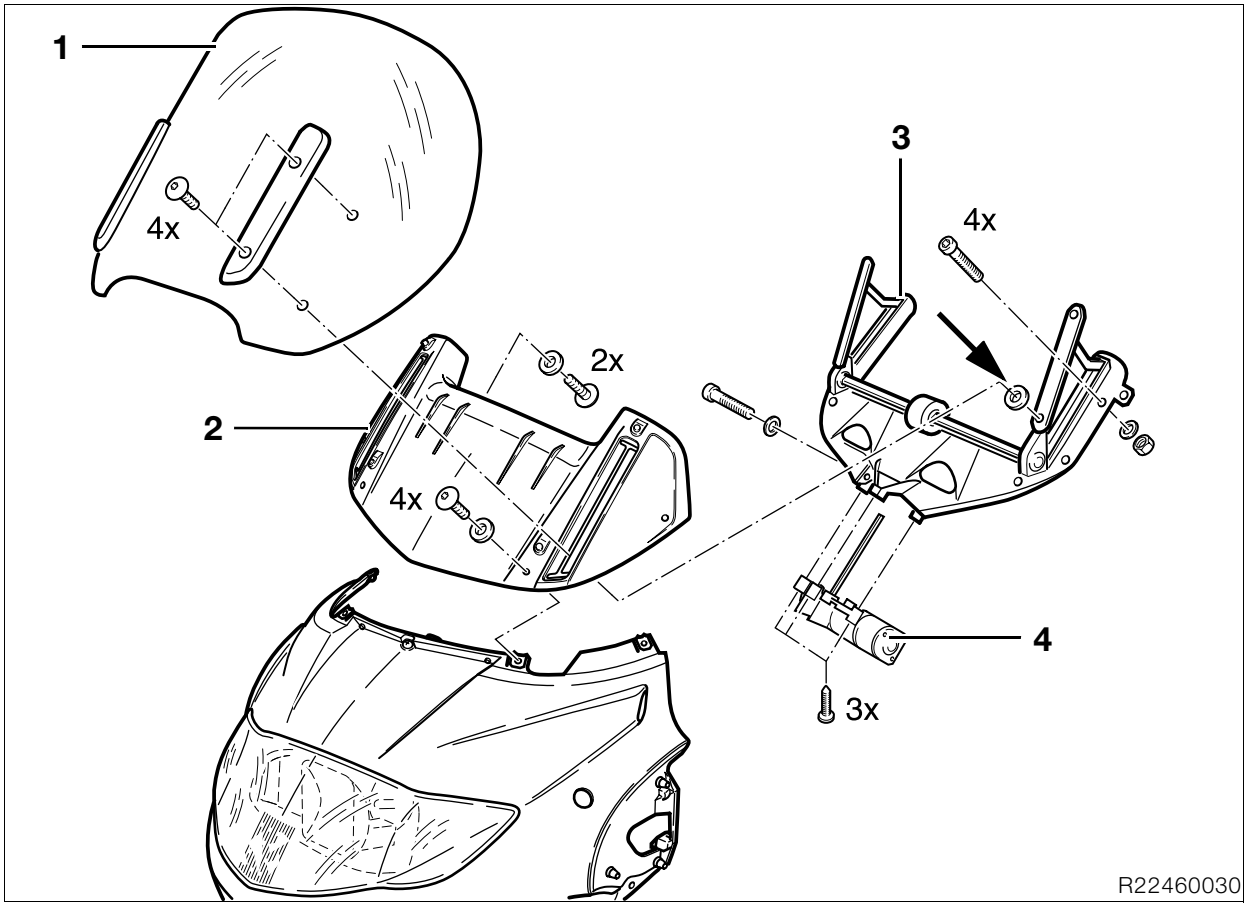
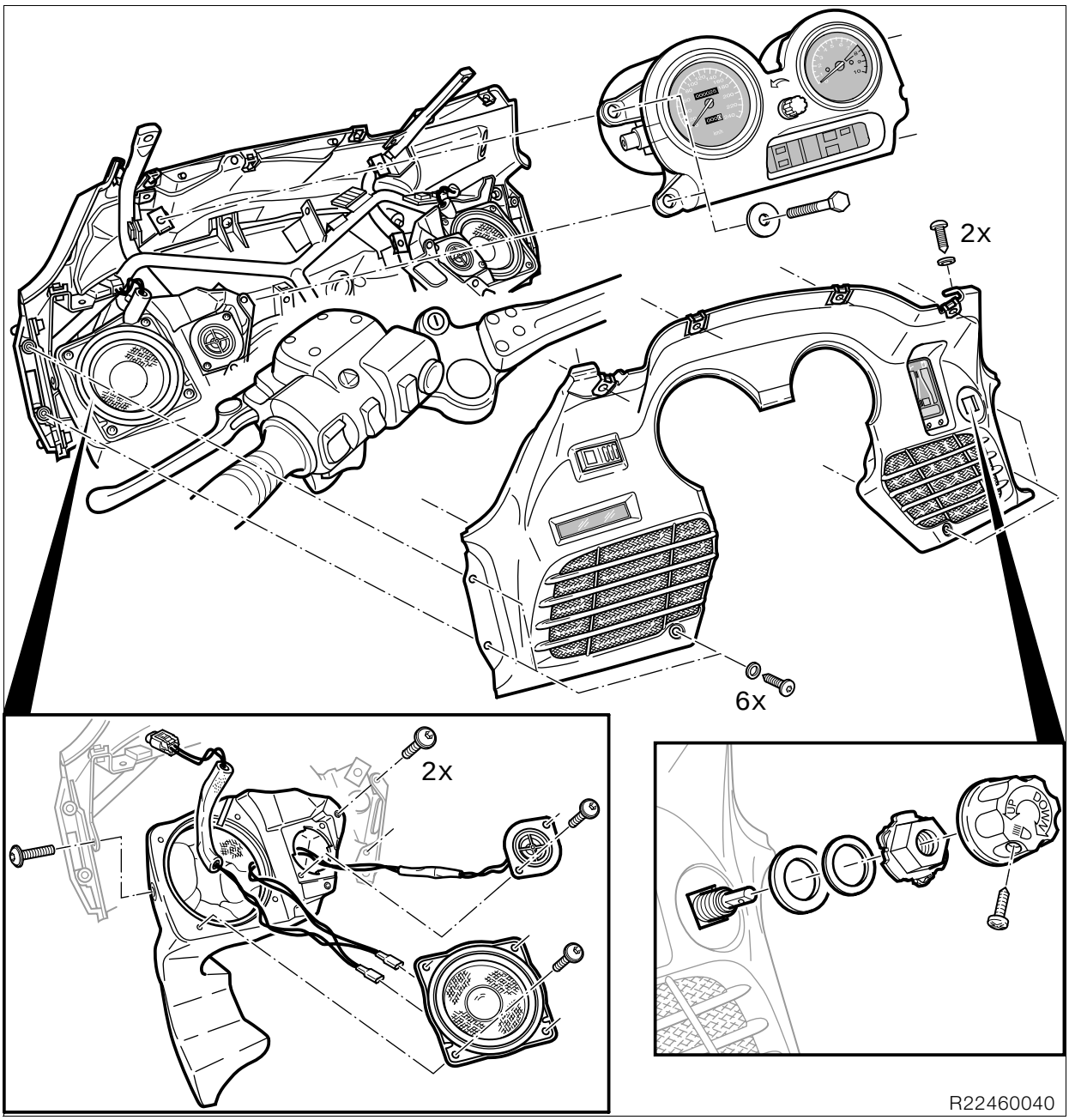


46 63 Removing and installing windscreen adjuster

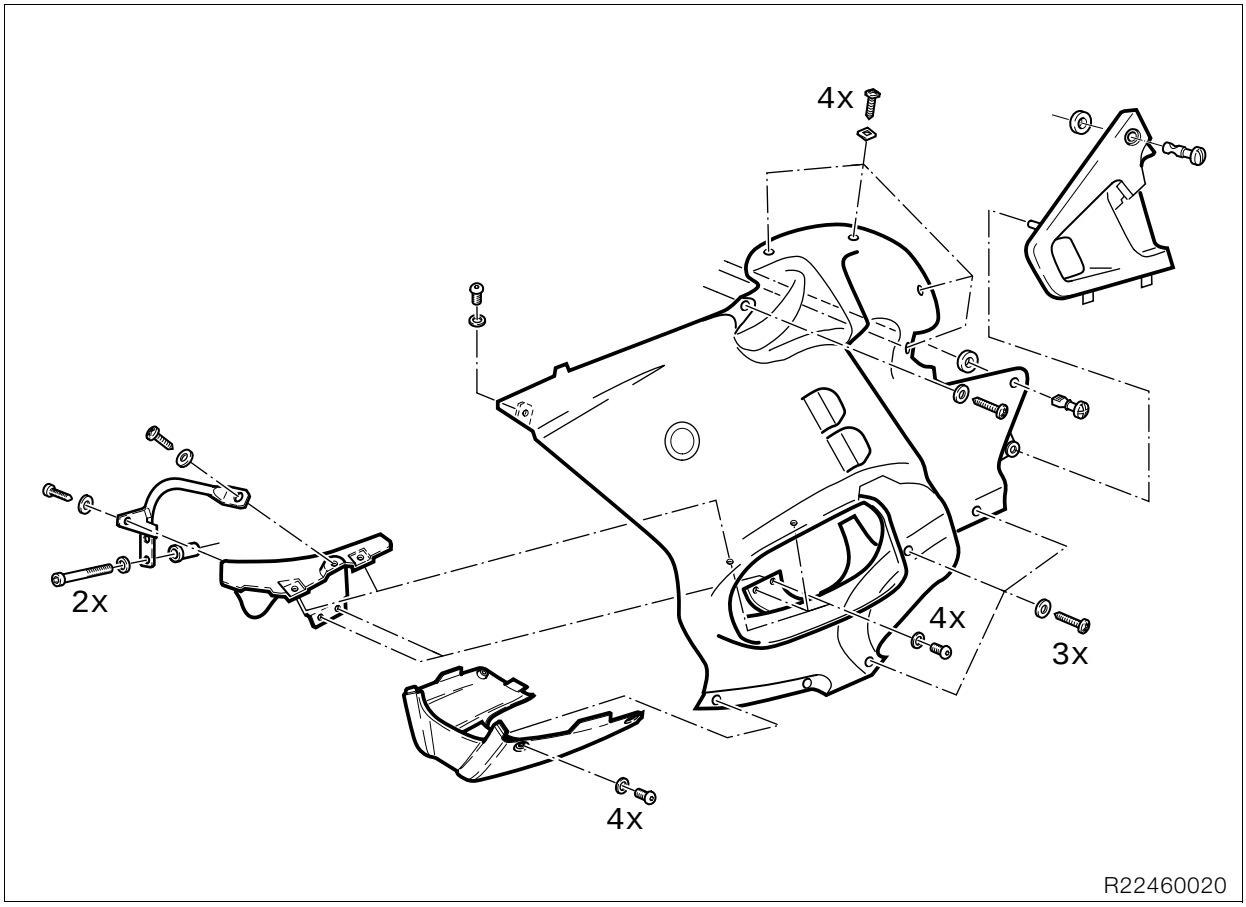
- Remove the seat.
- Remove side mirrors.
- Remove fairing side sections.
- Remove windscreen (1).
- Remove cover for windscreen adjuster (2).
- Remove inner trim of fairing.
- Remove upper section of fairing.
- Remove windscreen adjuster (3).
- Disconnect plug and remove electric drive (4).
- Installation is the reverse of the removal procedure.

Note:
Note washers (arrow).



46 63 Removing and installing inner trim of fairing

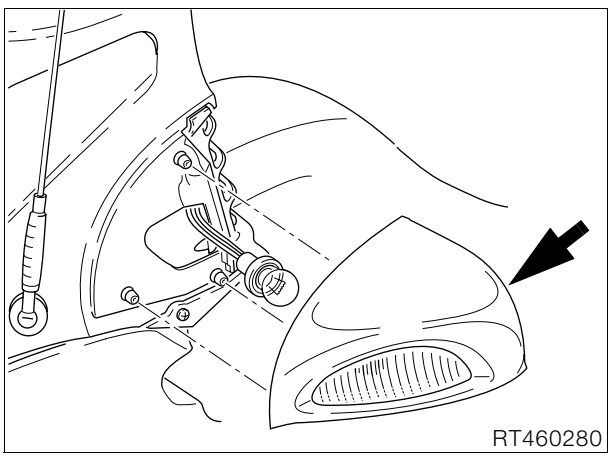
- Remove knob for headlight beam throw adjustment.
- Remove windscreen.
- Remove cover for windscreen adjuster.
- Remove mirrors.
- Remove inner cover.
- Installation is the reverse of the removal procedure.



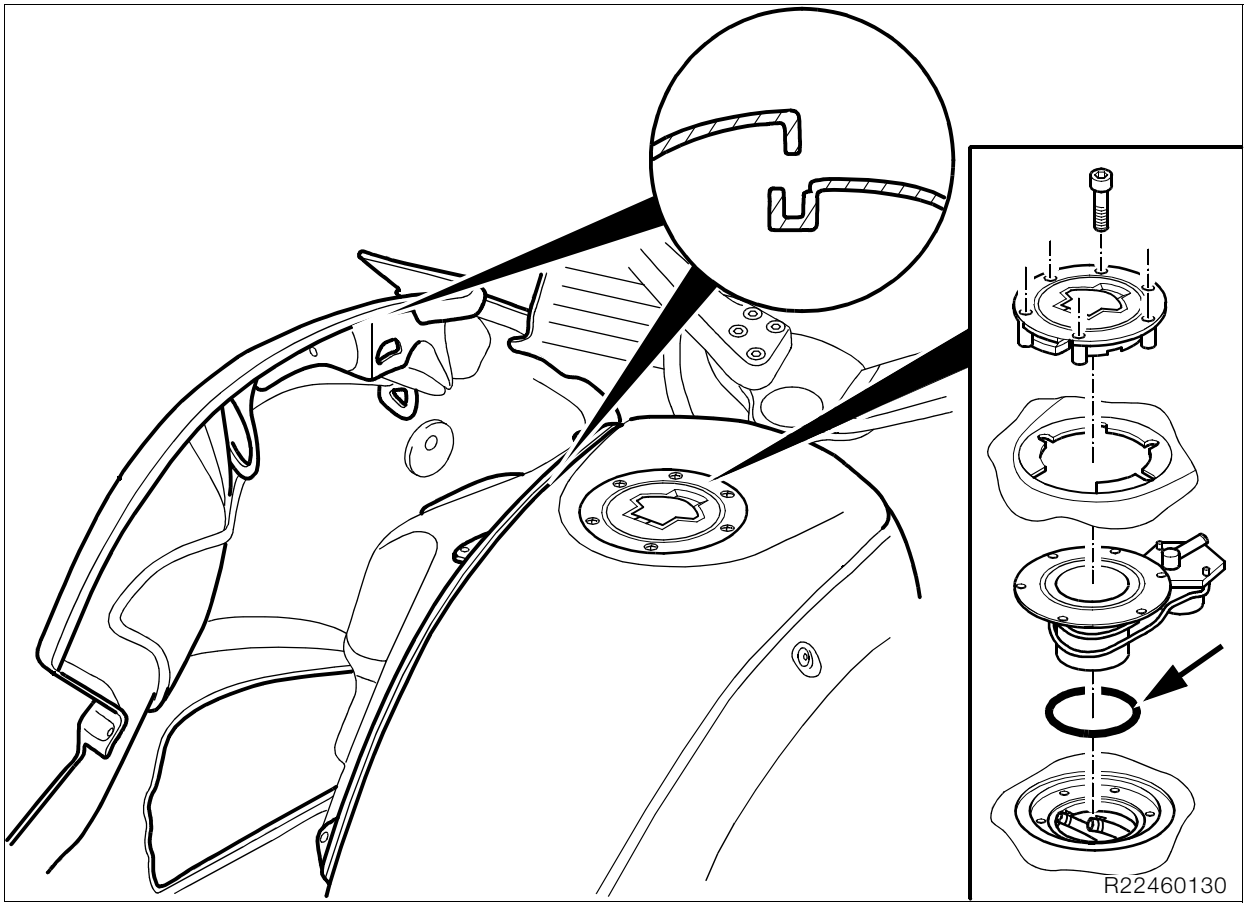
46 63 Removing and installing fairing

46 63 Removing and installing fairing side section

- Remove seat.
- Remove small side fairing panels.



- Hold side mirror with one hand. Release the mirror by tapping lightly with the other hand on the mirror casing in the direction of the mirror.
- Remove engine spoiler.
- Remove fairing side sections.
- Installation is the reverse of the removal procedure.
- Position the mirror at the 3 attachment points. Tap the mirror housing gently to engage it, first at the front and then at the rear.

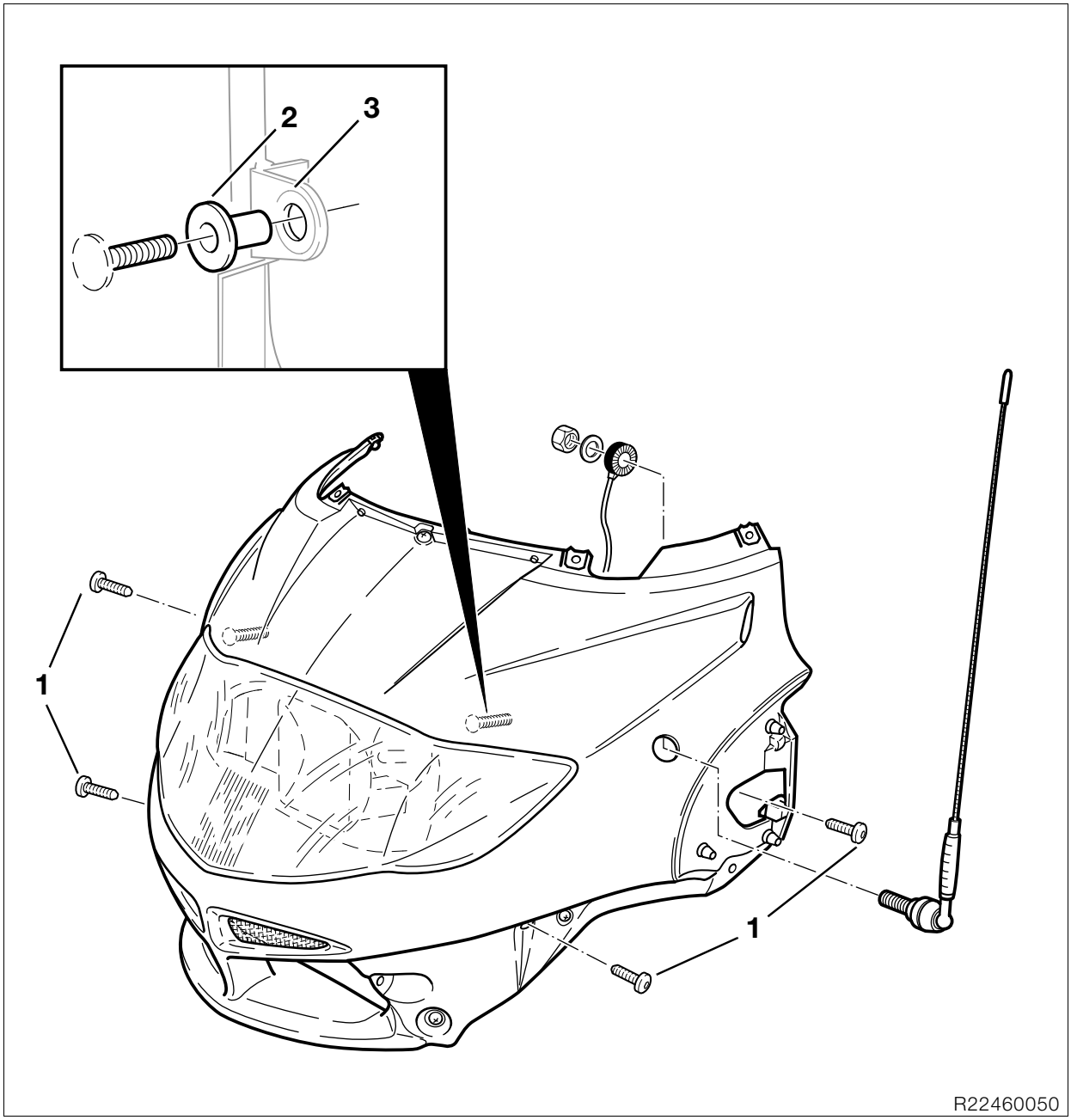


46 63 Removing and installing tank trim

Attention:
Fuel is flammable and a hazard to health.
Observe all applicable safety regulations.

- Remove side panels.
- Remove screws securing fuel filler cap.
- Remove fuel filler cap.
- Remove tank trim.
- Installation is the reverse of the removal procedure.

Attention:
Make sure that O-ring seal (arrow) is correctly seated.
After installing, check fuel filler cap for leaks.

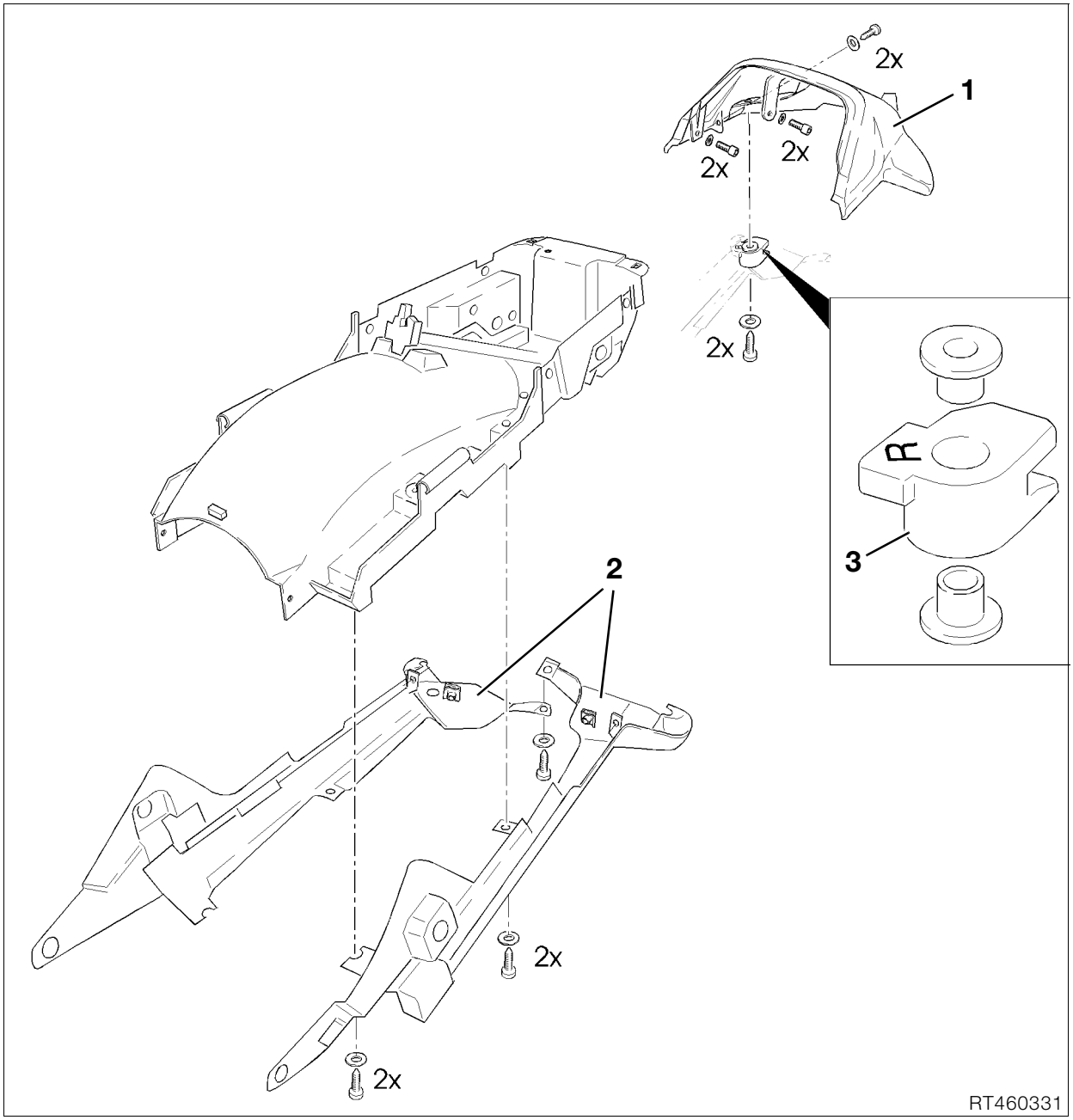


46 63 Removing and installing upper section of fairing

Attention:
Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove the seat.
- Remove side mirrors.
- Remove fairing side sections.
- Remove windscreen.
- Remove cover for windscreen adjuster.
- Remove inner trim of fairing.
- Remove left loudspeaker box.
- Remove aerial.
- Remove the sidelight from the headlight housing.
- Feed left and right turn-indicator cables through the fairing.
- Remove screws (1), pull the upper section of the fairing forward and hold it in position.
- Disconnect plug for headlight.
- Remove upper section of fairing.
- Installation is the reverse of the removal procedure.

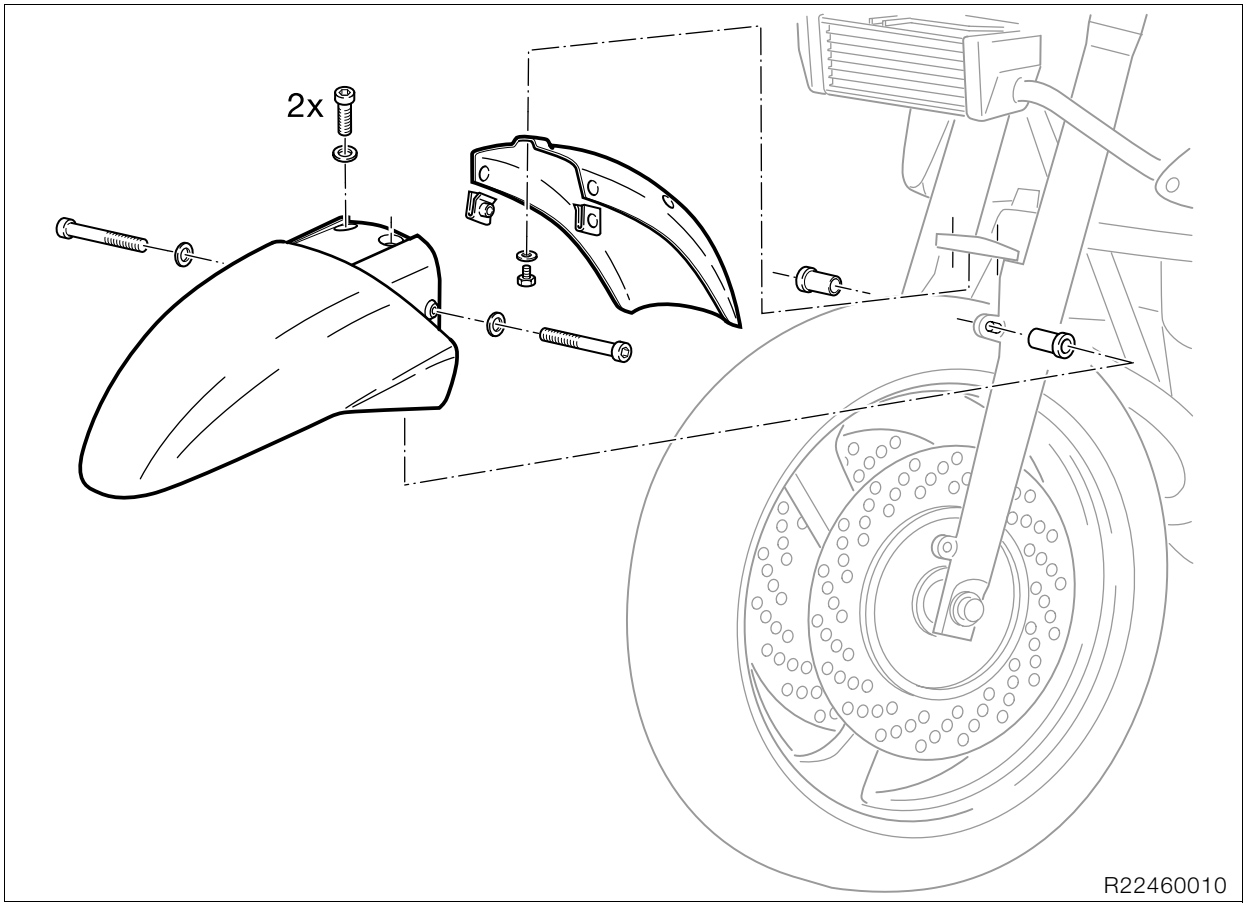
Note:
Before installing the upper section of the fairing, insert metal bush (2) into rubber guide (3). Make sure that the headlight adjuster is correctly routed.

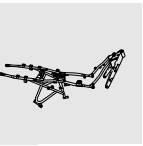


46 63 Removing and installing rear trim panels

- Remove the seat.
- Remove small side panels.
- Remove luggage rack and case holders.
- Remove the tail light.
- Remove rear trim panels (1) and (2).
- Installation is the reverse of the removal procedure.

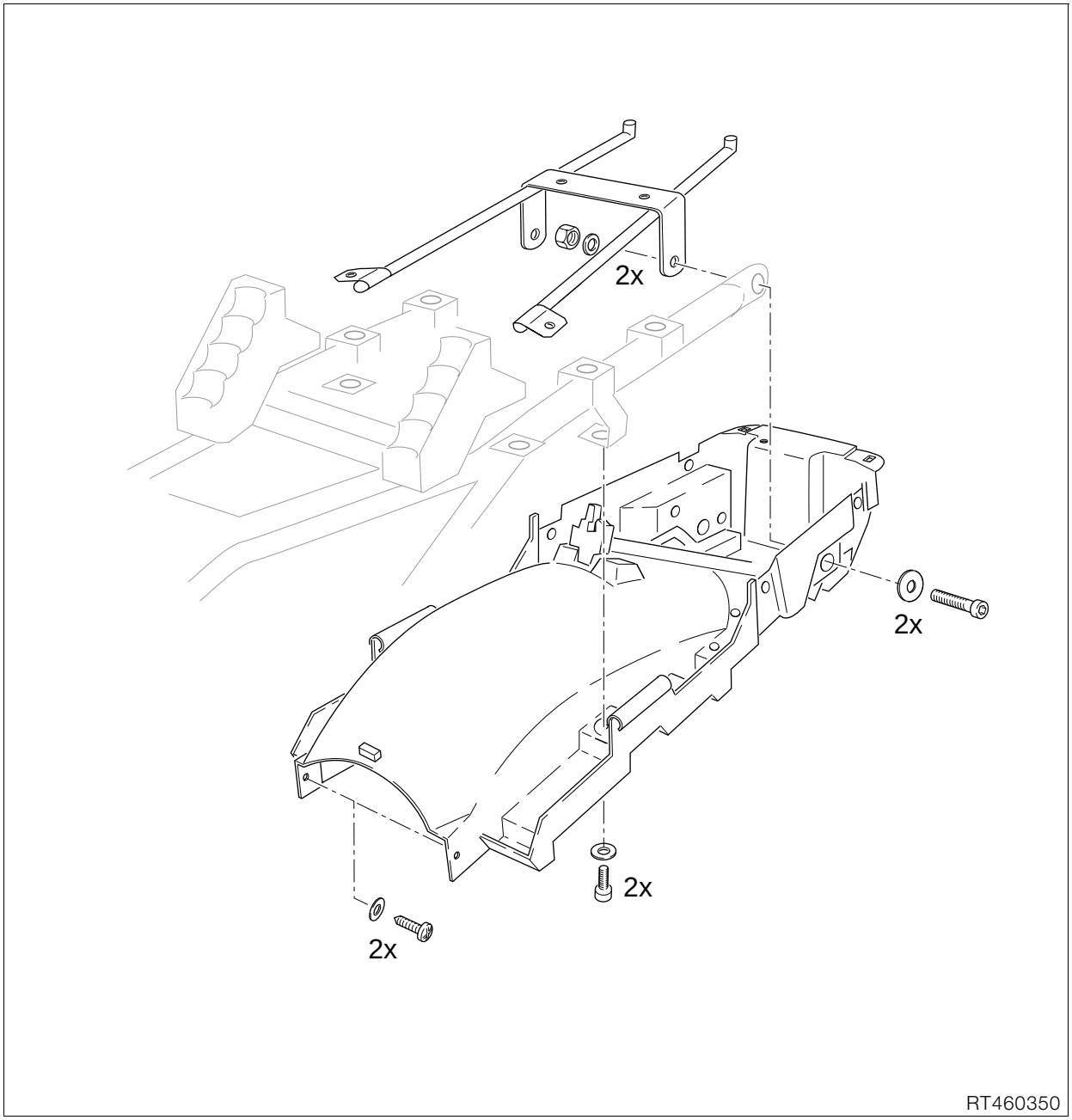
Note:
When installing, note right and left rubber buffers (3).





46 61 Removing and installing front mudguard

- Remove front section of front mudguard.
- Remove the rear section of the front mudguard.
- Installation is the reverse of the removal procedure.

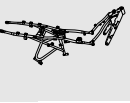


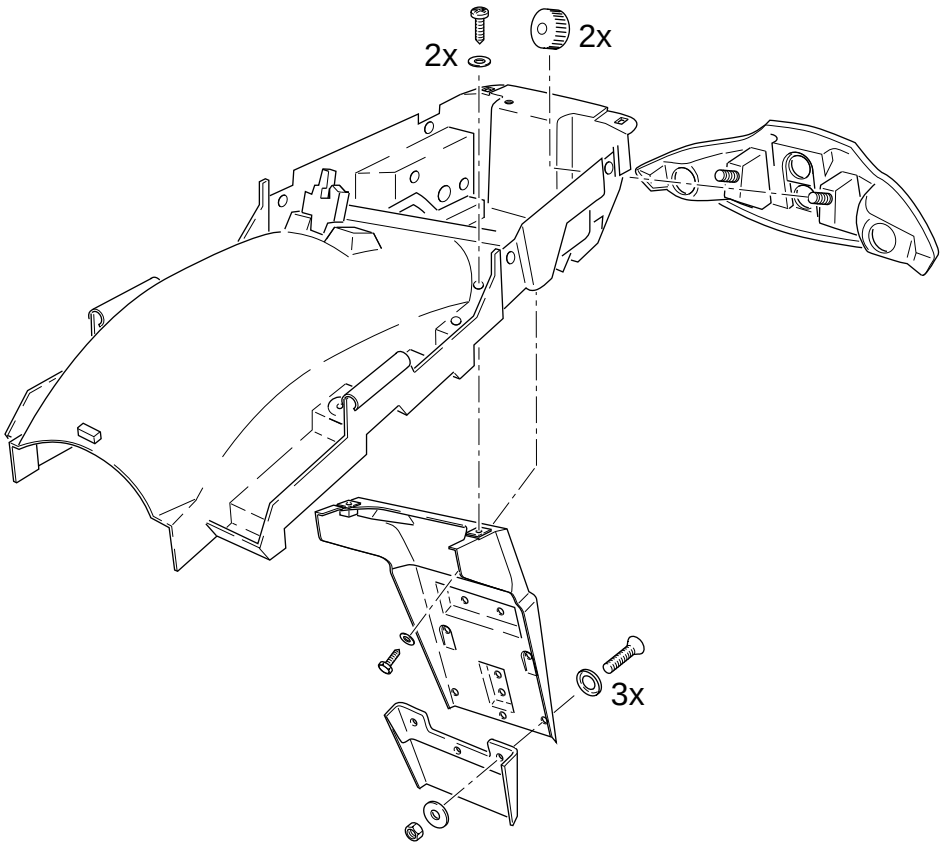
RT460350

46 62 Removing and installing the rear section

Attention:
Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove seat.
- Remove small side panels.
- Remove rear light cluster.
- Remove luggage rack and case carriers.
- Remove rear side panels.
- Remove rear section, bottom.
- Installation is the reverse of the removal procedure.

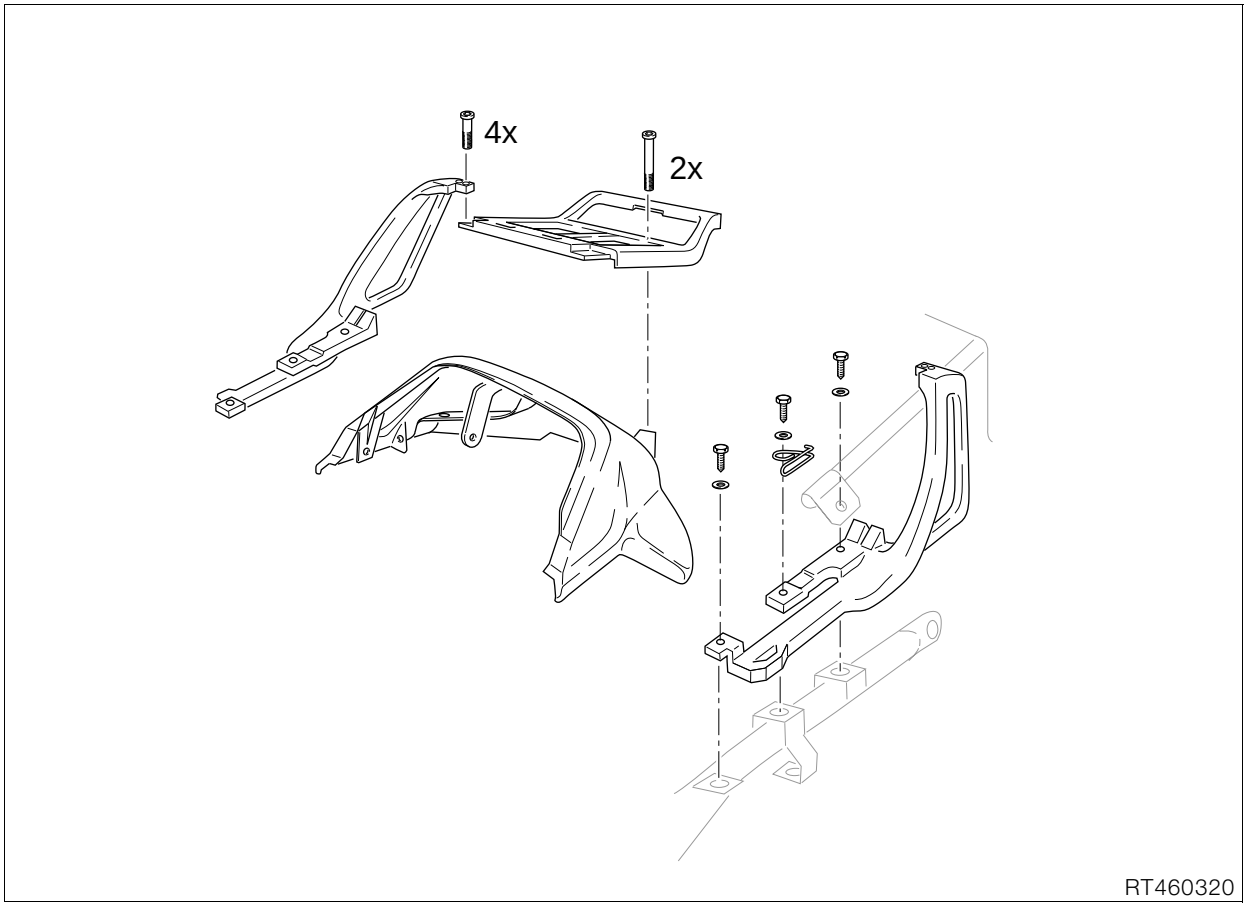




RT460340

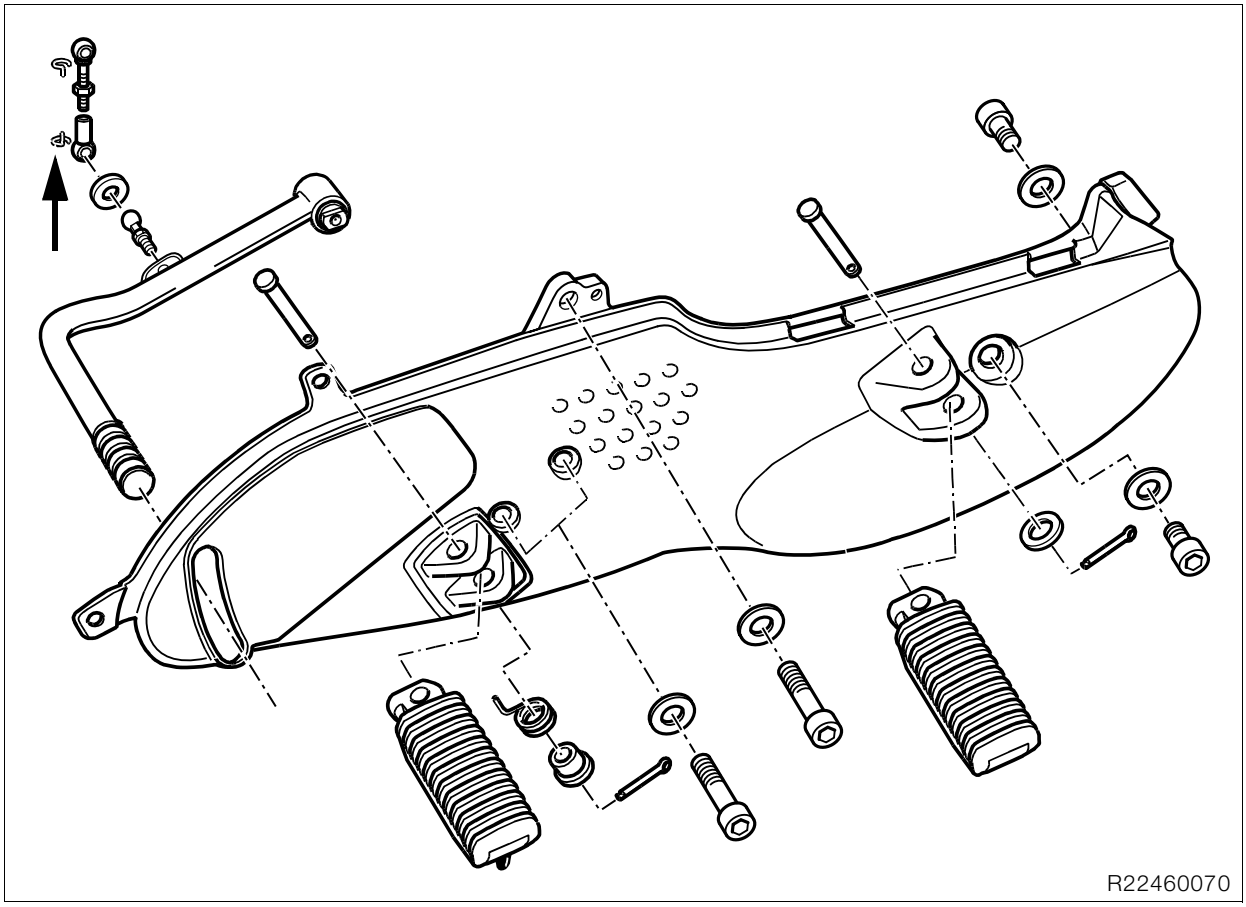
46 62 Removing and installing number-plate carrier

- Remove the seat.
- Remove the number-plate carrier.
- Installation is the reverse of the removal procedure.



46 63 Removing and installing luggage rack/case holder

- Remove the seat.
- Remove small side panels.
- Remove luggage rack and case holders.
- Installation is the reverse of the removal procedure.



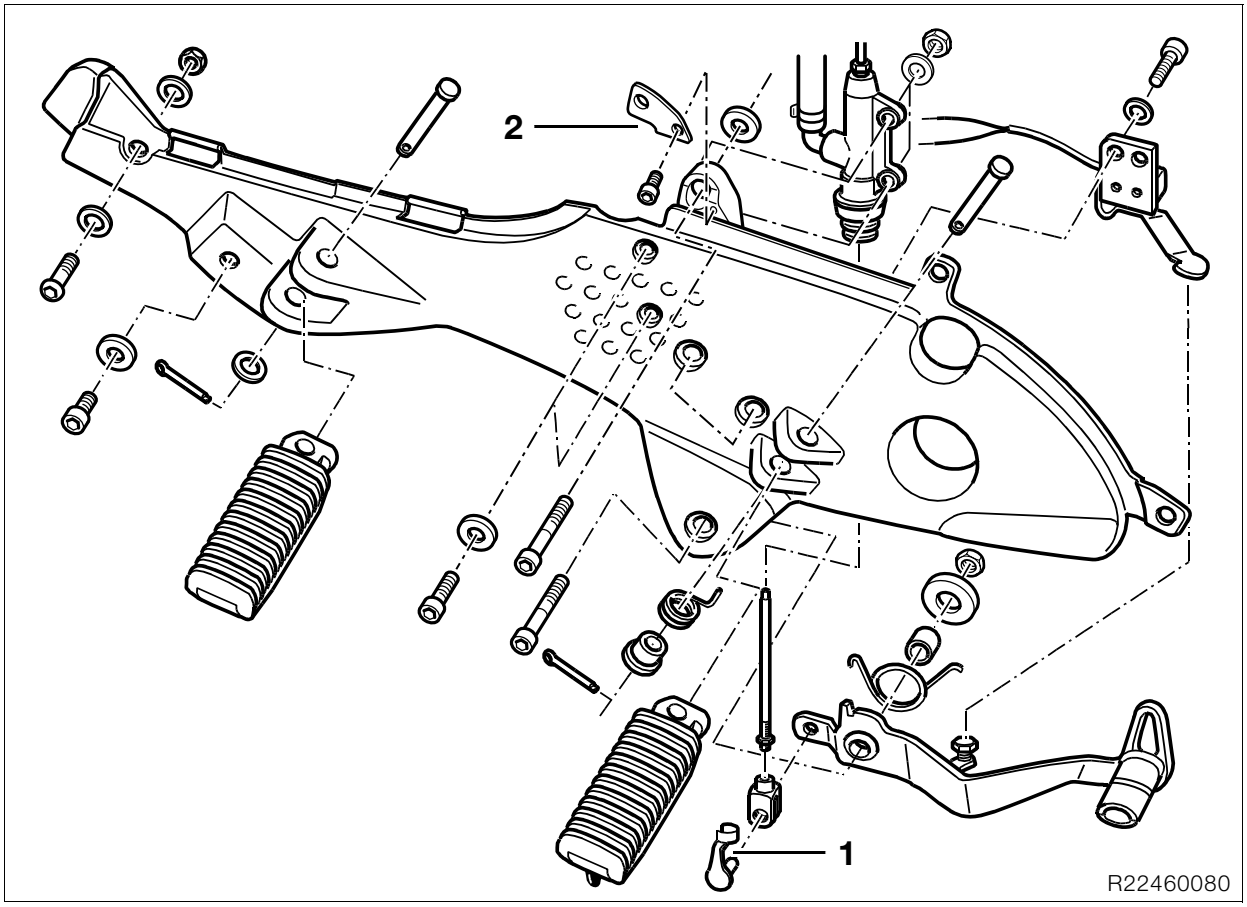
Removing and installing footrest plates

46 71 Removing and installing left footrest plate

- Remove the seat.
- Remove small left fairing panel.
- Remove left side section of fairing.
- Remove retainer (arrow) and remove gearshift linkage.
- Remove the footrest plate.
- Installation is the reverse of the removal procedure.

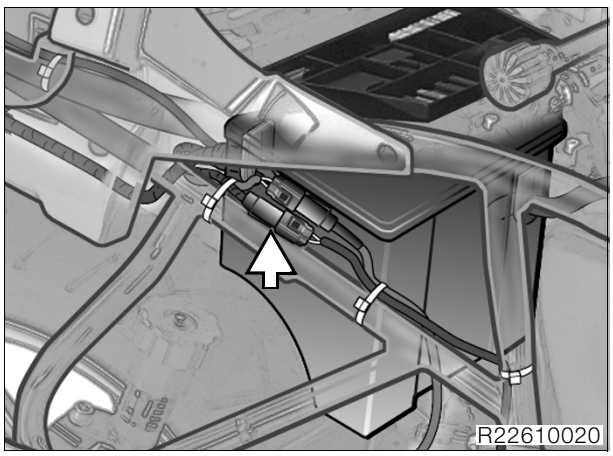
Tightening torque:

Footrest plate to rear frame
M 8 screw ..... 19 Nm
M 10 screw ..... 36 Nm
Footrest plate to gearbox
M 8 screw ..... 19 Nm
M 10 screw ..... 42 Nm
Gearshift lever to footrest plate ..... 35 Nm



46 71 Removing and installing right footrest plate

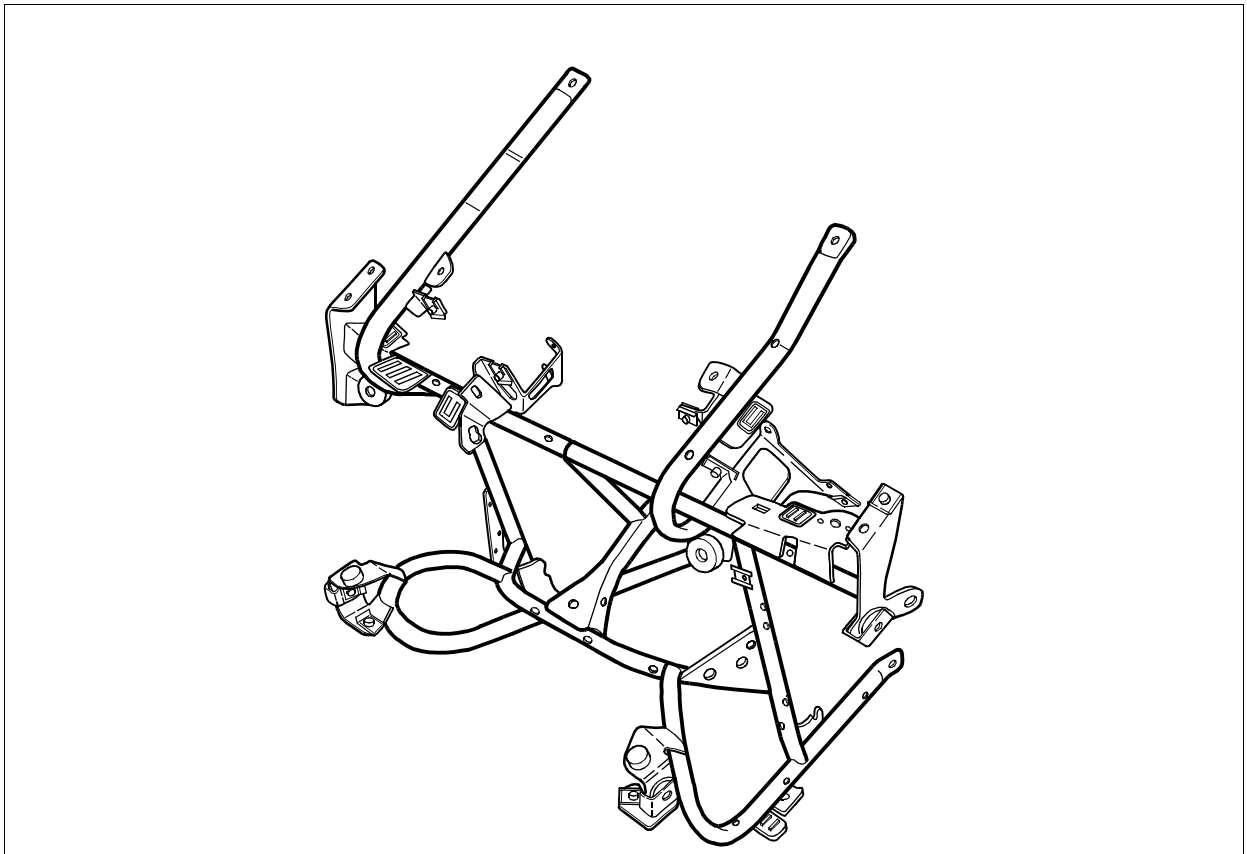
- Remove the seat.
- Remove small right fairing panel.
- Remove right side section of fairing.
- Release pin (1) in the brake linkage.
- Disconnect plug of brake-light switch (arrow) for rear brake and remove the cable.



- Remove securing screws for brake master cylinder from footrest plate.
- Remove holder (2).
- Remove the footrest plate.
- Installation is the reverse of the removal procedure.

Tightening torque:

Footrest plate to rear frame	
M 8 screw	19 Nm
M 10 screw	36 Nm
Footrest plate to gearbox	
M 8 screw	19 Nm
M 10 screw	42 Nm
Master brake cylinder to footrest plate	9 Nm
Footbrake lever to footrest plate (clean thread + Loctite 2701)	21 Nm



R22460060

46 63 Removing and installing fairing bracket

Attention:
Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove fairing side sections.
- Remove upper section of fairing.
- Remove fuel tank.
- Remove windscreen adjuster.
- Remove plug and cable of the instrument cluster.
- Remove instrument cluster.
- Remove connector strips, wiring harness and cables from fairing bracket.
- Remove the oil cooler fastener.

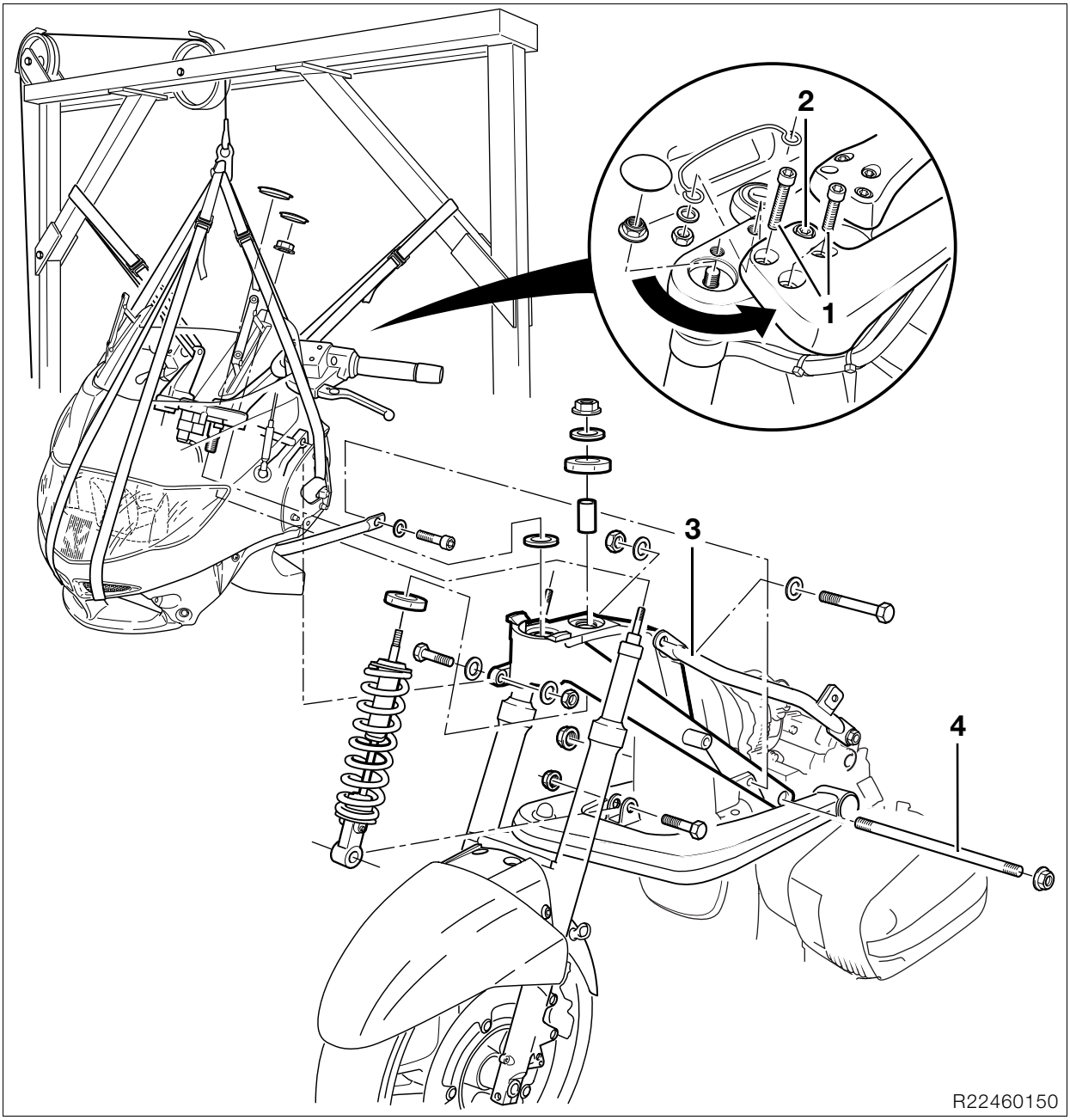
Note:
Take care not to damage the mudguard when laying down the oil cooler.

- Remove fairing bracket.
- Installation is the reverse of the removal procedure.

Attention:
Make sure that connector strips, wiring harness and cables are correctly positioned (➟ 61.17).

Tightening torque:

Fairing bracket to frame	20 Nm
Fairing bracket to frame with holder for horn	20 Nm



Removing and installing frame

46 51 Removing and installing frame front section

Attention:
Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove fuel tank.
- Secure stand with overlength bushes, **BMW No. 00 1 520/529**, to motorcycle.
- Remove distributor for brake lines from frame.
- Remove screws (1).
- Slacken screws (2) and pivot the handlebars inward.
- Release the fasteners securing the fixed tubes in the fork bridge.
- Pivot the handlebars back to original position and tighten screws (2).
- Remove all cable ties from front section of frame.
- Using straps, secure the handlebars to the crane, **BMW No. 46 5 640**.

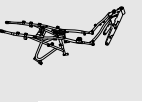
Note:
The threaded stud is a press fit in the angular-contact ball bearing: remove as a complete unit.

- Remove fork bridge and lift it slightly clear of the frame at the front.
- Remove front spring strut.

Attention:
Use cloths to protect the windscreen and painted components from damage.

- Secure the fairing bracket to workshop crane, **BMW No. 46 5 640**.
- Remove left and right oil cooler lines from fairing bracket.
- Release the fairing bracket from the frame and pull it slightly forward with the workshop crane.
- Remove the ignition coil.
- Remove fasteners securing struts (3) to frame.

Attention:
If necessary, mask off the leading link to prevent it from being scratched.



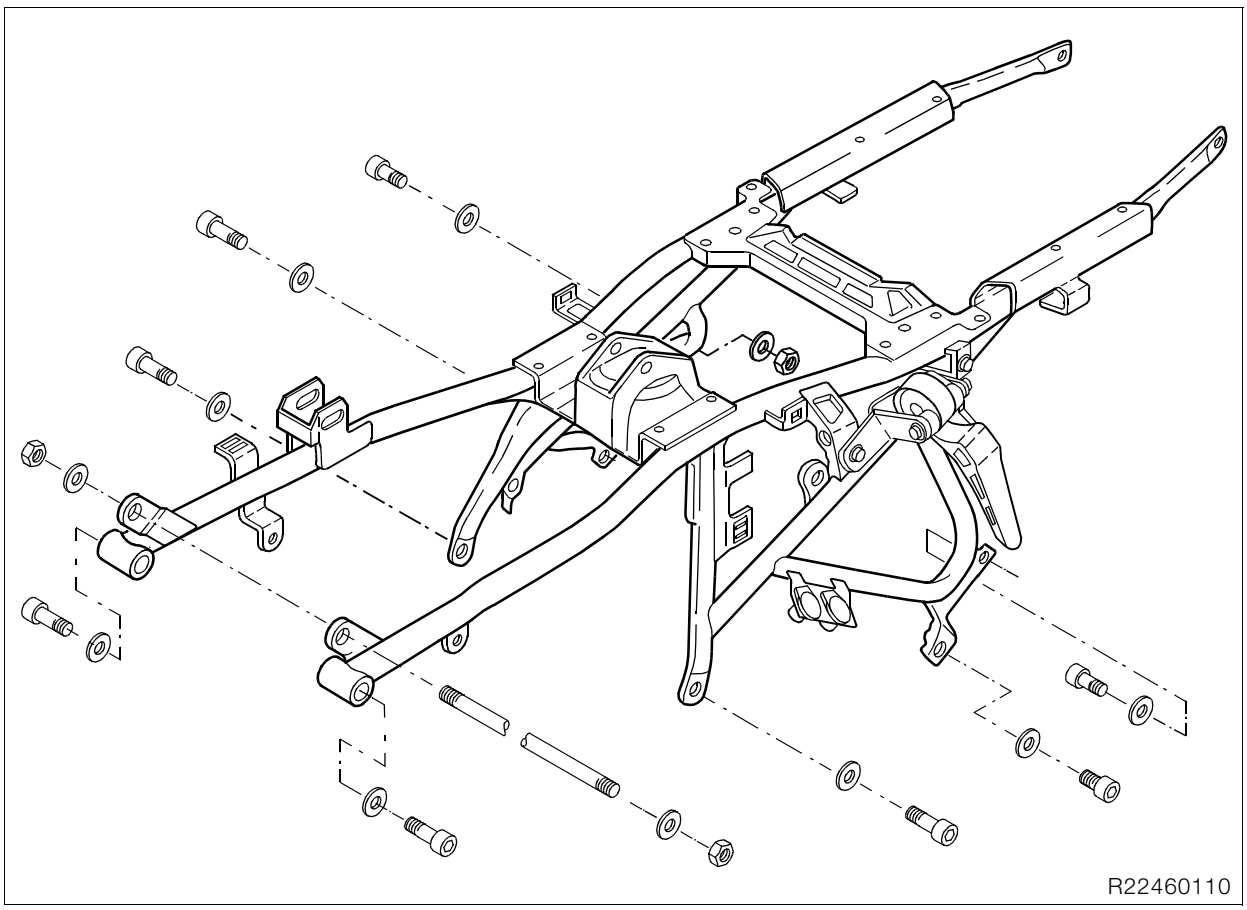
- Heat left and right nuts on stud (4) to max. 120 °C (248 °F) and remove.
- Remove stud (4).

Attention:
Avoid damage to the brake lines.

- Remove frame.
- Installation is the reverse of the removal procedure.

Tightening torque:

Fork bridge to frame (clean thread + Loctite 243)	130 Nm
Spring strut to frame	43 Nm
Spring strut to leading link	50 Nm
Frame to engine	82 Nm
Struts to frame	58 Nm
Fairing bracket to frame	20 Nm
Fixed tube to fork bridge (free from oil and grease)	45 Nm
Handlebars to fork bridge	21 Nm



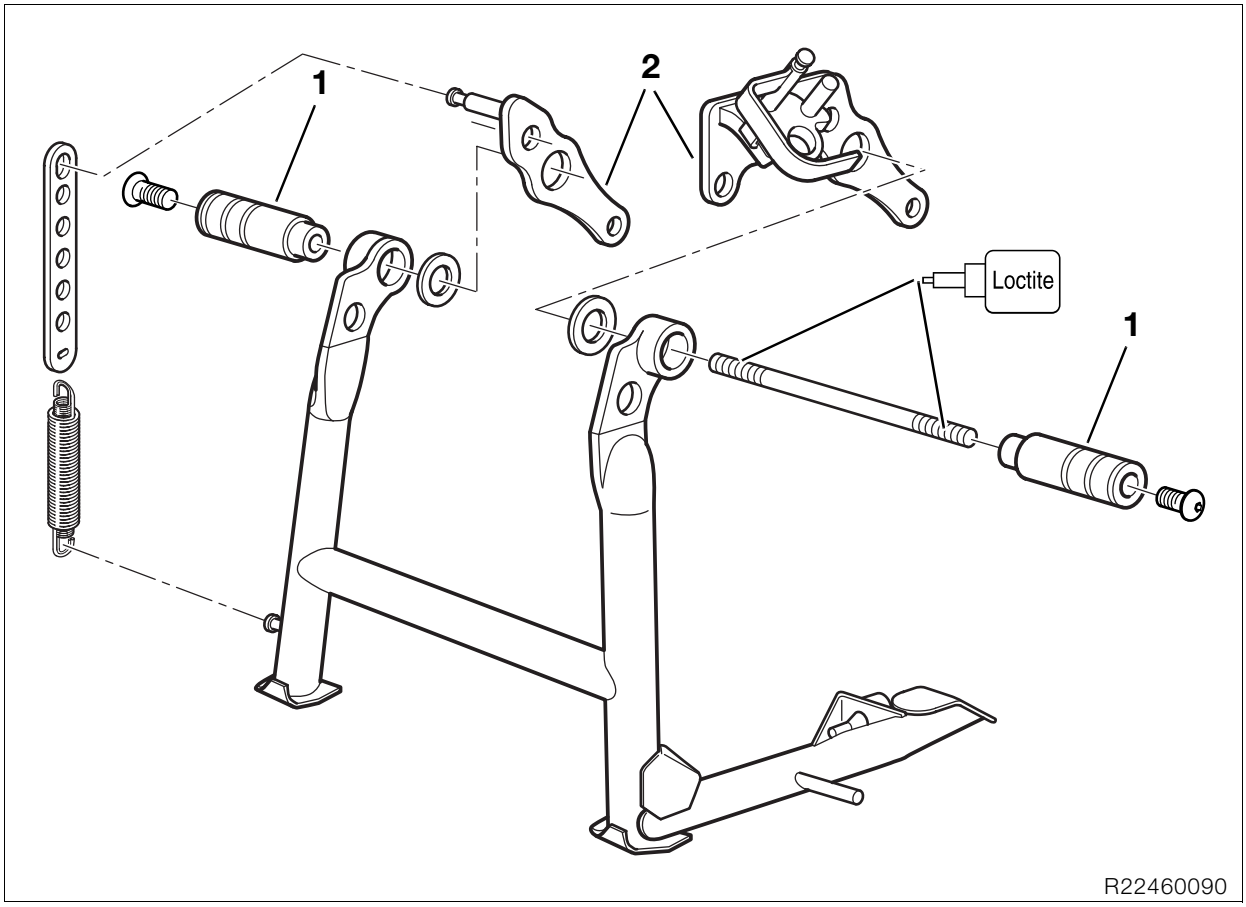
46 51 Removing and installing frame rear section

Attention:
Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove the seat.
- Remove fuel tank.
- Remove luggage rack and case holders.
- Remove rear side panels.
- Remove rear section, bottom.
- Disconnect the diagnostic plug and the cable.
- Remove seat adjuster and auxiliary frame.
- Remove central electrics box from rear frame.
- Disconnect plug of rear ABS sensor and cable.
- Disconnect the plug for the rear brake-light switch and remove the cable.
- Disconnect the side stand switch plug and remove the cable.
- Disconnect the power-socket plug and remove the cable.
- Disconnect the fuel-tank plug and remove the cable.
- Disconnect the fuel-tank breather hoses.
- Remove holder of brake line.
- Remove rear brake fluid reservoir from its holder.
- Remove the silencer from the rear frame section.
- Remove fasteners securing footrest plate to rear frame, slacken fasteners securing it to gearbox housing.
- Remove upper fastener of spring strut.
- Remove spring-strut adjuster from rear frame.
- Remove air filter and remove air filter box from rear frame.
- Remove rear section of frame.
- Remove fitted components.
- Installation is the reverse of the removal procedure.

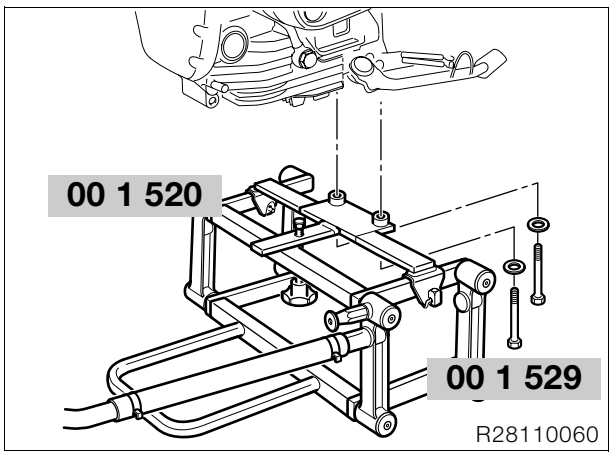
Tightening torque:

Frame to gearbox and footrest plate	42 Nm
Frame to engine	42 Nm
Struts to engine (clean thread + Loctite 2701)	58 Nm
Spring strut to frame	43 Nm

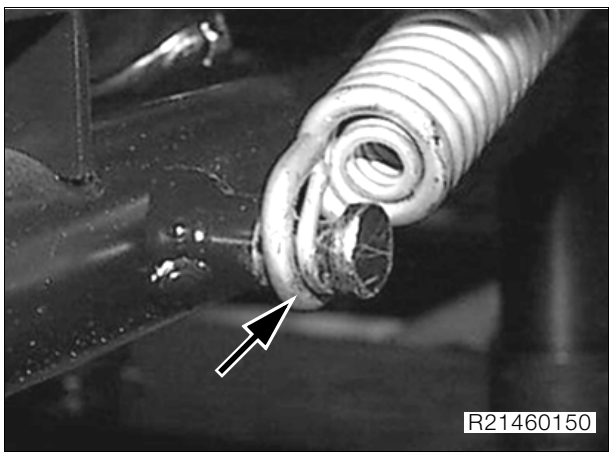


46 52 Removing and installing main (centre) stand

- Remove side stand.



- Secure stand, **BMW No. 00 1 520**, to motorcycle with bushes and screws, **BMW No. 00 1 529**.
- Disengage tension springs.
- Remove right and left bearing bushings (1).
- Remove the main (centre) stand.
- Remove right and left bearing blocks (2).
- Installation is the reverse of the removal procedure.



Note:
When installing the springs, make sure that the thick spring is on the inside and the thin spring on the outside (arrow).

Lubricant:..... e.g. Staburags NBU 30 PTM

Tightening torque:
Pivot mount to engine, right, M 12 screw
(clean thread + Loctite 2701)..... 72 Nm

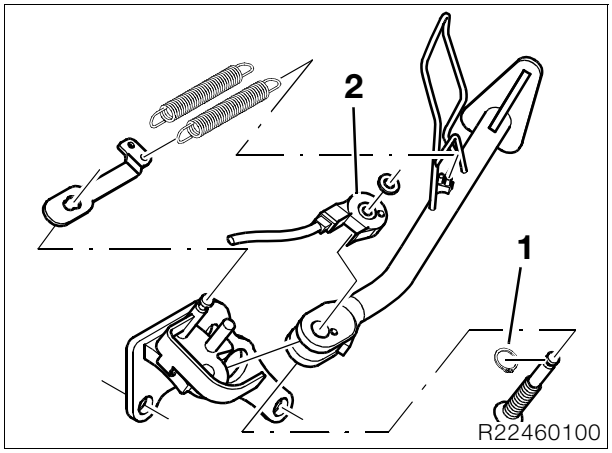
Pivot mount to engine, left
M 12 screw
(clean thread + Loctite 2701)..... 72 Nm
M 8 screw
(clean thread + Loctite 2701)..... 21 Nm

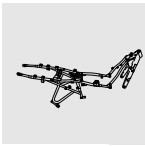
Pivot mount of main (centre) stand (stud bolt)
(clean thread + Loctite 243)..... 21 Nm

Pivot mount of main stand,
(cheesehead screw) ..... 21 Nm

Side stand to pivot mount
(clean thread + Loctite 2701)..... 58 Nm

46 53 000 Removing and installing side stand

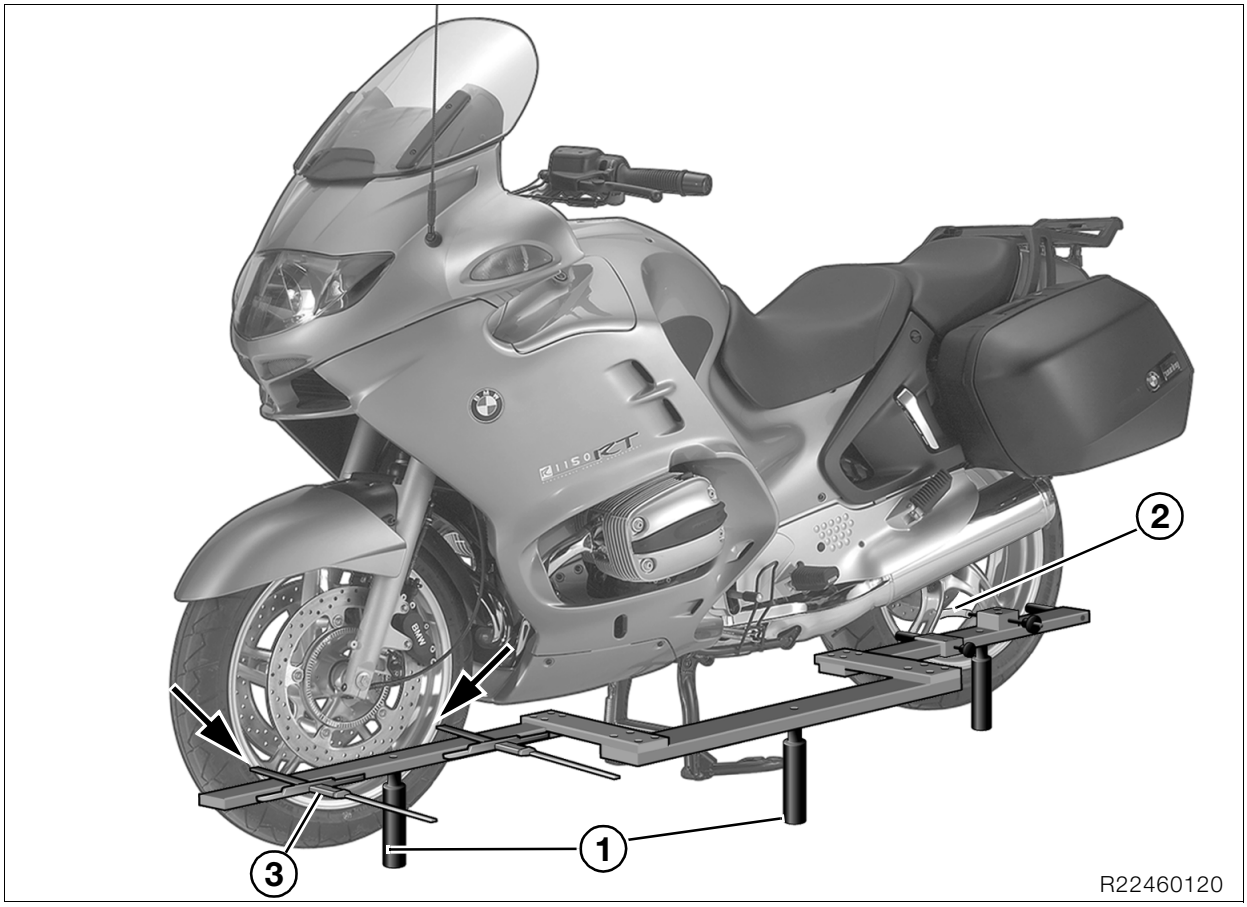




- Disengage tension springs.
- Remove retaining ring (1).
- Remove side stand switch (2).
- Remove side stand.
- Installation is the reverse of the removal procedure.

Lubricant:..... e.g. Staburags NBU 30 PTM

Tightening torque:
Side stand to pivot mount
(clean thread + Loctite 2701)..... 58 Nm



46 51 040 Measuring wheel track offset

– Wheel bearings, zero play.
– Rims checked for runout.

- Place the motorcycle on its main (centre) stand on a flat, level surface.
- Place the track offset 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.

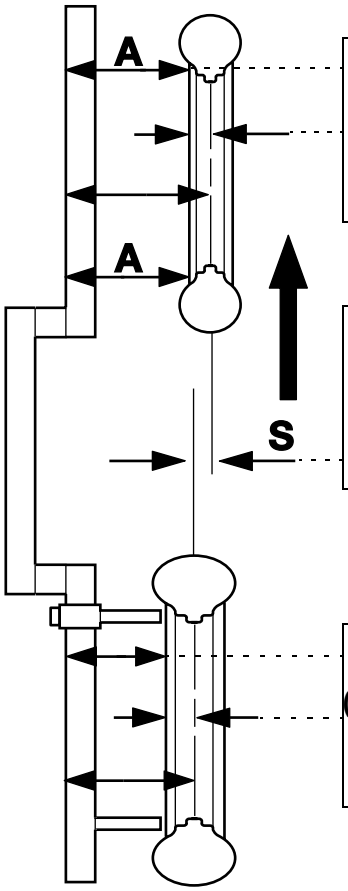
- Adjust supports (1) so that the track alignment gauge, **BMW No. 36 3 920**, is installed as high as possible and align it horizontally.
- Position the measuring stops (arrows) so that they touch the wheel rim and not the tyre.
- Attach hook (2) to wheel spoke to secure the gauge firmly to the wheel.
- Align front wheel parallel with the gauge.
- Measure gap with depth gauge (3) from outer edge of gauge up to rim and note reading in measurement record.
- Measure rim widths front and rear with caliper gauge and note reading in measurement record.
- Calculate wheel track offset “S”.

Wheel track offset “S” is the distance to left or right of the longitudinal axis of the rear wheel from that of the front wheel.

Track offset (S):
.....+ 3.5 mm (+ 0.1378 in) (= to right)
Permissible wheel track offset (S):
..... ± 9 mm (± 0.3543 in)
based on + 3.5 mm (+ 0.1378 in)

Note:
Key to measurement result:
Negative sign = wheel track offset to left
Positive sign = wheel track offset to right

Measurement record, wheel track offset



		Example	
Distance A	**___mm (in)**	**Distance A**	98.5 **mm (**3.8780 **in)**
+ ½ rim	**___mm (in)**	**+ ½ rim**	41.4 **mm (**1.6299 **in)**
= Front	**___mm (in)**	**= Front**	139.9 **mm (**5.5079 **in)**
Rear	**___mm (in)**	**Rear**	139.3 **mm (**5.4843 **in)**
- Front	**___mm (in)**	**- Front**	139.9 **mm (**5.5079 **in)**
= S	**___mm (in)**	**= S**	- 0.6 **mm (**- 0.0236 **in)**
Distance	**90.0 _mm**	**Distance**	**90.0 mm (3.5464 in)**
(3.5464 in)		**+ ½ rim**	49.3 **mm (**1.9409 **in)**
+ ½ rim	**___mm (in)**	**= Rear**	139.3 **mm (**5.4843 **in)**

Key to measurement result:

Wheel track offset “S” is the distance to left or right of the longitudinal axis of the rear wheel from that of the front wheel.

Negative sign = wheel track offset to left
Positive sign = wheel track offset to right

Permissible wheel track offset (S):
...±9 mm (0.3543 in); datum is +3.5 mm (0.1378 in)

Measured wheel track offset (S):
_____mm (in)

51 Equipment

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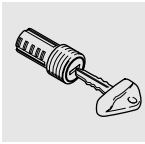
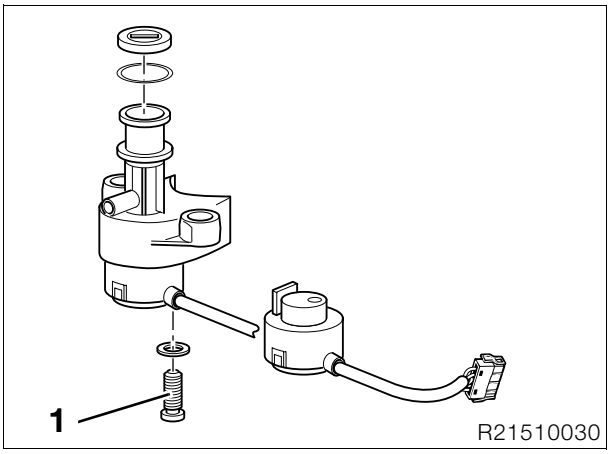


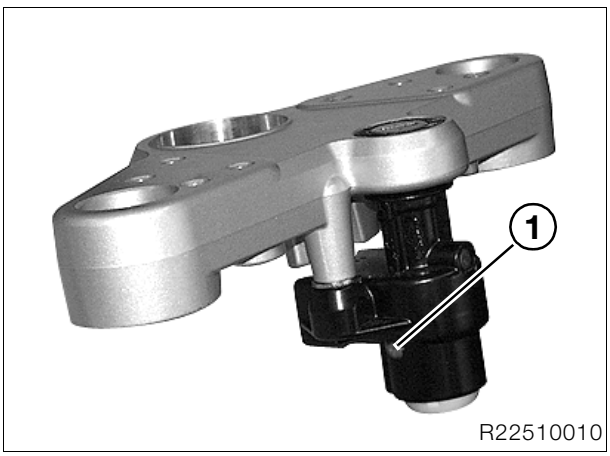
51 25 040 Removing and installing ignition switch/steering lock



- Remove fork bridge.
- With a 4 mm (0.1575 in) dia. drill bit, drill approx. 5 mm (0.1969 in) into non-removable screw (1).
- Use an 8 mm (0.3149 in) dia. drill bit to drill away the screw head.
- Pull out ignition and steering lock.
- Unscrew and remove remainder of screw with stud bolt extractor.
- Install steering lock with socket wrench insert for non-removable screws, **BMW No. 51 0 531**.

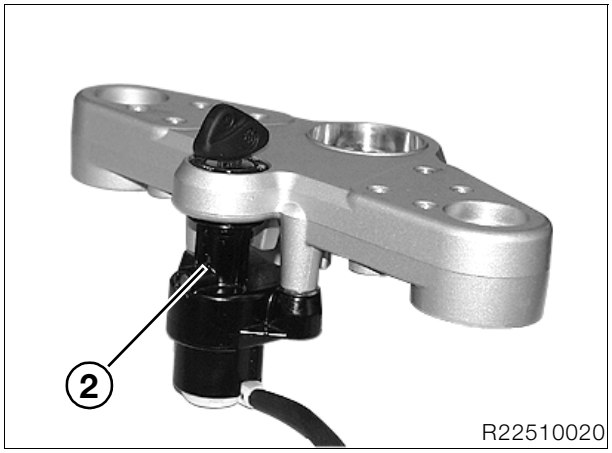
Tightening torque:
Non-removable screws
(microencapsulated) ..... 20 Nm

61 31 308 Removing and installing ignition/light switch



- Remove screw (1).
- Remove the ignition/light switch.
- Installation is the reverse of the removal procedure.

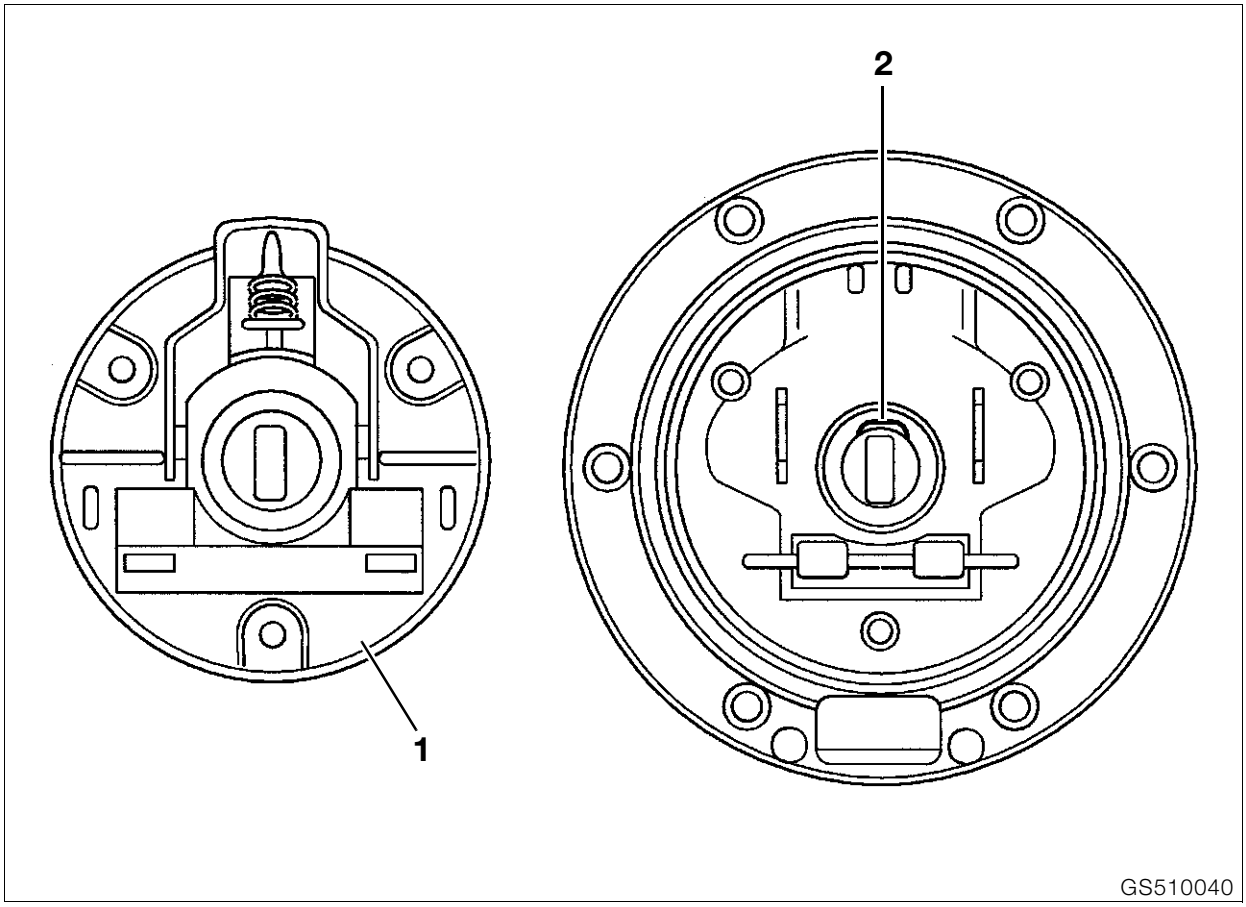
51 25 Removing and installing lock barrel



- Key in ON position/press in keeper (2) 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 (0.1574-0.1968 in) dia. drill bit to drill the full length of the lock barrel.
- Continue to increase the diameter of the drill bit until the lock barrel can be extracted.



51 25 020 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

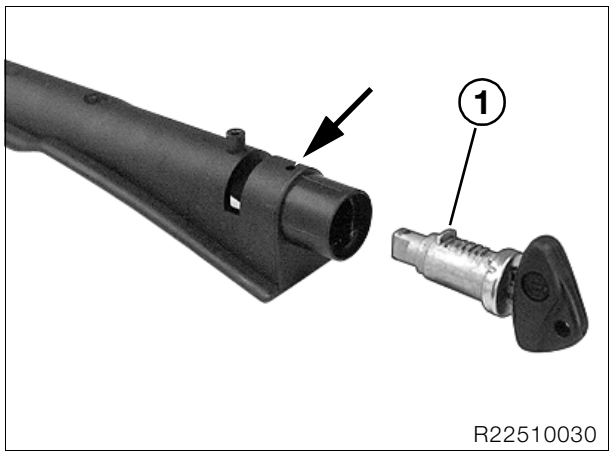
Attention:
Note drilling depth. Make sure that metal chips do not drop into the fuel tank.

- Use a 4-5 mm (0.1574-0.1968 in) dia. drill bit to drill the full length of the lock barrel.
- Continue to increase the diameter of the drill bit until the lock barrel can be extracted.

51 25 050 Removing and installing seat lock

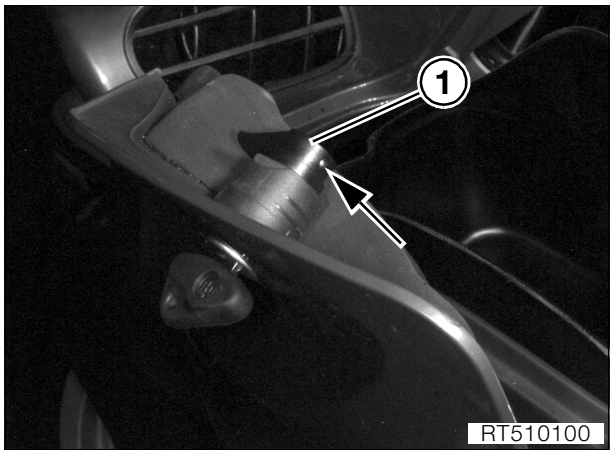
- Remove the rear seat.
- Remove the seat lock.

51 25 060 Removing and installing seat lock



- Insert key into lock barrel.
- Press keeper (1) of the lock barrel into the housing through the opening (arrow) and use the key to pull out the barrel.
- Lubricate the new lock barrel with **Shell Retinax A**.
- Installation is the reverse of the removal procedure.

51 25 Removing and installing cover of radio compartment/stowage compartment



- Remove retaining pin (arrow) with a length of wire or similar tool.
- Remove latch (1).
- Pull out lock barrel with key.
- Lubricate the new lock barrel with **Shell Retinax A**.
- Press in the keeper in the barrel and insert the lock barrel.
- Place latch (1) in position and press in the retaining pin (arrow).

52 Seat

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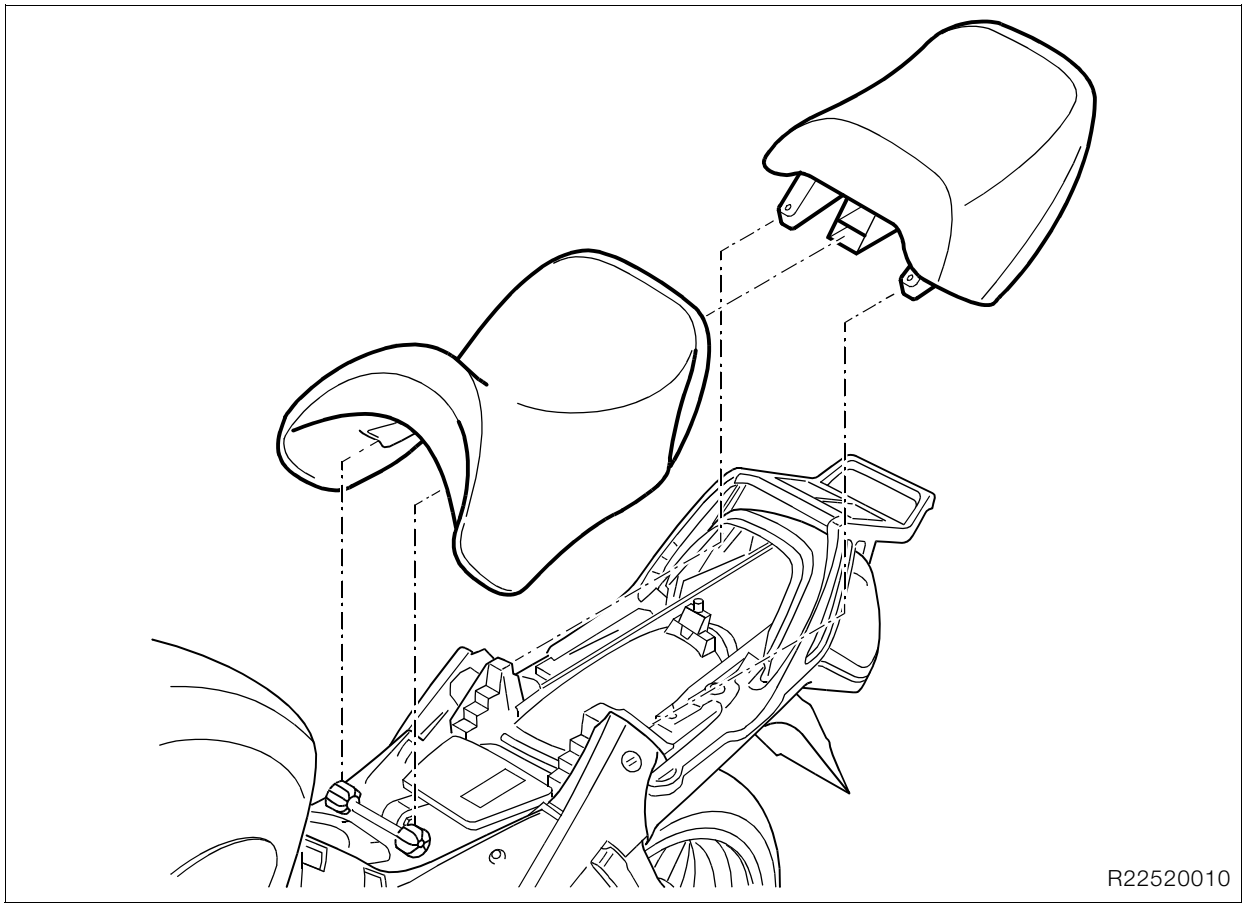

52 53 Disassembling and assembling seat

61 General electrical equipment

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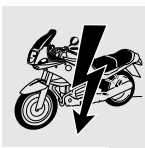
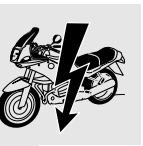
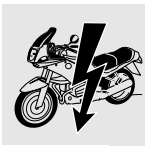
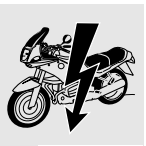
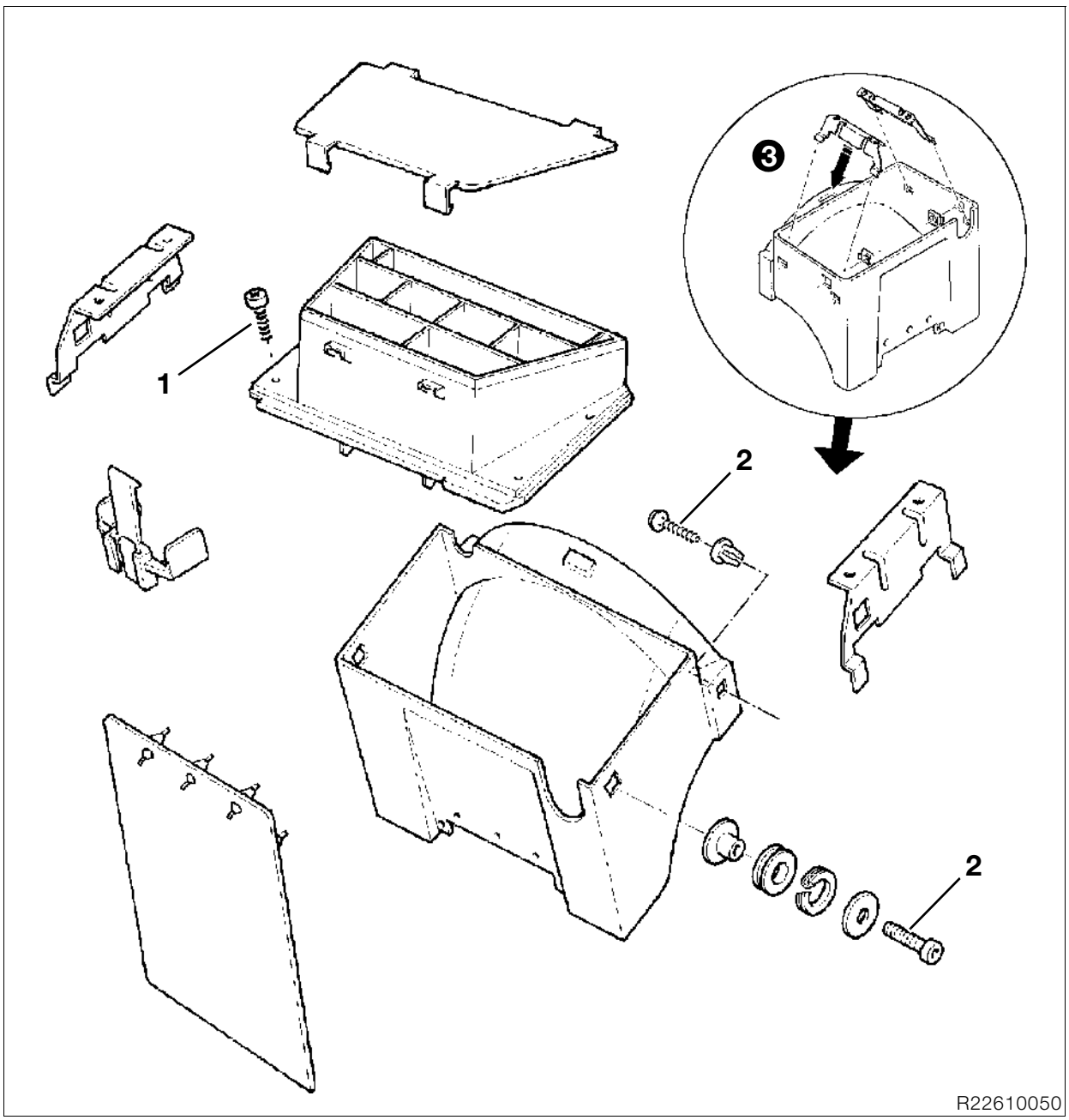




Technical Data 61 Electrical system		R 1150 RT
Battery		
Voltage	V	12
Rated battery capacity	Amp/h	19
Low temperature test current	A	170
Fuses	A	4 (4 of) 7.5 (1 of) 10 (2 of) 15 (2 of)







61 13 Removing and installing central electrical equipment box

Attention:
Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove the seat.
- Remove small side fairing panels.
- Remove screws (2) securing bottom of central electrical equipment box.
- Remove screws (1) securing top of central electrical equipment box.
- Pull cable tray down and remove.
- Remove relay and relay base or if necessary, disconnect entire wiring harness and remove complete with fuse box.
- 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.

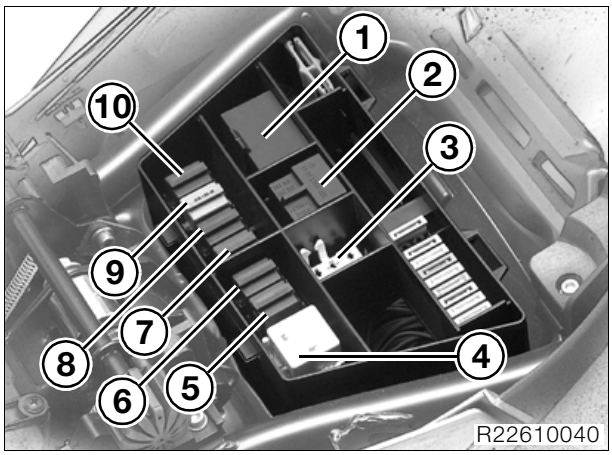
Note:
Disconnecting the battery deletes all entries (e.g. faults, settings) stored in the Motronic control unit's memory.
Loss of settings can temporarily impair the operating characteristics when the engine is restarted.

61 13 Disassembling and assembling central electrical equipment box

- See illustration (3).

61 31 Relay positions/fuse assignments (central electrical equipment box)

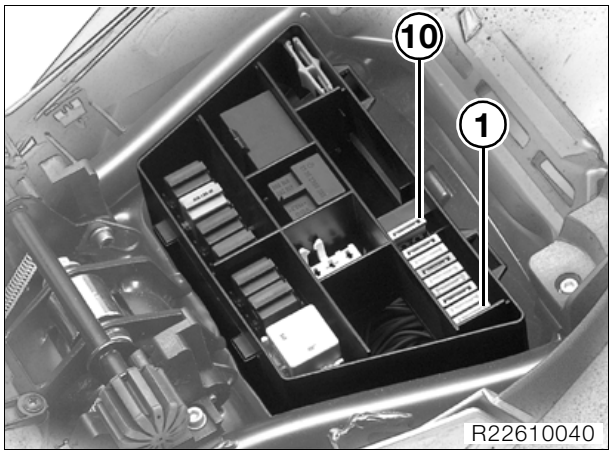
Relay positions



1. Flasher unit
2. Indicator damping
3. Coded plug for Motronic (not used)
4. Starter motor relay
5. Relief relay
6. Horn relay
7. Fuel pump relay
8. Motronic relay
9. ABS warning relay
10. Lighting relay

Fuse assignments

(No. 1 on left, looking forwards)



1. Instrument cluster (telltale lights, revolution counter), indicator damping, windscreen adjuster ..... 4 A
2. Parking light, tail light ..... 4 A
3. Windscreen adjuster, power sockets 1 and 2, FID, OE socket, radio ..... 15 A
4. Horn ..... 7.5 A
5. Motronic control unit, Motronic relay, diagnosis connector ..... 10 A
6. Fuel-pump relay (injection valves, cycle valves, oxygen sensor) ..... 10 A
7. Heated handlebar grips ..... 4 A
8. Radio ..... 4 A
9. Not used
10. Fog lamp relay ..... 15 A

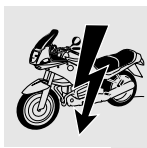
61 11 Wiring-harness routing, frame

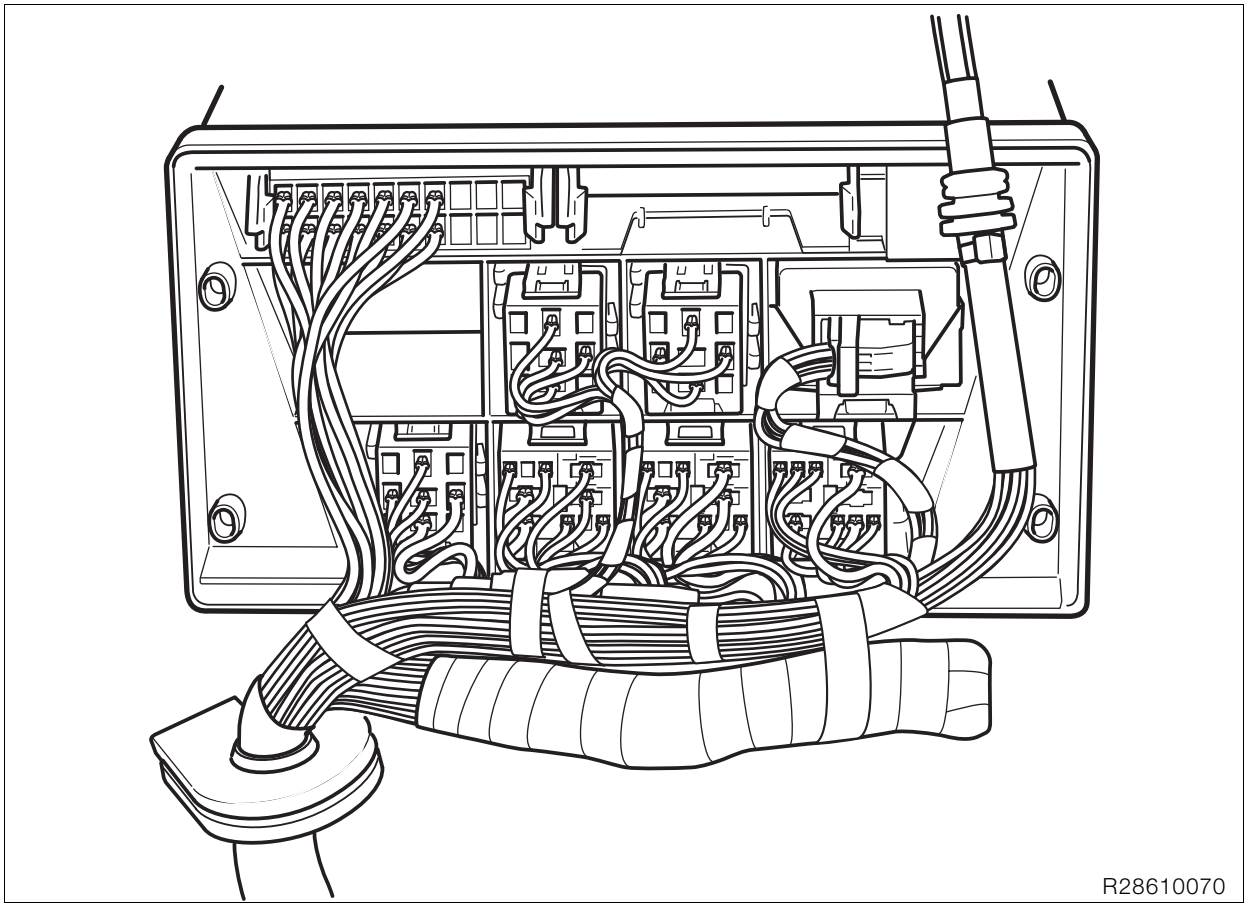
Attention:
Use (yellow) galvanized screws for the ground (earth) connection to the engine.
Screws with unsuitable corrosion proofing can cause the electrical resistance to rise as high as 80 Ω. Run wiring harness without kinking and avoid risk of abrasion.
Note the number and position of the cable straps.

- 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.

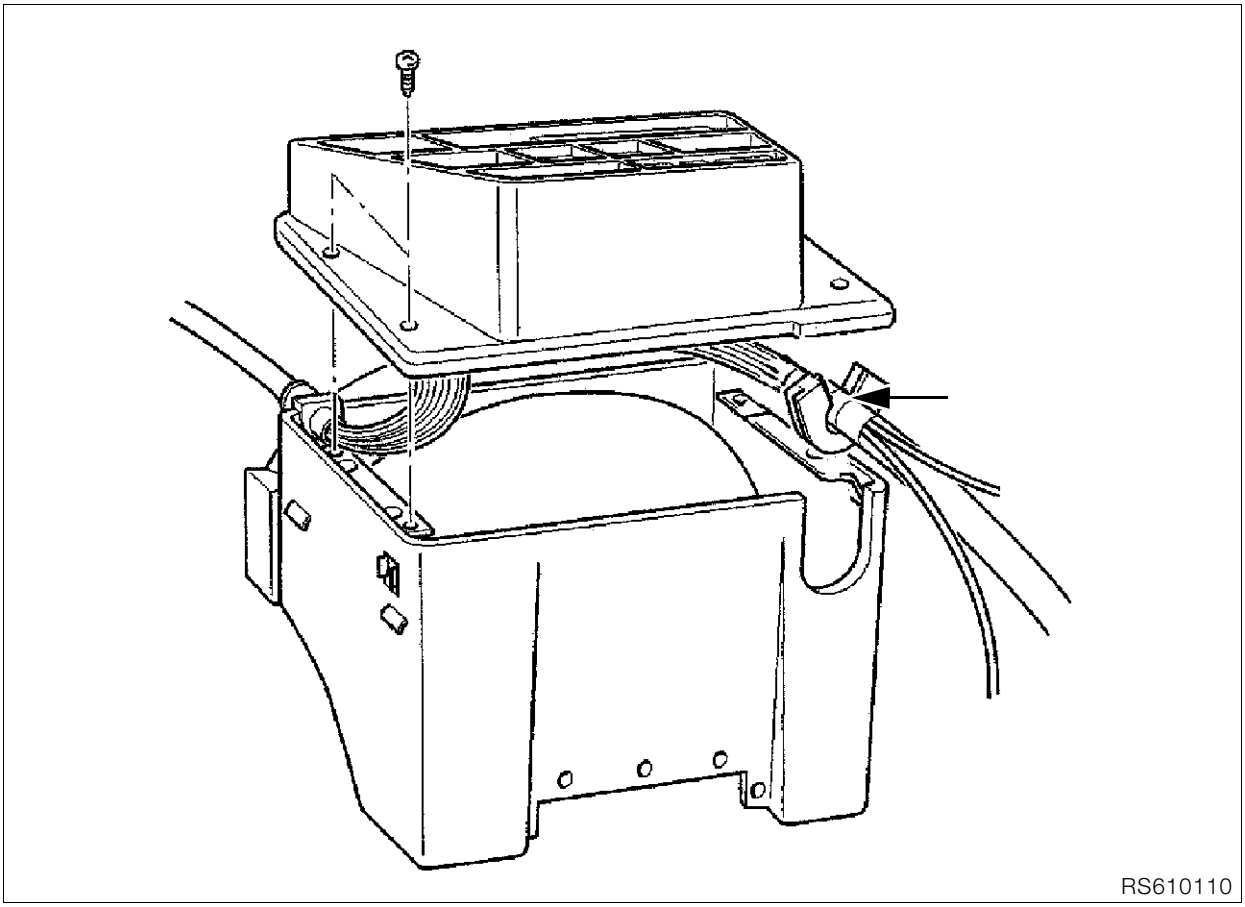
Note:
When removing the wiring harness, take out the central electrical equipment box at the same time. When installing, install the central electrical equipment box first.

Tightening torque:
Ground terminal to engine block ..... 9 Nm





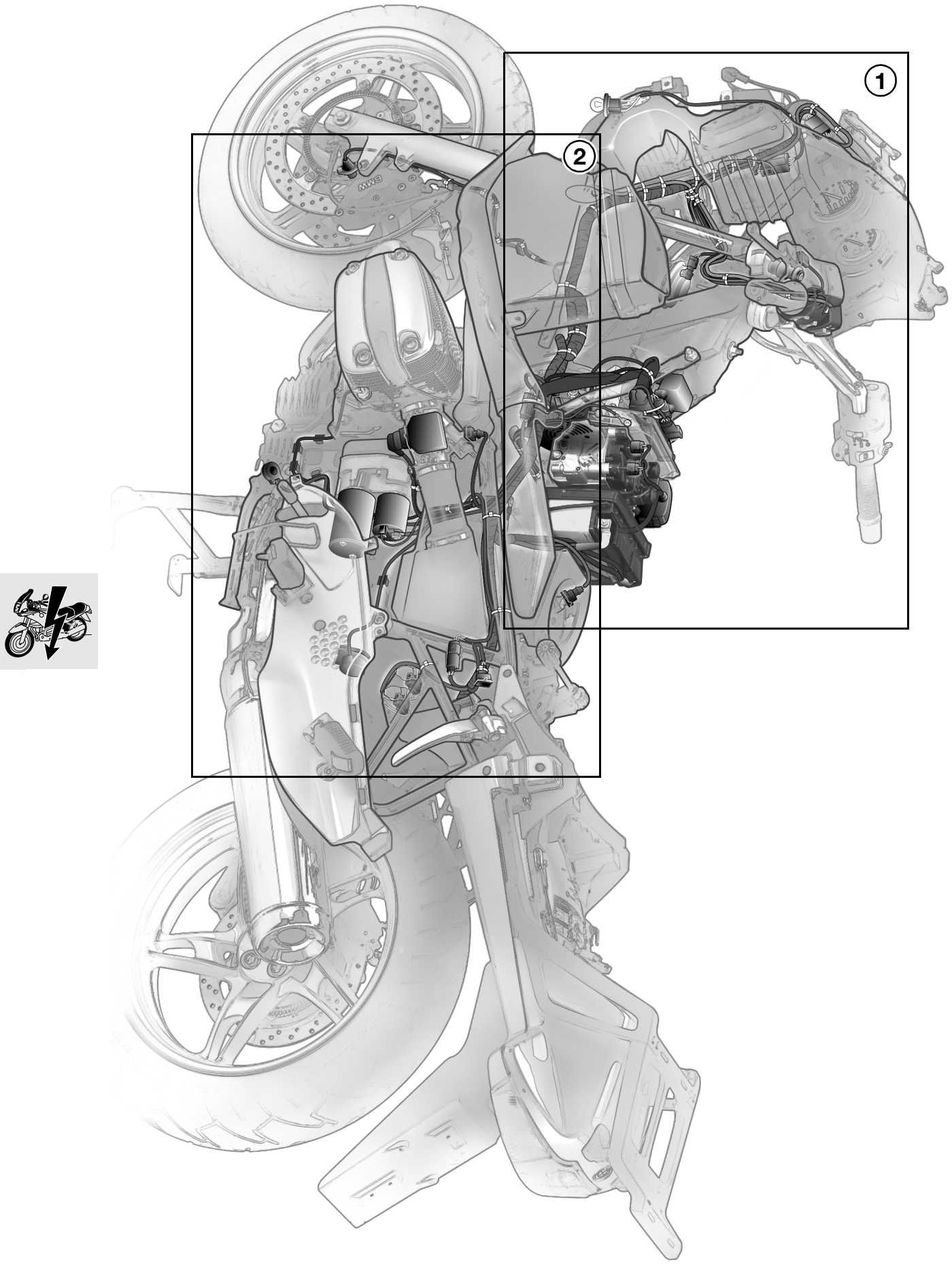
61 11 Wiring-harness routing/connection in central electrical equipment box

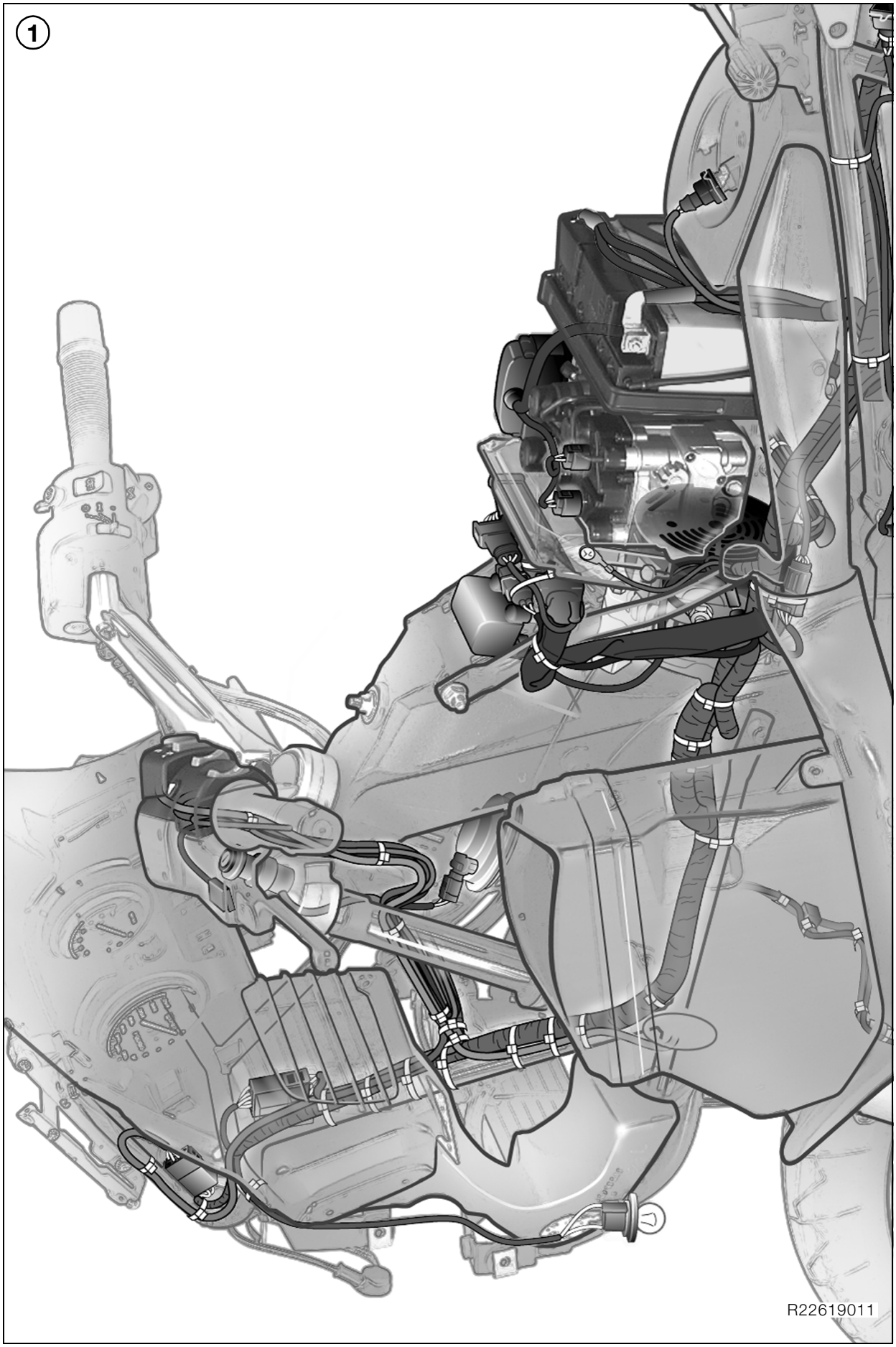


61 11 Wiring-harness routing/central electrical equipment box/output

Note:
The white mark (arrow) must be covered by the grommet.

61 11 Wiring-harness routing
View from left




1
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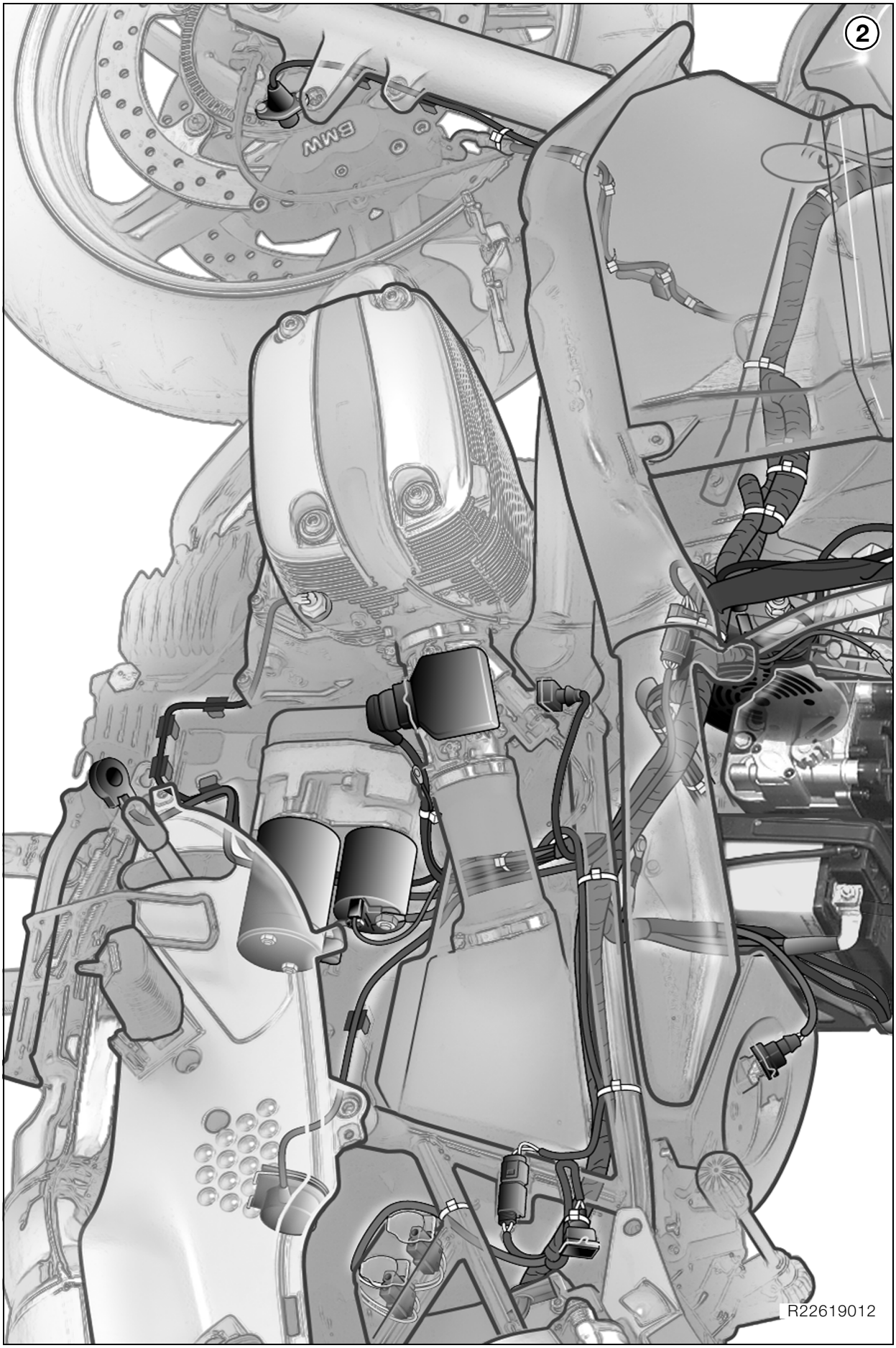
2
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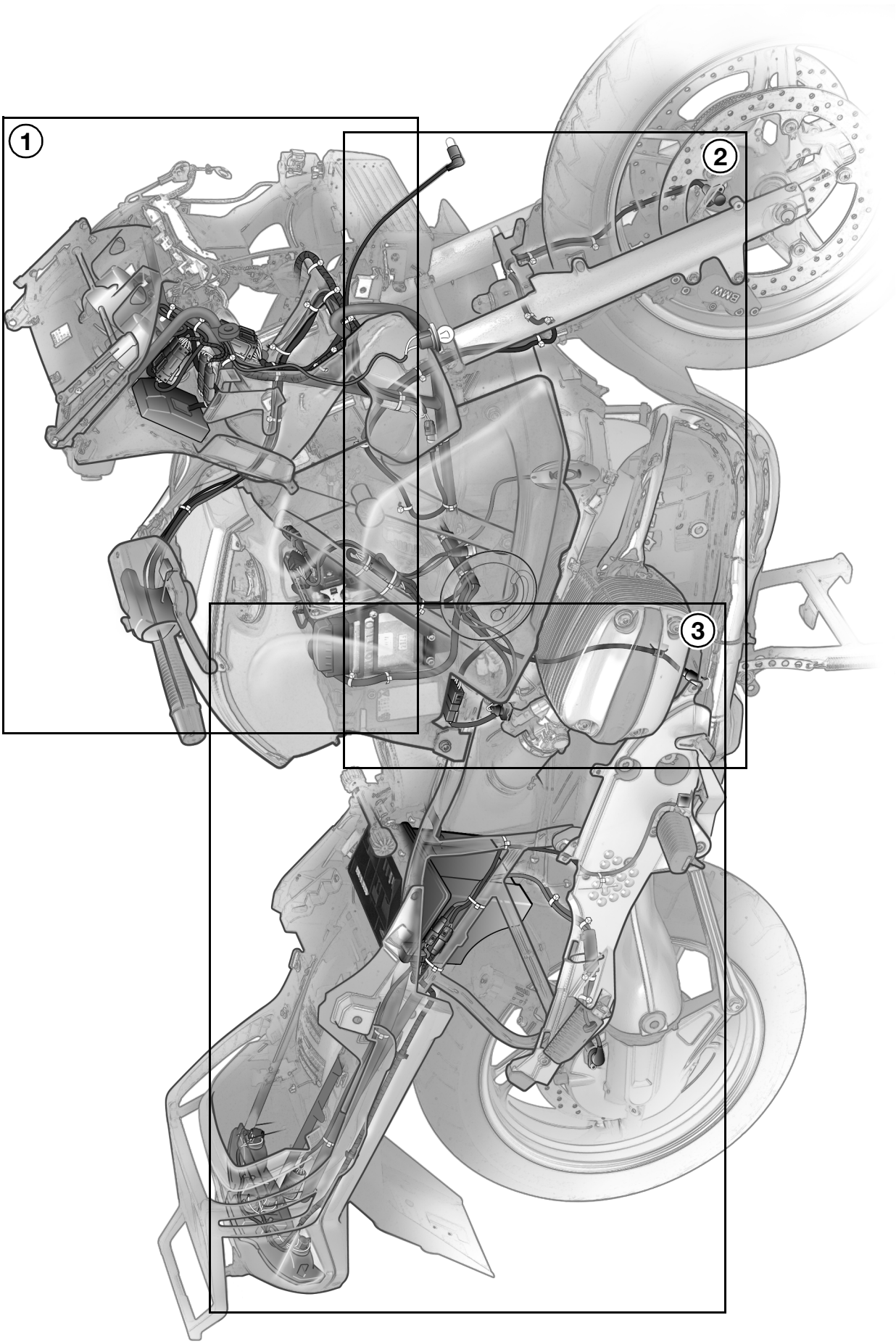
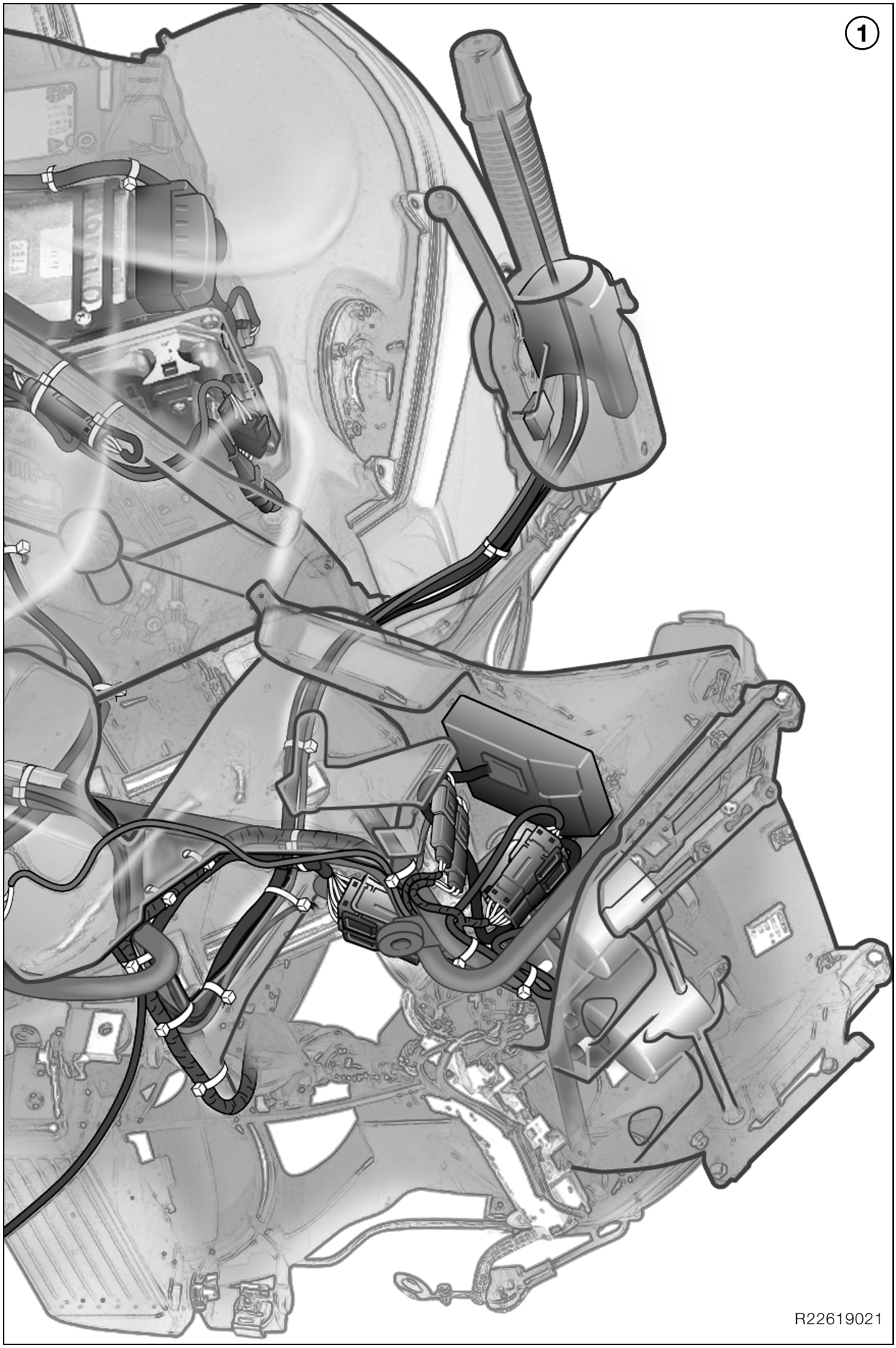
61 11 Wiring-harness routing
View from right

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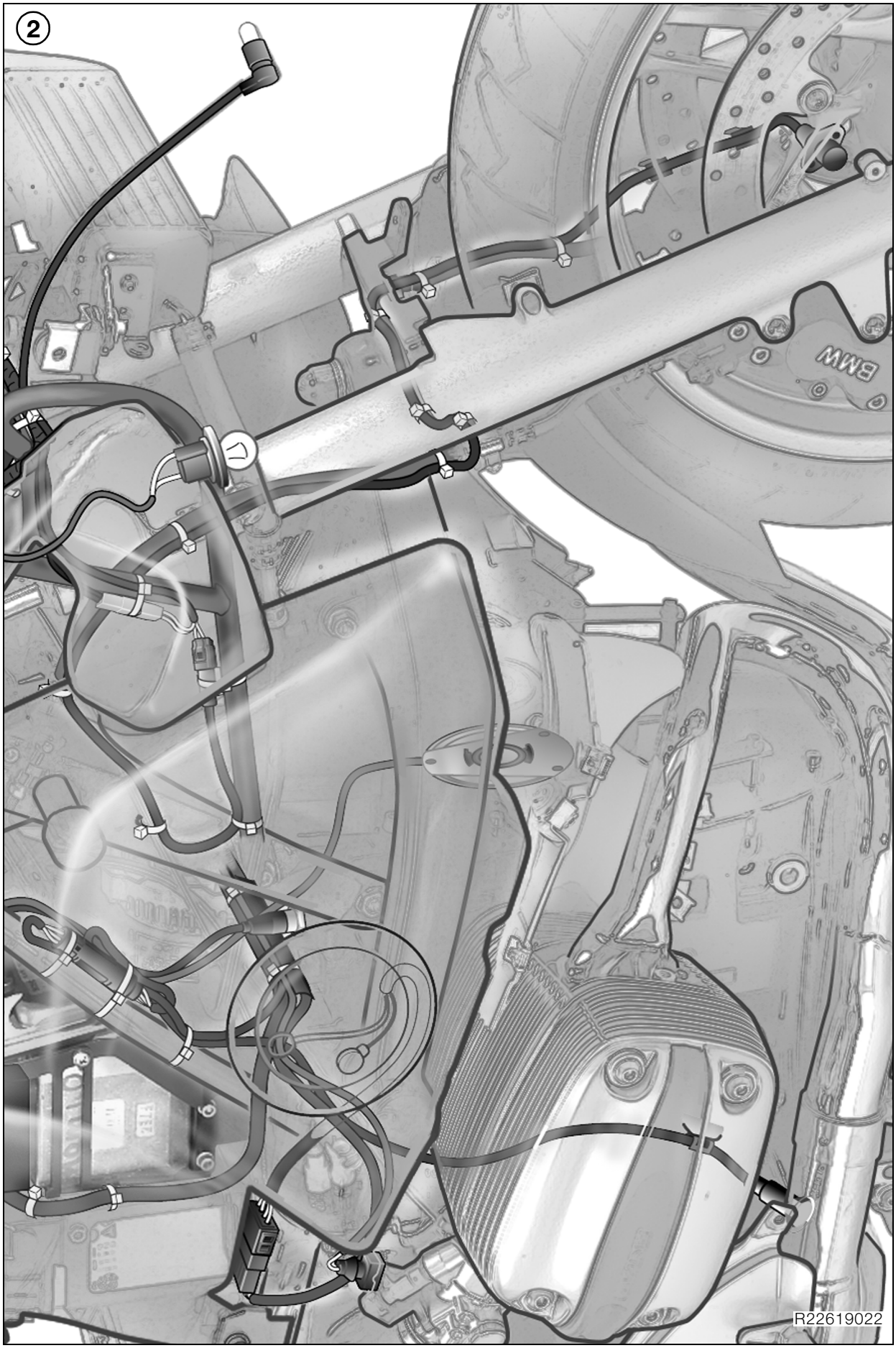
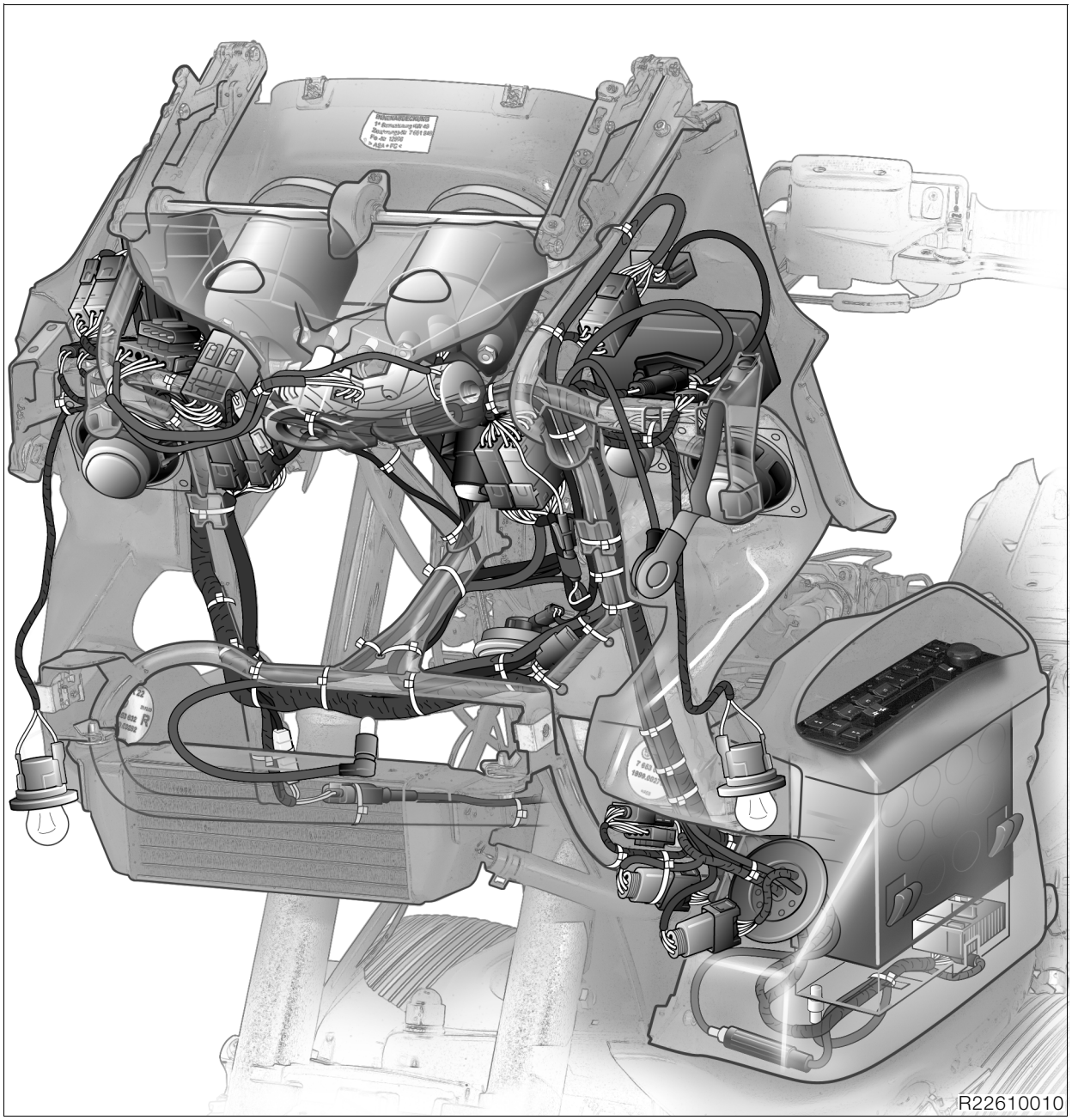
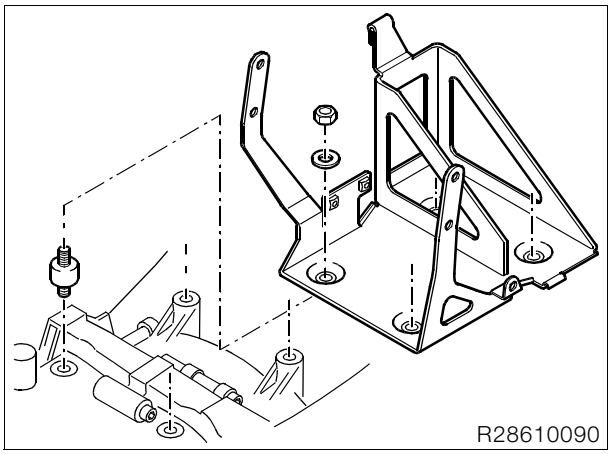

2
BMW
R22619022


3
R22619023

Front



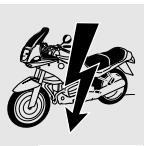
61 21 Removing and installing battery carrier



- Remove the seat.
- Remove side panels (➟ 46.8).

Attention:
Fuel is flammable and a hazard to health. Observe all applicable safety regulations.

- Remove fuel tank (➟ 16.5).
- **Integral ABS** Drain the brake system (➟ 34.17).
- Remove the intake air pipe.



Attention:
Disconnect the negative battery terminal first, then the positive terminal.
Connect the positive battery terminal first, then the negative terminal.

- Remove the battery.
- Remove the Motronic control unit.

Attention:
Always follow the instructions in the Repair Manual.

- **Integral ABS** Remove pressure modulator (➟ 34.15).
- Disconnect Bowden cable for starting-speed increase from handlebar fitting.
- Disconnect cable from left throttle valve.
- Remove fasteners of battery carrier and raise the carrier.
- Remove Bowden-cable divider from holder.
- Pull the battery carrier to the left to remove.
- Installation is the reverse of the removal procedure.

Warning:
Always replace the spring clips on the brake lines on the pressure modulator when you open the connector. Make sure that positioning is correct (➟ 34.15).

- **Integral ABS** Filling and bleeding brake system (➟ 34.20).
- 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.

- Check and, if necessary, adjust idling speed, synchronisation, throttle flaps (➟ 00.59).

Tightening torque:
Battery carrier to rubber-metal element..... 8 Nm

62 Instruments

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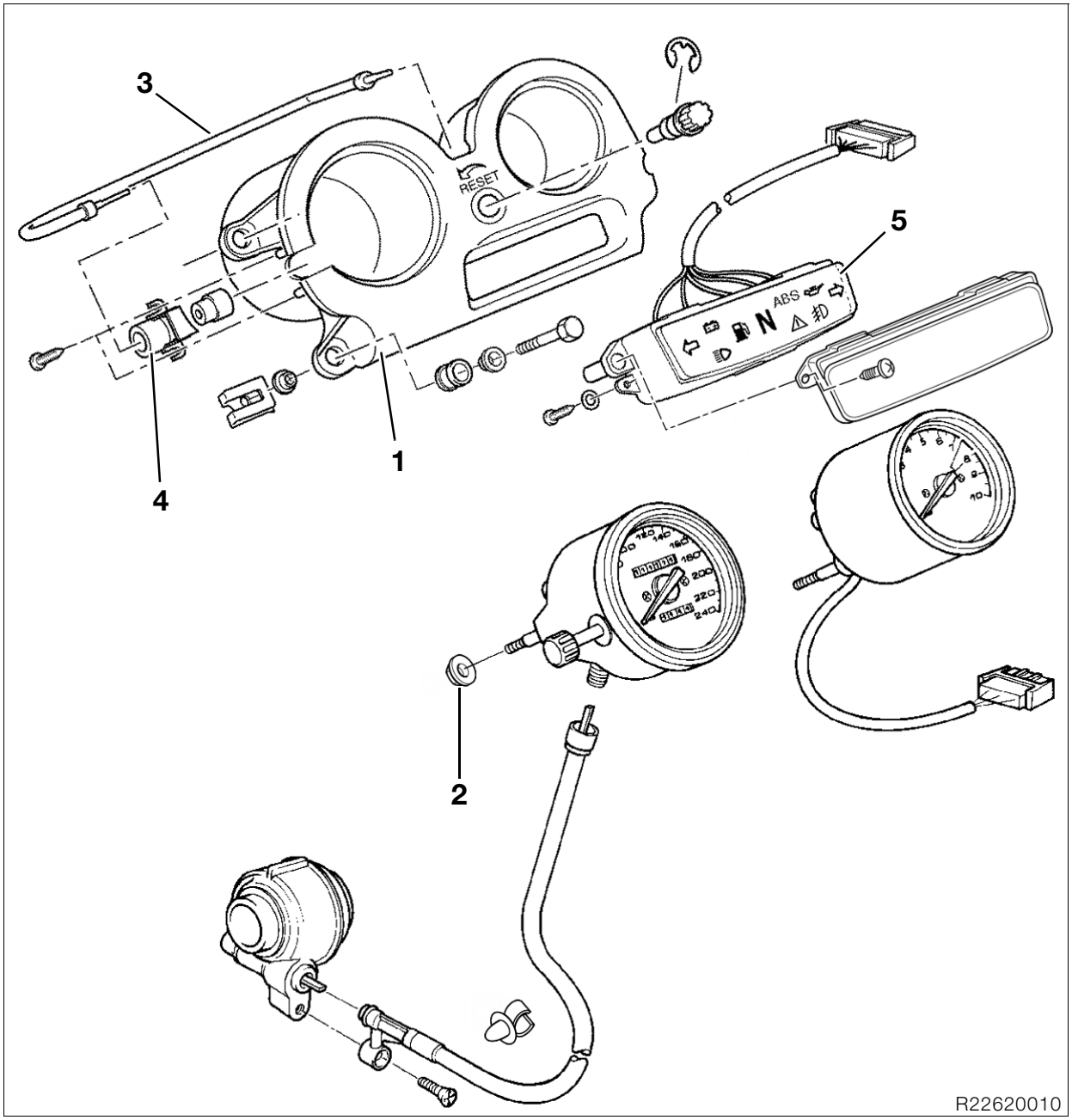
Technical Data 62 Instruments	R 1150 RT
Instrument cluster	
Speedometer type	mechanical
Speedometer drive ratio	i = 2.6
Tachometer type	electronic
Turn-indicator cancellation	manual
Instrument lighting	A 12V 1.7W
Telltale and warning lights	
Turn indicator	A 14V 3.0W
High (main) beam headlamp	A 14V 3.0W
Fog lamps	A 12V 1.7W
Neutral	A 12V 1.7W
Oil pressure	A 12V 1.7W
Charge monitor	A 12V 1.7W
Fuel gauge	A 12V 1.7W
ABS warning lamp	A 12V 1.7W
Main warning lamp (brake failure)	A 14V 3.0W



62 11 200 Removing and installing instrument cluster

- Remove the seat.
- Raise the windscreen.
- Remove left side section of fairing (➟ 46.8).

⚠ Attention:
Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove fasteners of cover for windscreen adjuster push adjuster up.
- Remove inner trim of fairing.
- **[Radio]** Remove left loudspeaker box.
- **[Radio]** Slacken right loudspeaker box.
- Disconnect speedometer shaft.
- Release instrument cluster (1) and pull it up until it is clear of the mount.
- Disconnect plugs.
- Installation is the reverse of the removal procedure.

62 11 623 Disassembling and assembling instrument cluster

- Remove instrument fastener (2).
- Disconnect reset shaft (3) of trip meter from speedometer.
- Remove adapter (4) from reset shaft.
- Remove instrument lighting.
- Remove control unit (5).
- Assembly is the reverse of the disassembly procedure.

63 Lights

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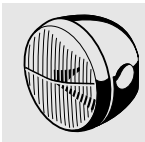
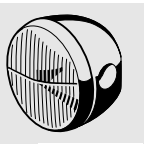
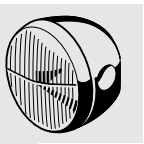
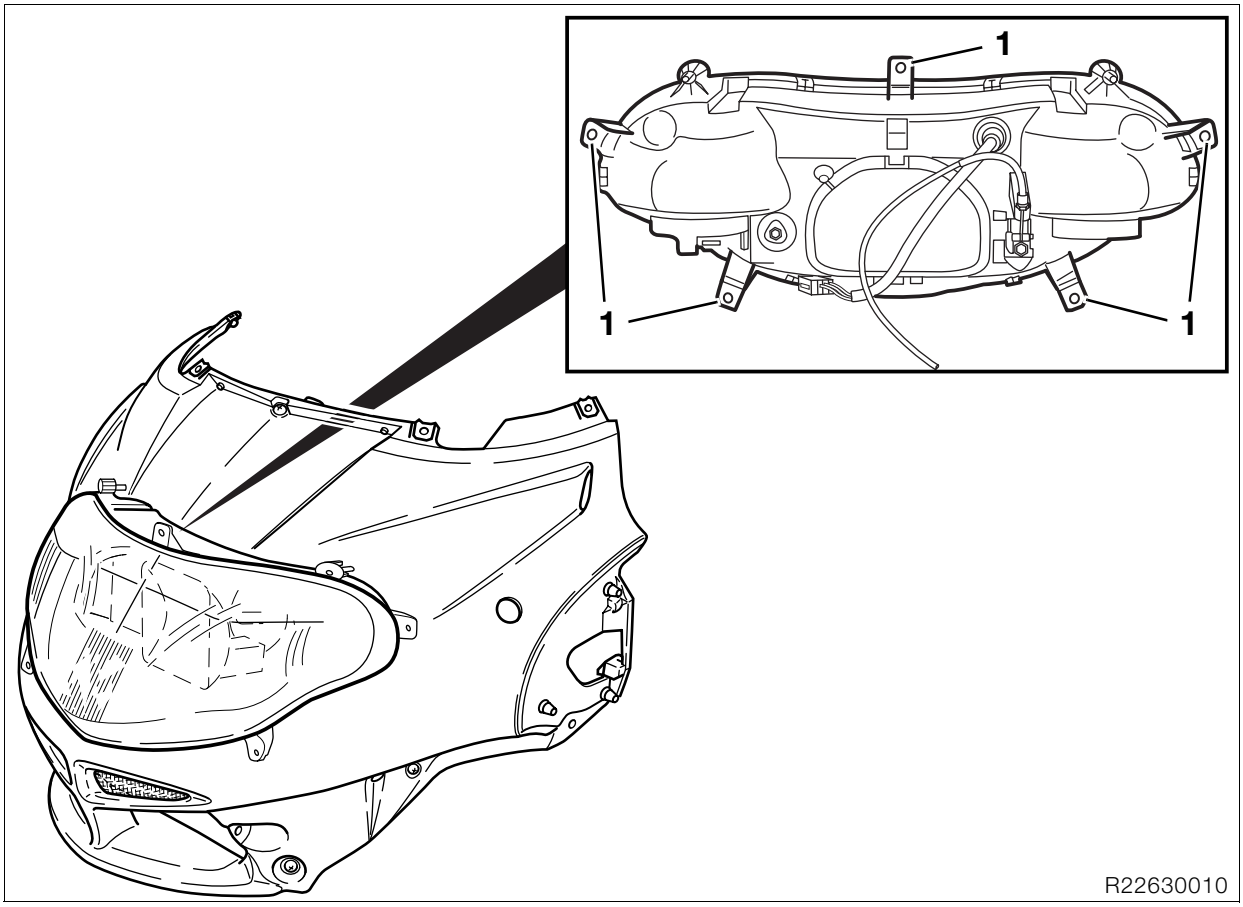




Technical Data 63 Lights	**R 1150 RT**
Headlamp type	Halogen tandem headlamp with two fog lights
Bulbs	
Low (dipped) beam headlight	H7 halogen bulb, 12V 55W
High (main) beam headlamp	H3 halogen bulb, 12V 55W
Fog lamps	H3 halogen bulb, 12V 55W
Parking light	W 12V 5W
Rear plate/licence plate lamp	R 12V 10W
Brake lamp Standard designation	12V 21W P 25-1
Flashing turn indicator Standard designation	12V 21W P 25-1





63 12 090 Removing and installing headlight

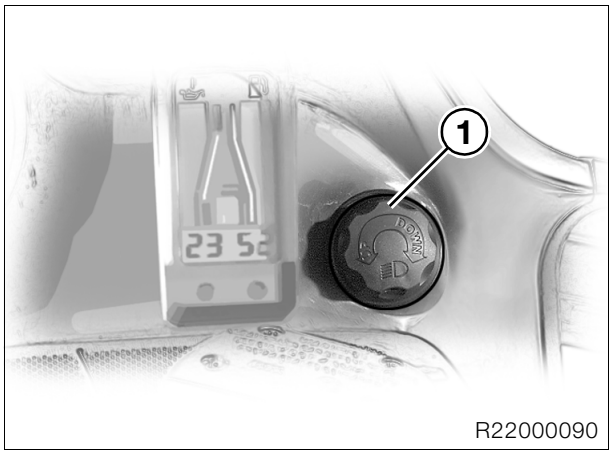
Attention:
Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove the seat.
- Remove side panels (➟ 46.8).
- Remove upper section of fairing (➟ 46.10).
- Slacken securing screws (1) of headlight.
- Remove headlight.
- If necessary, check Bowden cable for damage and connect it to the new headlight.
- Installation is the reverse of the removal procedure.

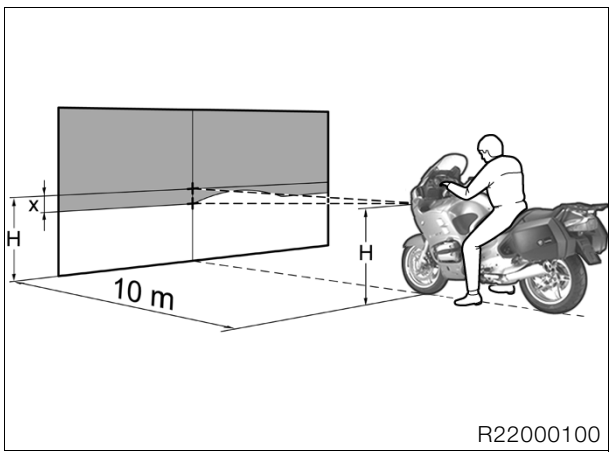
Attention:
Do not touch reflectors or bulbs with your bare hands.

- Check headlight beam throw, adjust if necessary (➟ 63.6).

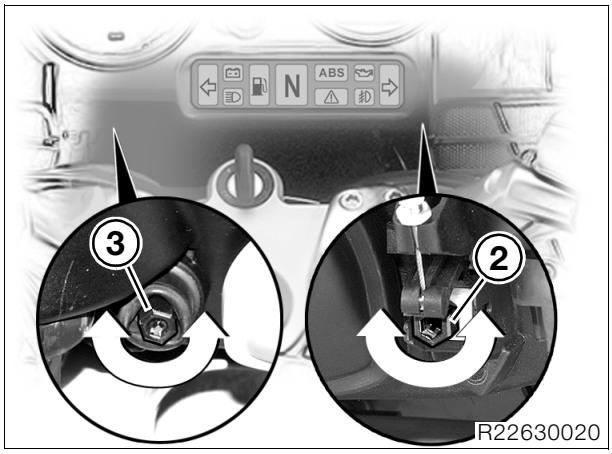
63 10 004 Adjusting headlight



- Motorcycle on level surface.
- Rider's weight on motorcycle (approx. 85 kg/187 lbs).
- Turn knob (1) counter-clockwise as far as it will go.
- Check headlight beam throw.



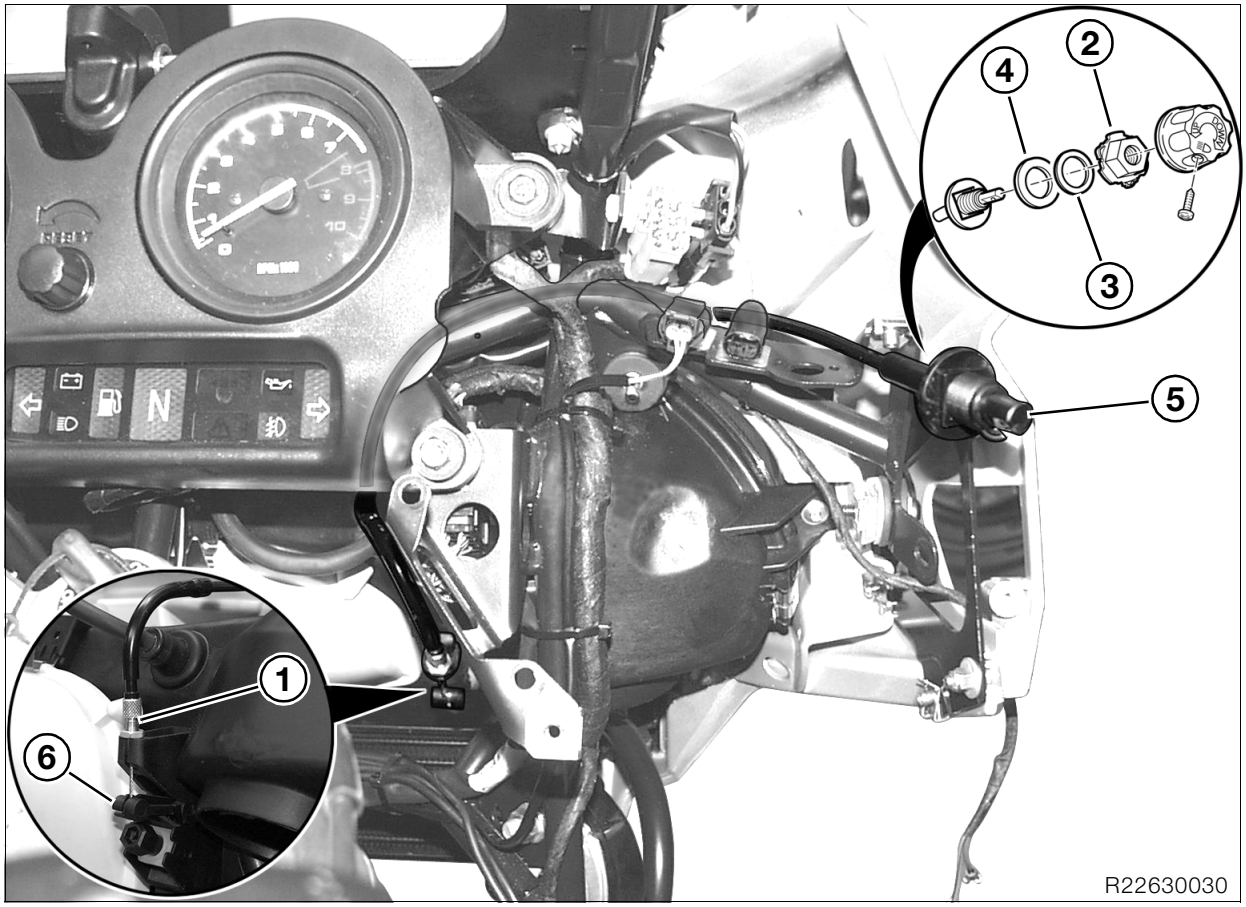
Setting for headlight beam angle adjuster
X= ....-10 cm (-3.9370 in) for 10 m (32.8 ft) distance
H= ..... Height to centre of headlamp



- Turn screw (2) to adjust beam throw, if necessary.

Direction of rotation,
counter-clockwise.....further/higher
Direction of rotation,
clockwise .....shorter/deeper

- Adjust left/right angle by turning screw (3).



63 10 150 Removing and installing Bowden cable for headlight beam throw adjustment

63 10 Removing Bowden cable

Attention:
Switch off ignition.
Disconnect earth (ground) lead from battery.
Insulate earth (ground) lead.

- Remove the seat.
- Remove side panels (➡ 46.8).
- Remove upper section of fairing (➡ 46.10).
- Disengage Bowden cable (1) from the headlight.

63 10 Installing and adjusting Bowden cable

- Engage Bowden cable (1) at the headlight.
- Secure nut (2) with rubber ring (3) and washer (4) to Bowden cable.
- Turn adjuster (5) counter-clockwise as far as it will go.
- Adjust play of Bowden cable (1) at headlight to zero.

Attention:
Make sure that Bowden cable is not trapped and is free of kinks.

- Install the upper section of the fairing.
- Install inner trim of fairing.
- Turn adjuster (5) counter-clockwise as far as it will go.

Attention:
Make sure that lever (6) is not held by Bowden cable (1).

- Slacken Bowden cable (1) at headlight and set to zero play.
- Check function of headlight beam throw adjustment.
- Assemble the motorcycle.
- Check headlight beam throw, adjust if necessary (➡ 63.6).

63 21 380 Removing and installing rear light cluster

See illustration in section on removing and installing number-plate light (➡ 46.14).