Repair Manual

K1 – K100RS 16V



BMW Motorrad GmbH + Co.
Service Department

This file is based on a scan from the org. BMW microfich.
Quality : not a beauty – but usable.

Must be an early edition because the K100 16V models are not included.

Nevertheless : It can be used for all K100 16V models as well

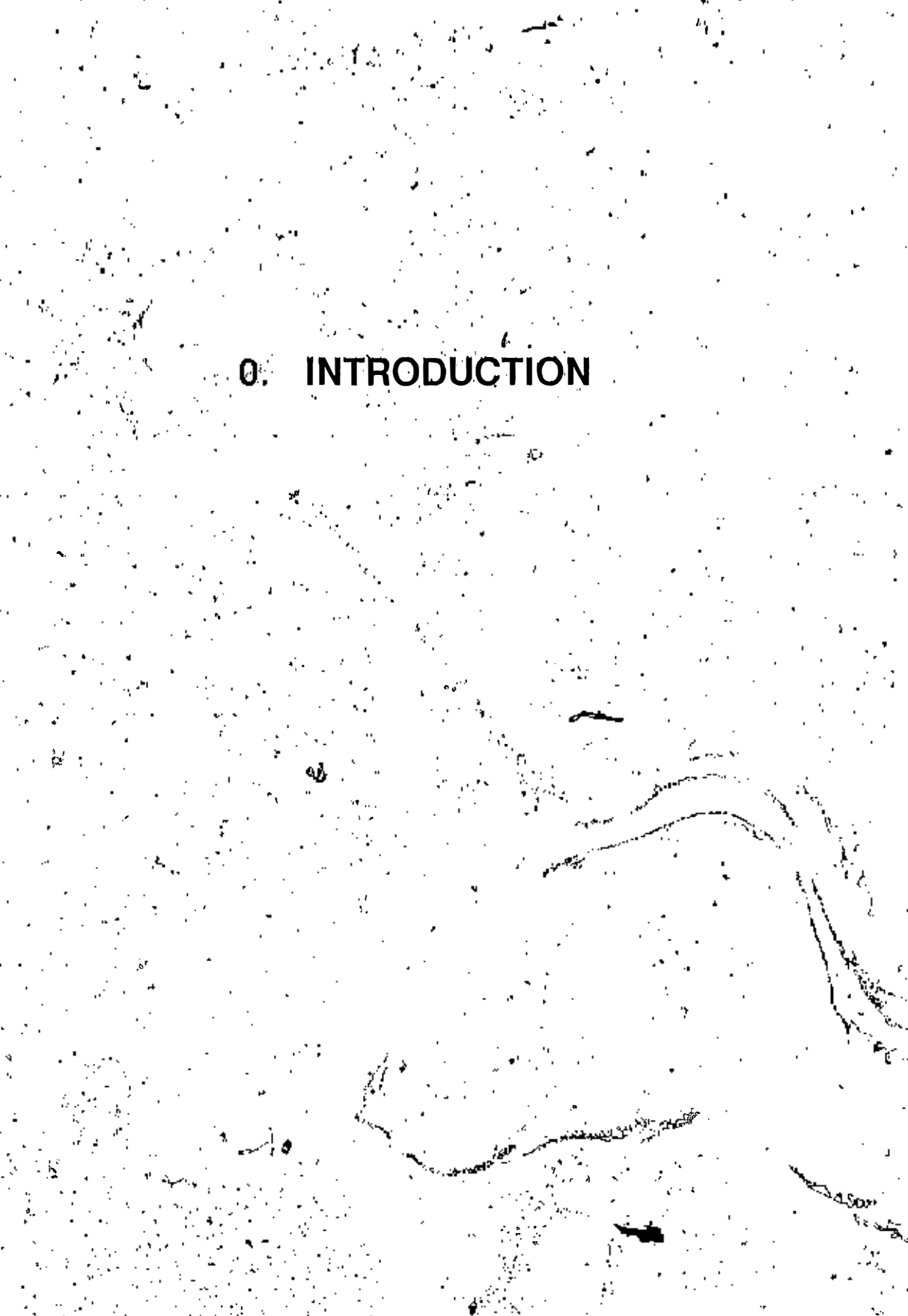
The PDF file is made with Acrobat 9.0 Pro

Printing:

- Print every chapter alone
- Quality is good enough for A4 size

Thx to the scanner !

0. INTRODUCTION



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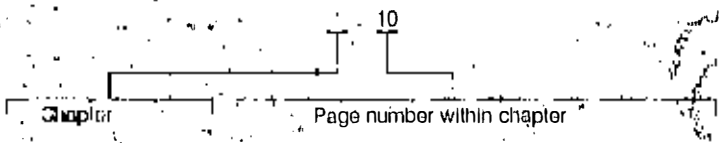
Introduction

This Workshop Manual is intended to ensure that all major maintenance and repair work is carried out expertly. If used regularly by workshop personnel, it will add to the practical and theoretical knowledge provided by the Service Training School, and therefore make it easier to achieve the required high service quality standards.

A new edition will be issued if amendments or additions (supplements) are needed. The sections of the manual concerned will be marked with the new issue date. Microfiches which are rendered out of date as a result should be destroyed without delay.

All information contained in illustrations or descriptions refers to standard production motorcycles or those fitted with Original BMW Accessories and not modified in any other way.

- The Workshop Manual is laid out in the logical working order: removal, stripping down (dismantling), repair, assembly, installation.
- The contents are divided up into separate chapters. The page numbering means:



- The work to be performed during an inspection is stated in an Inspection and Maintenance Schedule. The various levels of inspection work are designated with Roman figures: I, II, III. The same designations are used in the work descriptions which follow, so that a continuous work sequence is assured.
- Where necessary, the work descriptions state which BMW special tools are to be used.

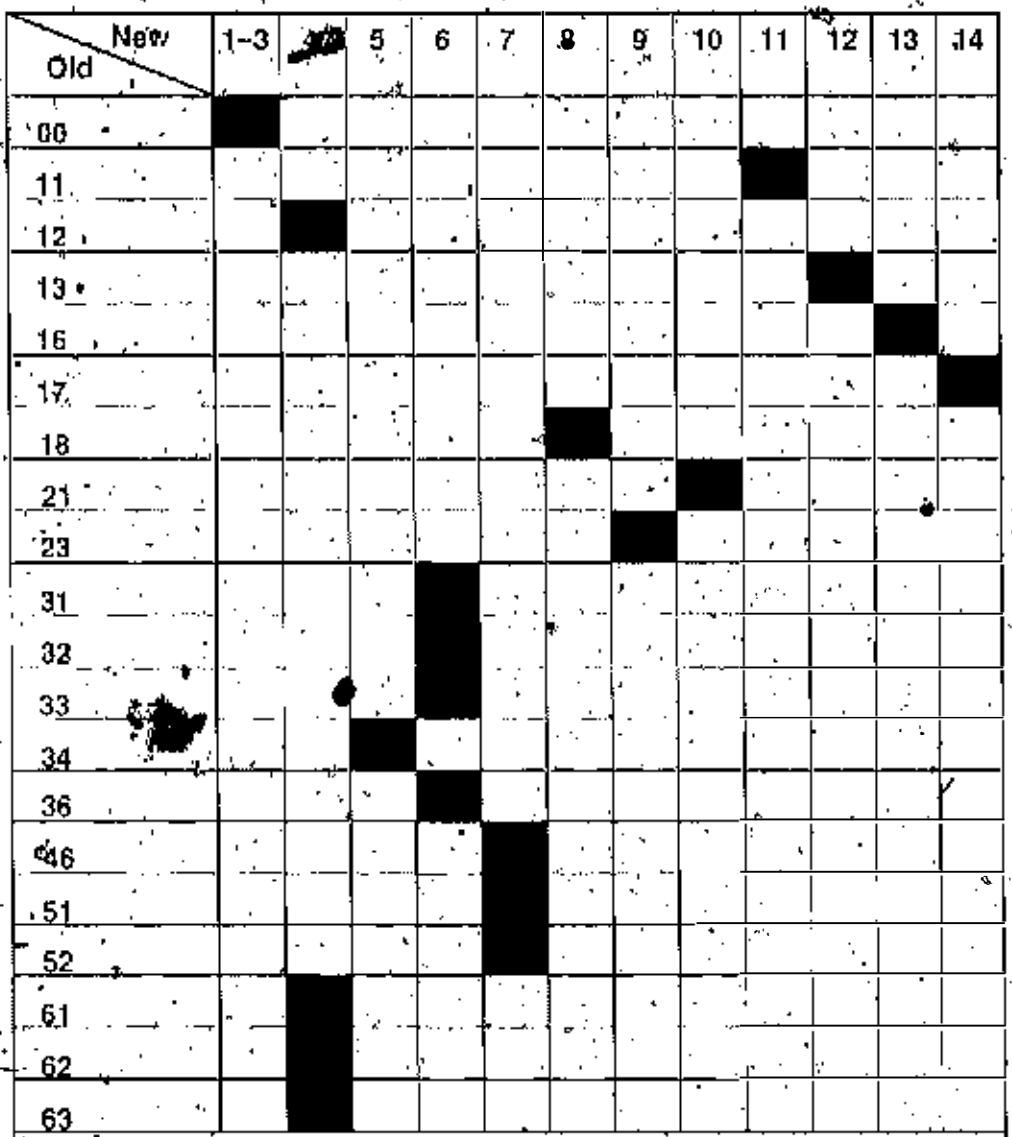
When the need arises, repair instructions are also issued in the form of Service Information bulletins. Their contents are incorporated into the next issue of the Workshop Manual. In addition, you are recommended to refer to the Illustrated Parts microfiche as a further source of information.

BMW Motorrad GmbH + Co.
Service Department – Technical

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SUMMARY OF MAIN GROUPS



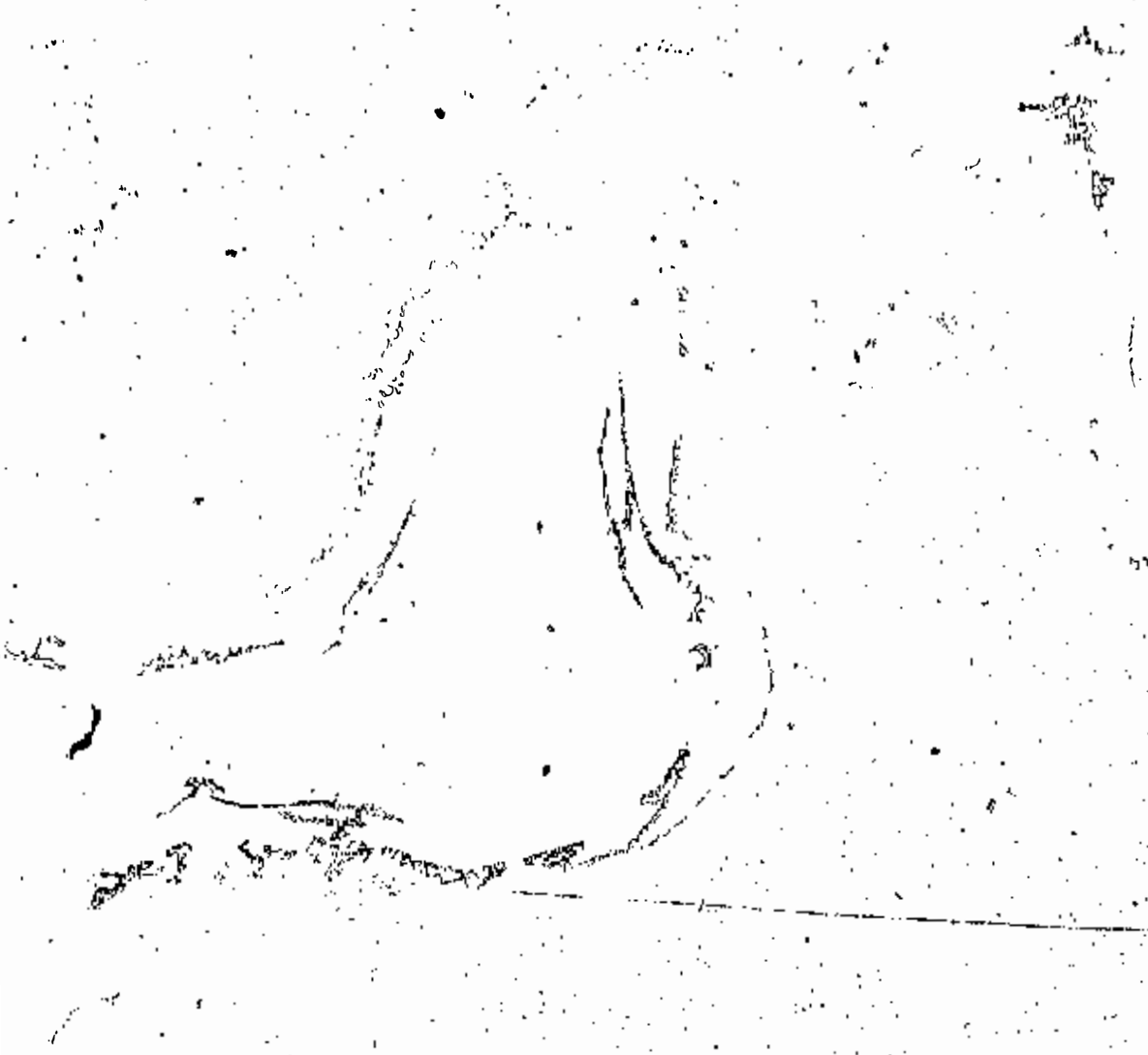
Note:

The form and structure of the Workshop Manual have been revised; the main groups and their numbering have also changed.

Since the contents of individual main groups are closely related, they have now been grouped together into chapters of their own. This makes it easier to locate the required information and gain access to the group concerned.

The old and new main group numbers are compared in this summary. The black areas indicate the actual status of the manual.

1. COMPLETING THE MOTORCYCLE AND PRE-DELIVERY CHECK

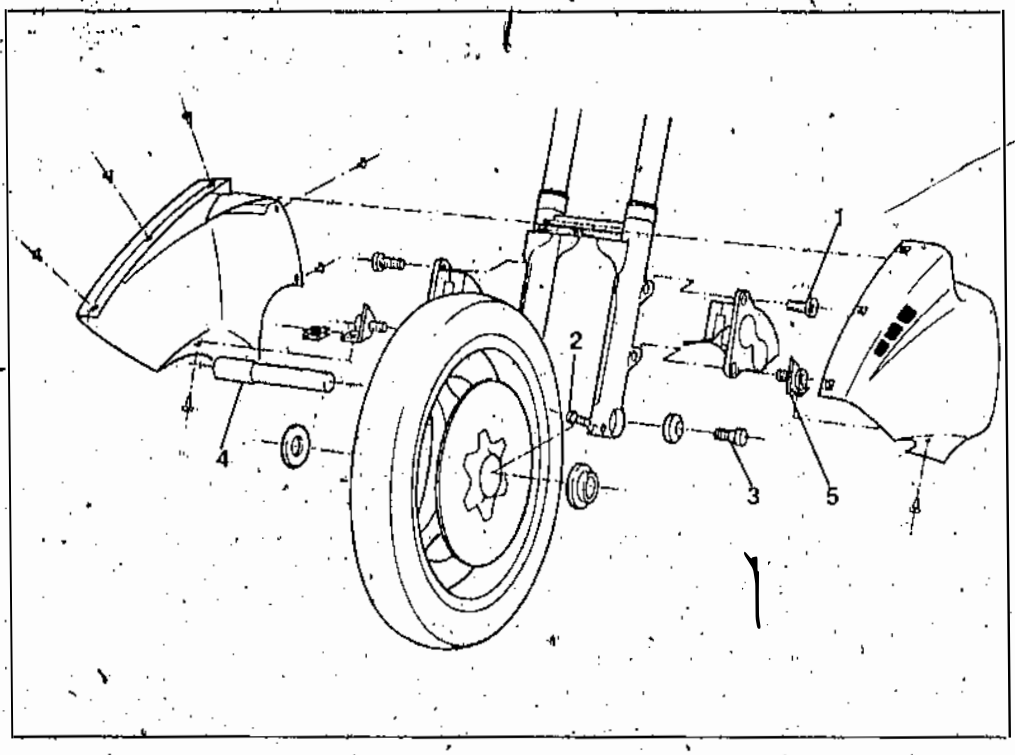


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COMPLETING THE MOTORCYCLE

Tightening torque

Machine screw	*33 ± 4 Nm*
Clamp screw	*14 ± 2 Nm*

INSTALLING THE FRONT WHEEL

- Slacken off the retaining straps
- Raise the motorcycle with a jack or hoist and loosen the straps.
- Allow the brake caliper retaining screws (1) to hang down freely.
- Slacken the left and right front axle clamp screws.
- Unscrew the machine screw from the quick-release axle and pull out the axle.
- Lower the motorcycle so that the front wheel can be inserted without lifting it.
- Install the quick-release axle from the right.
- Note the spacing washers at left and right.
- Screw the machine screw with spacer into the quick-release axle.
- Tighten the clamp screws on the left side only at first.
- Force the brake pads apart.
- Carefully push the brake caliper over the brake disc.

> **WARNING:**
> Mask off the inside of the brake caliper with insulating tape or similar to prevent damage to the wheel rim.

- Insert the retaining screws (1); the lower screw has a holder (5).

Tightening torque:

Machine screw	*32 ± 2 Nm*

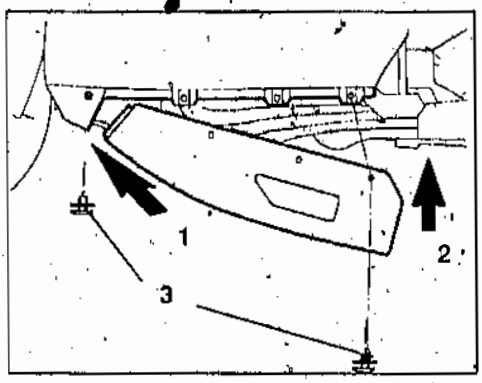
- Roll the motorcycle off its pallet and compress the telescop fork several times.
- Tighten the clamp screws on the right side of the wheel.

INSTALLING THE FRONT MUDGUARD

- Slacken off the screws holding the fork stabilizer cover and apply tyre fitting lubricant to the rubber mudguard guide.
- Push the two halves of the mudguard into the rubber guide on the fork stabilizer.
- Secure the mudguard to the telescopic fork with Allen screws.
- Screw the two halves of the mudguard together with 6 Allen screws and tighten the cover.

Tightening torque:
Fork stabilizer *21 J: 2 Nm*

INSTALLING THE ENGINE UNDERTRAY



- Insert the engine undertray into the fairing and screw it on tight.

NOTE:
Insert Phillips-head screws at the rear left and right.

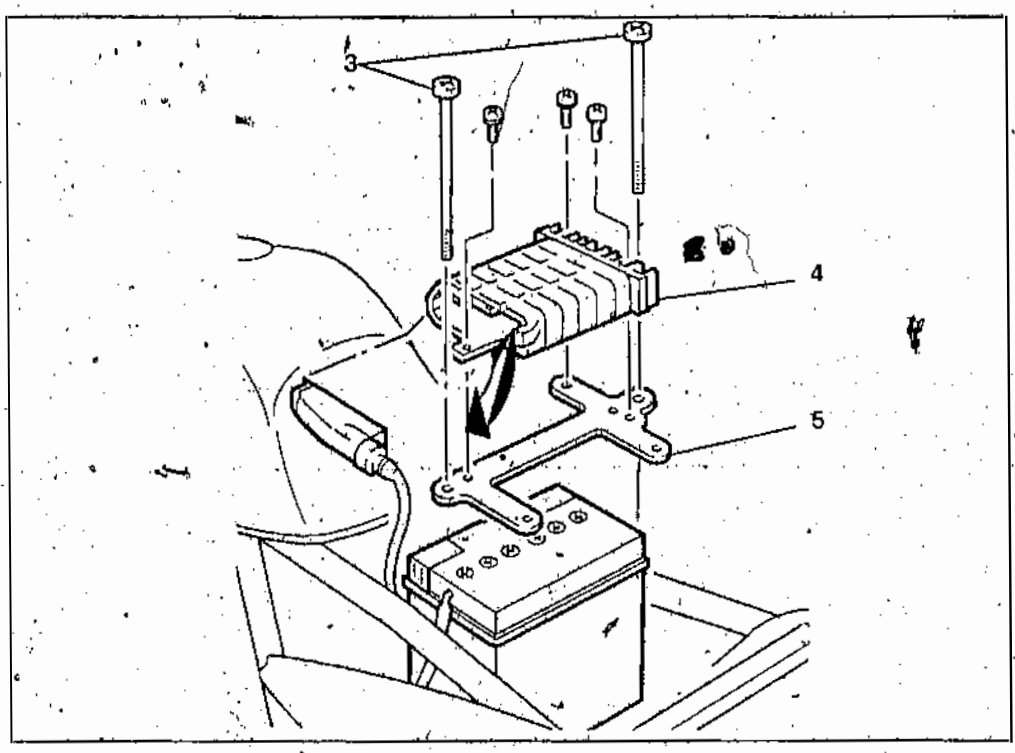
CLEANING THE MOTORCYCLE

- Before the preservative coating is removed and the motorcycle is cleaned, read the latest Service Information bulletins.

WARNING:
Degrease the brake discs carefully (e.g. with thinners).

CHECKING MOTORCYCLE FOR COMPLETENESS

- Toolkit
- Breakdown kit
- Rider's handbook
- List of dealers
- First aid instructions
- 3 motorcycle keys (one folding, two rigid)
- Special equipment (options) as ordered by customer.

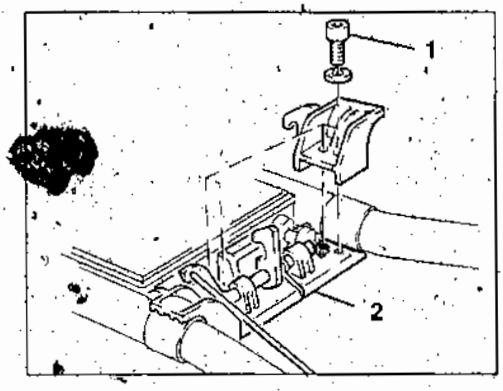


PRE-DELIVERY CHECK

NOTE:
Do not perform the pre-delivery check until just before the motorcycle is to be handed over to the customer.

REMOVING THE BATTERY

- Open left storage compartment flap. Release and take off the dualseat.



- Remove the retaining screws (1).
- Take off the dualseat lock holder.
- Release the keeper on the control unit plug and pull the plug out of the control unit on the cable entry side (arrow).
- Remove the retaining screws (3) and take out the control unit (4) with holder (5).
- Detach the lead from the negative pole of the battery first, followed by the positive pole. Pull the vent tube out of the mudguard.
- Lift out the battery.

FILLING BATTERY WITH ACID

WARNING:

The battery contains sulphuric acid. Avoid all contact with the eyes, skin or clothing. Antidote: rinse off with water (EXTERNAL ONLY). Rinse eyes out with water and arrange medical treatment for victim immediately.
IF SWALLOWED: victim must drink large amounts of milk or water and be seen by a physician without delay.
Batteries emit explosive gases. Avoid sparks or naked flames and do not smoke near the battery. When working near the battery, always wear protective goggles.

STORE THE BATTERY OUT OF REACH OF CHILDREN.

Charge batteries only in well ventilated rooms. Always remove the filler plugs when charging.

- Remove the filler caps and add pure accumulator-grade sulphuric acid to VDE 0510 standard or equivalent to the battery, up to the "Max" mark. Specific gravity: 1.28 kg/l; for tropical countries: 1.25 kg/l, in both cases at 20° acid temperature.
- Allow the battery to stand for about 1 hour, then shake or tilt it slightly to allow bubbles to escape. If necessary, top up the acid level to the "Max" mark.
- Do not insert the filler plugs until battery charging has been completed.

WARNING:

After a dry, pre-charged battery has been filled, it will initially reach only about 60 % of its nominal capacity. Always charge the battery after it has been filled.
Avoid storing batteries for any length of time after they have been filled. Add acid only shortly before you know that the battery is needed.

CHARGING THE BATTERY

WARNING:
Maximum charging current must not exceed 10 % of the battery's rated capacity. During the charging process, the temperature must not exceed 40°C.

Example:

Charging current for 25 Amp/hour (Ah) battery	*= 2.5 Amp*
Charging time	*= 5 - 10 hours*

The state of battery charge can be checked by measuring the specific gravity of the acid. When the battery is fully charged, the specific gravity should be 1.256 ... 1.30 kg/l at 20°C.

- Shake the battery carefully after charging, and if necessary top up to the "Max" mark with distilled water
- Press in the filler plugs and install the battery. Installation is in the opposite order of work to removal.

WARNING:
Connect the positive lead first, then the negative lead.

NOTE:
Make sure that the vent tube is run correctly.

CHECKING TIGHTNESS OF REAR WHEEL STUDS

Tightening torque:	
Rear wheel studs	*105 ± 4 Nm*

CHECKING/CORRECTING TYRE PRESSURES

Tyre pressures (tyres cold)

On - up	*front*	*2.2 bar*
	rear	*2.5 bar*
Two-up	*front*	*2.5 bar*
	rear	*2.9 bar*

CHECKING LIGHTING/SIGNALLING EQUIPMENT

- High and low headlight beams, parking light
- Brake and licence plate lights, flashing turn indicators
- Telltale and warning lights for high beam, battery charge, neutral indicator and engine oil pressure
- Horn

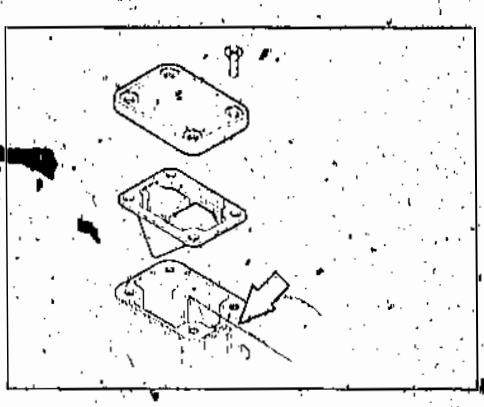
Also check the function of any optional lights installed on the motorcycle

CHECKING/TOPPING UP BRAKE FLUID LEVEL

WARNING:
Brake fluid has a corrosive action. Avoid contact with eyes, skin or clothing

NOTE:
The rear brake circuit fluid level should be just below the "Max" mark, but must never drop below the "Min" mark.

Topping up brake fluid,(front brake circuit)

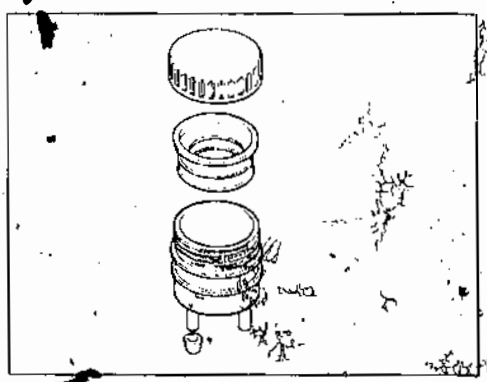


- Remove the four Phillips. head screws from the cover
- Turn the steering to the left, pressing the cover down slightly to prevent brake fluid from escaping ".
- Take off the cover with diaphragm and add brake fluid up to the upper edge of the cast in hole.
- Install the cover again in the opposite order of work

NOTE:
Use only brake fluid to DOT 4 specification

Topping up brake fluid (rear brake circuit)

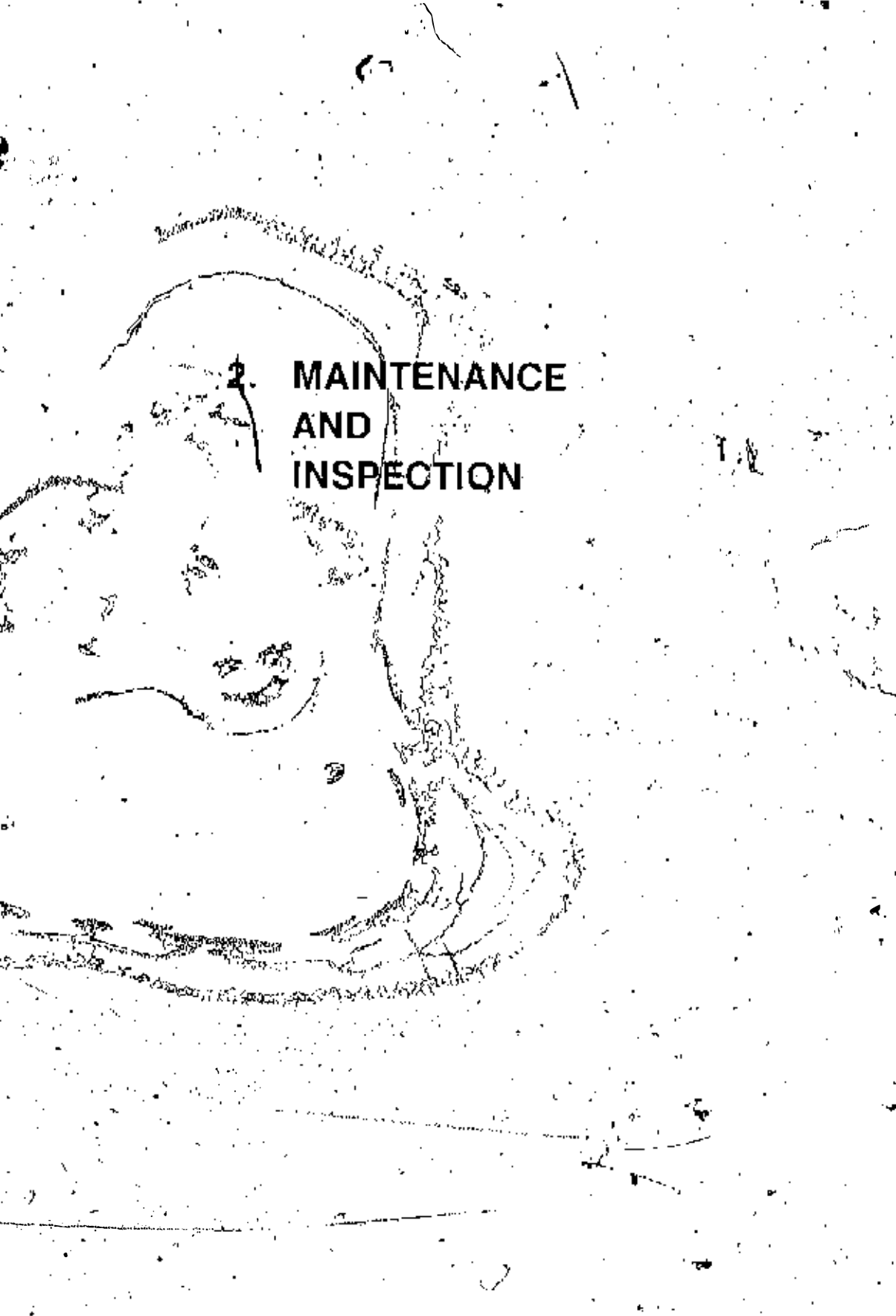
- Add brake fluid up to the "Max" mark.



- Take off the dualseat.
- Pull the brake fluid reservoir out of its holder on the right side of the motorcycle.
- Add brake fluid up to the "Max" mark, see note.

PERFORMING FUNCTIONAL CHECK

- Clutch
- Gear shift
- Steering
- Foot brake
- Handbrake
- Instruments
- Check the function of these items or test ride the motorcycle as necessary.
- Check engine idling (with the engine at its correct operating temperature) and adjust, if necessary (idle speed 950 ñ 50/min)
- Inspect the engine, gearbox, rear wheel drive, telescopic fork, brake lines and fuel system for leaks
- After completing the pre delivery check, confirm it by a stamp and signature in the Rider's Handbook.



2. MAINTENANCE AND INSPECTION

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Driveline

Driveline	BMW Inspection at 1,000 km	II BMW Service at 7,500 km and then every 15,000 km	III BMW Inspection at 15,000 km and then every 15,000 km	Technical data	Page
Change engine oil at correct operating temperature, renew oil filter element	X	X [1]	X [1]	3,75 L	2.8
Change gearbox and rear wheel drive oil at correct operating temperature	X		X [2]	0,85 L 0,26 L	2.8/9
Clean inductive transmitter on rear wheel drive	X		X	2,5 Nm	2.9
Check spark plug electrode gaps		X		0,6 - 0,7mm max. 0,9mm	
Renew spark plugs			X	20 ± 2 Nm	2.9
Grease upper and lower clutch cable nipples		X			2.9
Check clutch operating clearance, adjust if necessary	X		X	A = 4 ± 0,5mm B = 75 ± 1mm	2.9/10
Check valve clearances, adjust if necessary	X		Every 30 000 km	0,15 - 0,20 E 0,25 - 0,30	2.11/15
Renew air cleaner element			X [3]		2.15
Check throttle cable play, adjust if necessary	X		X	1 mm	2.16
Check idle speed and CO content of exhaust, adjust if necessary	X	X	X	950 ± 50 min-1 1,5 ± 0,5%	2.16
Renew contact surface of chain tensioner rail			Every 60 000 km [4] X		

Recommendation: In severe operating conditions, regrease throttle twistgrip and steering bearings at least every 3,000 km*

* To be invoiced additionally

1) At least every 6 months; every three months or after not more than 3,000 km if motorcycle is used exclusively for short journeys at outside temperatures below 0°C
2) At least once a year
3) In very dirty or dusty conditions renew air cleaner element every 7,500 km or even more frequently
4) Normally every 30,000 km; if fuel quality is poor, every 15,000 km
5) At least every 3 months

Running gear

Running gear	I BMW Inspection at 1,000 km	II BMW Service at 7,500 km and then every 15,000 km	III BMW Inspection at 15,000 km and then every 15,000 km	Technical data	Page
Change oil in telescopic fork	X		X	E15 ± 2 Nm A,9 ± 1 Nm	2.17
Check steering bearing play, adjust if necessary			X *)	spelling	2.19
Renew fuel filter	-	-	X *)		2.19
Check brake pads and discs for wear, renew if necessary*)			X		2.20/21
Check brake fluid level in front and rear circuits, top up if necessary. Check brake system for leaks and damage. Renew brake fluid at least once a year*)	X		X	DOT 4	2.21/22
Check battery acid level, top up with distilled water if necessary; clean and grease battery terminal posts			X *)		2.23
Check hose connections on fuel and cooling systems for leaks; take up slack at hose clips	X		X		
Check coolant concentration, correct if necessary. Renew coolant at least every two years*)	X			60 % water 40 % antifreeze -28 °C 50% : 50% -36 °C	2.23
Check for play in swinging arm and rear wheel drive bearings, adjust if necessary			X *)		2.23
Take up slack at nuts and bolts	X		X		2.23
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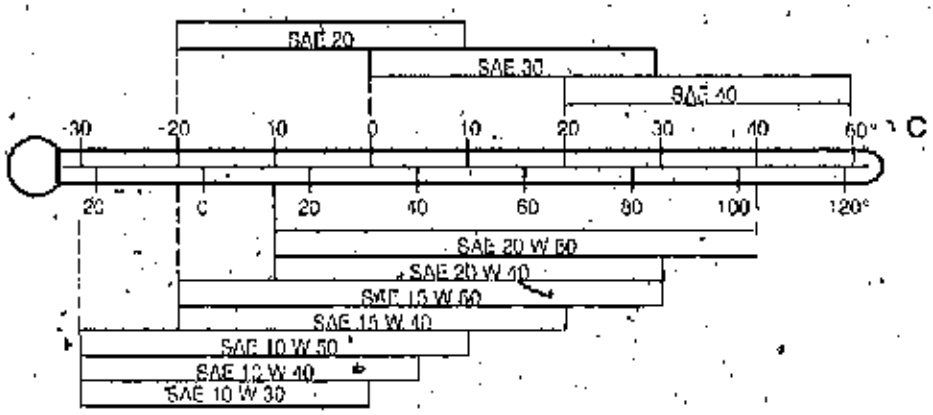
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Operating media – K models

Use/designation	Example of use	Order number	Quantity
Lubricant			
Staburags NBU 30 PTM high-performance lubricant	Highly-stressed spline tracks and keyways, pressure points on clutch and rear wheel drive shaft	07 55 9 056 992 07 55 9 056 993	75 g tube 400 ml spray
Never Seez high-temperature assembly paste	Swinging arm bearing inner races	18 21 1 337 498	30 g tube
Uni Moly C 220 anti-friction lacquer	K 100 output shaft components	11 21 9 056 999	150 ml spray
Siliconenvet 300 zwaar	Fluidbloc K 75	07 58 9 058 193	10 gr. tube
Dow pinpoint Silicone damping grease 300 (new)	K 75 fluidbloc bearing	07 58 9 058 193	10 g tube
Rotha A (taper) roller bearing grease	Wheel and steering head bearings	HWB 81 22 9 407 302 HWB 81 22 9 407 303	900 g can 150 g tube
CRC contact spray	Water-repellent action and friction reduction on plugs, protective effect	HWB 81 22 9 400 208	300 ml spray
Sealants			
3-Bond 1209 surface sealant	All metal sealing faces	07 589 062 376	30 ml tube
Loctite 574 surface sealant	Metal sealing faces on gearbox and rear wheel drive	HWB 81 22 9 407 301	50 ml tube
Curil K2	Ignition output stage	HWB 81 22 9 400 243	250 g can
Adhesives and keepers			
Loctite 242 thread retainer, medium-strength	Shock absorber piston to piston rod (telescopic fork); fixed rear wheel drive bearing journal in swinging arm	07 58 9 056 031	10 ml bottle
Loctite 270 thread retainer, strong	Spring sleeve eye to piston rod	HWB 81 22 9 400 086	10 ml bottle
Loctite 496 cyanacrylate	Fairing elements and rubber parts	16 11 1 235 651	10 ml tube
3-Bond 1110 B joint adhesive	K 100 output shaft bearings without shouldered bearing	07 589 056 998	5 g tube



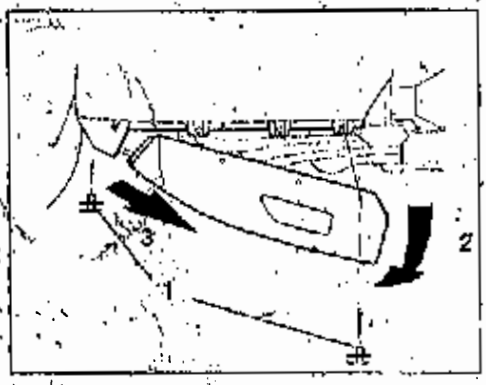
consumption

Service data

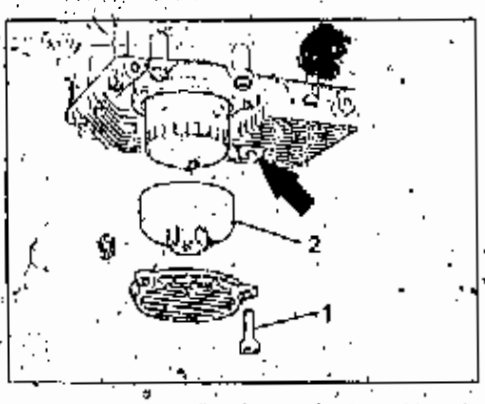
Item			Nominal value	Specification
Oil contents	Engine including filter	L	3.75	Brand-name HD oil for four-stroke spark ignition engines to API SE, SF or SG specification, can be combined with CC or CD specification
	Engine excluding filter	L	3.50	
	Gearbox	L	0.85	Brand-name hypoid gear oil to API Class GL 5: above 5°C SAE 90 below 5°C SAE 80; alternatively SAE 80 W 90
	Rear wheel drive	L	0.26	
	Telescopic fork (each leg)	L	0.400 −0.01	Esso Komfort, BMW Telescopic oil, Esso Super Komfort (< = 10° C)
Coolant		L	2.8 + 1.1 in header tank	60 % water 40 % glycol down to −28°C 50/50 % down to −36°C
Valve clearances	measured at max. 35°C engine temperature	mm	Inlet 0.15 0.20 Exhaust 0.25 0.30	
Ignition timing	Static	° bTDC	6	
	equivalent to	mm bTDC	0.24 (cyl. 1)	
Spark plugs			Bosch XR 5 DC Beru 12 R 5 DU	
	Electrode gap	mm	0.6 + 0.1	Wear limit 0.9
Idle speed		1/min	950 + 50	
CO content		% by vol	1.5 + 0.5	
Wire cable setting for cold-start enrichment	Measured at central stop of throttle butterfly strip			
	Stage I	mm	1.6	
	Stage II	mm	2.5	
Clutch operating clearance	Wire cable at gearbox	mm	75	
	Wire cable at handlebar lever	mm	4 ± 0.5	
Tyre pressures	With tyres cold		One up front 2.2 bar rear 2.5 bar Two up front 2.5 bar rear 2.9 bar	

Tightening torque	Nm
Oil filter	hand tight
Engine oil drain plug	20 ± 4
End plug in timing case cover	18
Camshaft bearing to cylinder head	9 ± 1
Chain sprocket to camshaft	54 ± 6
Gearbox oil filler/drain plug	20 ± 3
Rear wheel drive oil drain plug	23 ± 3
Rear wheel drive oil filler plug	23 ± 3
Inductive transmitter on rear wheel drive	2.5
Cylinder head cover to cylinder	8 ± 1
Spark plugs	20 ± 2
Exhaust manifold to cylinder head	21 ± 2
Oil drain plug in sliding tube	3.5 ± 0.5
Oil filler plug in spring bearing	14 ± 1.5
Quick-release axle nut	33 ± 4
Quick-release axle clamp screws	14 ± 2
Locking tube (steering head bearing)	65 ± 5
Locknut (steering head bearing)	65 ± 5
Brake caliper to sliding tube	32 ± 2
Rear wheel retaining studs	105 ± 4

ENGINE OIL CHANGE I, II, III



- Take out the screws (1) holding the engine fairing and remove the fairing in the direction of the arrow.



- Unscrew the oil drain plug (arrow) from the sump and drain the engine oil while it is at the correct engine operating temperature.
- Renew the sealing ring on the oil drain plug.
- Take out the screws (1) holding the oil filter cover.
- Using special wrench BMW No. 11 4 060 (2) and an open-ended wrench, unscrew the oil filter.
- Before installing, wet the sealing ring of the new filter element with oil.

NOTE:
Screw the oil filter element in until just hand-tight.

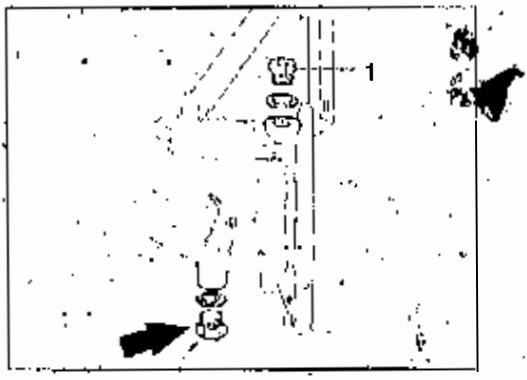
- If necessary, renew the O ring in the cover.

Tightening torque:

Oil drain plug	*18 ± 2 Nm*
Cover to sump	*6 ± 1 Nm*

Oil content when filter is renewed	*3.75 L*
For oil grades, see Service data, page	*2.5*

GEARBOX OIL CHANGE II, III



- Take out the gearbox oil drain plug (arrow) and allow the oil to drain out.
- Renew the sealing ring on the oil drain plug.

Tightening torque

Oil drain plug	*20 ± 2 Nm*

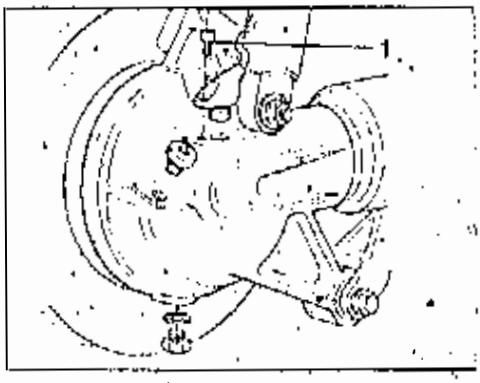
- Take out the oil filler plug (1) and add the correct amount of oil.
- Renew the sealing ring on the oil filler plug.

Tightening torque

Oil filler plug	*30 ± 3 Nm*

Oil content	*0.85 L*
For oil grades, see Service data, page	*2.5*

REAR WHEEL DRIVE OIL CHANGE I, III



- Remove the rear wheel drive oil drain plug and allow the oil to drain out
- Renew the sealing ring on the oil drain plug.

Tightening torque
Oil drain plug 25 ± 3 Nm

- Take out the oil filler plug and add oil up to the lowest turn of the thread in the filler hole.
- Renew the sealing ring on the oil filler plug

Tightening torque
Oil filler plug 20 ± 2 Nm

For oil grades, see Service data, page 2.5

CLEANING INDUCTIVE TRANSMITTER ON REAR WHEEL DRIVE I, II

- Take out the retaining screw and pull out the inductive transmitter; if necessary lever it out carefully with a screwdriver.
- Clean the inductive transmitter with a cloth

Tightening torque
Machine screw 2.5 Nm

RENEWING SPARK PLUGS III

- Spark plugs should be renewed after the motorcycle has covered a distance of 15,000 km, to ensure that a consistently ignition spark is produced

Tightening torque:
Spark plug 20 ± 2 Nm

Use only approved makes and types of spark plug; see Service data, page 2.5

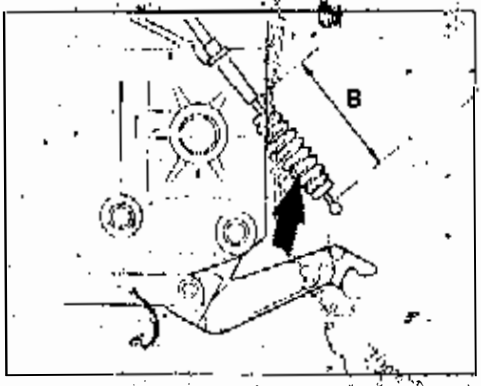
GREASING NIPPLE ON CLUTCH CABLE II, III

- Disconnect the wire cable from the clutch release lever on the gearbox. Then push the protective cover back. Grease both nipples (0.3 g with Shell Retinax A)

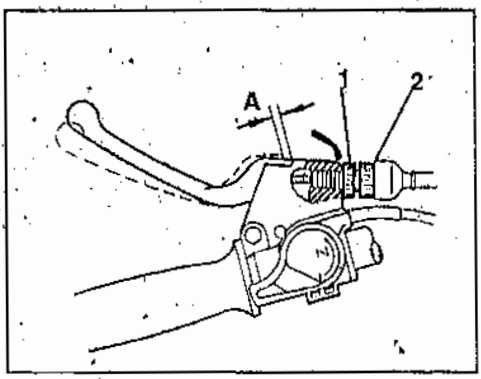
CHECKING CLUTCH OPERATING CLEARANCE, ADJUSTING IF NECESSARY I, III

- To ensure that the clutch engages and disengages fully and can be released fully at the handlebar lever, the basic setting and play at the handlebar lever must be correct.
- To check the basic setting, disconnect the clutch cable from the release lever on the gearbox.

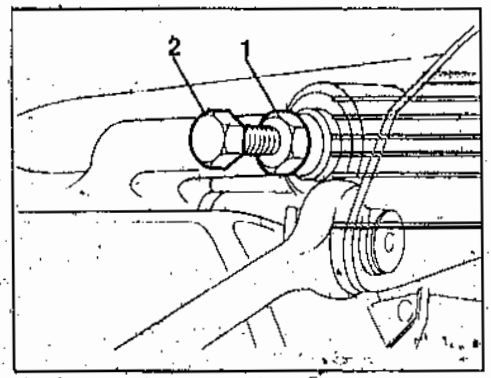
Basic setting:



- Pull the rubber gaiter (arrow) back slightly and use BMW No. 21 3 500 adjusting gauge to obtain a distance B = 75 ± 1 mm at the adjusting screw on the handlebar lever.



- Slacken off the knurled nut (1) for the adjusting screw on the clutch handlebar lever and turn the adjusting screw (2) until distance B is obtained.
- Reconnect the wire cable to the release lever.



- Slacken off the locknut (1).
- Unscrew the adjusting screw (2) by one to two turns, then slowly tighten it again until the pressure point is felt.
- Secure the adjusting screw in this position with the locknut.
- When the basic setting is correct, adjust play at the handlebar lever (Fig. 11).
- Adjust to dimension A at the adjusting screw (2).
- Prevent the adjusting screw from moving by tightening the knurled nut.

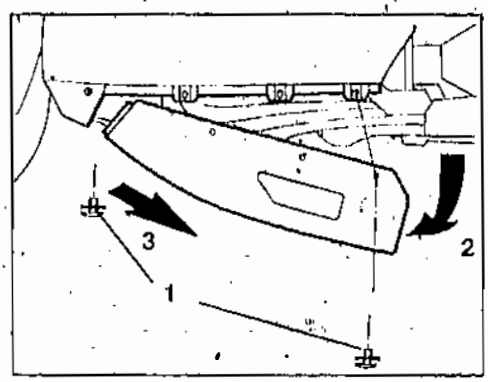
IMPORTANT:
If adjustment is needed to compensate for wear, it must always take place at the adjusting screw on the release lever.

Note:

Distance A	*4 ± 0.5 mm*
Distance B	*75 ± 1.0 mm*

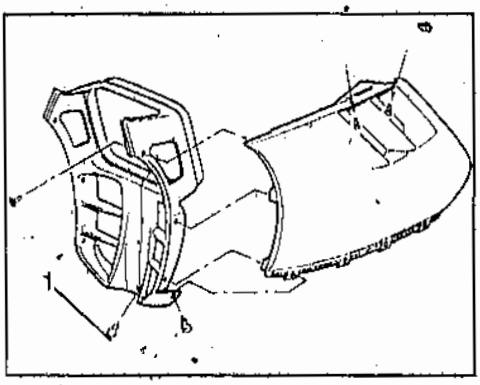
CHECKING VALVE CLEARANCES, ADJUSTING IF NECESSARY I (EVERY ADDITIONAL 30,000 KM)

Removing the engine fairing



- Take out the retaining screws (1) at left and right. Swing the fairing out at the rear, pull it back slightly and take it off.

Removing left side section of fairing



- Take out the retaining screws in the radiator surround and from the upper section and the fairing holder.

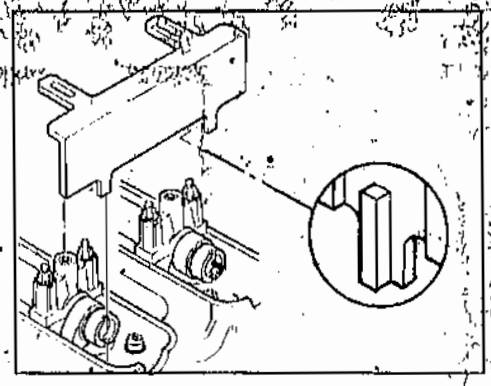
Removing the radiator surround

- Take out the other retaining screws in the radiator surround and detach the mounting (1) at the engine.

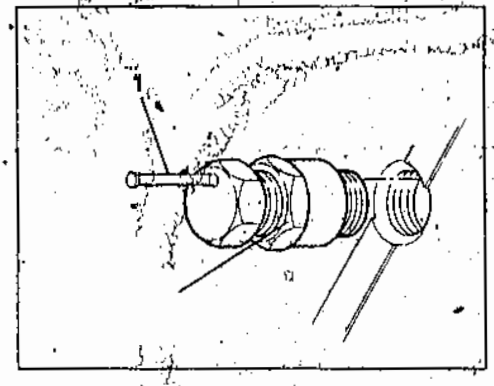
Checking valve clearances

IMPORTANT:
Always take out the spark plugs before checking valve clearance. Particles of carbon and oil could become lodged behind the exhaust valves and falsify the result.

- Remove the cylinder head
- The cam followers/tappets which clearance is to have its base circle on cooler).



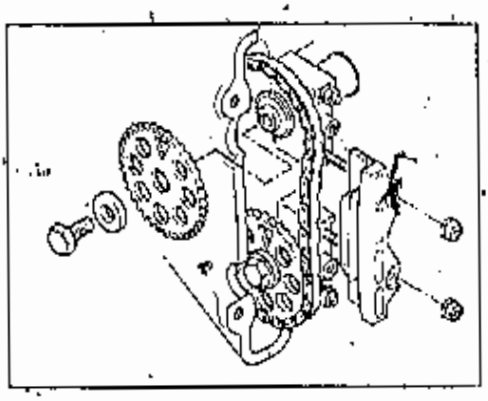
- Unscrew the end plug from the timing case cover.



Prevent the chain tensioner



valve clearances.



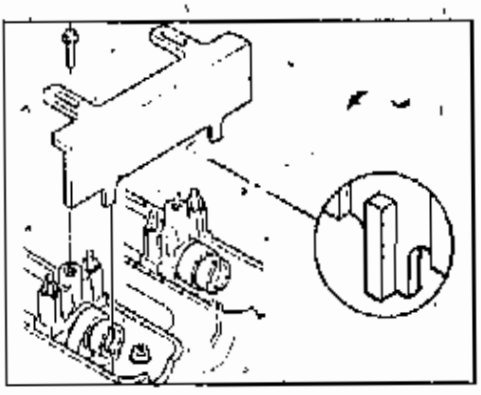
- Take out the screws holding the chain sprockets, and take off the chain sprokkets.
- Detach the chain guide from the studs.
- Remove the camshaft thrust bearings first in order to avoid tilting.
- Remove the remaining camshaft bearings and lift out the camshaft.
- Using BMW No. 61 1 250 relay pliers or a magnet, pull out the bucket type tappets which have to be renewed.

NOTE:
Only bucket-type tappets exchanged at the 1,000 km inspection are suitable for re-use.

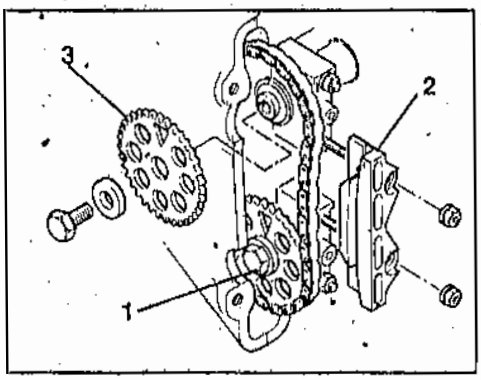
Installing the camshafts

- To avoid accidentally interchanging the camshafts, they are provided with identification marks.
- Inlet: one groove after the thrust bearing.
- Exhaust: no groove
- The camshaft bearing caps are also marked:
- Inlet side: odd numbers
- Exhaust side: even numbers
- The numbering starts at the front (timing end) and rises towards the rear.
- Oil the camshaft bearing points lightly before installing.
- Tighten the bearing caps uniformly, working from the inside outwards.
- Install the thrust bearing (timing end) last.

Tightening torque:
Bearing caps *9 ± 1 Nm*



- Turn the camshafts until the grooves on the rear ends are vertical in relation to the cylinder head.
- The grooves at the front end must face inwards, towards the crankshaft.
- Insert BMW No. 11 3 700 adjusting gauge and secure it to the camshaft bearings.



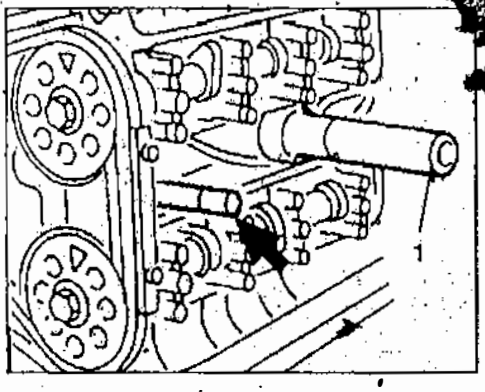
- Install the lower chain sprocket (1) together with the chain and chain guide (2). The pin on the chain sprocket must engage in the groove on the camshaft.
- The triangular mark on the chain sprocket points upwards in the correct installed position.
- Next, install the upper chain sprocket (3) with chain.
- Screw the chain sprocket retaining screws up only hand-tight at first.
- Remove the eccentric clamp.

IMPORTANT:
Remove the adjusting device before the chain sprockets are finally tightened, or else the camshafts will be damaged.

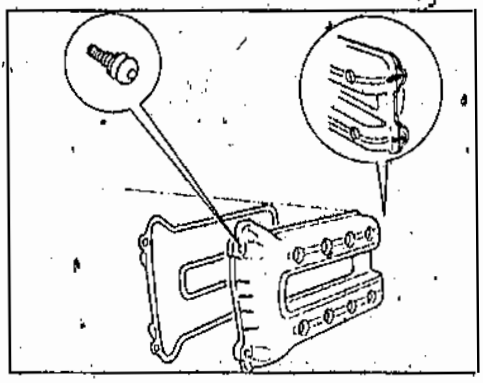
Tightening torque:
Chain sprocket to camshaft *54 ± 6 Nm*

- Check that the valve clearances have not altered.

Installing the cylinder head cover



- Insert reamed bolt BMW No. 11 1 980 (arrow) into the inner front hole.
- Press centering pin BMW No. 11 1 990 (1) with grip BMW No. 00 5 500 into the mounting under the third camshaft bearing.



- Insert the cylinder head cover gasket with the half-moons first. The marks (arrows) on the cover and the gasket must be aligned at front and rear.
- Press the rear half- moons in first (gearbox end).
- Apply a small amount of oil to the gasket groove and the half-moon areas of the cover to simplify assembly.
- Apply a small quantity of sealant to the upper and lower areas on the timing case cover and cylinder head where the surfaces meet (the surfaces should be free from grease).

WARNING:
Handle solvents with care - health hazard.
Comply with the instructions for use.

- Place the cylinder head cover with gasket over the centering tools on the cylinder head.
- Insert and tighten all the retaining screws, but stop before the screws are pre-loaded
- Finally tighten the retaining screws in a crosswise pattern, working from the inside outwards.
- Remove the reamed bolt and the centering pin. Insert and tighten the final retaining screw.

Tightening torque:
Cylinder head cover to cylinder head *8 ± 1 Nm*

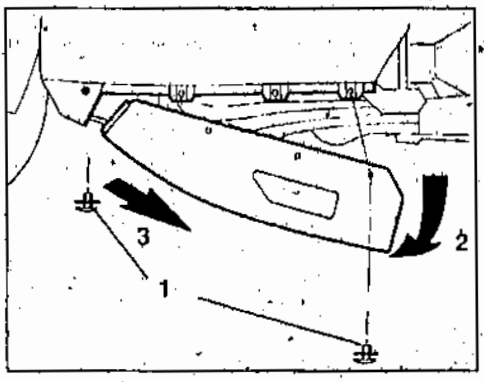
NOTE:
Make sure that the cylinder head cover is inst accurately, or else leaks may occur.

- Insert and screw on the spark plug cover.
- Install the fairing elements, working in the opposite order to their removal.

NOTE:
Tighten the fairing retaining screws with care.

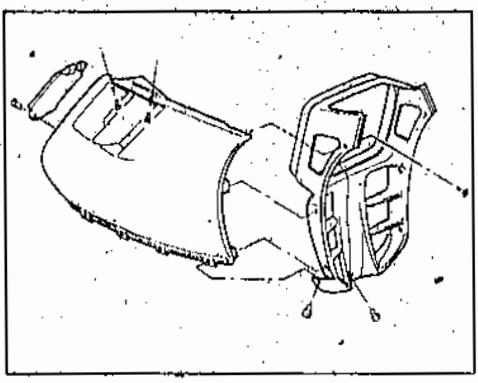
REMOVING AND INSTALLING AIR CLEANER ELEMENT III

Removing engine fairing

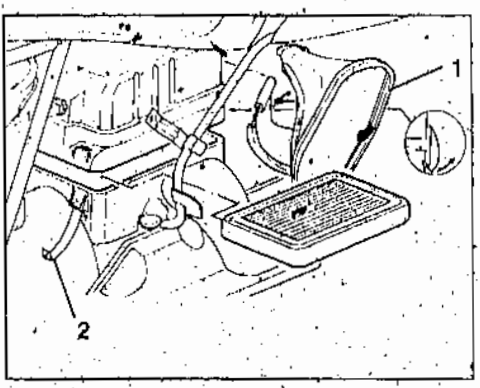


- Take out the retaining screws (1) at left and right, swing out the fairing at the rear (2), pull it back slightly (3) and take it off.

Removing right side section of fairing



- Take out the retaining screws in the radiator surround and for the upper section and the fairing holder.



- Pull out the air duct (1), turning it slightly at the same time.
- Release clips (2) on the air cleaner housing (one at front, two at rear).
- Raise the upper section of the housing slightly and pull out the air cleaner element.
- Install the air cleaner and the fairing sections in the opposite order of work from removal.

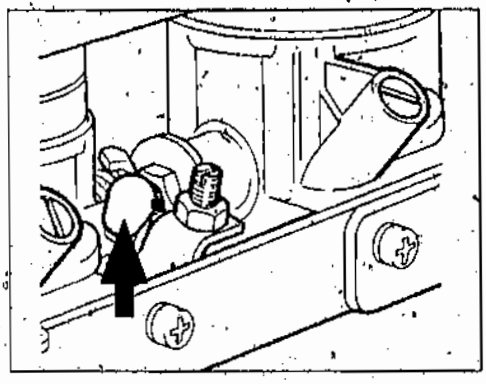
NOTE:
The correct installed position of the air cleaner element is with the inscription at the rear (in relation to the motorcycle's direction of travel) and with the arrow mark "OBEN/TOP" uppermost

ADJUSTING THROTTLE CABLE PLAY I, III

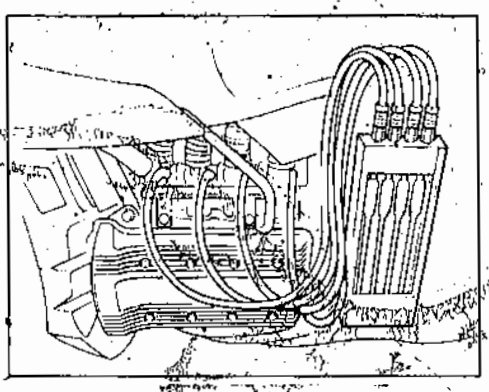
- With the handlebar turned to the right, there should be 1 mm of play in the throttle cable.
- Correct throttle play if necessary at the adjusting screw on the right handlebar fitting.

ADJUSTING IDLE SPEED I, III

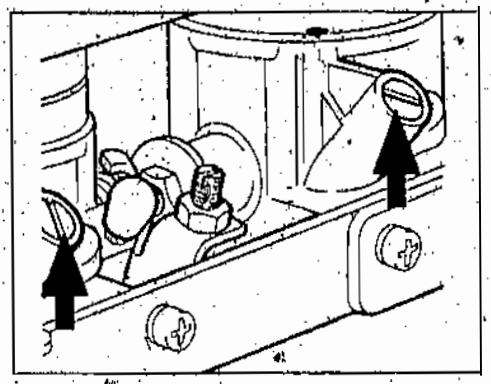
- Remove the left side section of the fairing (the procedure is similar to removing the right side section, page 2.12).
- Adjust idle speed only with the engine at its correct operating temperature (85°C).



- Pull out the plug (arrow) on the vacuum connections and detach the vacuum hose at cylinder 1.



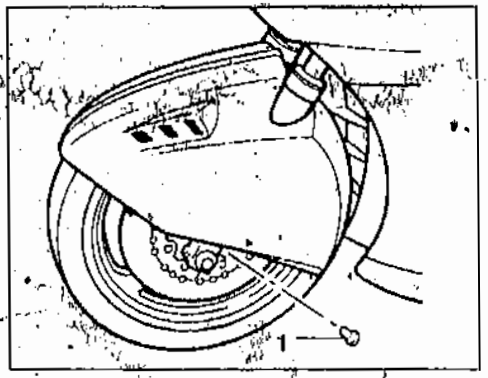
- Connect the Synchrotester, BMW No. 13 0 700, to cylinders 2, 3 and 4 with adapters BMW No. 13 0 702.
- Connect the Synchrotester to cylinder 1 with adapter BMW No. 13 0 703.
- Connect the vacuum hose previously detached to the adapter.



- Turn the individual recirculating air screws (arrows) until all cylinders run uniformly (the four columns of mercury must be at the same height).
- Turning the recirculating air screws also varies the idle speed.

Idle speed 950 ± 50/min.

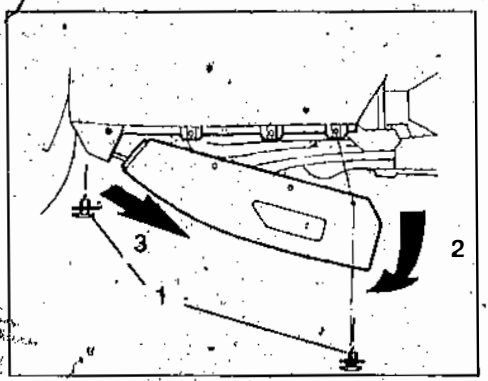
OIL CHANGE IN TELESCOPIC FORK I, III



- Place the motorcycle on its main (centre) stand.
- Unscrew the oil filler plugs from the upper left and right spring mountings.
- Unscrew the oil drain plugs (1) from the left and right fork slider tubes and allow the fork oil to drain out.
- When no more oil drain out, compress the fork several times to force out the remaining oil.
- Renew the sealing rings on the oil drain plugs before screwing them back in

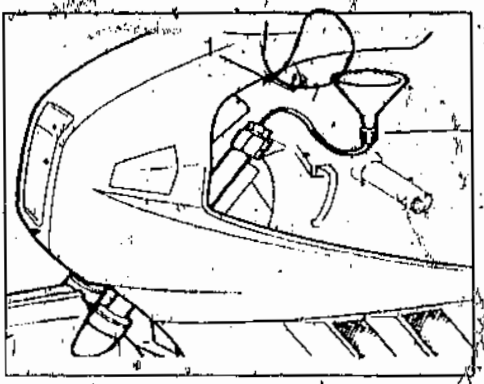
Tightening torque:
Oil drain plug: 3.5 ± 0.5 Nm

- Remove the engine fairing.



- Take out the left and right retaining screws (1), swing the fairing out at the rear (1), pull it back slightly (3) and take it off.

- Using a lifting device, BMW No. 00 1 510, raise the motorcycle so that the front wheel is just clear of the ground.



- Add fresh fork oil with a calibrated beaker and funnel (with flexible extension tube)

Oil content of each fork leg 0.60 ± 0.01 l

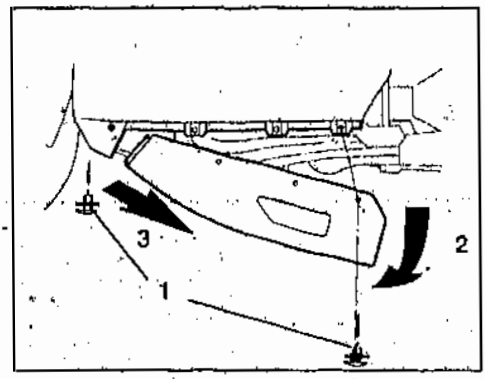
- Insert and tighten the oil filler plugs

Tightening torque
Oil filler plug 20 ± 2.5 Nm

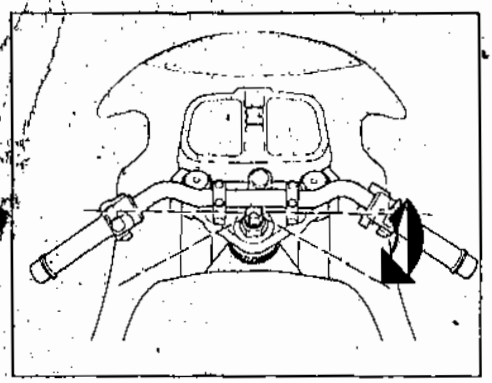
CHECKING STEERING BEAR PLAY, ADJUSTING IF NECESSARY III

Checking steering bearing play

- Place the machine on its centre stand.
- Remove the engine fairing.



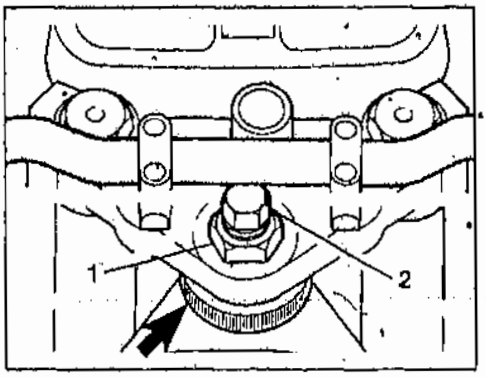
- Take out the left and right retaining screws (1) for the engine fairing, swing it out at the rear (2), pull it back slightly (3) and take it off.
- Using a lifting device, BMW No. 00 1 510, raise the motorcycle so that the front wheel is clear of the ground.



- The handlebar should fall slowly round from the central position to the left and right full-lock positions under its own weight.

Adjusting steering bearing

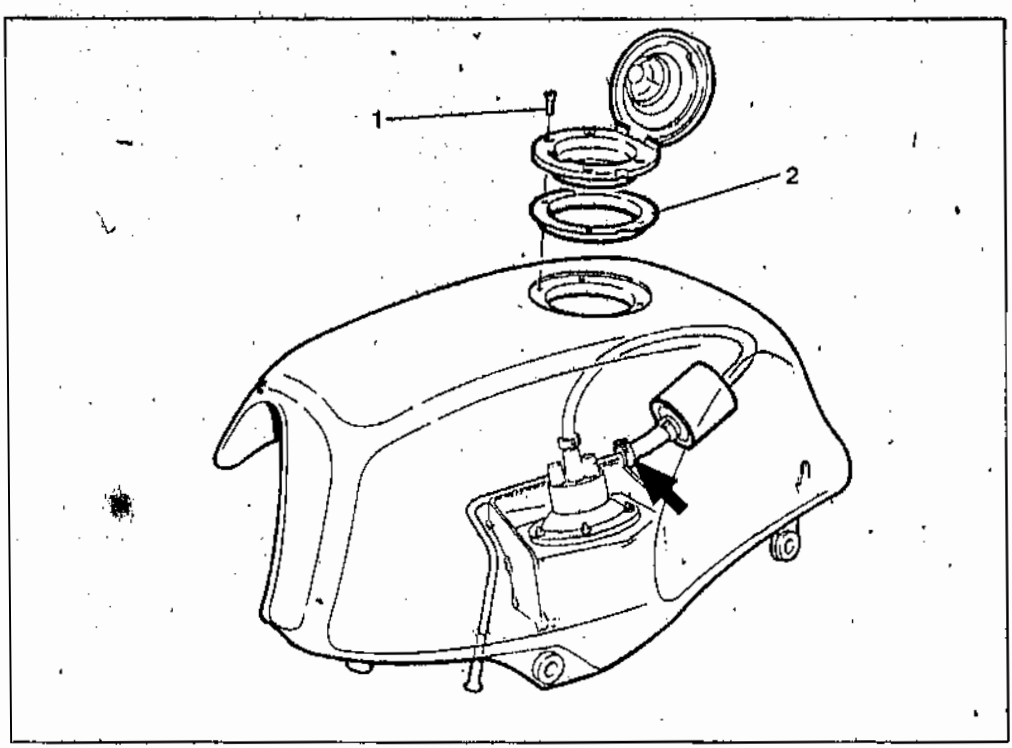
- Carry out the preparatory work as for checking steering bearing play.



- Slacken off the hex nut (1) and locking tube (2).
- Release bearing preload by tapping the locking tube several times with a plastic-faced hammer).
- Slacken off or tighten the knurled ring (arrow) by hand, according to the bearing play previously determined.
- Retighten the locking tube and the locknut.

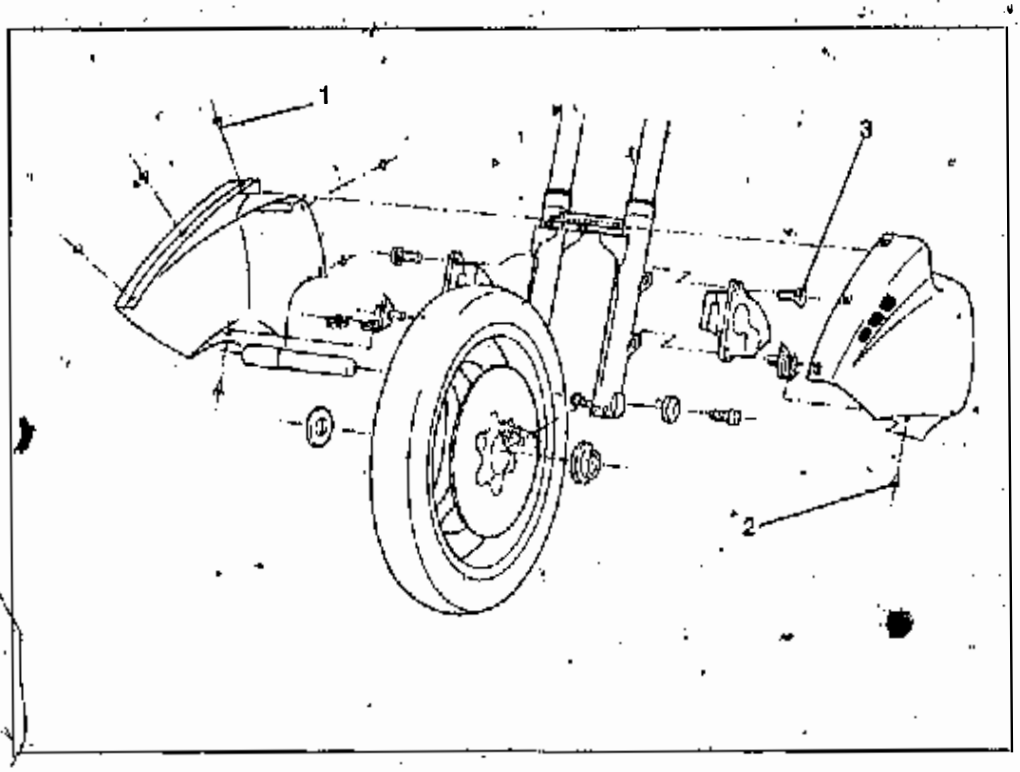
Tightening torque:

Locking tube	*65 ± 5 Nm*
Hex nut	*65 ± 5 Nm*



RENEWING FUEL FILTER III

- Use a hand pump to lower the fuel level until the filter is exposed.
- Open the fuel tank filler cap and take out the retaining screws (1).
- Remove the filler cap with seal (2).
- Slacken the hose clip (arrow) at the pipe end, and push it on to the pipe.
- Pull the flexible hose with fuel filter out of the fuel tank.
- Renew the fuel filter (note its correct installed position) and install the pipe in the fuel tank again.
- When inserting the seal into the filler cap, make sure that the overflow hole is not blocked.
- Install the filler cap on the tank again.



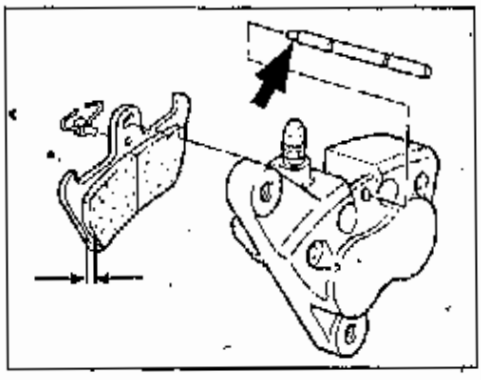
CHECKING BRAKE SYSTEM I, III

- Take out the retaining screws (1, 2) and pull the mudguard halves out sideways.
- Check that all brake lines are undamaged and run in their correct positions.
- Wipe down all threaded unions on the brake pipes.
- Apply the brake firmly and hold it on for a short time. Afterwards, inspect the brake pipes and unions again for signs of leakage.

CHECKING BRAKE PADS FOR WEAR, RENEWING IF NECESSARY II, III

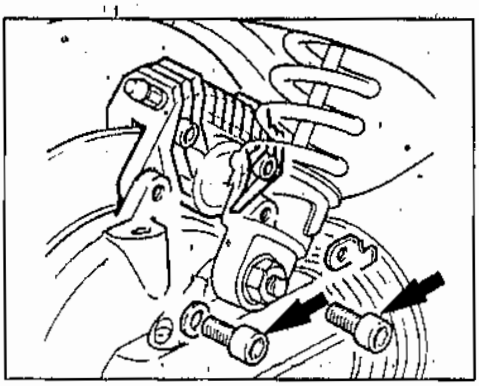
Front brake

- Remove the mudguard as described above.
- Remove the retaining screws (3) from the right and left brake callpers.
- Mask off the upper inside face of the brake callpers with adhesive tape to prevent damaging the wheel rim during removal.



- Pull out the brake pad retaining pin (arrow) and remove the pads downwards.
- The minimum thickness for the brake pad on its backplate is 1.5 mm.

Rear brake



- Remove the retaining screws (arrows) and take off the brake caliper.
- Carefully drive out the brake pad retaining pins from the wheel side, and remove the pads downwards.
- The minimum thickness for the brake pad on its backplate is 1.5 mm.

Tightening torque:
Brake caliper mounting *32 ± 2 Nm*

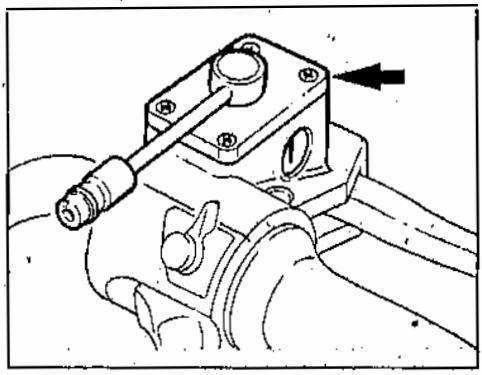
RENEWING BRAKE FLUID III

- Brake fluid must be renewed once a year. It is exposed to severe (and alternating) thermal loads, so that its natural ageing process is encouraged. Moisture is absorbed from the surrounding air, and causes a potentially dangerous drop in the fluid's boiling point.

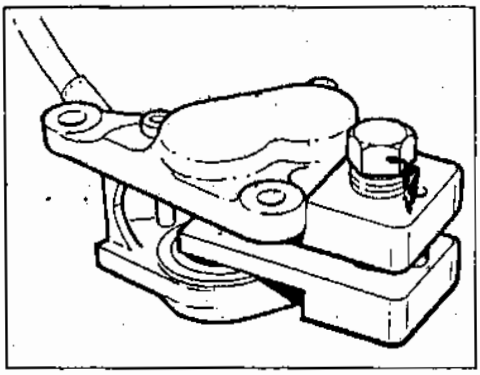
WARNING:
The motorcycle's paintwork will be damaged if brake fluid is allowed to contact it.

- Renew the brake fluid with a brake system filling and bleeding device. Recommended: Joma 3 L.

Renewing fluid in front brake circuit

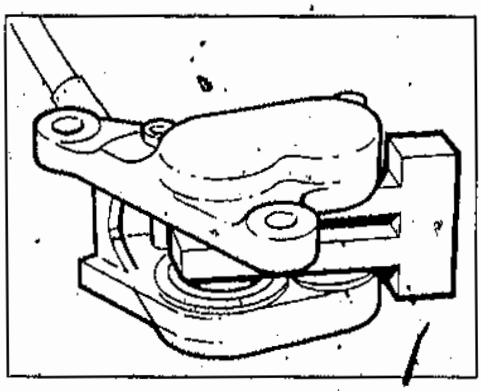


- Renewing fluid in front brake circuit
- Remove the cover of the brake fluid reservoir with diaphragm.
- Screw on Joma adapter for K1 models (arrow) in place of the cover, and connect the brake bleeding device.
- Carry out preparatory work as for checking the brake pads:
- Remove mudguard.
- Remove left and right brake callpers.
- Remove left and right brake pads.



- Place a suitable vessel under the bleed screw on the caliper to trap the escaping brake fluid. Open the bleed screw by half a turn.

- Use piston resetting tool BMW No. 34 1 500 to force back the pistons.



- Remove the piston resetting tool and insert spacer BMW No. 34 1 520 in its place.
- Also force back the pistons in the second brake caliper, but leave the piston resetting tool in place.
- Renew the brake fluid as stated in the filling and bleeding device's operating instructions.
- Allow brake fluid to escape from the two brake calipers in succession until it is clear and free from bubbles.
- Tighten the bleed screw and remove the catch vessel containing the drained-off brake fluid.
- Install the brake pads again.
- Inspect the brake discs for score-marks and other signs of damage.
- If the brake disc has clearly visible score-marks deep enough to be felt, or other forms of damage (cracks), it must be renewed.

Brake disc thickness *min. 4.5 mm*

- Removing and installing brake disc: see Chapter 4.
- Installation is by following the removal work sequence in the reverse order.
- Set the lever of the brake system filling device to pressure release.
- Remove the adapter from the brake fluid reservoir and install the cover with diaphragm.
- Pull the handbrake lever towards the handlebar grip several times and let is snap back, until the pressure point can be felt. While doing this, turn the steering fully to the left.

Tightening torque:
Brake caliper mounting *32 ± 2 Nm*

Installing the front mudguard

- Slacken the screws holding the fork stabilizer and apply tyre fitting lubricant to the rubber guide for the mudguard.
- Push the mudguard halves into the rubber guide on the fork stabilizer.
- Secure the mudguard to the telescopic fork with Allen screws.
- Screw the two halves of the mudguard together with 5 Allen screws, and tighten the fork stabilizer.

Tightening torque:
Fork stabilizer *21 ± 2 Nm*

Renewing fluid in rear brake circuit

- The rear brake caliper does not have to be removed or its pistons forced back.
- Screw on the Joma adapter for the rear brake fluid reservoir.
- The remaining procedure is similar to that for changing the fluid in the front brake circuit.

CHECKING BATTERY ACID LEVEL III

- Make a visual check on battery acid level and add distilled water up to the "MAX" mark if necessary. Check the state of charge with a hygrometer. Apply acid-proof grease (e.g. Bosch Ft 40 V1) to the battery terminal posts.

CHECKING COOLANT CONCENTRATION, ADDING COOLANT III

- Using a suitable measuring device (e.g. Glycomat), draw coolant out of the header tank. The device will show the low-temperature protection limit directly in degrees Centigrade.
- Normal concentration 40:60 (40 % antifreeze, 60 % water) = protection down to -28°C. In Scandinavian countries, a 50:50 % mix is used.
- Only add coolant to the header tank, with the engine is cold (at ambient temperature).
- As the engine cools down, a partial vacuum develops in the cooling system, so that coolant flows into the radiator from the header tank.
- The level of coolant in the header tank must be between the "MIN" and "MAX" marks. Never fill above the "MAX" mark.
- Use only antifreezes and corrosion inhibitors which contain no nitrides.
- Renew the coolant at least every two years.

Content: 2.8 L + 1.1 L in header tank

CHECKING PLAY IN SWINGING ARM AND REAR WHEEL DRIVE BEARINGS, ADJUSTING IF NECESSARY III

- Hold the rear tyre with one hand and the motorcycle's frame with the other, and try to move the rear wheel sideways.
- If any play is detected, determine where it comes from.
- Unscrew the slack bearing.
- Tighten the bearing journal and the locknut to the specified torques.

TAKING UP SLACK AT NUTS AND BOLTS I, III

- Threaded connections which play an important part in the motorcycle's safety must be checked regularly to ensure that they are tightened to the correct torque.

Tightening torque:

Rear wheel studs	*105*	*± 4 Nm*
Spring strut mounting	*51*	*± 6 Nm*
Frame to power train	*45*	*± 6 Nm*
Machine screw in quick release axle	*33*	*± 4 Nm*
Quick-release axle clamp screws	*14*	*± 2 Nm*
Front/rear brake caliper mountings	*32*	*± 2 Nm*
Bearing journal (loose swinging arm bearing and rear wheel drive bearing)	*7.5*	*± 0.5 Nm*
Locknut (loose swinging arm bearing)	*41*	*± 3 Nm*
Locknut (rear wheel drive)	*105*	*± Nm*

FINAL INSPECTION WITH ROAD SAFTY AND OPERATING RELIABILITY CHECK I, II, III

- For the customer's safty and the avoid damage to the motorcycle, a final inspection, if necessary with test ride, should be carried out.

Checking lighting and signalling equipment

- High and low headlight beams, parking lights;
- Brake and licenceplate lights, and turn indicators;
- High beam telltale, battery charge and engine oil pressure warning lights, neutral indicator;
- Rear light monitor;
- Horn;
- Check operation of any optional extras as appropriate.

Functional check

- Correct operation of clutch, gear shift, steering, foot brake and handbrake; correct engine idle speed settings (with engine at normal operating temperature).
- Le from engine, gearbox, rear wheel drive, brake lines or fuel system

Check front and rear tyre pressures

Tyre pressures

Rider only

Front 2,2 bar

Rear 2,5 bar

With pillion passenger

Front 2,5 bar

Rear 2,9 bar

3. OPERATING MEDIA AND SERVICING DATA

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OPERATING MEDIA - K MODELS 3.3
BMW MAINTENANCE AND INSPECTION SCHEDULE 3.4
Driveline 3.4
Running gear 3.5



Operating media – K models

Use/designation	Example of use	Order number	Quantity
Lubricant			
Staburags NBU 30 PTM high-performance lubricant	Highly-stressed spline tracks and keyways, pressure points on clutch and rear wheel drive shaft	07 55 9 056 992 07 55 9 056 993	75 g tube 400 ml spray
Never-Seez high-temperature assembly paste	Swinging arm bearing inner races	18 21 1 337 498	30 g tube
Unl Moly C 220 anti-friction lacquer	K 100 output shaft components	11 21 9 056 999	150 ml spray
Siliconenvet 300 zwaar Dempingsvo Silicone damping grease 300 heavy	Fluidbloc K 75 K 75 fluidbloc bearing	07 58 9 058 193 07 58 9 058 193	10 gr. tube 10 g tube
Retinax A (taper) roller bearing grease	Wheel and steering head bearings	HWB 81 22 9 407 302 HWB 81 22 9 407 303	900 g can 150 g tube
CRC contact spray	Water-repellent action and friction reduction on plugs, protective effect	HWB 81 22 9 400 208	300 ml spray
Sealants			
3-Bond 1209 surface sealant	All metal sealing faces	07 589 062 376	30 ml tube
Loctite 574 surface sealant	Metal sealing faces on gearbox and rear wheel drive	HWB 81 22 9 407 301	50 ml tube
Curil K2	Ignition output stage	HWB 81 22 9 400 243	250 g can
Adhesives and keepers			
Loctite 242 thread retainer, medium-strength	Shock absorber piston to piston rod (telescopic fork); fixed rear wheel drive bearing journal in swinging arm	07 58 9 056 031	10 ml bottle
Loctite 270 thread retainer, strong	Spring strut eye to piston rod	HWB 81 22 9 400 086	10 ml bottle
Loctite 496 cyanacrylate	Fairing elements and rubber parts	16 11 1 235 651	10 ml tube
3-Bond 1110 B joint adhesive	K 100 output shaft bearings without shouldered bearing	07 589 056 999	5 g tube

Driveline

Driveline	BMW Inspection at 1,000 km	BMW Service at 7,500 km and then every 15,000 km	BMW Inspection at 15,000 km and then every 15,000 km	Technical data	Page
Change engine oil at correct operating temperature, renew oil filter element	X	X [1]	X [1]	3,75 L	2.6
Change gearbox and rear wheel drive oil at correct operating temperature	X	-	X [1]	0,85 L 0,20 L	2.8/9
Clean inductive transmitter on rear wheel drive	X	-	X	2,5 Nm	2.9
Check spark plug electrode gaps		X	-	0,6...0,7mm max 0,9mm	
Renew spark plugs		-	X	20 ± 2 Nm	2.9
Grease upper and lower clutch cable nipples	-	X	X		2.9
Check clutch operating clearance, adjust if necessary	X	-	X	A = 4 ±0,5mm B = 75 ± 1mm	2.9/10
Check valve clearances, adjust if necessary	X	-	Every 30 000 km	I 0,15-0,20 E 0,25-0,30	2.11/15
Renew air cleaner element	-	-	X [3]		2.15
Check throttle cable play, adjust if necessary	X	-	X	1 mm	2.16
Check idle speed and CO content of exhaust, adjust if necessary	X	X	X	950 ± 50 min⁻¹ 1,5 ± 0,5%	2.16
Renew contact surface of chain tensioner roll			Every 60 000 km X		

Recommendation: In severe operating conditions, regrease throttle twistgrip and steering bearings at least every 3,000 km*

*) To be invoiced additionally

1) At least every 6 months; every three months or after not more than 3,000 km if motorcycle is used exclusively for short journeys or at outside temperatures below 0°C
2) At least once a year
3) In very dirty or dusty conditions, renew air cleaner element every 1,500 km or even more frequently
4) Normally every 30,000 km; if fuel quality is poor, every 15,000 km
5) At least every 3 months

4. ELECTRICS

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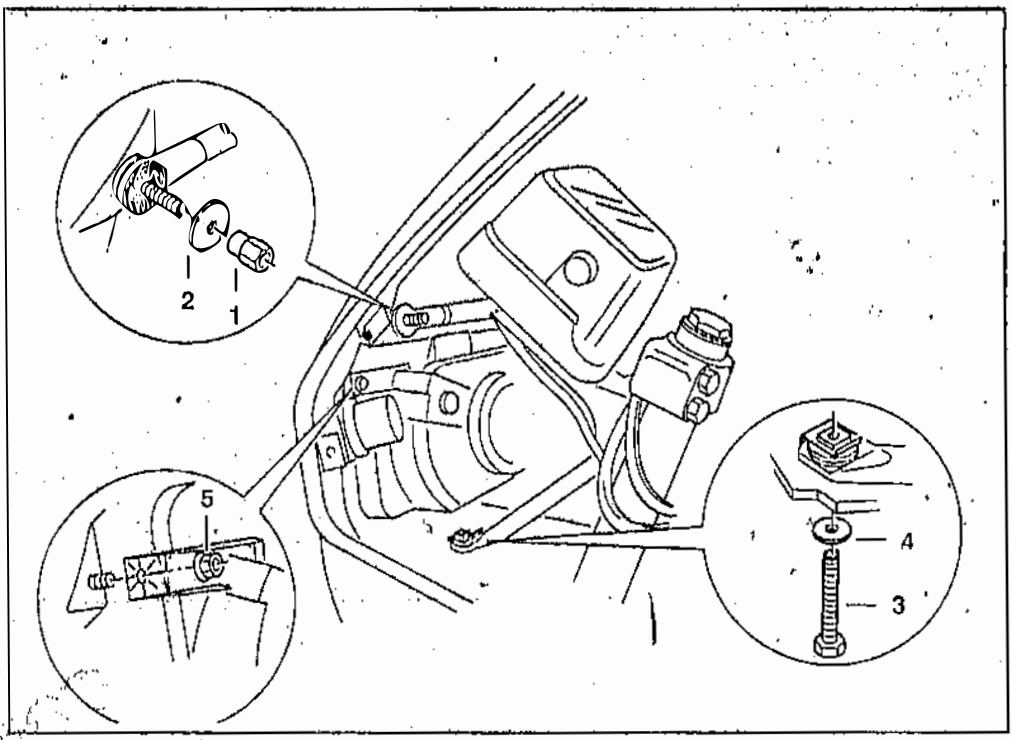
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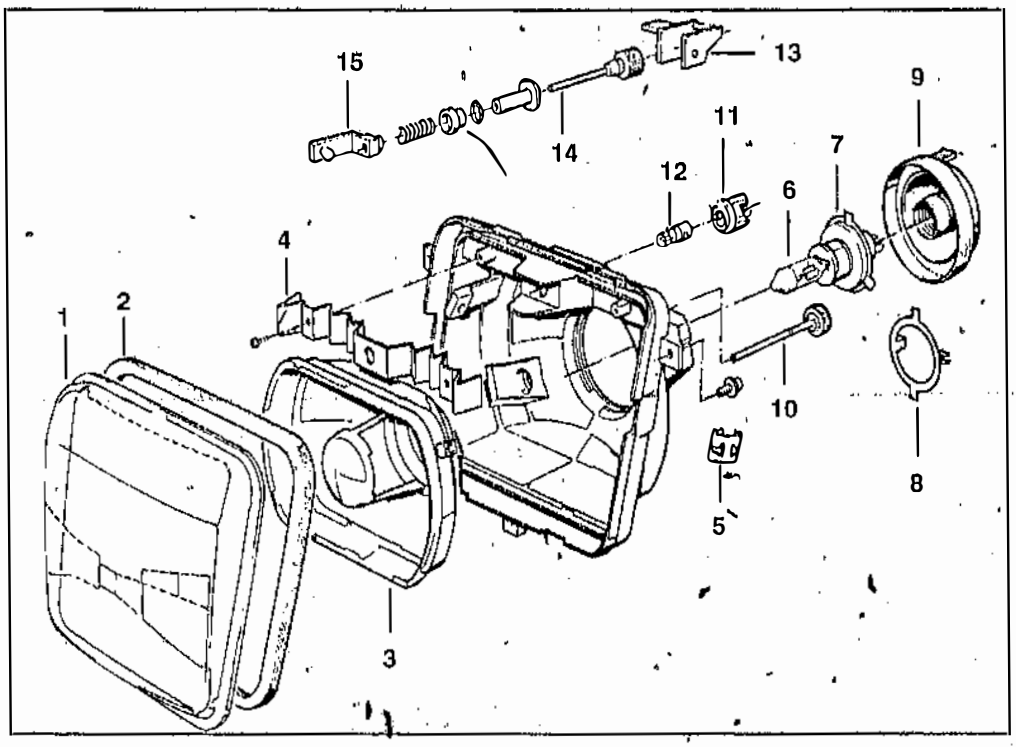


LIGHTING

REMOVING AND INSTALLING HEADLIGHT

- Remove the left/right knee pad.
- Remove the left/right inner fairing cover.
- Disconnect the plugs for the auxiliary instruments.
- Remove the engine cover.
- Remove the left/right centre section of the fairing.
- Remove the horn holder.
- Remove the radiator surround.
- Pull off the plug connectors for the flashing turn indicators, the three-pin plug, the rubber sleeve and the parking light plug connectors.
- Unscrew the 2 retaining nuts with washers (1/2).
- Take out the retaining screw/washer (3/4).
- Take off the upper section of the fairing.
- Unscrew the 3 retaining nuts (5) on the headlight.
- Carefully remove the headlight from the upper section of the fairing.
- Install/attach in the opposite order of work.

NOTE:
After installation, the headlight beam must be re-aligned.



STRIPPING AND ASSEMBLING HEADLIGHT

- Remove the six spring retaining clips (5).
- Take off the glass/seal (1/2).
- Remove the adjusting screw (14).

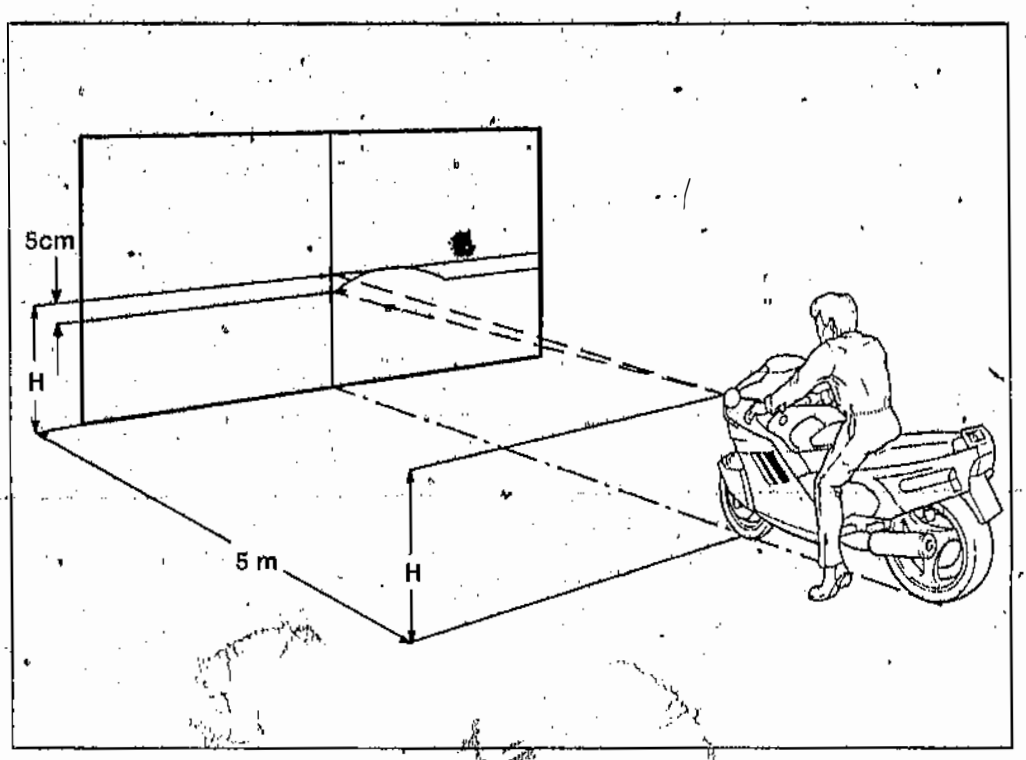
> **NOTE:**
> Do not touch the reflector with the fingers.

- Take out the reflector (3).
- Remove the retaining spring (8).
- Take out bulb holder (7).
- Remove bulb (6).
- Take out bulb holder (11).
- Remove bulb (12).
- Assembly is in the opposite order of work.

> **NOTE:**
> During assembly/installation, do not touch the bulb glass with the fingers.
> The headlight beam must be re-aligned.

Components:

1	*Asymmetric glass*
2	*Seal*
3	*Reflector*
4	*Reflector*
5	*Retaining spring*
6	*H4 60/55 W asymmetric bulb*
7	*Bulb holder*
8	*Retaining spring*
9	*Cover*
10	*Adjusting screw*
11	*Bulb holder*
12	*12 V/4 W bulb*
13	*Actuating lever*
14	*Adjusting screw*
15	*Holder*

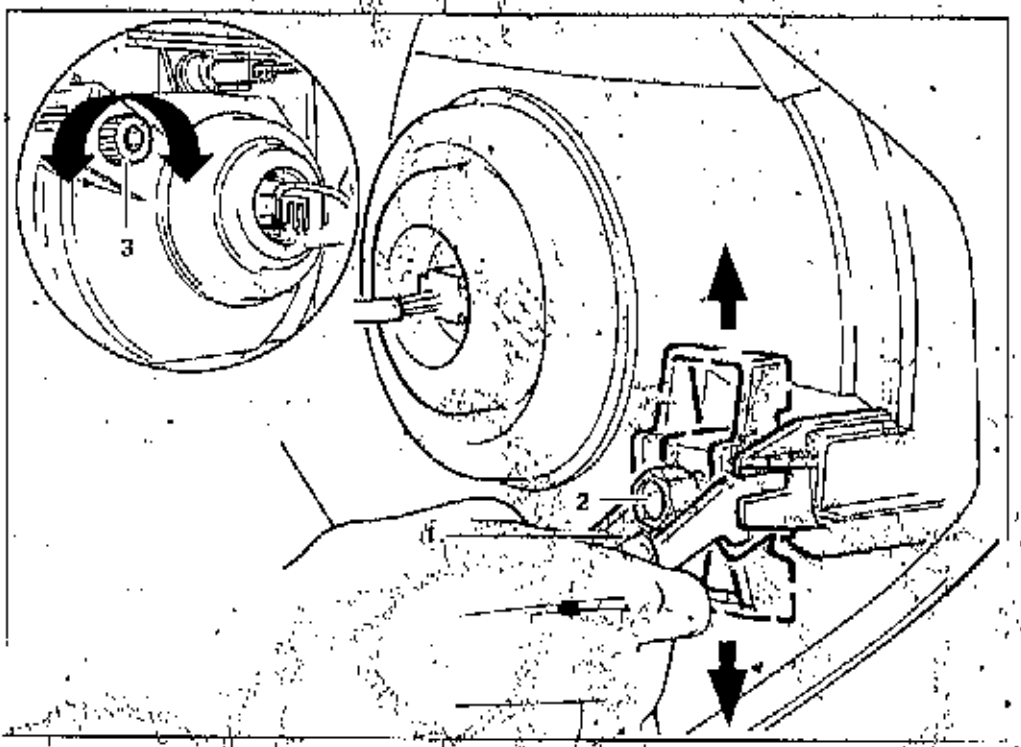


CHECKING HEADLIGHT BEAM SETTING (WITHOUT ALIGNMENT EQUIPMENT)

- Correct tyre pressures to the specified values if necessary.
- Set the rear spring strut to one up riding.
- Position the motorcycle on a flat surface 5 metres from a light-coloured wall.

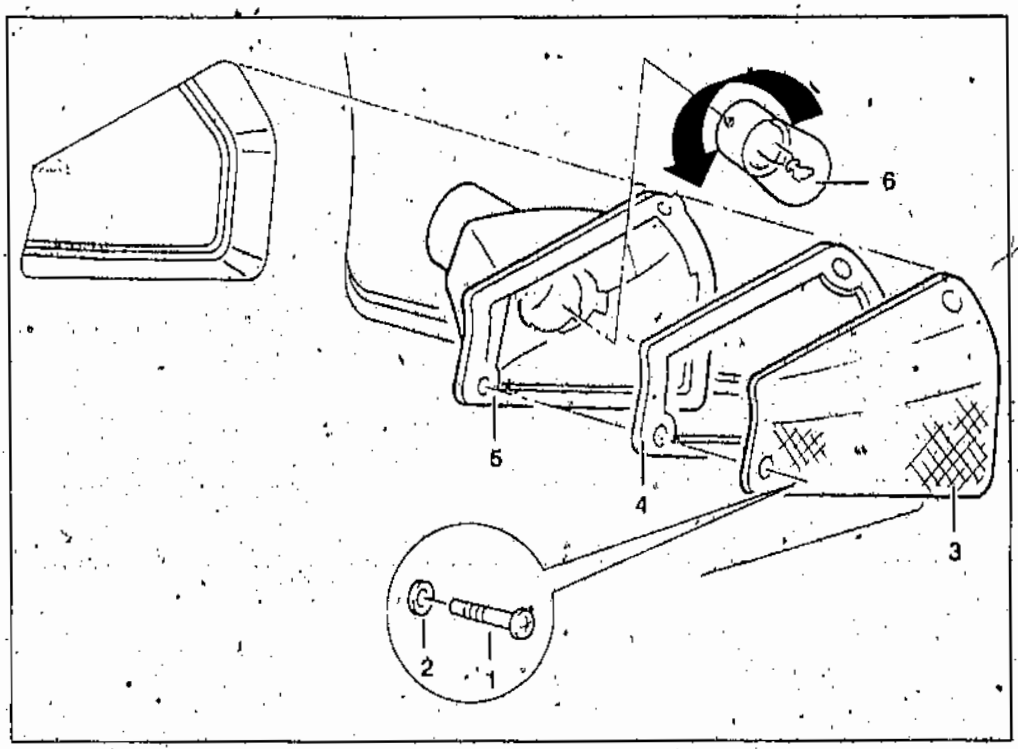
NOTE:
The motorcycle should be on its wheels, not on the centre stand.

- The rider's weight should be supported by the motorcycle.
- Measure distance (H) from the ground to the centre of the headlight.
- Transfer distance (H) to the wall and mark with a cross.
- Make a second cross 5 centimetres below the first one.
- Switch on the low headlight beam.
- Align the headlight so that the light-dark boundary runs across level with the lower cross.
- The boundary must rise to the height of the upper cross to the right of the centreline (motorcycles for countries where the right-hand rule of the road applies), and then drop again.



ADJUSTING HEADLIGHT

- Set the multi-position lever (1) in the uppermost position.
- Obtain the correct beam setting by turning adjusting screw (2)
- Turn to the left to lower the headlight beam.
- Turn to the right to extend the beam
- Side-to-side correction is by turning knurled screw (3).



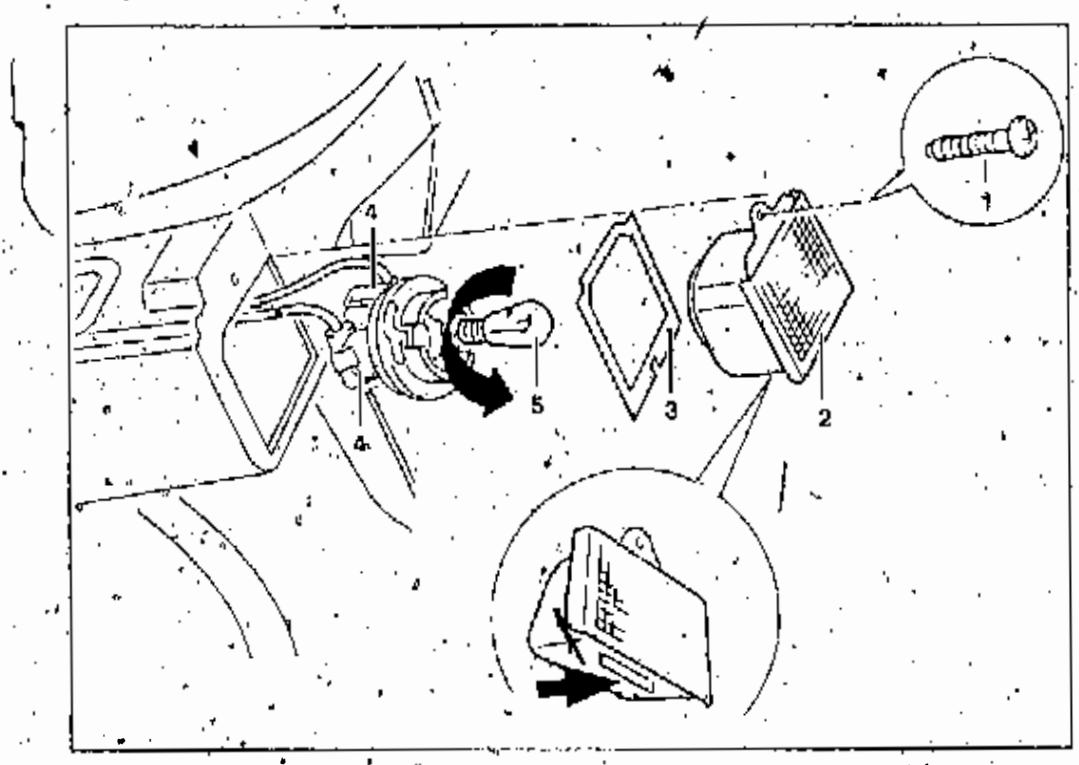
REMOVING AND INSTALLING FRONT FLASHING TURN INDICATORS

- Remove left/right knee pad
- Remove left/right inner fairing cover.
- Detach the plug connectors to the flashing turn indicators.
- Remove the 2 retaining screws/sealing rings (1/2) from the flashing turn indicator cover.
- Take off the flashing turn indicator cover/ seal (3/4).
- Take the flashing turn indicator housing (5) out of the upper section of the fairing.
- Turn the bulb holder to the left (arrow) to release it.
- Take out the bulb (6).

NOTE:
Do not touch the reflector with the fingers.

- Installation is in the reverse order of work.

NOTE:
When inserting a new bulb, do not touch the glass with the fingers.
Make sure that the seals (2) are in good condition.

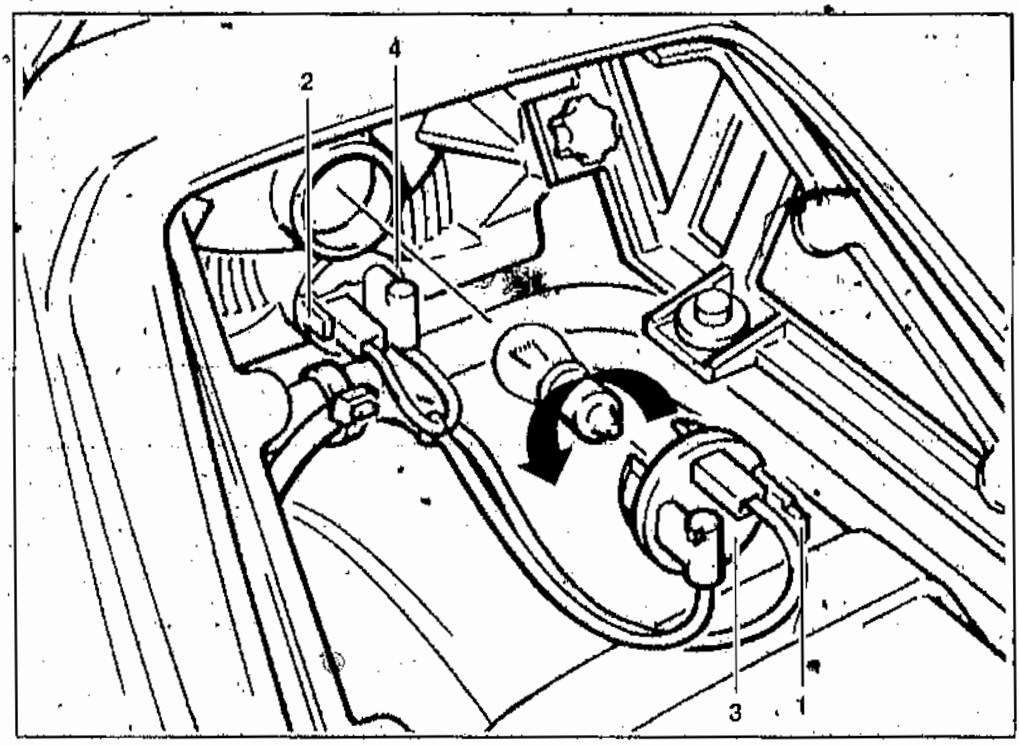


REMOVING AND INSTALLING REAR FLASHING TURN INDICATORS

- Remove the storage compartment cover.
- Take the retaining screw (1) out of the flashing turn indicator housing.
- Take out the flashing turn indicator housing (2).
- Take off the seal (3).
- Pull off the plug connections (4).
- Release the bulb holder by turning it to the left (arrow).
- Take out the bulb (5).
- Installation is the reverse order of work.

NOTE:

When inserting a new bulb, do not touch the glass with the fingers.
Make sure that the plastic projection (arrow) is correctly located.



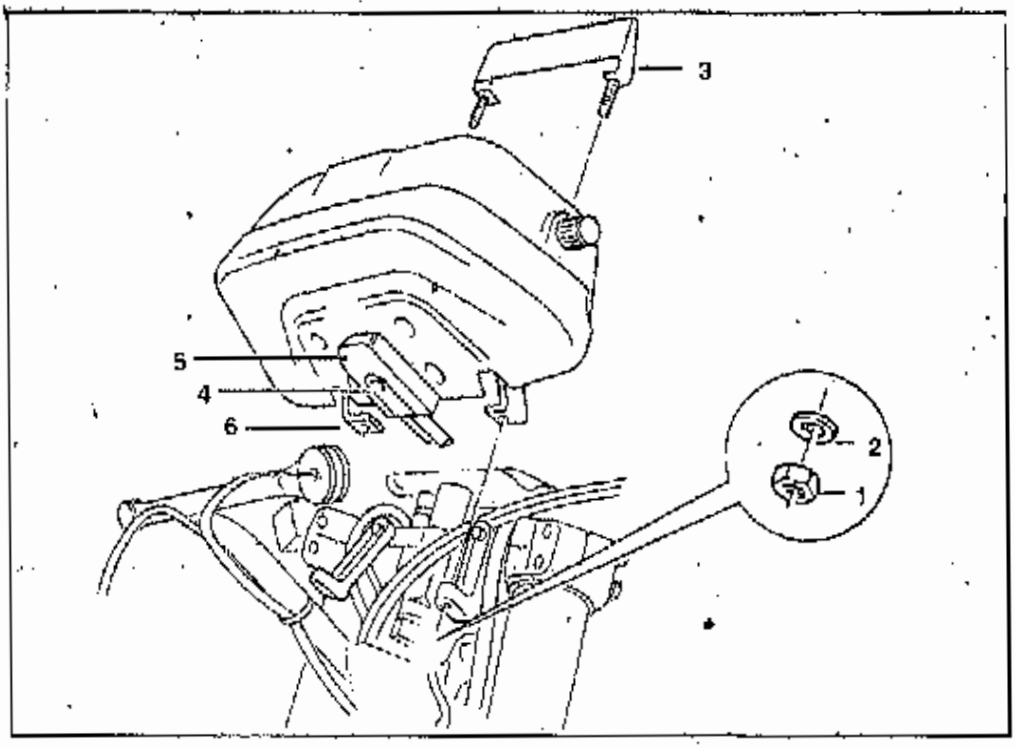
REMOVING AND INSTALLING REAR LIGHT ASSEMBLY

- Take off the dualseat cover/dualseat.
- Press in the clamp (1/2) for the brake/rear light.
- Take out the bulb holders (3/4).
- Release the brake/rear light bulb holder by turning it to the left (arrow).
- Take out the bulbs.
- Installation is in the reverse order of work.

NOTE:
When inserting a new bulb, do not touch the glass with the fingers.

Bulbs:

Brake light	*12 V/21 W/P 25-1*
Rear light	*12 V/10 W/R 19/10*

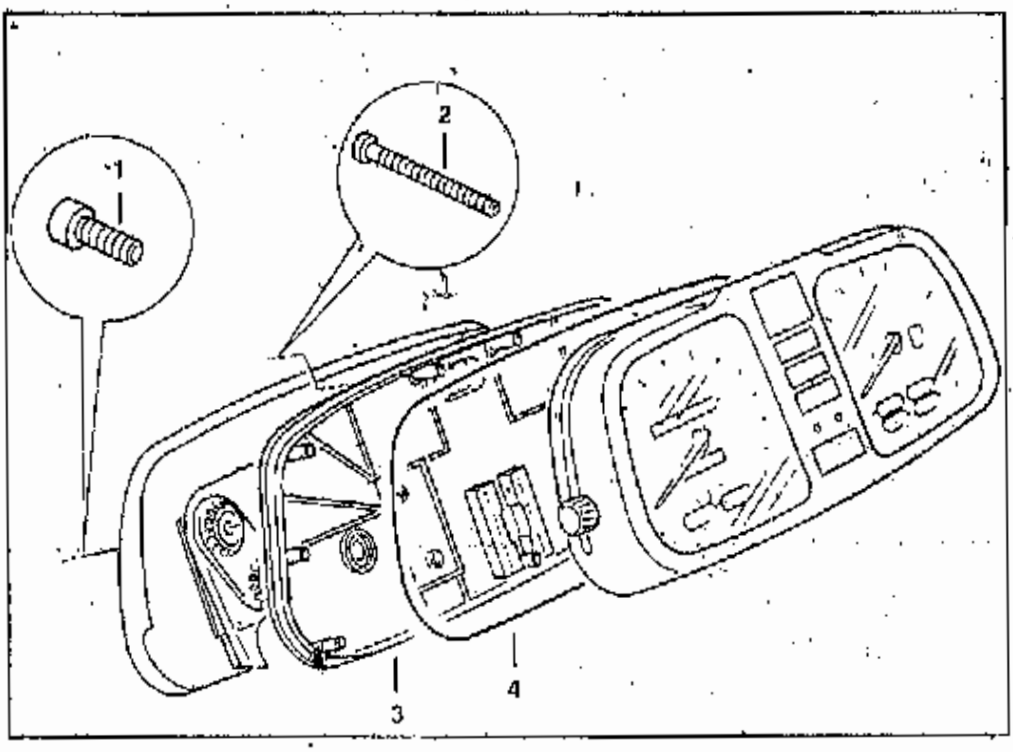


INSTRUMENT CLUSTER

COMBI-INSTRUMENT UIT-/INBOUWEN

REMOVING AND INSTALLING INSTRUMENT CLUSTER

- Take off the dualseat cover and the dualseat.
- Remove the left/right knee pad.
- Remove the left/right inner section of the fairing.
- Disconnect the plugs for the auxiliary instruments.
- Take off the upper section of the fairing.
- Remove the 2 retaining screws/washers (1/2) from the retaining plate.
- Take off the retaining plate (3).
- Loosen retaining screw (4).
- Pull off the multi-pin plug (5).
- Pull the instrument cluster out of the retaining bracket (6).
- For installation and attachment of the fairing, follow the above instructions in the reverse order.



STRIPPING AND ASSEMBLING THE INSTRUMENT CLUSTER

- Remove the instrument cluster.

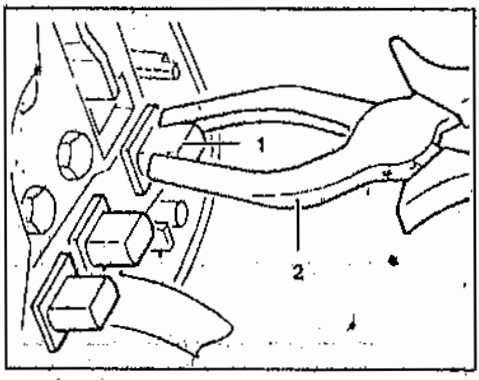
> **NOTE:**
> Avoid damage to the housing or glass.

- Take the 4 retaining screws (1) out of the instrument carrier.
- Take the 9 retaining screws (2) out of the housing cover.
- Take off the housing cover (3) with seal (4).
- Assembly, installation and attachment of the fairing take place in the reverse order of work.

> **NOTE:**
> When assembling, make sure that the seal is positioned correctly.

Removing and installing telltale lamp

NOTE:
Avoid damage to the printed circuits.



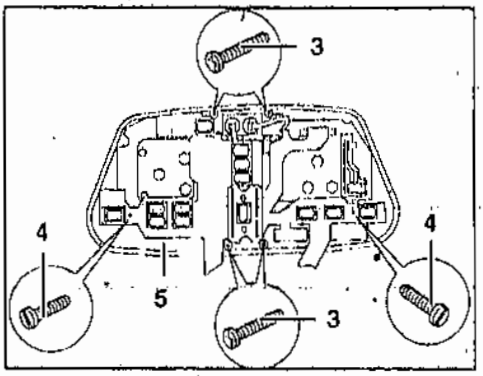
- Grip telltale lamp (1) diagonally with relay pliers, BMW No. 61 1 250 (2).
- While pulling the lamp out, move it to and fro slightly.
- Assemble and install the instruments and attach the fairing in the reverse order of work.

NOTE:
When installing, avoid kinking the printed circuits.
Make sure that the seals are correctly positioned.

Telltale lamp bulbs:
Instrument lighting *12 V/3 W*

Removing and installing the printed circuit board

NOTE:
When removing, avoid damage to the printed circuits.

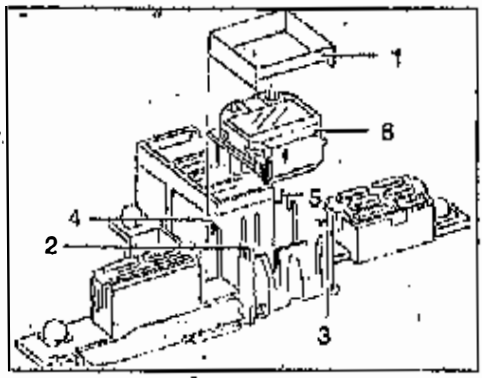


- Take out the 4 retaining screws (3).
- Take out the 2 retaining screws (4).
- Carefully lever out the printed circuit board (5) at the plug contacts.
- Installation and attachment are in the opposite order of work.

NOTE:
When installing, do not damage the printed circuits.
Make sure that the plug contacts are correctly positioned.

Removing and installing the quartz clock

NOTE:
Avoid damage to the printed circuits.

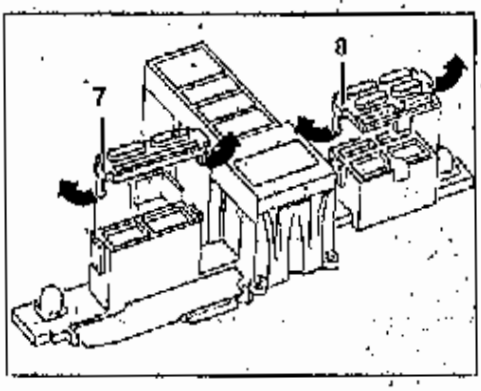


- Carefully pull the frame (1) out upwards.
- Press the 4 retaining hooks carefully outwards in pairs, in the order (2/3), (4/5).
- Pull the quartz clock (6) out upwards.
- Install/attach in the opposite order of work.

NOTE:
When installing, make sure that the hooks and plug contacts are positioned correctly.

Removing and installing frame for tail/stop lamps

NOTE:
Avoid damage to the printed circuits.

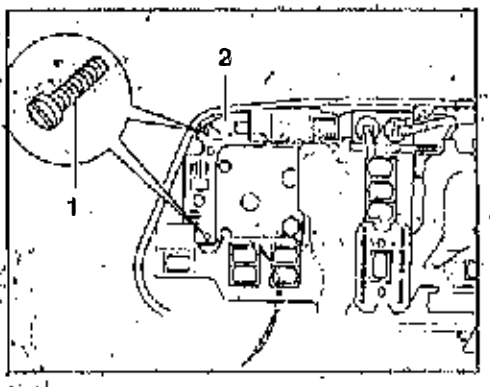


- Carefully press the hooks (arrows) outwards.
- Take off the frames (7/8).
- Install/attach in the opposite order of work.

NOTE:
When installing, make sure that the hooks and plug contacts are positioned correctly.

Removing and installing component board for fuel gauge

NOTE:
Avoid damage to printed circuits.

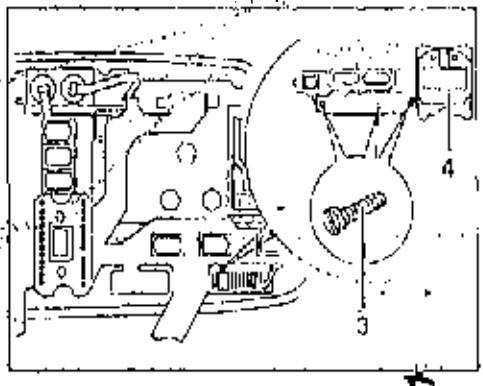


- Take out the 2 retaining screws (1).
- Take out the component board (2).
- Install/attach in the opposite order of work.

NOTE:
Avoid damage to the component board as it is removed or installed.

Removing and installing component board for speedometer

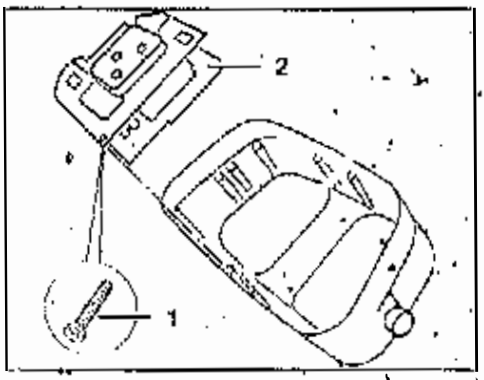
NOTE:
Avoid damage to printed circuits.



- Take out the 3 retaining screws (3).
- Take off the component board (4).
- Install/attach in the opposite order of work.

NOTE:
Avoid damage to the component board when installing.

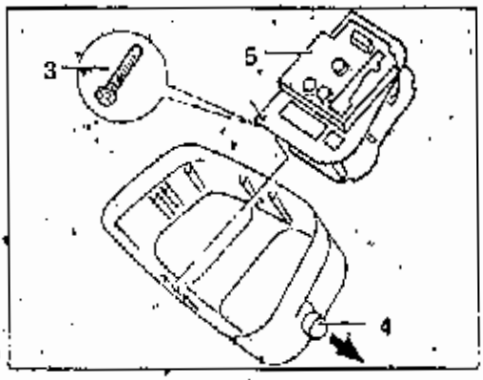
Removing and installing revolution counter



- Remove the 2 retaining screws (1).
- Lift out the revolution counter (2).
- Install/attach in the opposite order of work

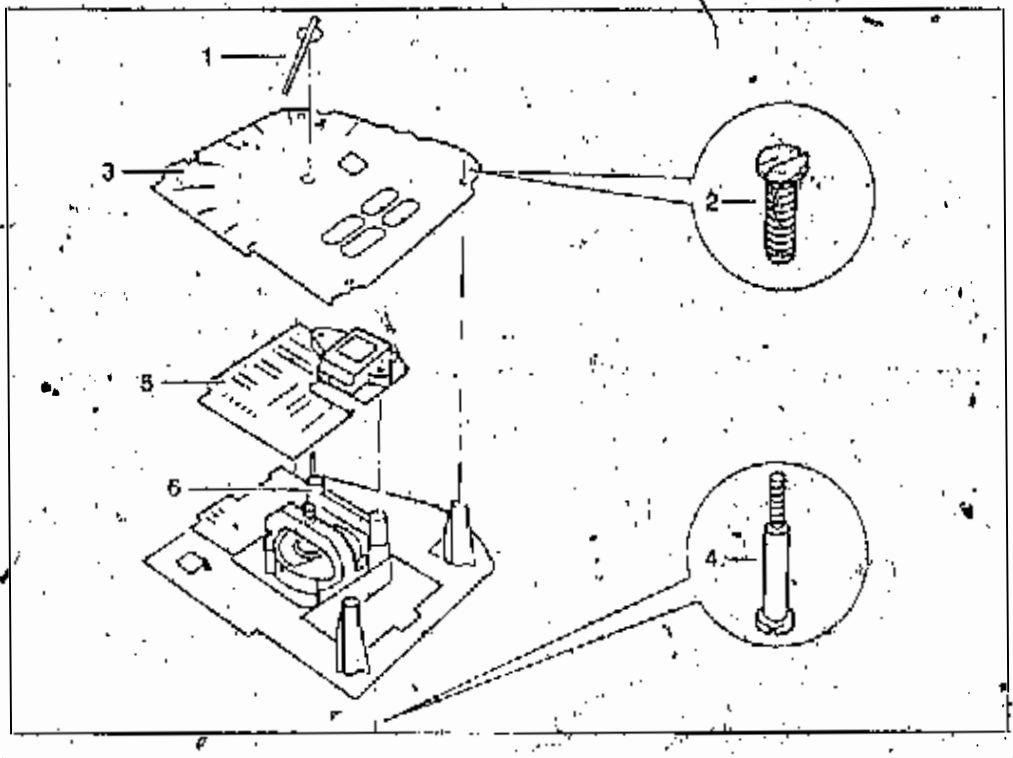
NOTE:
When installing, avoid damage to the printed circuits

Removing and installing speedometer



- Remove the 2 retaining screws (3).
- Pull the reset knob (4) fully out to the right (arrow).
- Take out the speedometer (5).
- Install/attach in the opposite order of work

NOTE:
When installing, avoid damage to the printed circuits

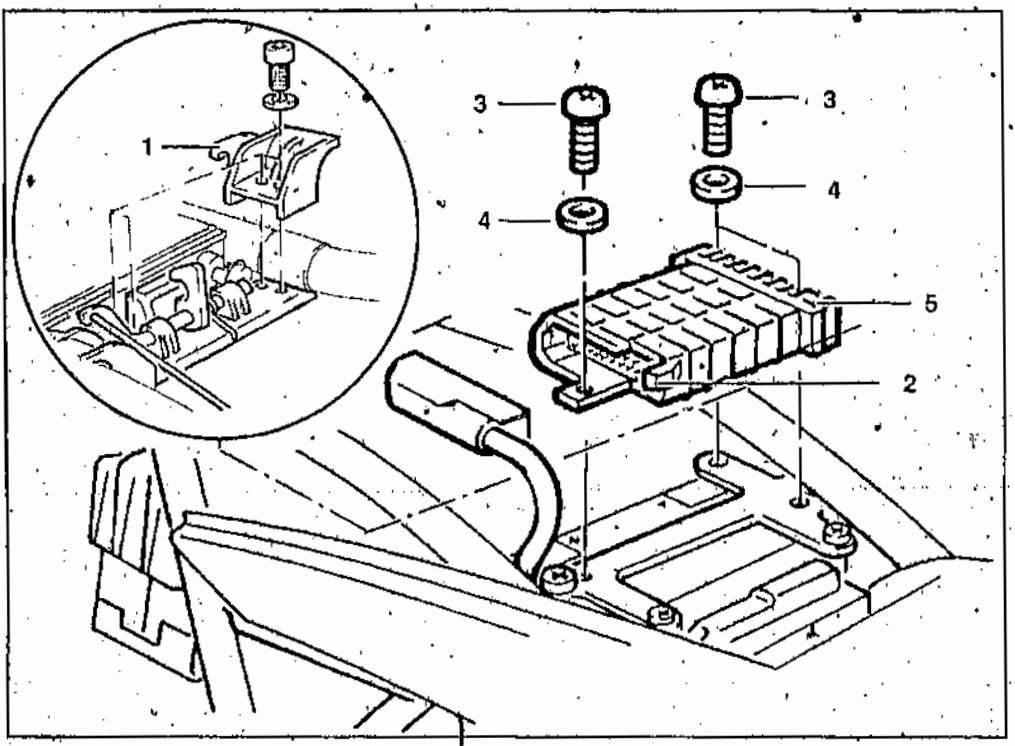


Removing and installing gear shift indicator component board

NOTE:
Avoid damage to the printed circuits

- Remove the revolution counter.
- Pull the revolution counter needle (1) carefully off its shaft.
- Remove the 3 retaining screws (2).
- Take off the dial (3).
- Take out the two retaining screws (4).
- Take off the component board (5).
- Install/attach in the opposite order of work.

NOTE:
When installing, avoid damage to the component board.
Note the spacer (6).
Do not damage the dial or needle.



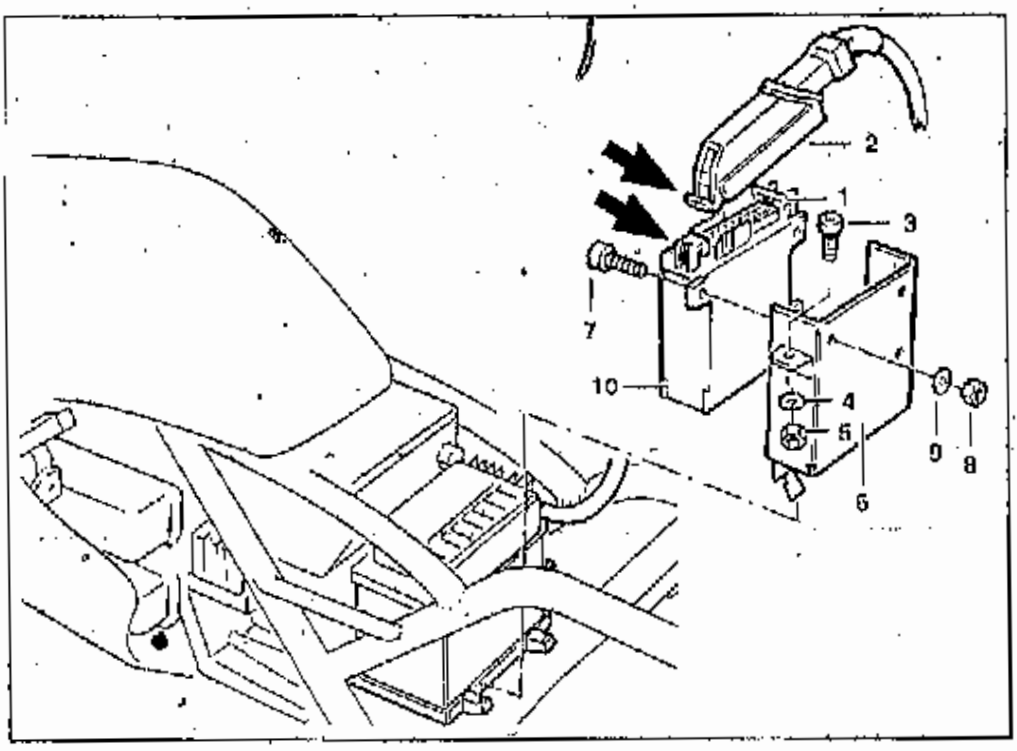
GENERAL MOTORCYCLE ELECTRICS

REMOVING AND INSTALLING MOTRONIC CONTROL UNIT

WARNING:
Ignition must be switched off.
Detach earth lead from gearbox.
Insulate the earth lead.

- Take off the dualseat cover/dualseat.
- Unscrew the dualseat lock mounting (1).
- Release the snap fastener (2) on the multi-pin plug and press it to one side.
- Remove the fuel injection control unit (5) to the rear and upwards. At the same time, pull the multi-pin plug out of the fuel injection control unit.
- Install in the reverse order of work.

Tightening torque:
Retaining screws *5.25 Nm*



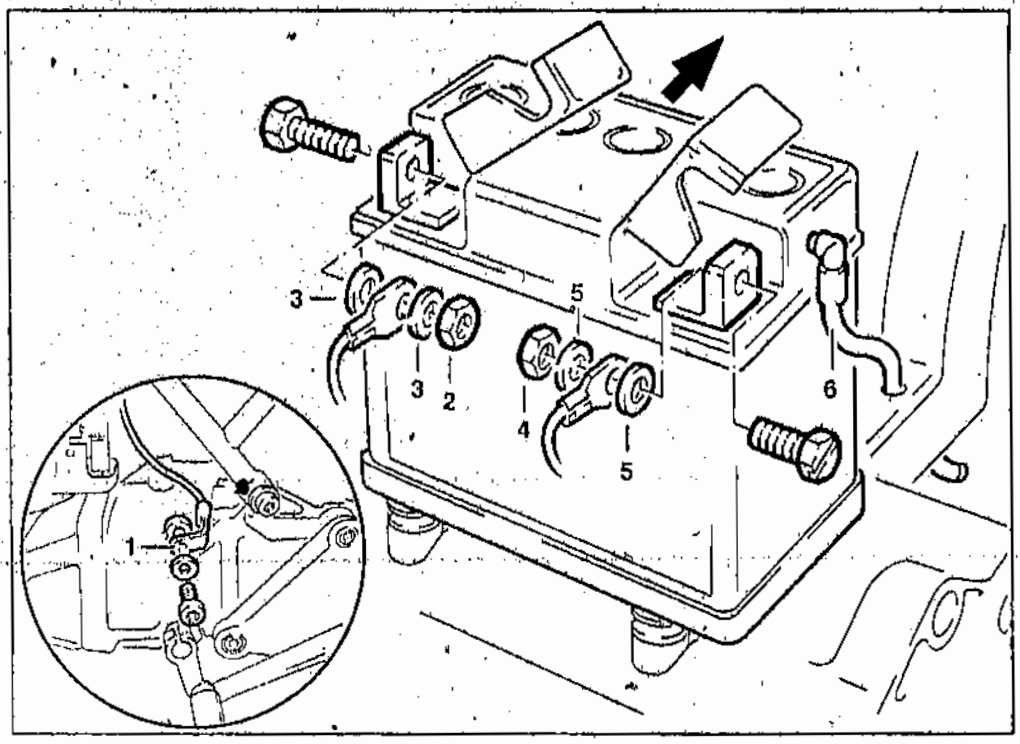
REMOVING AND INSTALLING ABS CONTROL UNIT

WARNING:
Ignition must be switched off.
Detach earth lead from gearbox.
Insulate the earth lead.

- Take off the dualseat cover/dualseat.
- Release the snap fastener (1) on the control unit.
- Detach the multi-pin plug (2) from its lock (arrows) and pull it off.
- Remove the 2 retaining screws with washers and hex nuts (3/4/5) from the control unit housing.
- Take out the housing (6) with the control unit.
- Remove the 3 retaining screws/hex nuts/washers (7/8/9).
- Take the ABS control unit (10) out of the housing.
- Install in the opposite order of work.

Tightening torque:

Retaining screws	*5.25 Nm*



REMOVING AND INSTALLING BATTERY - WITHOUT/WITH ABS

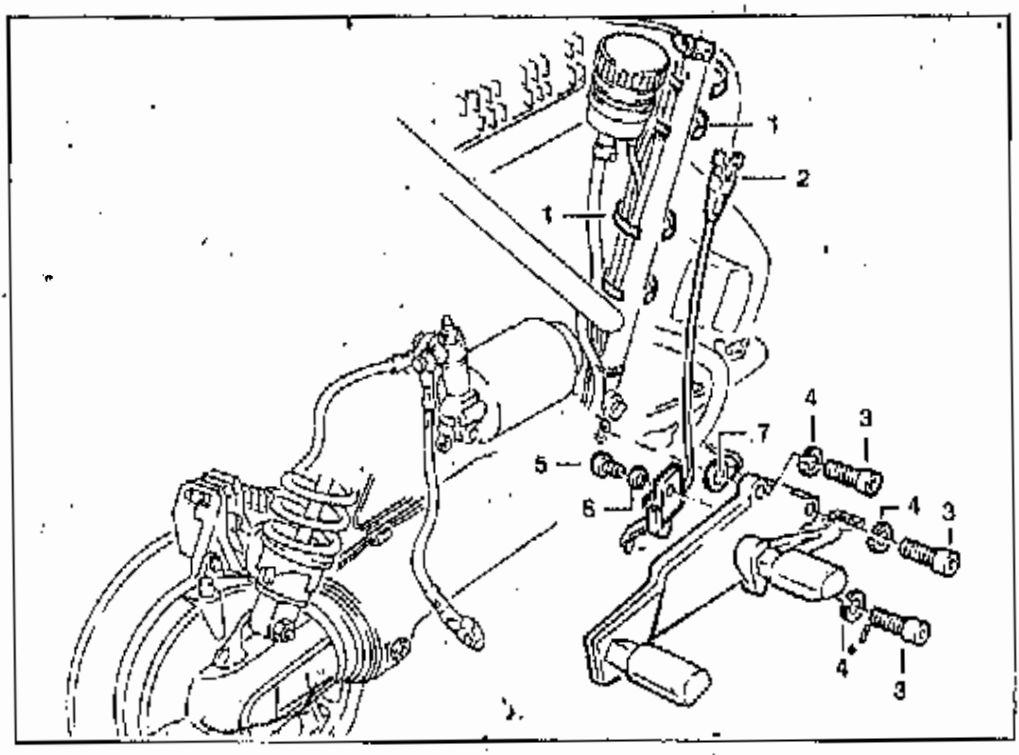
WARNING:

Ignition must be switched off.
Detach earth lead (1) from gearbox.
Insulate the earth lead.

- Take off the dualseat cover/dualseat.
- Unscrew and remove the dualseat lock mounting.
- Remove the MOTRONIC control unit.
- Remove the ABS control unit.
- Detach the brake fluid reservoir from its clips.
- Remove the 2 retaining screws from the battery holder.
- Unscrew the retaining nut with washers (2/3) at the negative lead.
- Unscrew the retaining nut with washers (4/5) at the positive lead.
- Pull the battery vent tube (6) out of the hole in the rear mudguard.
- Lift the battery out to the rear (arrow).
- Install in the opposite order of work.

NOTE:

When installing, do not kink the vent tube.
Connect the battery only with the ignition switched off.
Connect the positive pole first, then the negative pole.
Apply terminal grease to the battery poles.
Do not over-tighten the battery retaining screws.



REMOVING AND INSTALLING FOOT BRAKE LIGHT SWITCH

- Detach the 2 cable straps (1) at the right.
- Separate the plug connector (2) for the brake light switch.
- Remove the 3 retaining screws with washers (3/4) from the footrest plate.
- Pull the footrest plate out of the holder in the fairing.
- Take out the retaining screw with washer (5/6) on the brake light switch.
- Take off the brake light switch.
- Install in the opposite order of work.

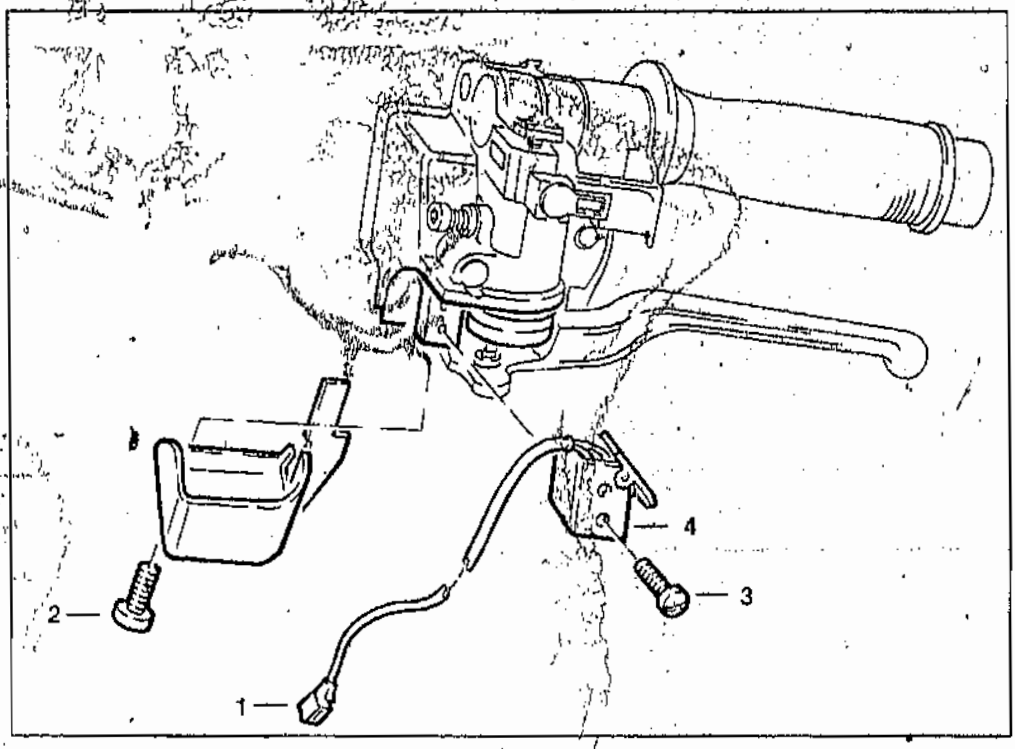
NOTE:

When installing, secure the brake light switch retaining screw with LOCTITE 242. Check the basic setting of the foot brake lever and correct if necessary.
With the foot brake lever operated, the brake light must come on as soon as the brake starts to slow down the rear wheel.
Note the earth cable connection (7) on the footrest plate/gearbox.

Basic setting:
Adjusting screw 9 mm

Tightening torque:

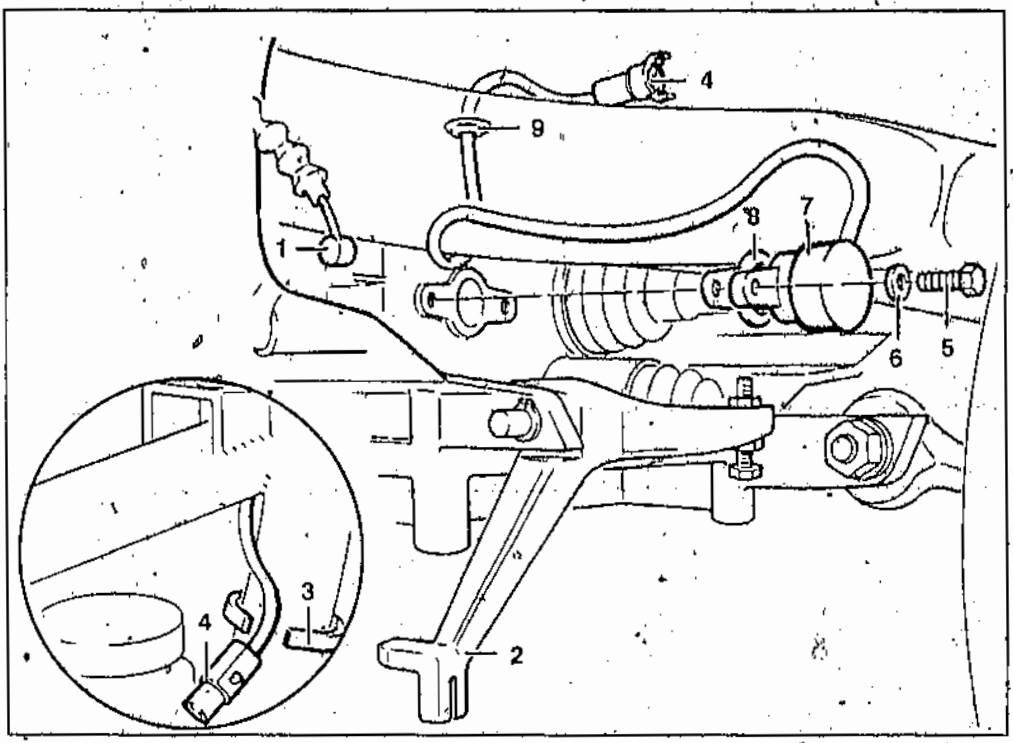
Footrest plate to gearbox	*45 ± 2 Nm*
Brake light switch to footrest plate max.	*5 Nm*



REMOVING AND INSTALLING HANDBRAKE LIGHT SWITCH

- Remove the dualseat cover/dualseat.
- Remove the left/right knee pad.
- Remove the fuel tank pad.
- Remove the left/right inner fairing cover.
- Separate the plug connectors for the auxiliary instruments.
- Take off the fuel tank.
- Separate the plug connection (1) for the brake light switch.
- Open the 5 cable straps.
- Remove the retaining screw (2) from the brake lever cover.
- Remove the 2 retaining screws (3) at the brake light switch (4).
- Pull out the switch and cable.
- Install in the opposite order of work.

NOTE:
When installing, note correct position of cable.
Install the cable without kinks or potential points of abrasion.



REMOVING AND INSTALLING GEAR RATIO INDICATOR SWITCH

- Remove the right knee pad.
- Remove the rear wheel.
- Remove the rear wheel swinging arm.
- Disconnect the clutch release cable (1) at the release lever (2).
- Open 1 cable strap (3) on the right frame tube.
- Separate the plug connection (4) for the switch.
- Pull the cable through under the battery holder.
- Remove the 2 retaining screws with lock washers (5/6) at the switch.
- Pull off the switch (7). Note seal (8).
- Press the rubber grommet (9) out downwards through the gearbox housing.
- Take the switch out to the rear.
- Install in the opposite order of work.

NOTE:

When installing, renew the seal.
Note the flat area on the switch and gearbox shaft.
Make sure that the cables are run correctly and secured by the proper cable straps.

WARNING:

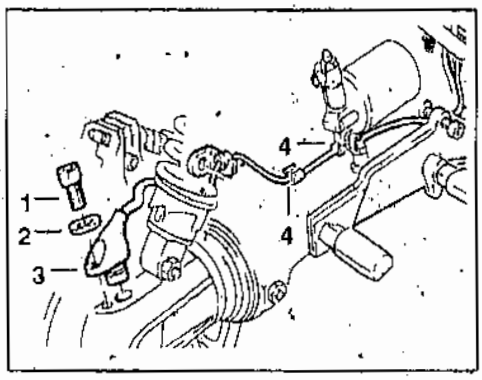
Check the sensor gap at the rear wheel (ABS) and adjust if necessary.
Make quite sure that the stated gap is maintained.

Distance between sensor face and pulse wheel:

Maximum	*0.60 - 0.65 mm*
Minimum	*0.20 - 0.25 mm*

REMOVING AND INSTALLING INDUCTIVE SENSOR

- Open the 2 cable straps.
- Separate the plug connection for the inductive sensor lead.



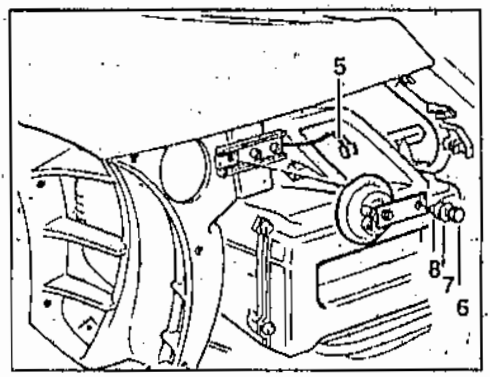
- Remove the retaining screw with lock washer (1/2) at the inductive sensor.
- Carefully lever the inductive sensor (3) out of the rear wheel drive.
- Detach the cable from clips (4) on the rear wheel swinging arm and inductive sensor.
- Install in the opposite order of work.

NOTE:
When installing, make sure that the cable is correctly located!

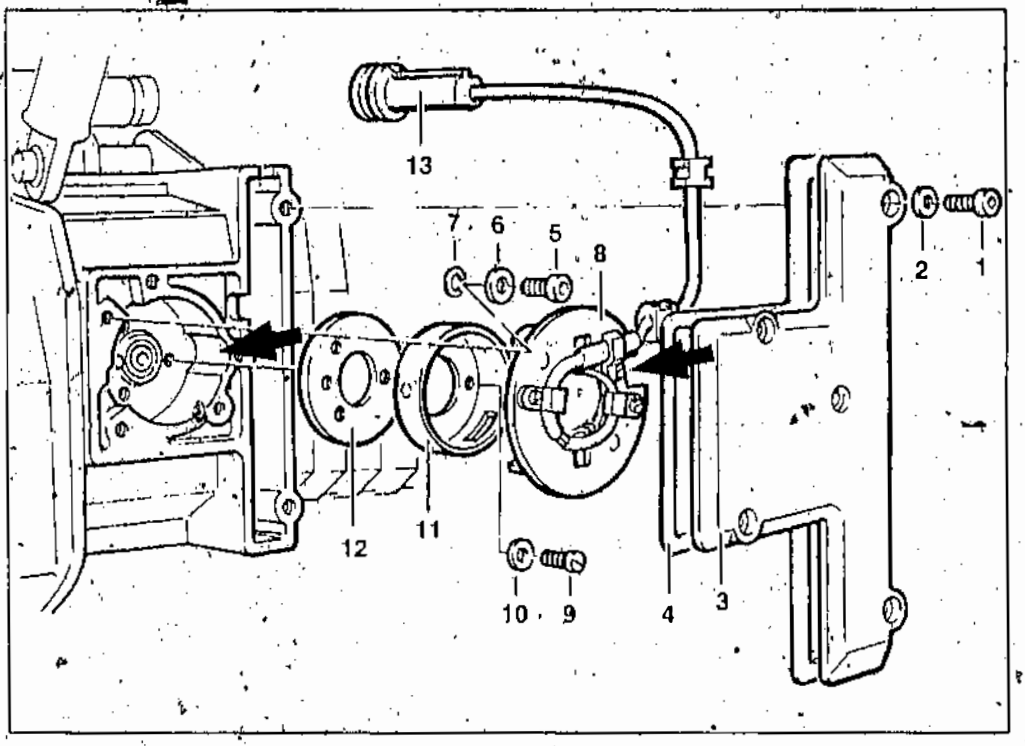
Tightening torque:
Inductive sensor to rear wheel drive 2.5 ± 0.5 Nm

REMOVING AND INSTALLING HORN

- Remove the dualseat cover/dualseat.
- Remove the left knee pad.
- Remove the left inner fairing cover.
- Separate the plug connectors for the auxiliary instruments.
- Remove the engine cover.
- Remove the left centre section of the fairing.



- Pull the cable shoes (5) off the horn.
- Remove the retaining screw with lock washer and plain washer (6/7/8).
- Detach the horn from its holder.
- Install in the opposite order of work.



ENGINE ELECTRICS

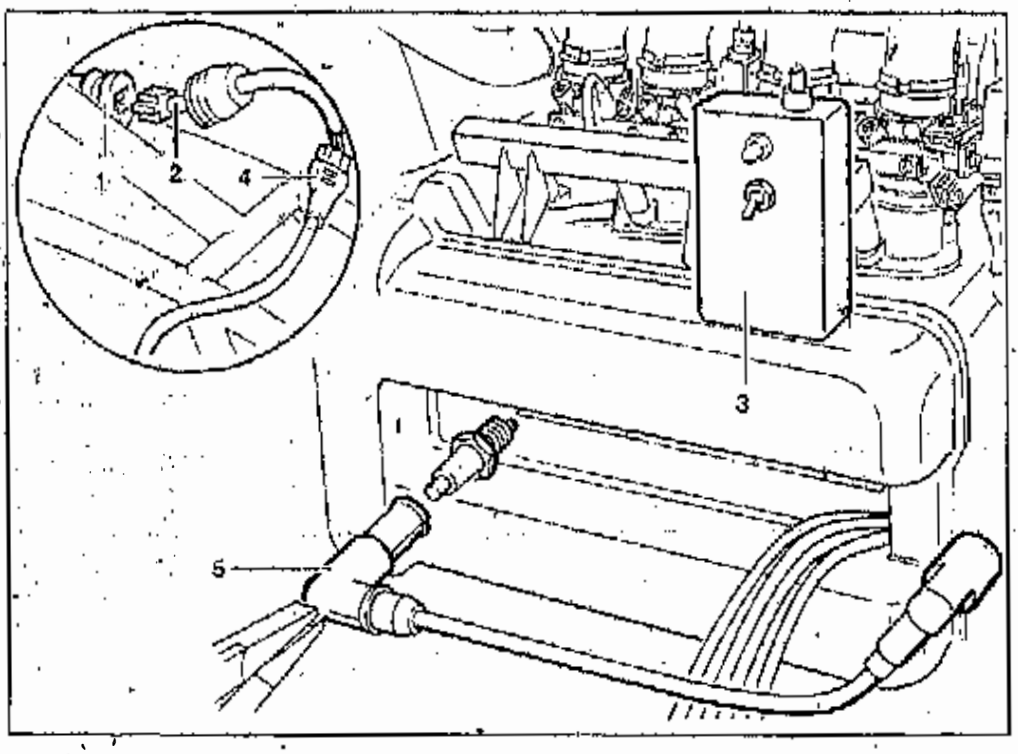
REMOVING AND INSTALLING HALL-EFFECT TRANSMITTER

WARNING:
Switch off the ignition.
Disconnect the earth lead at the gearbox.
Insulate the earth lead.

- Remove the dualseat cover/dualseat.
- Remove the left/right knee pad.
- Remove the fuel tank pad.
- Remove the left/right inner fairing cover.
- Separate the plug connectors for the auxiliary instruments.
- Remove the engine cover.
- Remove the left/right centre section of the fairing.
- Remove the radiator surround.
- Take off the fuel tank.
- Open the 2 cable straps.
- Remove the 5 retaining screws with washers (1/2) from the cover of the Hall-effect transmitter.
- Take off the cover with seal (3/4).
- Remove the 2 clamp screws with washers (5/6/7).
- Take out the baseplate (8).
- Remove the 3 retaining screws with washers (9/10) from the rotor.
- Take out the rotor with adjusting disc (11/12).
- Separate the plug connector (13) at the Hall-effect transmitter cable.
- Install in the opposite order of work.

NOTE:
When installing, the cutouts in the baseplate and housing (arrows) must be aligned.
Note the correct installed positions of the rotor and adjusting disc.
Locate the cable for the Hall-effect transmitter correctly.
Remove the ignition.

Tightening torque
Magnetic gate plate to timing case cover: 3.5 ± 0.5 Nm
Cover to Hall-effect transmitter: 6 ± 1 Nm



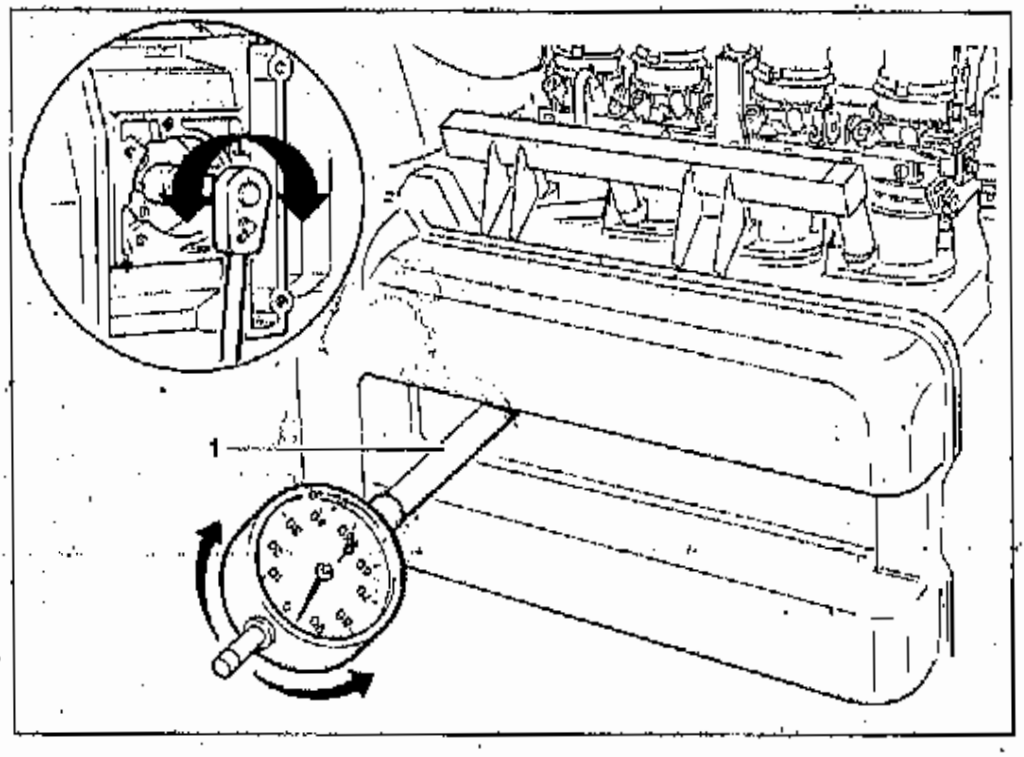
TIMING THE IGNITION

WARNING:
Switch off the ignition before starting work. Disconnect the earth lead at the gearbox. Insulate the earth lead.

- Remove the dualseat cover/dualseat.
- Remove the left/right knee pad.
- Remove the fuel tank pad.
- Remove the left/right inner fairing cover.
- Separate the plug connectors for the auxiliary instruments.
- Take off the engine cover.
- Remove the left/right centre section of the fairing.
- Remove the radiator surround.
- Take off the fuel tank.
- Remove the 5 retaining screws from the cover of the Hall-effect transmitter.
- Take off the cover with seal.
- Remove the two retaining screws.
- Take out the baseplate.
- Separate the plug connection (1) at the Hall-effect transmitter cable.
- Connect adapter cable BMW No. 12 3 651 (2) to the Hall-effect transmitter cable.
- Connect ignition timing device BMW No. 12 3 650 (3) to the connecting plug (4) on the adapter cable.
- Pull off spark plug caps (5) with flat pliers.

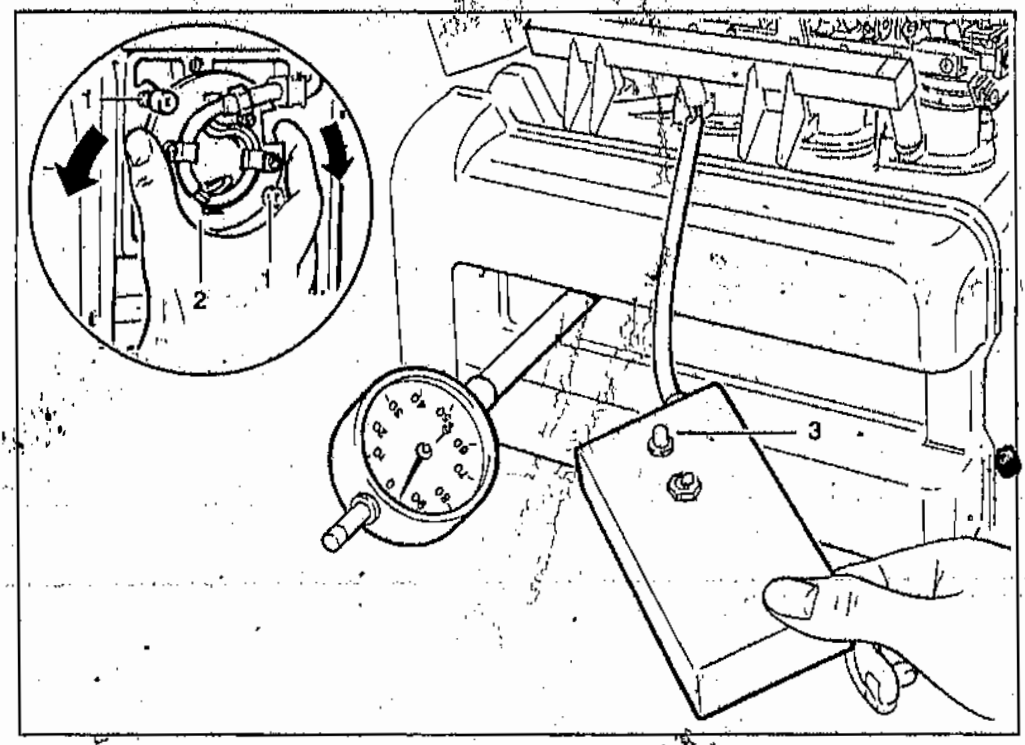
WARNING:
Do not tilt the spark plug wrench. The ceramic insulator is easily damaged.

- Unscrew the spark plugs with spark plug wrench BMW No. 12 3 500.



- Screw dial gauge on to extension BMW No. 00 2 580 (1).
- Screw dial gauge extension into cylinder 1.
- Move piston in this cylinder to top dead centre (TDC) by turning the crankshaft (arrow).
- Set the dial gauge scale ring to 0.
- Turn the crankshaft back in the direction opposite to normal rotation (arrow) until the piston position for the ignition spark is reached.

Ignition timing:
6° before TDC = 0.24 mm before TDC



- Slacken off the two clamp screws (1) on the baseplate.
- Slowly turn the baseplate (2) to the left or right (arrow) until diode (3) on the ignition timing device goes out.

NOTE:

Turning to left: ignition retarded
Turning to right: ignition advanced

- Retighten the clamp screws.
- Check that ignition timing has not altered.

NOTE:

Check by turning the engine over by hand. At piston position 0.24 mm before TDC (dial gauge reading), diode (3) on the ignition timing device must go out.

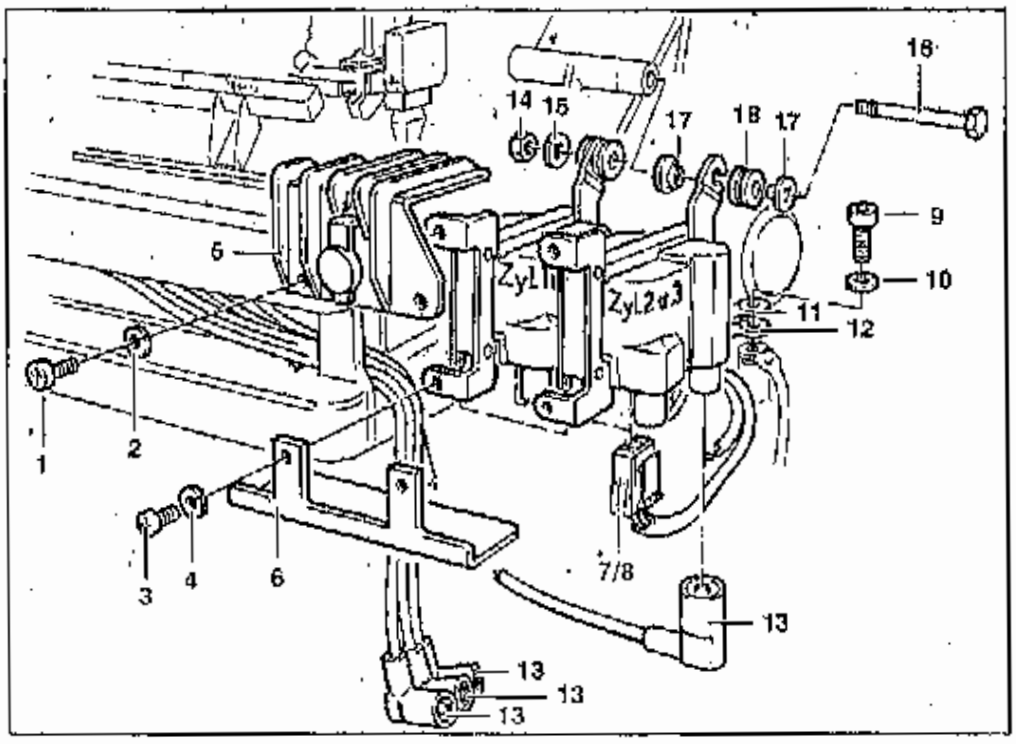
- Assemble/install in the opposite order of work.

WARNING:

When installing, note that the ceramic spark plug insulators are easily damaged. Screw the spark plugs in carefully. Do not tilt the spark plug wrench.

Tightening torque:

Magnetic gate plate to timing case cover	*3.5 ± 0.5 Nm*
Adjusting disc for TDC	*2.5 ± 0.5 Nm*
Cover for Hall-effect transmitter	*6 ± 1 Nm*
Spark plugs	*20 Nm*



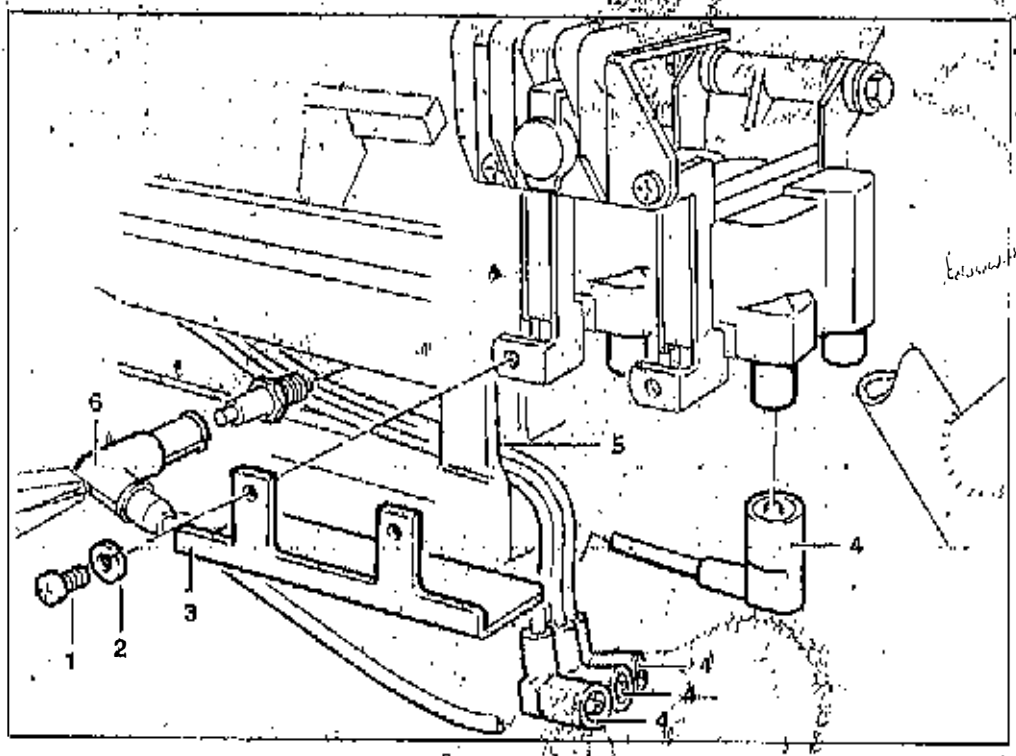
REMOVING AND INSTALLING IGNITION COILS

WARNING:
Switch off the ignition.
Disconnect the earth lead from the gearbox.
Insulate the earth lead.

- Remove the dualseat cover/dualseat.
- Remove the left knee pad.
- Remove the left inner fairing cover.
- Remove the engine cover,
- Remove the left centre section of the fairing.
- Remove the 2 retaining screws with lock washers (1/2/3/4) from the upper/lower coil covers.
- Take off the upper/lower covers (5/6).
- Separate the 2 plug connectors (7/8) for terminals 1 and 15.
- Remove the retaining screw with lock washer (9/10) for the earth leads (11/12) at the starter motor.
- Carefully pull off the 4 round plugs (13) at the coils.
- Remove the retaining nut with lock washer (14/15) at the upper/lower support pins.
- Hold the coils firmly and pull out the support pin (16).
- Pull the left/right bushings/rubber grommets (17/18) off the coil holder at top and bottom.
- Install in the opposite order of work.

NOTE:
When installing, note instructions on coils.
Attach the coil holders at top and bottom.
Make the plug connections for terminals 1 and 15.
Push on the earth leads.

Tightening torque:
Coils to intermediate flange *5 ± 0.5 Nm*

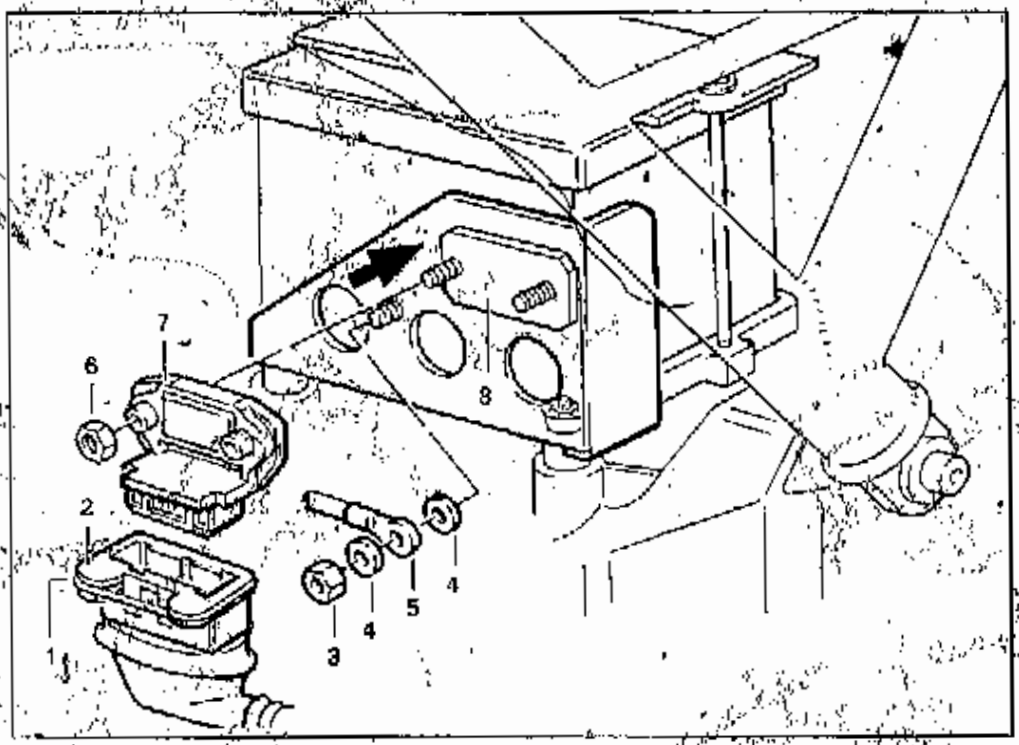


REMOVING AND INSTALLING IGNITION LEADS

WARNING:
Switch off the ignition.
Disconnect the earth lead from the gearbox.
Insulate the earth lead.

- Take off the dualseat cover/dualseat.
- Remove the left knee pad.
- Remove the left inner fairing cover.
- Remove the engine cover.
- Remove the left centre section of the fairing.
- Remove the 2 retaining screws with lock washers (1/2) from the lower coil cover.
- Take off the cover.
- Carefully pull off the 4 round plugs (4) at the coils.
- Open 1 cable strap (5).
- Detach the spark plug caps (6).
- Pull the ignition leads out of the cylinder head cover.
- Install in the opposite order of work.

NOTE:
When installing make sure that the ignition leads are connected to the correct cylinders (designated on coils and ignition leads).
Make sure that the plugs are firmly attached to the coils.



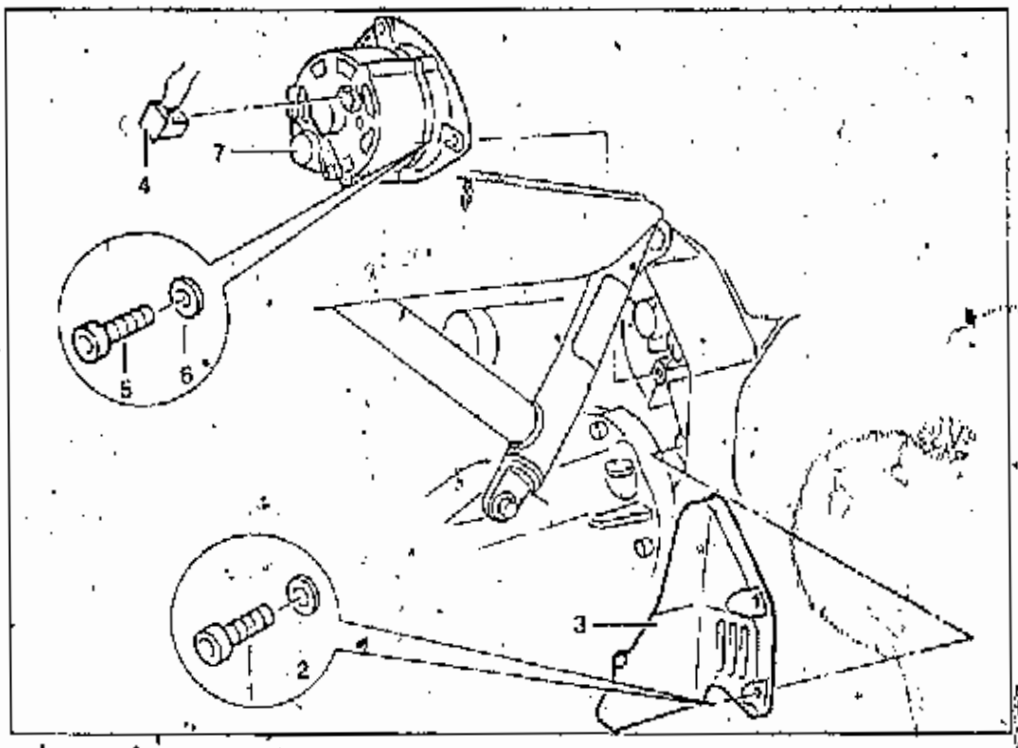
REMOVING AND INSTALLING IGNITION OUTPUT STAGE

WARNING:
Switch off the ignition.
Disconnect the earth lead from the gear-box.
Insulate the earth lead.

- Remove the ignition coils.
- Release the keeper loop (1) on the multi-pin plug.
- Pull the multi-pin plug (2) off the ignition output stage.
- Unscrew the retaining nut with washers (3/4) from the earth lead. Take off the earth lead (5).
- Unscrew the 2 retaining nuts (6) on the ignition output stage.
- Detach the ignition output stage/heat sink (7/8) from the retaining plate.
- Separate the ignition output stage from the heat sink.
- Install in the opposite order of work.

NOTE:
When installing, the recess on the heat sink must face the retaining plate (arrow).
Clean the surfaces to which adhesive is to be applied.
Attach the ignition output stage to the heat sink with CURIL K.
Attach the heat sink to the retaining plate with CURIL K.

Tightening torque:
Ignition coils to intermediate flange 5 ± 0.5 Nm

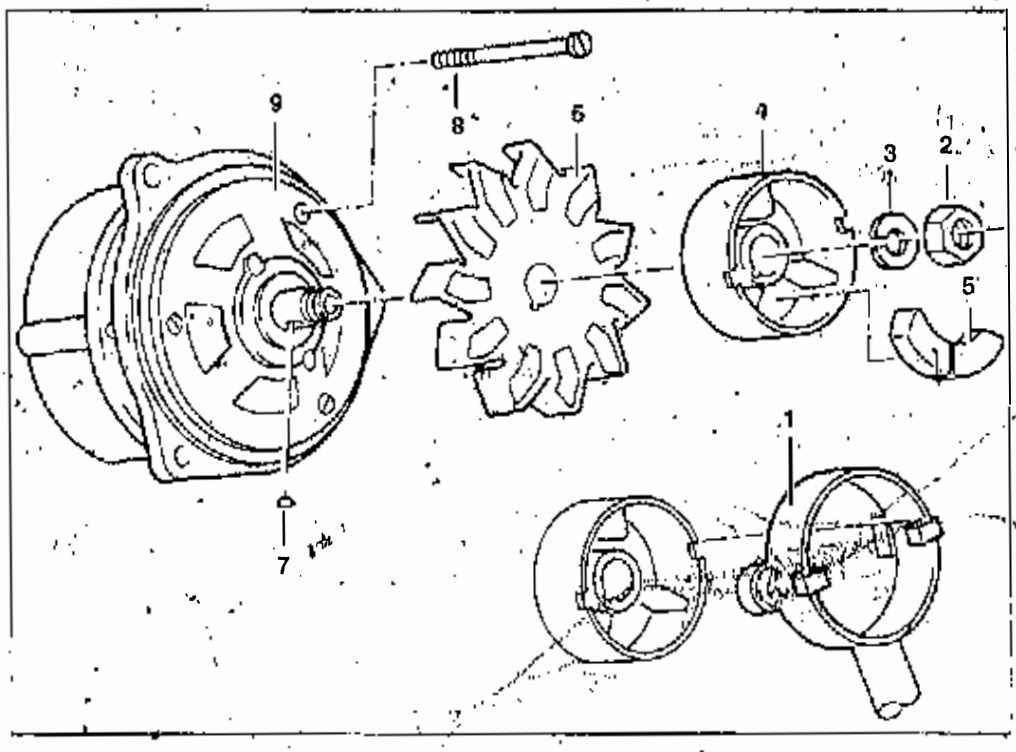


REMOVING AND INSTALLING ALTERNATOR

WARNING:
Switch off the ignition.
Disconnect the earth lead from the gearbox.
Insulate the earth lead.

- Take off the dualseat cover/dualseat.
- Detach the dualseat lock mounting.
- Remove the MOTRONIC control unit.
- Remove the ABS control unit.
- Remove the battery.
- Remove the 2 retaining screws with washers (1/2) from the alternator cover.
- Take off the cover (3)
- Pull off the twin plug (4).
- Remove the 3 retaining screws with washers (5/6) on the alternator.
- Lift the alternator (7) out to the rear.
- Install in the opposite order of work.

Tightening torque:
Alternator to intermediate flange *21.5 ± 2 Nm*

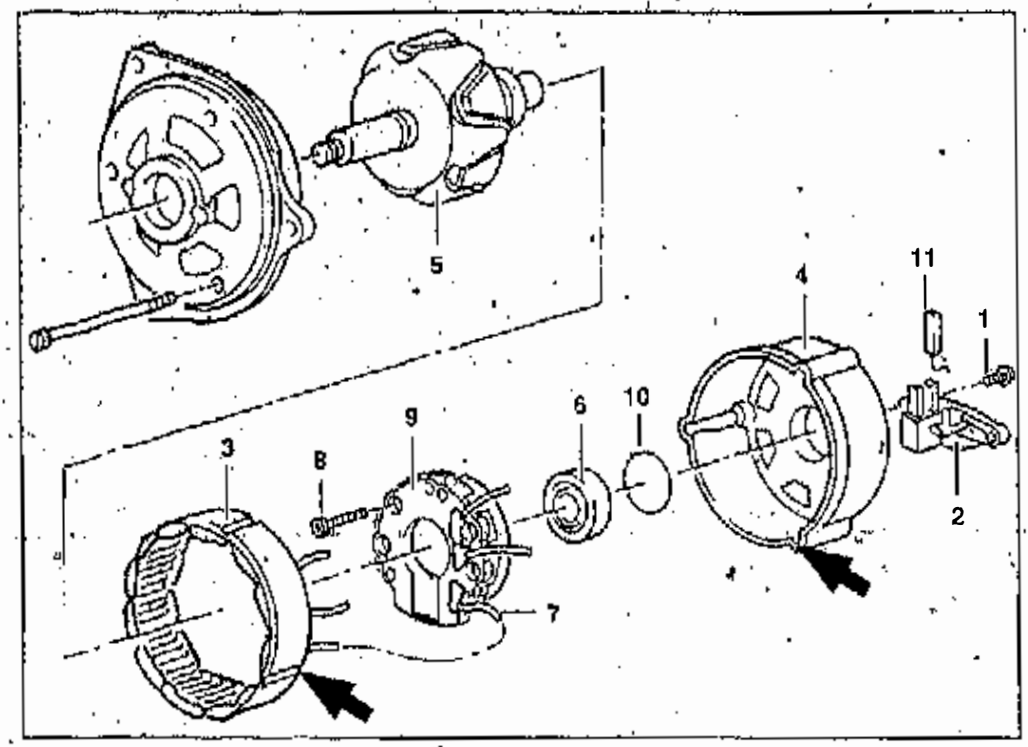


STRIPPING AND ASSEMBLING ALTERNATOR

- Remove the alternator.
- Retain the coupling housing in position with locking device BMW No. 12 4 600 (1).
- Unscrew hex. nut with spring washer (2/3).
- Take off coupling housing with rubber bushing (4/5).
- Pull off the fan (6).
- Pull key (7) out of its groove with pliers.
- Remove the 3 retaining screws (8).

NOTE:
Use a vise with soft jaws.

- Clamp the alternator into the vise.
- Pull off input-side bearing (9) with 3-arm puller BMW No. 33 1 830.



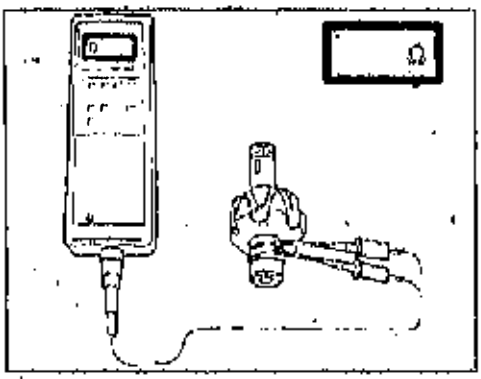
- Remove the 2 retaining screws (1) from the voltage regulator.
- Take off the voltage regulator (2).
- Press ring winding (3) on to slipring bearing (4).
- Pull rotor (5) upwards out of the slipring bearing.
- Pull off deep-groove ball bearing (6) with a two-arm puller.
- Detach the ring winding from the slipring bearing.
- Mark the 3 connections (7) on the ring winding/diode board to identify them.
- Unsolder the connections from the diode board.
- Take off the ring winding.
- Remove the 4 retaining screws (8) from the diode board.
- Take diode board (9) out of the slipring bearing.
- Install in the opposite order of work.

NOTE:

When installing, insulate the soldered connections with silicone sealant.
Make sure that O-ring (10) in the slipring bearing is in good condition.
Apply Molykote paste to the bore in the slipring bearing.
Note that the milled cutouts (arrows) for the slipring bearing and ring winding must be aligned.
Always exchange the voltage regulator and carbon brushes (2/11) as a complete assembly.

Checking exciter winding at sliprings

NOTE:
Before each ohmmeter reading, zero with the BMW diagnosis tester.
Zeroing: connect the positive (yellow) and negative (green) leads together.
Press the ea button until the digital display shows 0.00 Ω.



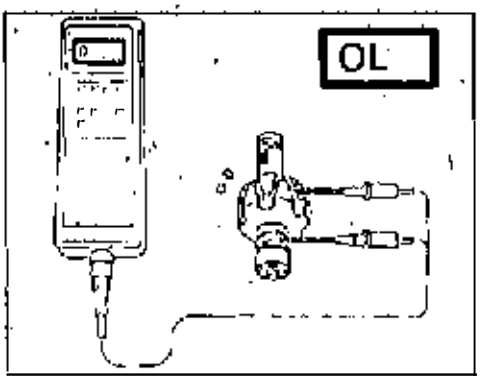
- Measure as shown in the drawing.
- Take the reading.

NOTE:
If "OL" is displayed, the rotor is defective.

Tightening torque:
Nominal resistance *6.9 ± 0.69 Ω*

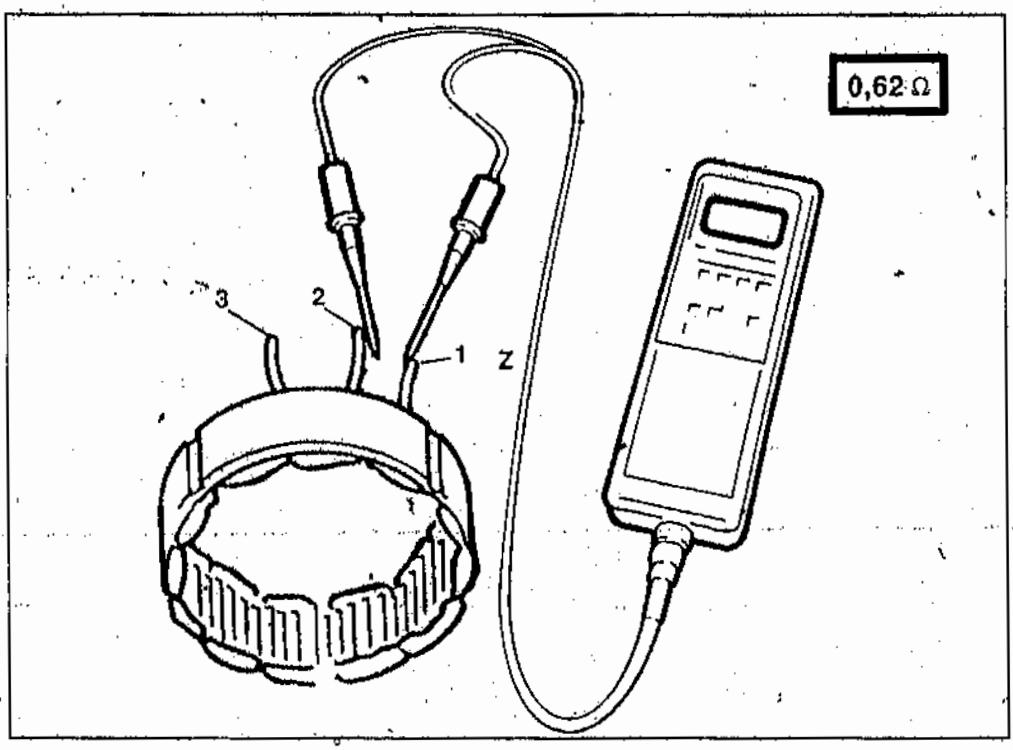
Checking rotor for short to earth (ground)

NOTE:
Before each ohmmeter reading, zero with the BMW diagnosis tester.
Zeroing: connect the positive (yellow) and negative (green) leads together.
Press the ea button until the digital display shows 0.00 Ω.



- Measure as shown in the drawing.
- Take the reading.

NOTE:
"OL" must be displayed.



Checking resistance between phase outputs

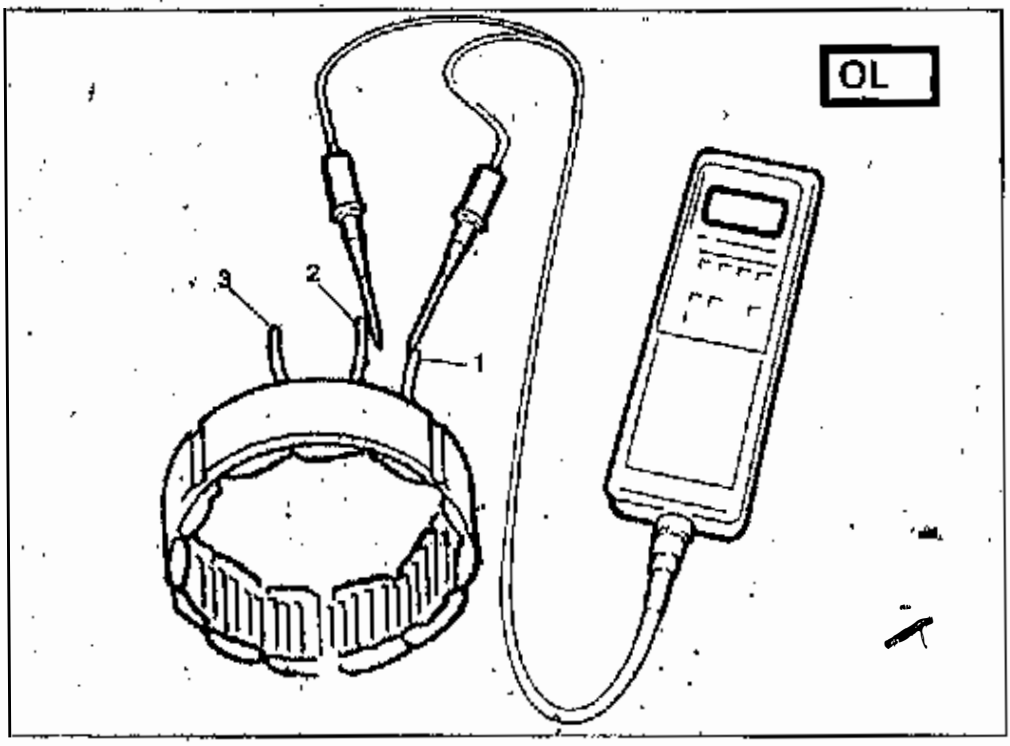
> **NOTE:**
> Before each ohmmeter reading, zero with the BMW diagnosis tester.
> Zeroing: connect the positive (yellow) and negative (green) leads together.
> Press the Ω button until the digital display shows 0.00 Ω.

- Check resistance between each pair of outputs:
  1 - 2
  1 - 3
  2 - 3

> **NOTE:**
> The resistance in Ohms between two phase outputs is always low.
> Temperature differences or production tolerances can result in nominal value fluctuations of 20 ... 30 %.
> If the reading is below 1.0 Ω, the stator winding is intact.

Value in Ohms:

Nominal resistance	*0.62 Ω*

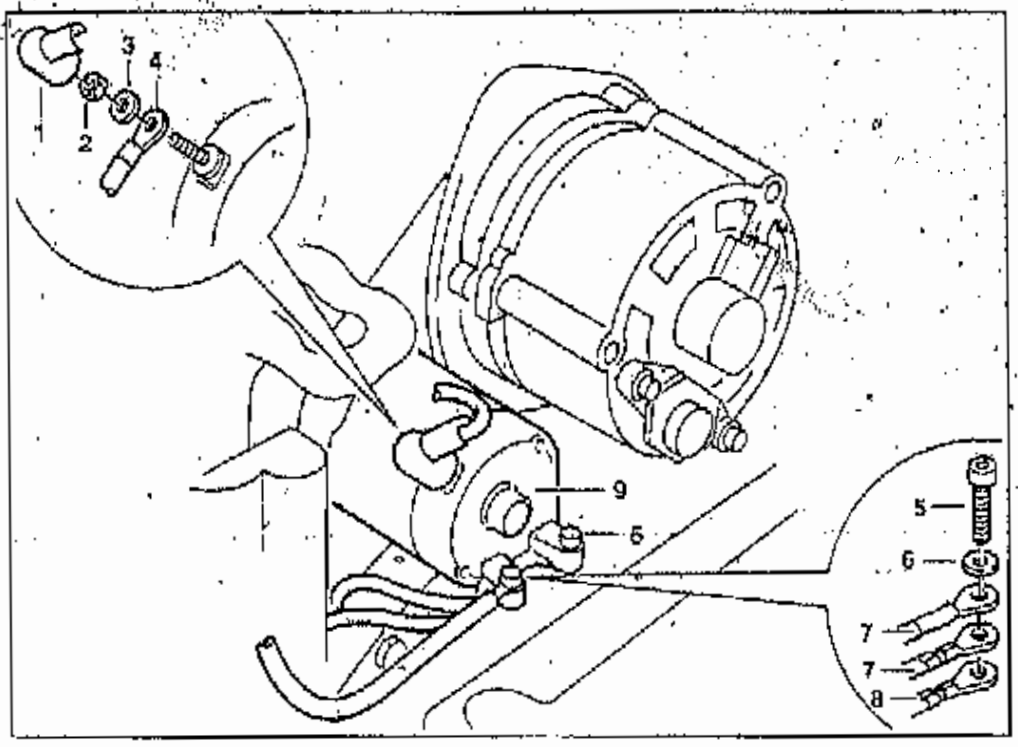


Checking stator winding for short to earth (ground)

NOTE:
Before each ohmmeter reading, zero with the BMW diagnosis tester.
Zeroing: connect the positive (yellow) and negative (green) leads together.
Press the Ω button until the digital display shows 0.00 Ω.

- Measure between each output and the housing.
  - 1 - housing
  - 2 - housing
  - 3 - housing

NOTE:
"OL" must be displayed.



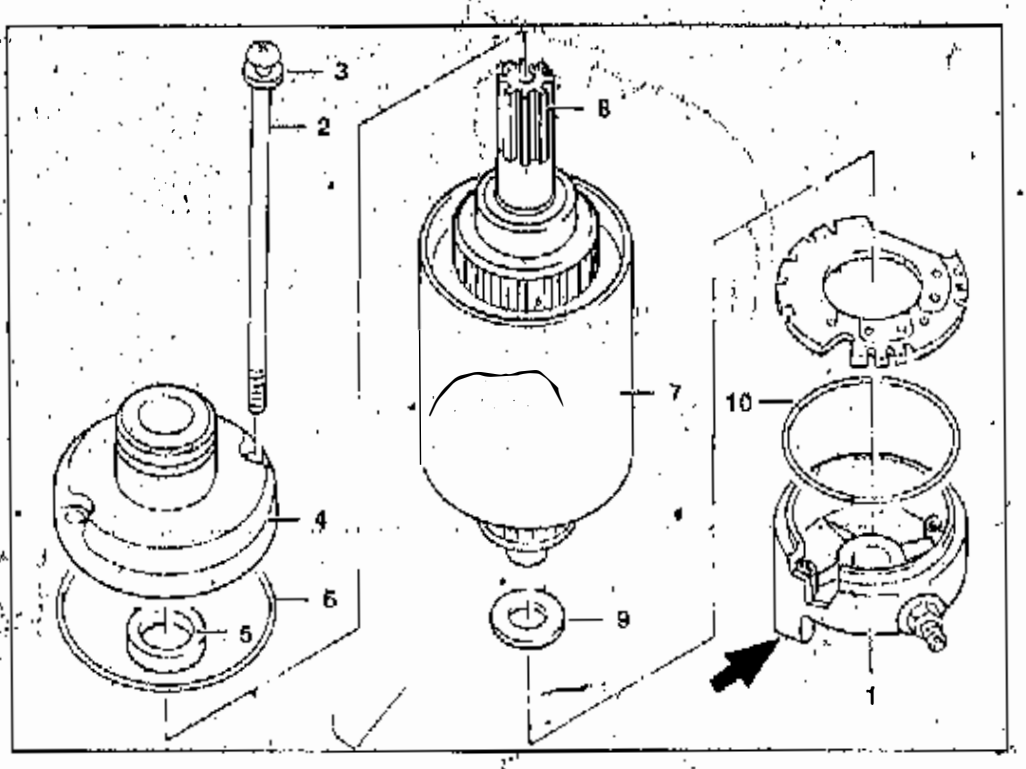
REMOVING AND INSTALLING STARTER MOTOR

NOTE:
Switch off the ignition.
Disconnect the earth lead at the gearbox and insulate it.

- Take off the dualseat cover/dualseat.
- Detach the dualseat lock holder.
- Remove the MOTRONIC control unit.
- Remove the ABS control unit.
- Remove the battery.
- Detach the protective cap (1) from the positive lead.
- Unscrew the retaining nut with lock washer (2/3) from the positive lead.
- Pull off the lead (4).
- Remove the 2 retaining nuts/locking rings (5/6) at the starter motor.
- Take off the earth leads at the ignition coils/MOTRONIC control unit (7/8).
- Remove the starter motor (9) to the rear.
- Install in the opposite order of work.

Tightening torque:

Starter motor to gearbox	*6 ± 1 Nm*
Cable connection to starter motor	*4 - 6 Nm*



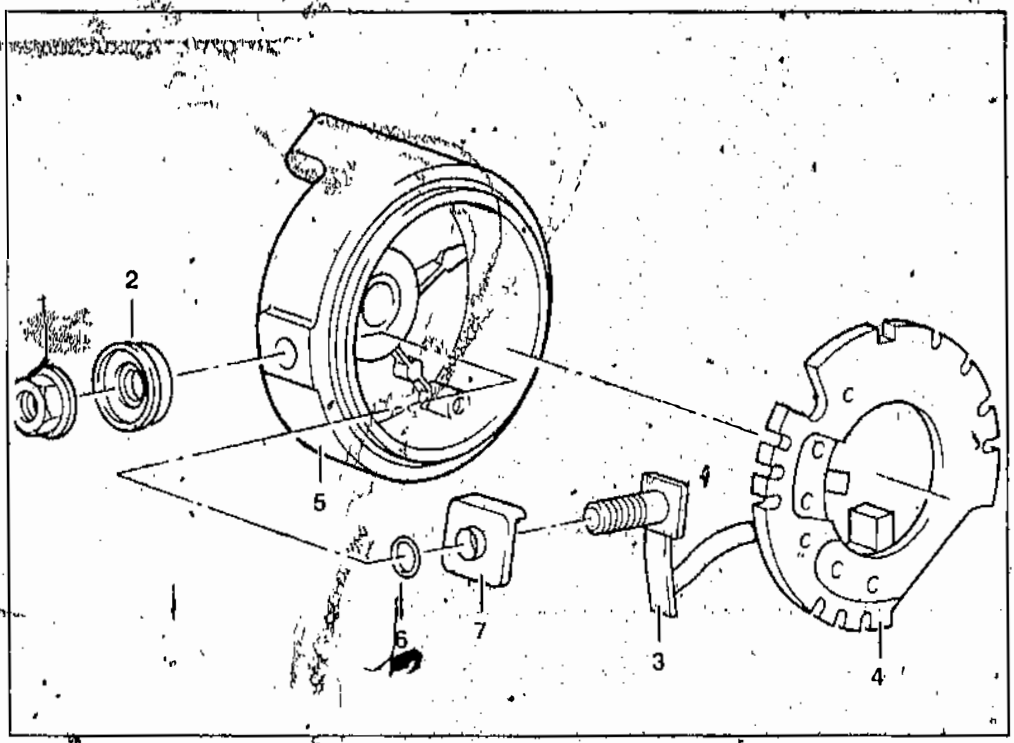
STRIPPING AND ASSEMBLING THE STARTER MOTOR

- Remove the starter motor.

> **NOTE:**
> Use a vise with soft jaws.

- Clamp the starter motor with the commutator bearing flange (1) into the vise.
- Remove the 2 retaining screws with spring washers (2/32) from the input-side bearing.
- Pull off the input-side bearing (4). Note seal and O-ring (5/6).
- Pull the exciter winding/rotor (7/8) out of the commutator bearing. Note spacing washers and O-ring (9/10).
- Pull the exciter winding off the rotor.
- Install in the opposite order of work.

> **NOTE:**
> When installing, renew O-rings and seal if damaged.
> Make sure that O-rin and seal are correctly located.



Removing and installing brush holder plate

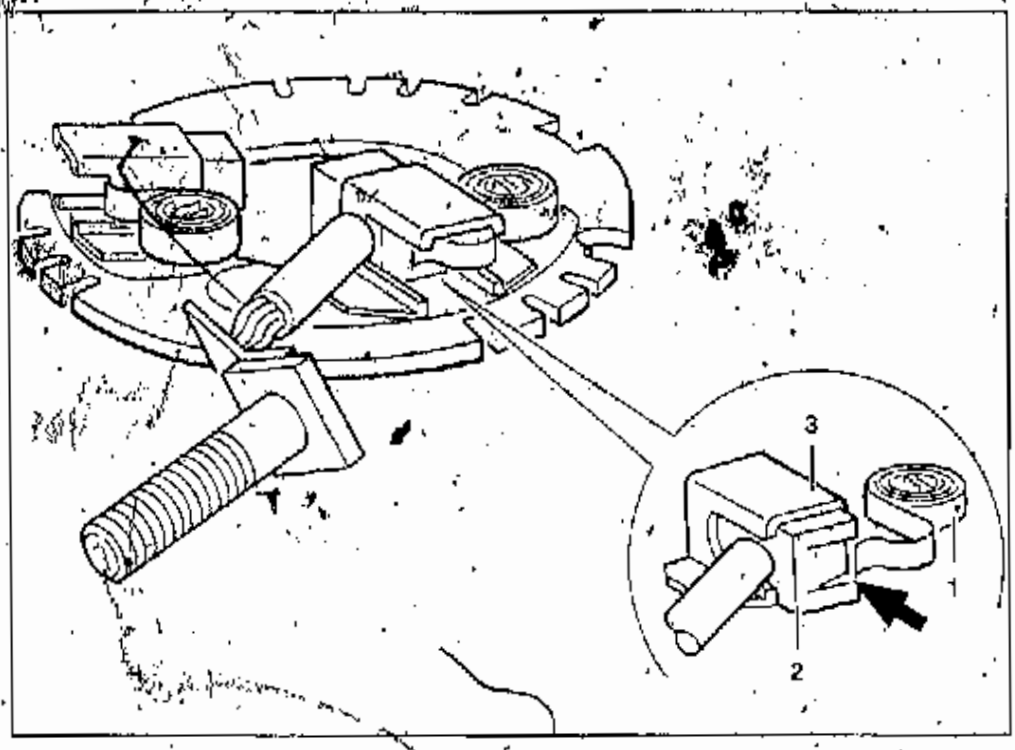
- Remove the starter motor.

NOTE:
Use a vise with soft jaws.

- Strip down the starter motor.
- Unscrew the retaining nut (1) for the brush assembly.
- Take off the plastic housing (2).
- Take the carbon brush holder and brush holder plate (3/4) out of the commutator bearing (5).
- Take off the O-ring.
- Take the locking plate (7) off the carbon brush holder.
- Install in the opposite order of work.

NOTE:
When installing, make sure the O-ring is correctly seated.

5. Monteer de startmotor en bouw hem in.



Renewing carbon brushes

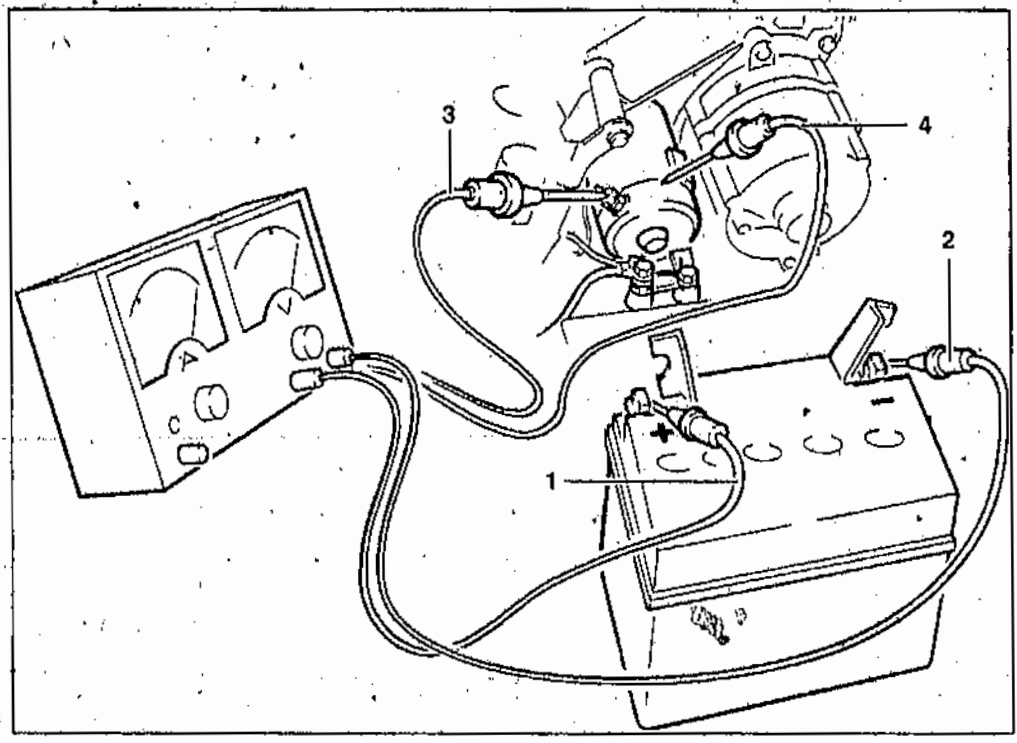
- Remove the starter motor.

> **NOTE:**
> Use a vise with soft jaws.

- Strip down the starter motor.
- Remove the brush holder plate.
- Using a small screwdriver, press out the spiral spring (1).
- Pull the carbon brushes (2) out of brush holder (3).
- Install in the opposite order of work.

> **NOTE:**
> When installing, the spiral spring must press on the angled surface (arrow) of the carbon brush.

- Assemble and install the starter motor.



TESTING STARTER MOTOR WITH VOLTMETER

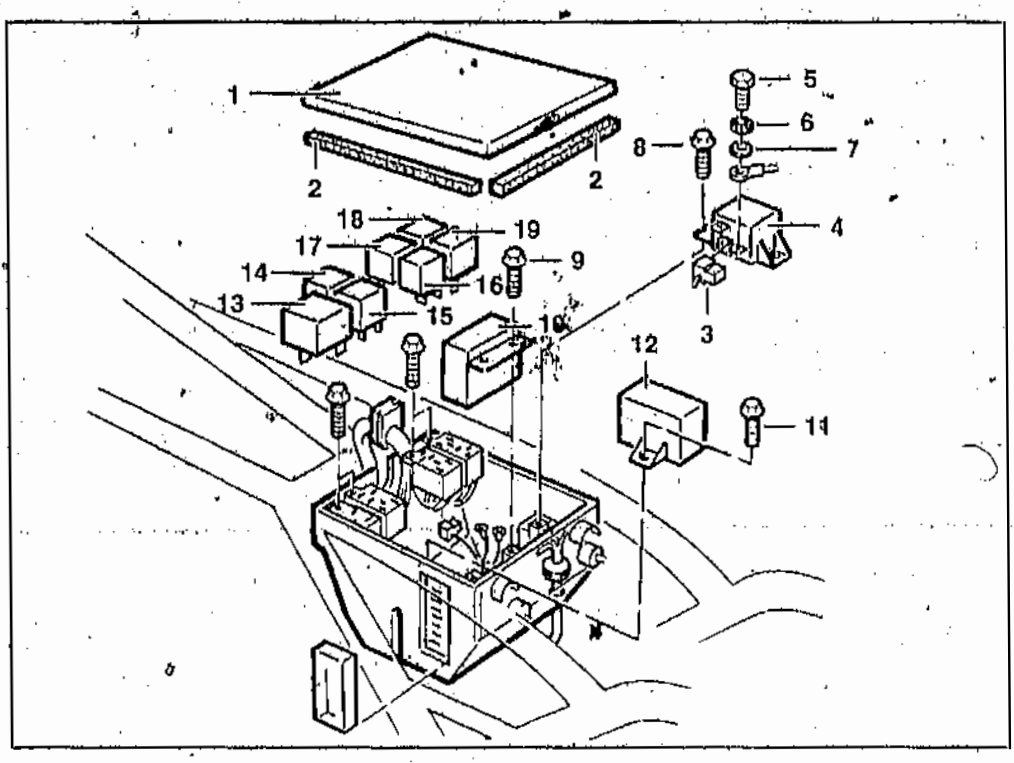
> **NOTE:**
> Before testing, if the starter motor runs too slowly or does not turn the engine over, check the state of battery charge

- Connect the voltmeter between the positive and negative posts of the battery (1/2).
- Run the starter motor for 2 ... 3 seconds.
- Note the voltage reading.

> **NOTE:**
> If the voltage drops well below 8 V, the battery is defective.
> If the reading remains above 8 V, make a note of it.

- Reconnect the voltmeter between terminal 30 of the starter motor (4) and earth (ground) on the starter motor (4).
- Run the starter motor for 2 ...3 seconds.
- Compare the reading with the value previously noted.

> **NOTE:**
> If the difference in the 2 values is greater than 0.5 V, check the connections and cable between the starter motor ands the battery.
> If the cable and connections are intact, the starter motor is defective.



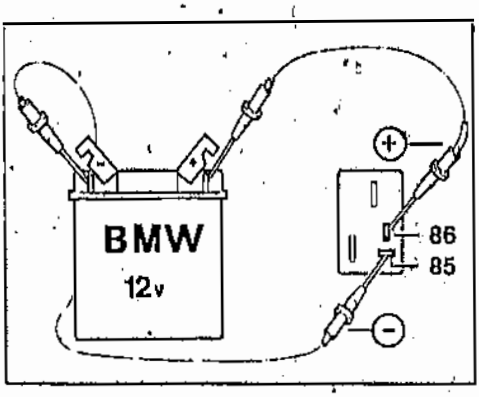
CENTRAL ELECTRICS

REMOVING AND INSTALLING RELAYS

WARNING:
Switch off the ignition.
Disconnect the earth lead from the gearbox.
Insulate the earth lead.

- Take off the dualseat cover/dualseat.
- Remove the left/right knee pad.
- Remove the left/right inner fairing cover.
- Separate the plug connectors for the auxiliary instruments.
- Remove the engine cover.
- Remove the left/right centre section of the fairing.
- Remove the fuel tank pad.
- Take off the fuel tank.
- Take off the cover (1) of the central electrical equipment box. Make sure that the sealing strip (2) is undamaged.
- Pull offthe plug connector (3) at the starter relay (4).
- Remove the retaining screw with lock ring and washer (5/6/7) at the negat and positive leads.
- Remove the 2 retaining screws (8) and take out the relay.
- Remove the 2 retaining screws (9) at the flashing turn indicator relay (10) and take out the relay.
- Remove the retaining screw (11) at the bulb monitor (12) and take out the bulb monitor.
- Pull the relays out of their holders:
  13) ABS relay
  14) MOTRONIC control unit relay
  15) ABS control unit relay
  16) Fuel pump relay
  17) Fan relay
  18) Load relief relay
  19) Horn relay
- Install in the opposite order of work.

TESTING STARTER MOTOR RELAY WINDING



- Connect the positive battery lead to terminal 86.
- Connect the negative battery lead to terminal 85.

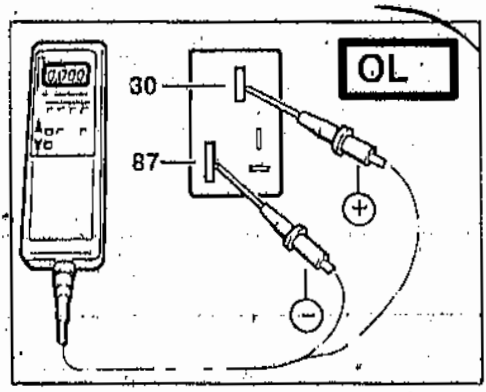
NOTE:

If no switching sound is heard, the relay is defective and should be renewed.
If a switching sound is heard, test resistance with the ohmmeter.

Testing starter motor relay with ohmmeter

NOTE:

Before each ohmmeter reading, zero with the BMW diagnosis tester.
Zeroing: connect the positive (yellow) and negative (green) leads together.
Press the Ω button until the digital display shows 0.00 Ω.

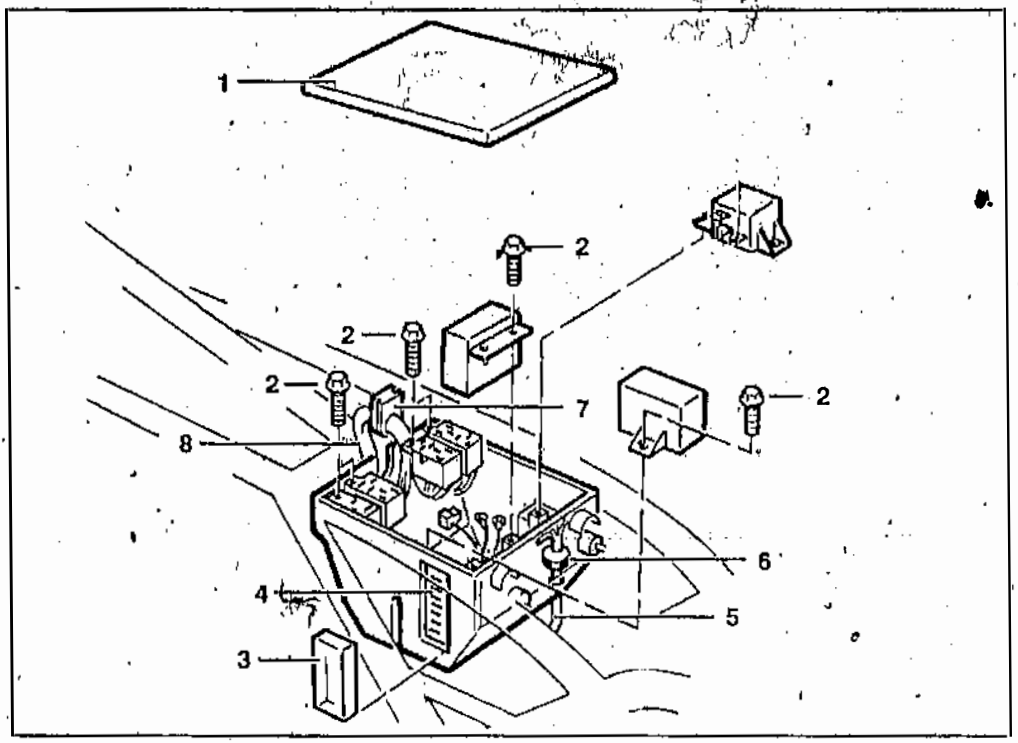


- Connect the positive lead to terminal 30.
- Connect the negative lead to terminal 87.

NOTE:

"OL" must be displayed.
If a reading in Ohms is displayed, repeat the zeroing procedure.
Take the reading.
If a value is again displayed, the relay is defective and should be renewed.

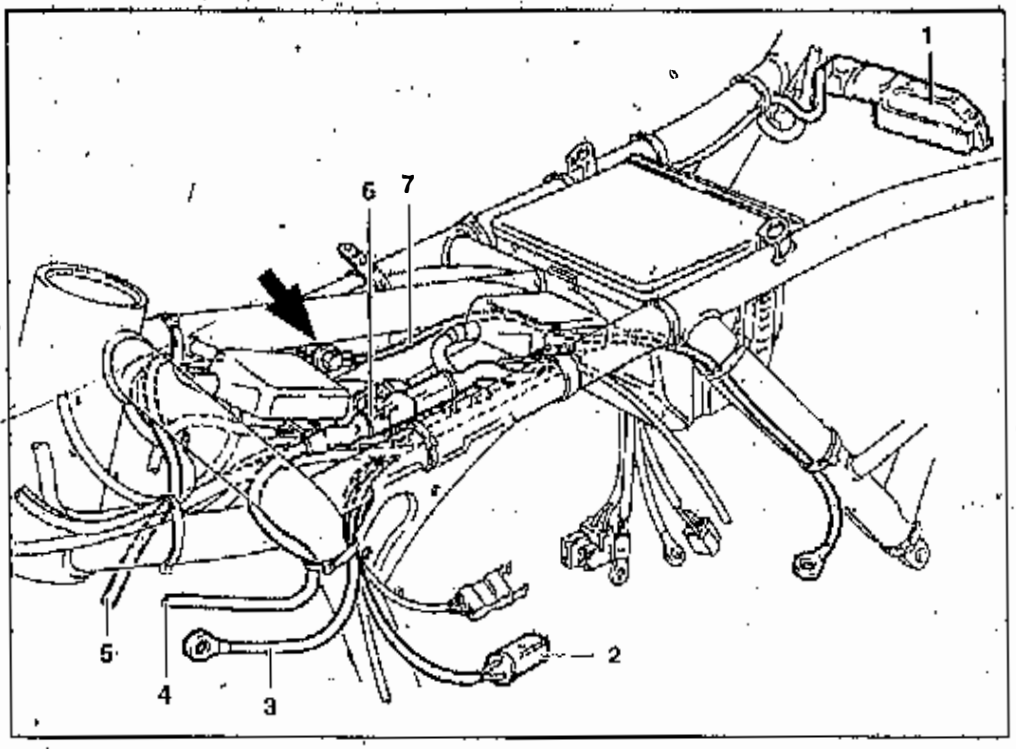




REMOVING AND INSTALLING CENTRAL ELECTRICAL COMPONENT BOX

WARNING:
Switch off the ignition.
Disconnect the earth lead from the gear-box.Insulate the earth lead.

- Take off the dualseat cover/dualseat.
- Remove the left/right knee pad.
- Remove the left/right inner fairing cover.
- Separate the plug connectors for the auxiliary instruments.
- Remove the engine cover.
- Remove the left/right centre section of the housing.
- Remove the fuel tank pad.
- Take off the fuel tank.
- Remove the battery.
- Take off the cover (1) of the central electrical component box.
- Detach the positive cable from the starter motor.
- Pull off the plug at the alternator.
- Pull off the multi-pin plug at the CO potentiometer.
- Pull off the multi-pin plug for the ignition output stage.
- Pull off the plug connection at the starter motor relay.
- Remove the 9 retaining screws (2) at the relay.
- Take the cover (3) off the fuse box.
- Release the retaining strip (4) from its clamp holder at top and bottom and push it into the central electrical component box.
- Pull the rear frame wiring harness (5) with rubber grommet (6) out upwards.
- Pull the rubber grommet and front frame wiring harness (7/8) out of the box.
- Lift out the box.
- Install in the opposite order of work.

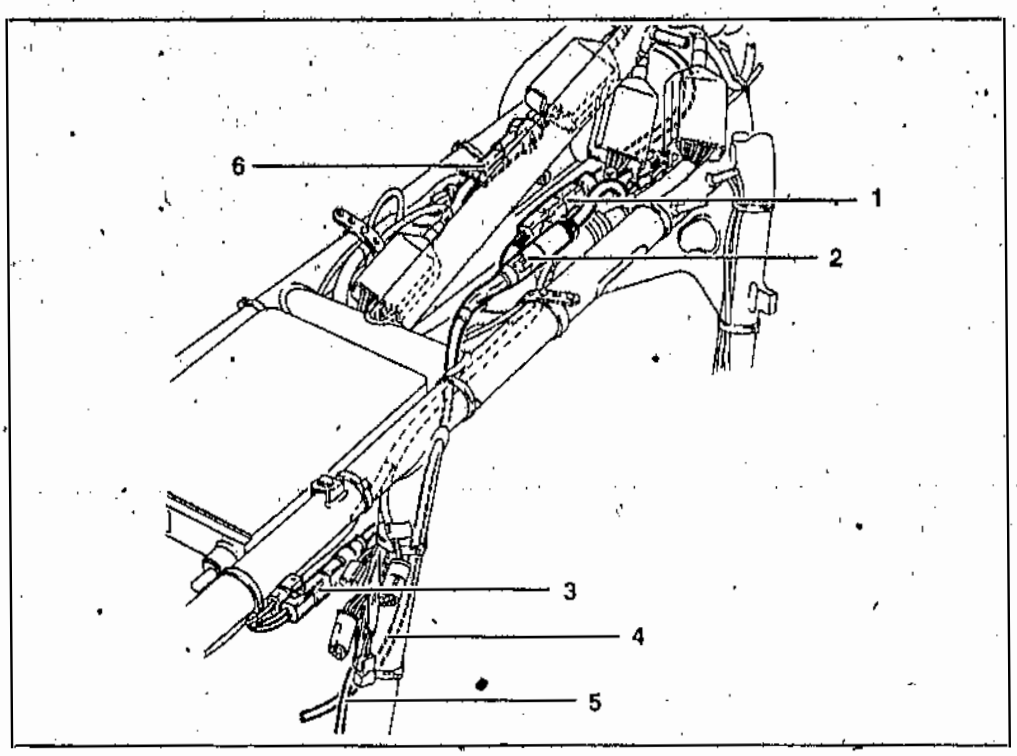


LAYOUT OF WIRING HARNESS/ CABLE STRAPS - without/with ABS

REMOVING AND INSTALLING ABS WIRING HARNESS

> **NOTE:**
> The numbering sequence is clockwise from right to left.

- Detach the earth (ground) connection (arrow).
- Open all cable straps for the ABS wiring harness.
- Detach the wiring harness from the frame.
- Connections:
  1) Connection to ABS control unit
  2) Connection to ABS pulse transmitter
  3) Earth (ground) connection at pressure modulator holder
  4) Wire to front pressure modulator
  5) Front sensor
  6) Connection for front modulator
  7) Earth (ground) wire



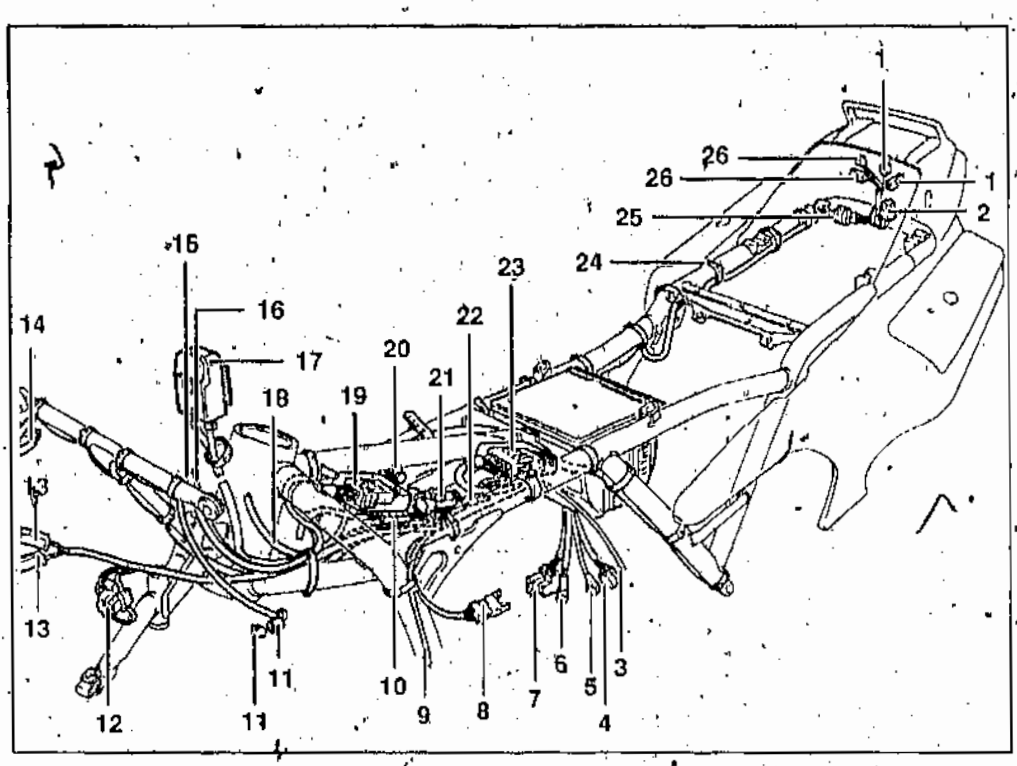
NOTE:
The numbering sequence is clockwise from right to left.

- Connections:
  1) Connection for front sensor
  2) Connection for rear pressure modulator
  3) Connection for rear sensor
  4) Wire to rear pressure modulator
  5) Wire to rear sensor
  6) Connection to front pressure modulator
- Install in the opposite order of work.

IMPORTANT:
The wiring harness must be installed without any kinks or potential abrasion points.
Never allow plug connectors to touch the frame.
Note correct positions of cable straps.

NOTE:
When installing, there should be no paint on the earth (ground) connection point. It should be given a thin coat of CENTROPLEX 3 CU contact grease.
Install the wiring harness from the centre towards the front and rear.

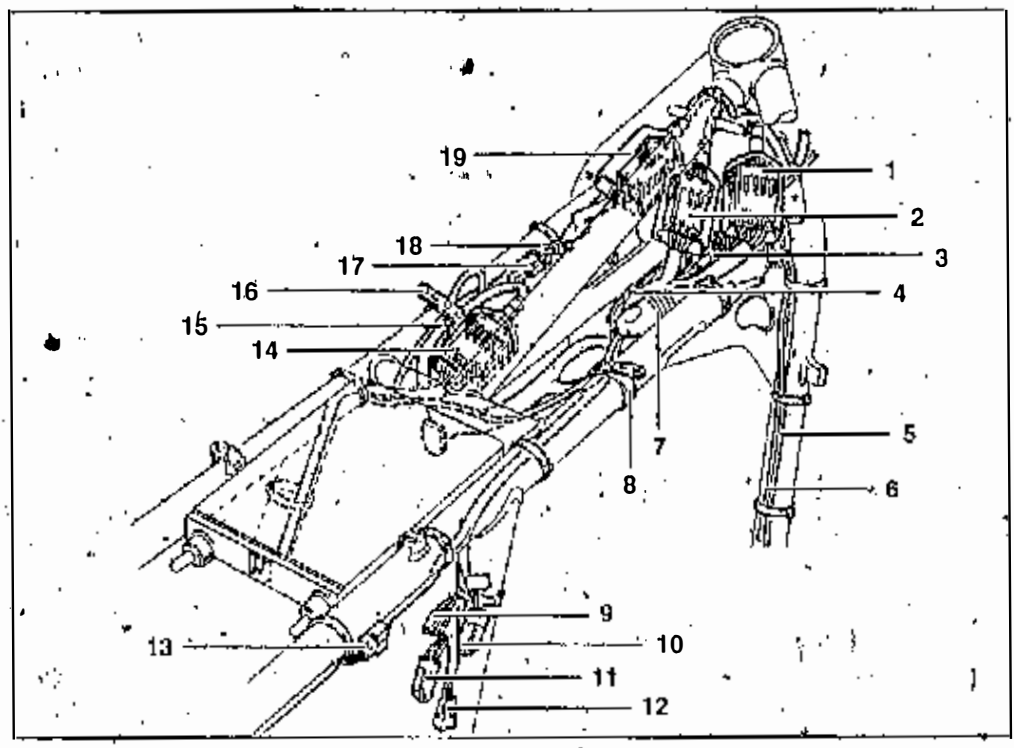
Tightening torque:
Earth (ground) connecting screw 8.8 Nm



REMOVING AND INSTALLING FRAME WIRING HARNESS

> **NOTE:**
> The numbering sequence is clockwise from r to left.

- Detach the earth (ground) connection (20) for the frame wiring harness.
- Open all cable straps.
- Pull out the keepers.
- Take out the central electrical component box with the wiring harness.
- Connections:
  1) Rear light connection (brown/grey -black)
  2) Rear left flashing turn indicator connection
  3) Choke switch wire
  4) Power socket connection
  5) Starter motor connection
  6) Battery (positive) connection
  7) Alternator connection
  8) Connection to hazard warning flasher switch (optional extra)
  9) Horn connection
  10) Fan connection
  11) Front left flashing turn indicator connection
  12) Headlight connection
  13) Parking light connection
  14) Front right flashing turn indicator connection
  15) Wire to multipurpose switch
  16) Wire to clutch switch
  17) Connection to instrument cluster
  18) Wire to ignition/light switch
  19) Connection to multipurpose switch, left
  20) Earth (ground) connection for frame wiring harness
  21) Connection to clutch switch
  22) Connection to choke switch
  23) Connection to engine wiring harness
  24) Cable strap
  25) Connection to wire for rear right flashing turn indicator
  26) Connection for brake light (brown/grey-yellow)



NOTE:
The numbering sequence is clockwise from right to left.

- Connections:
  1) Connection to multipurpose switch, right
  2) Connection to ignition/light switch
  3) Connection to handbrake light switch
  4) Connection to wire for oil
  5) Hall-effect transmitter line
  6) Wire for oil
  7) Connection to Hall-effect transmitter
  8) Cable strap
  9) Connection for foot brake light switch
  10) Connection for fuel level indicator
  11) Connection for gear box switch
  12) Connection for inductive sensor
  13) Connection for side (stand) switch
  14) Connection for engine wiring harness
  15) Marking tape
  16) Cable strap
  17) Connection for choke switch
  18) Connection for clutch switch
  19) Connection for multipurpose switch, left

- Install in the opposite order of work.

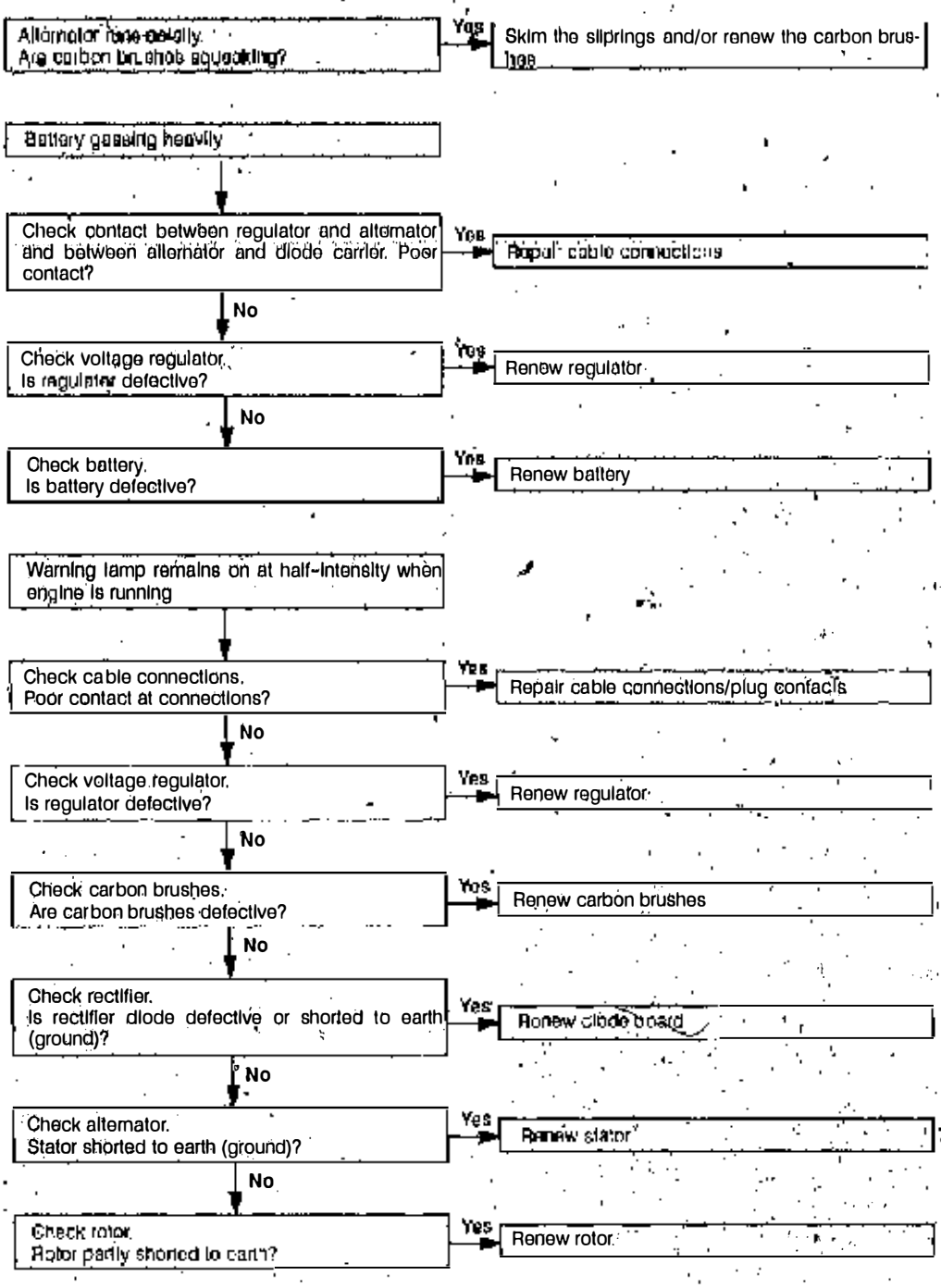
IMPORTANT:
The wiring harness must be installed without any kinks or potential abrasion points.
Never allow plug connectors to touch the frame.
Note correct positions of cable straps.

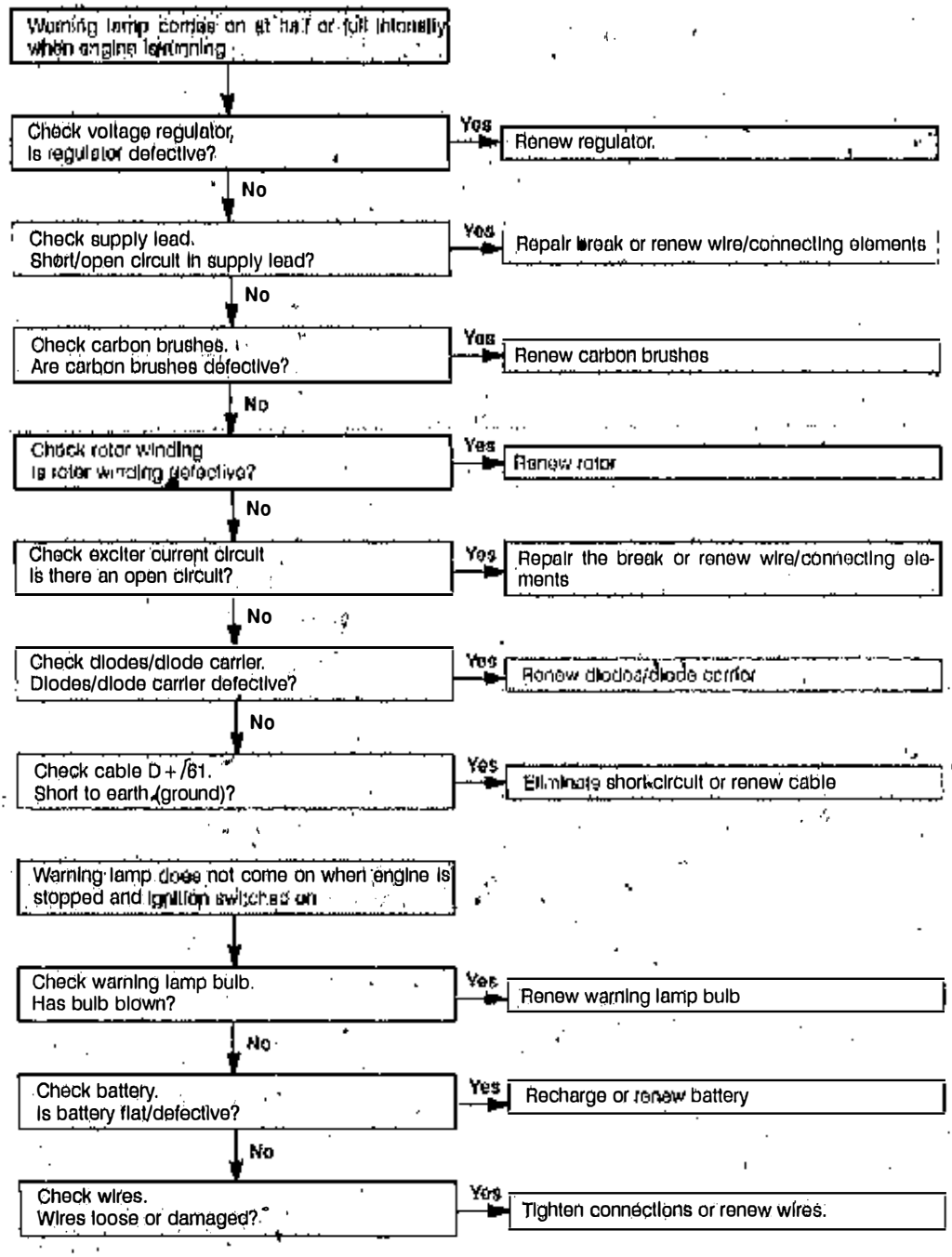
NOTE:
When installing, there should be no paint on the earth (ground) connection point. It should be given a thin coat of CENTROPLEX 3 CU contact grease.
Install the wiring harness from the centre towards the front and rear.

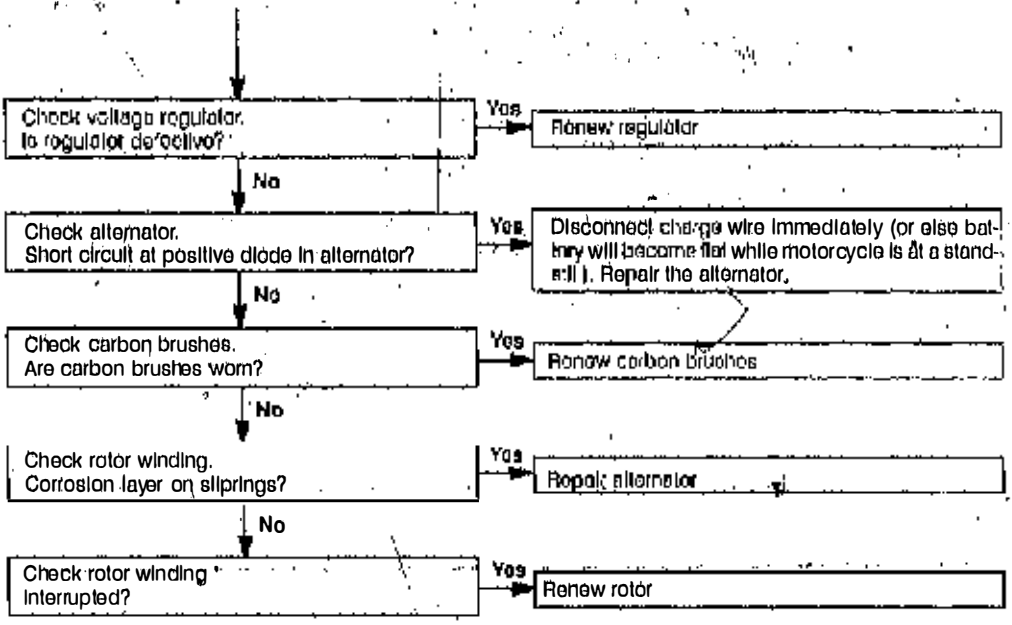
Tightening torque:
Earth (ground) connecting screw 5.8 Nm

TROUBLESHOOTING

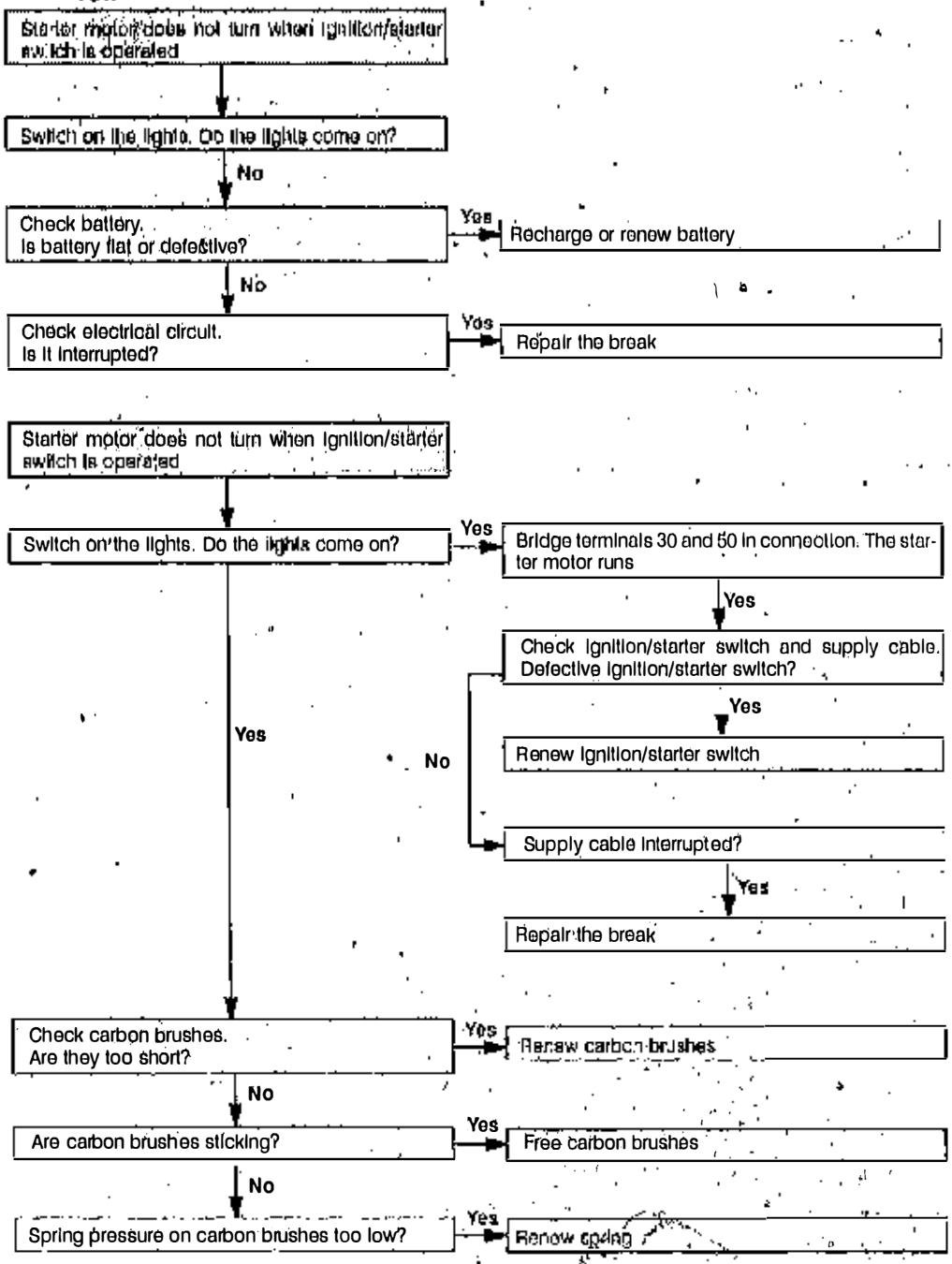
TROUBLESHOOTING ON ALTERNATOR

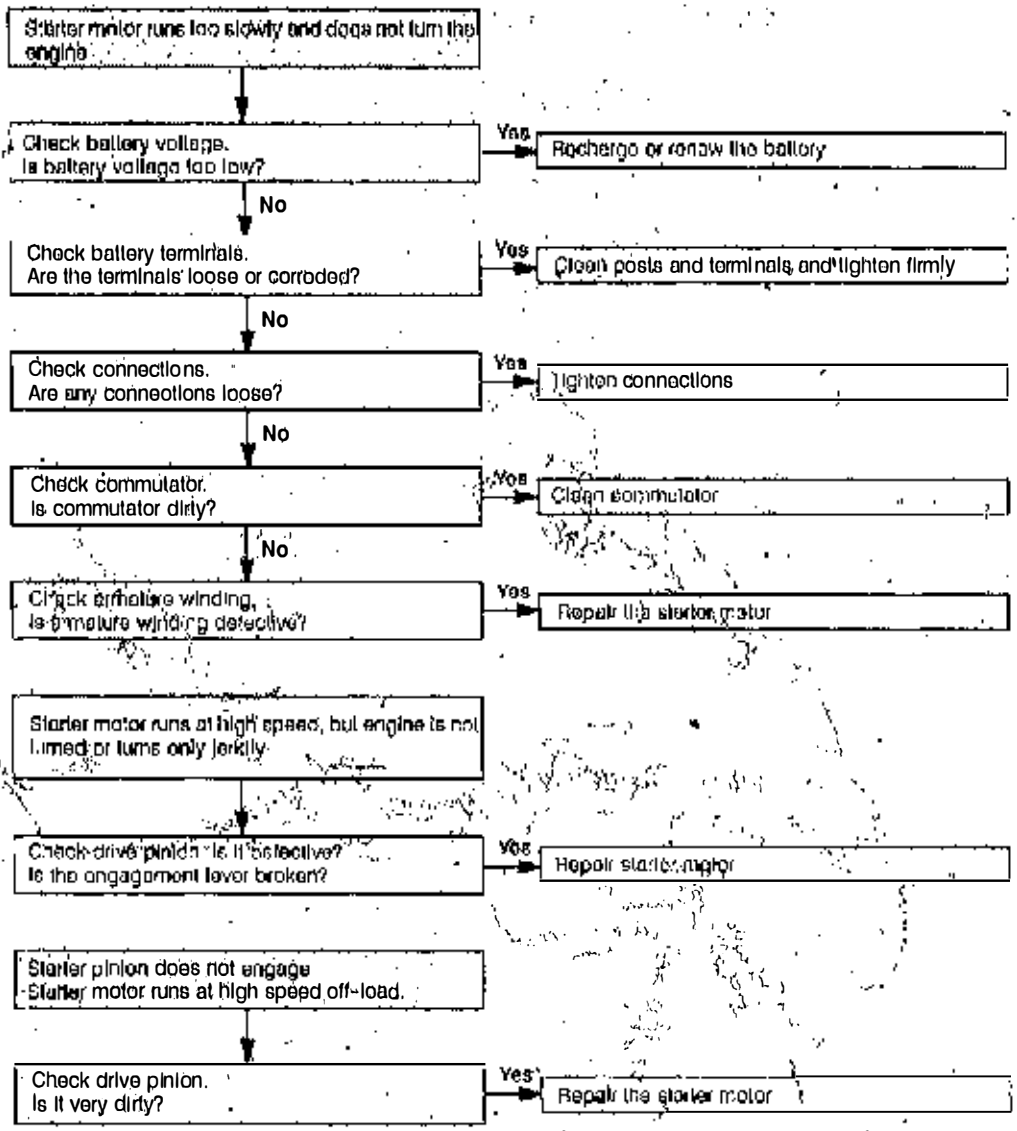



Warning lamp comes on at half or full intensity when engine is running
Check voltage regulator. Is regulator defective?
Yes
Renew regulator.
No
Check supply lead. Short/open circuit in supply lead?
Yes
Repair break or renew wire/connecting elements
No
Check carbon brushes. Are carbon brushes defective?
Yes
Renew carbon brushes
No
Check rotor winding Is rotor winding defective?
Yes
Renew rotor
No
Check exciter current circuit Is there an open circuit?
Yes
Repair the break or renew wire/connecting elements
No
Check diodes/diode carrier. Diodes/diode carrier defective?
Yes
Renew diodes/diode carrier
No
Check cable D+ /61. Short to earth (ground)?
Yes
Eliminate short-circuit or renew cable
Warning lamp does not come on when engine is stopped and ignition switched on
Check warning lamp bulb. Has bulb blown?
Yes
Renew warning lamp bulb
No
Check battery. Is battery flat/defective?
Yes
Recharge or renew battery
No
Check wires. Wires loose or damaged?
Yes
Tighten connections or renew wires.

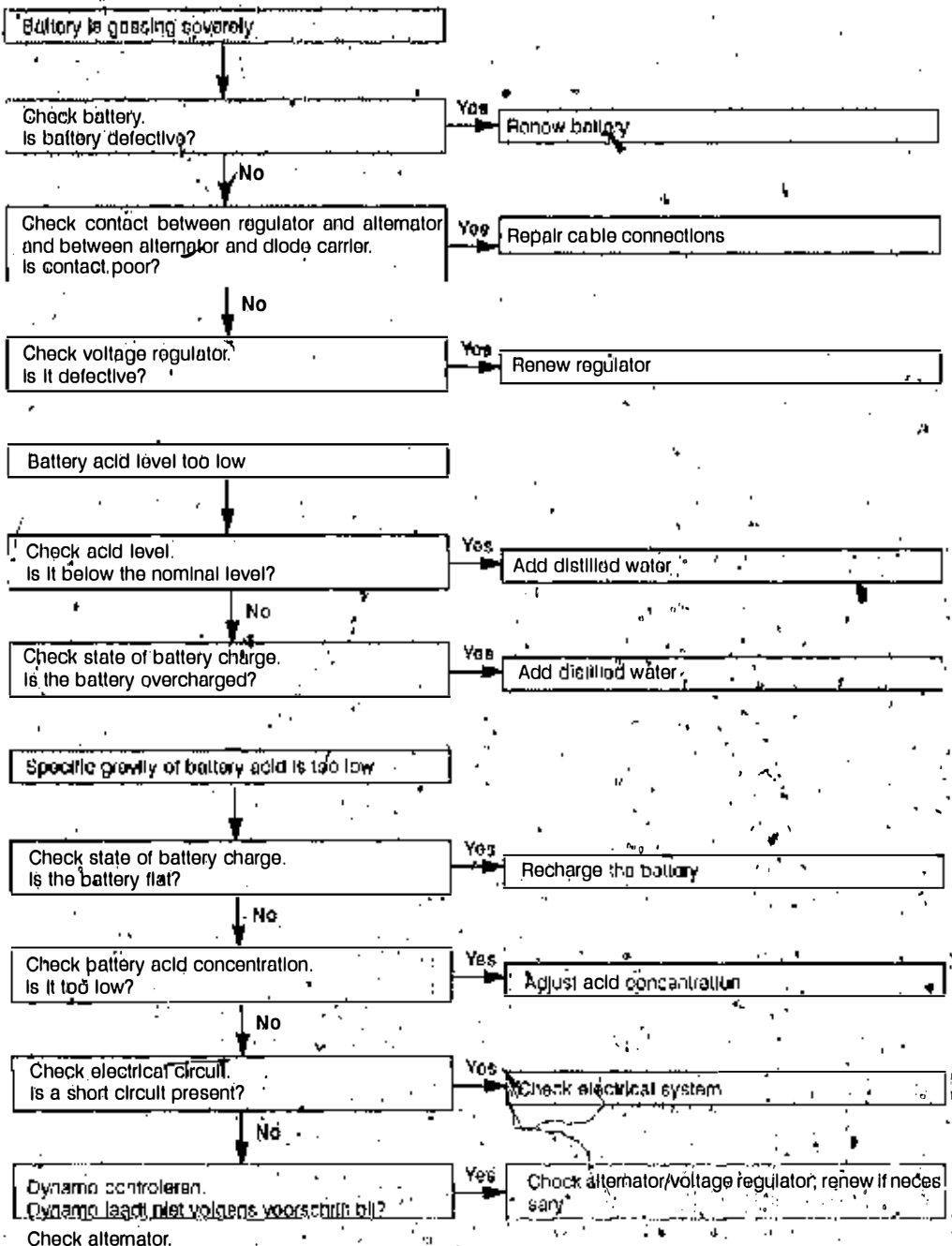

Check voltage regulator.
Is regulator defective?
Yes
Renew regulator
No
Check alternator.
Short circuit at positive diode in alternator?
Yes
Disconnect charge wire immediately (or else battery will become flat while motorcycle is at a standstill !). Repair the alternator.
No
Check carbon brushes.
Are carbon brushes worn?
Yes
Renew carbon brushes
No
Check rotor winding.
Corrosion layer on sliprings?
Yes
Repair alternator
No
Check rotor winding
interrupted?
Yes
Renew rotor

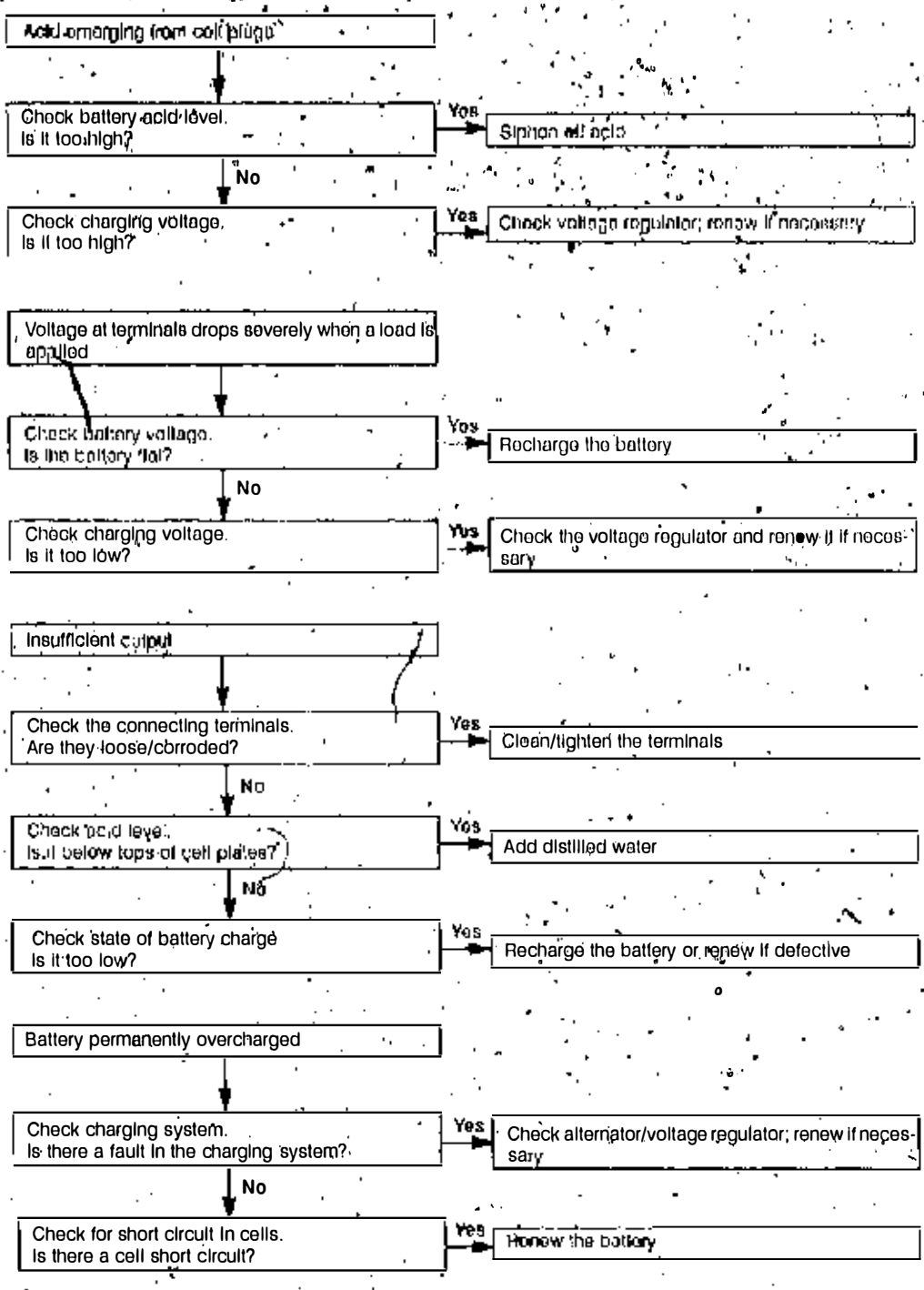
TROUBLESHOOTING ON STARTER MOTOR




Starter motor runs too slowly and does not turn the engine
Check battery voltage.
Is battery voltage too low?
Yes
Recharge or renew the battery
No
Check battery terminals.
Are the terminals loose or corroded?
Yes
Clean posts and terminals and tighten firmly
No
Check connections.
Are any connections loose?
Yes
Tighten connections
No
Check commutator.
Is commutator dirty?
Yes
Clean commutator
No
Check armature winding.
Is armature winding defective?
Yes
Repair the starter motor
Starter motor runs at high speed, but engine is not turned or turns only jerkily
Check drive pinion. Is it defective?
Is the engagement lever broken?
Yes
Repair starter motor
Starter pinion does not engage
Starter motor runs at high speed off-load.
Check drive pinion.
Is it very dirty?
Yes
Repair the starter motor

TROUBLESHOOTING ON BATTERY




Acid emerging from cell plugs
Check battery acid level.
Is it too high?
Yes
Siphon off acid
No
Check charging voltage.
Is it too high?
Yes
Check voltage regulator; renew if necessary
Voltage at terminals drops severely when a load is applied
Check battery voltage.
Is the battery flat?
Yes
Recharge the battery
No
Check charging voltage.
Is it too low?
Yes
Check the voltage regulator and renew it if necessary
Insufficient output
Check the connecting terminals.
Are they loose/corroded?
Yes
Clean/tighten the terminals
No
Check acid level.
Is it below tops of cell plates?
Yes
Add distilled water
No
Check state of battery charge
Is it too low?
Yes
Recharge the battery or renew if defective
Battery permanently overcharged
Check charging system.
Is there a fault in the charging system?
Yes
Check alternator/voltage regulator; renew if necessary
No
Check for short circuit in cells.
Is there a cell short circuit?
Yes
Renew the battery

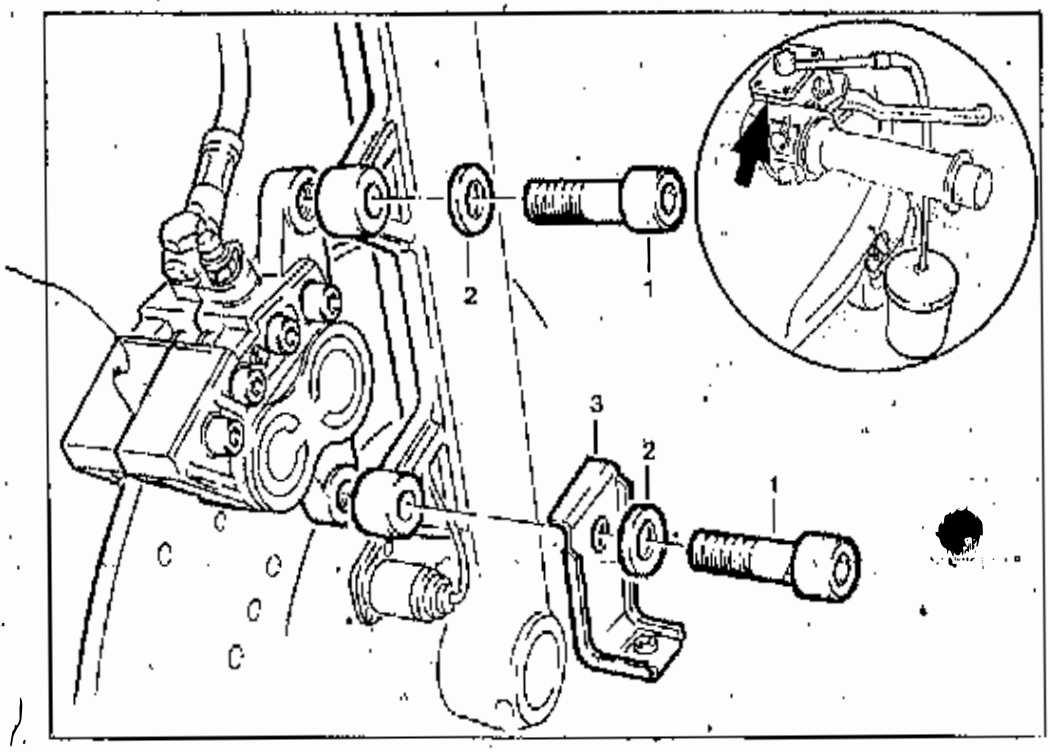
5. BRAKES

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REMOVING AND INSTALLING FRONT BRAKE (WITH ABS)

REMOVING BRAKE CALIPER

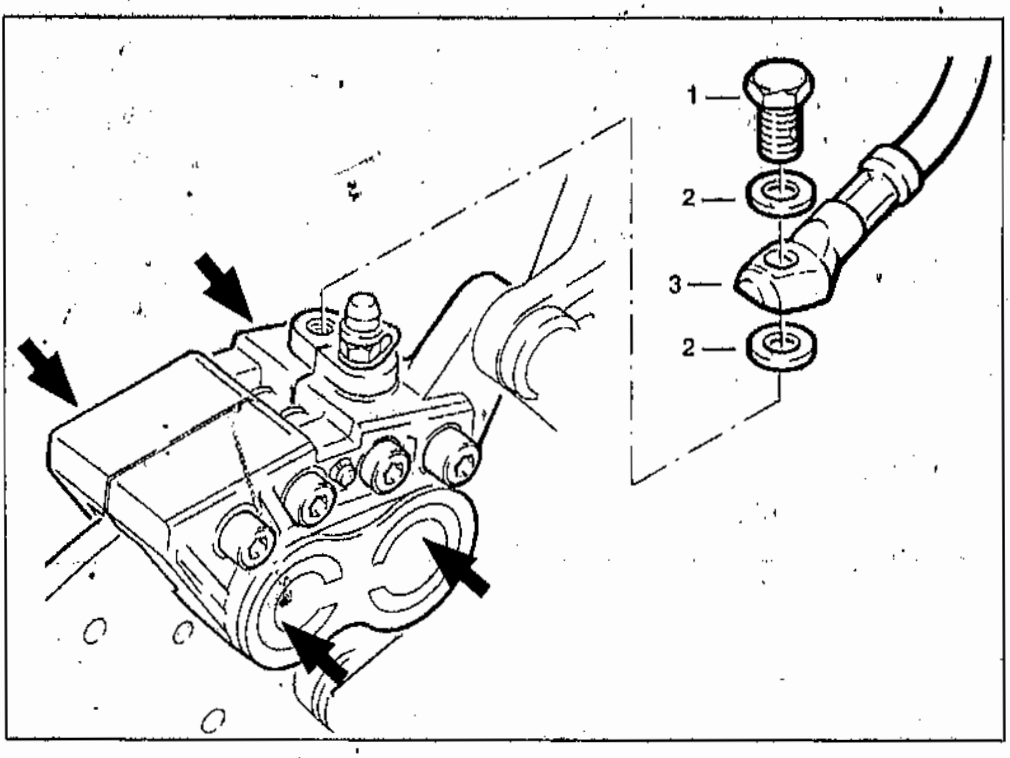
WARNING:

Brake fluid is highly corrosive.
Avoid all contact with the eyes, skin or clothing.
Never keep brake fluid in bottles that have contained drinks.
Use only specially marked vessels.
If brake fluid is accidentally swallowed, the victim must be seen by a physician without delay.

CAUTION:

Brake fluid will damage painted surfaces. Keep it away from all painted areas of the motorcycle.
Never re-use brake fluid after it has been drained or siphoned off. Dispose of I cordance with environmental protection laws.

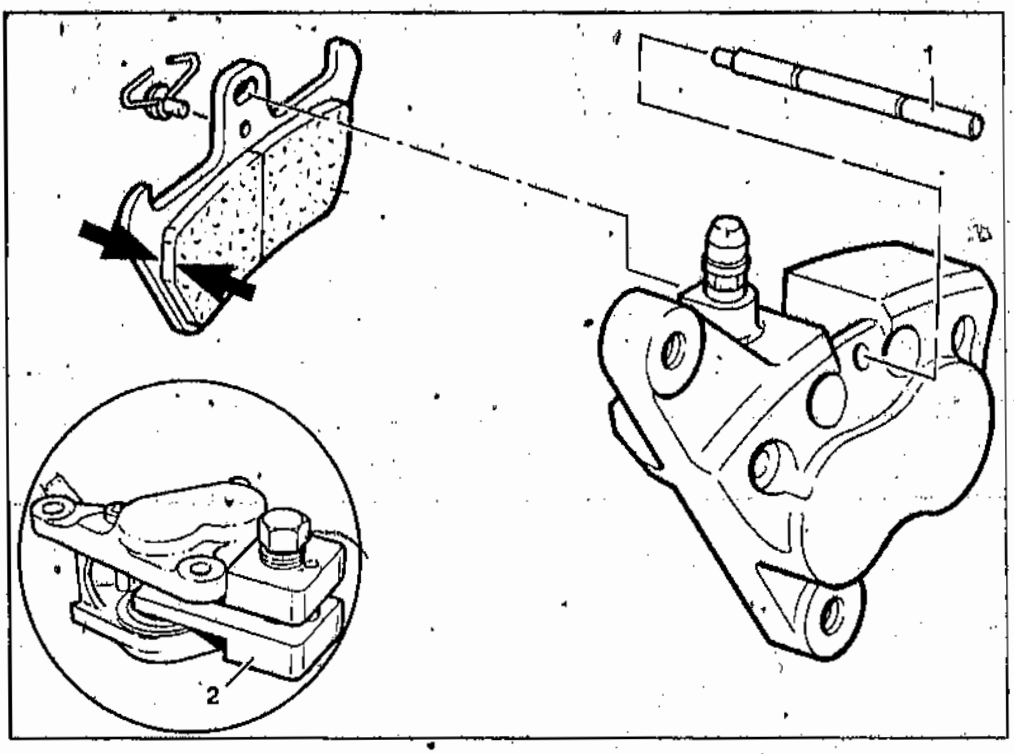
- Remove the front mudguard.
- Mask off the left/right brake caliper on the inside with adhesive tape.
- Take out the four retaining screws for the brake fluid reservoir cover.
- Turn the handlebar to the left and take off the cover.
- Take out the diaphragm.
- Screw on the Joma adapter (arrow) for the K1.
- Connect the brake fluid bleeding device, e.g. the Joma 3 L.
- Drain the front brake circuit with the device.
- Take out the 2 retaining screws with shims and retaining bracket (1/2/3) on the left/right brake caliper.



IMPORTANT:

Do not tilt the brake callpers when removing or installing them, or else the brake pads could be damaged.
Always perform the work steps in the order stated here.

- Take out the hollow screw with sealing rings (1/2) at the left/right brake caliper.
- Take off the left/right brake line (3).
- Carefully press the brake caliper inwards in a parallel movement (arrows).
- Guide the brake caliper to the rear, past the retaining lugs on the fork slider tube.
- Carefully press the brake caliper outwards in a parallel movement (arrows).
- Take off the brake caliper with great care.



REMOVING AND INSTALLING FRONT BRAKE PADS

Tightening torque:
Brake caliper to fork slider tube 32 ± 2 Nm

NOTE:

When removing:
Only detach the brake caliper.
Do not loosen the brake line.

- Remove the brake caliper.
- Drive out the retaining pin (1).
- Take the brake pads out downwards.

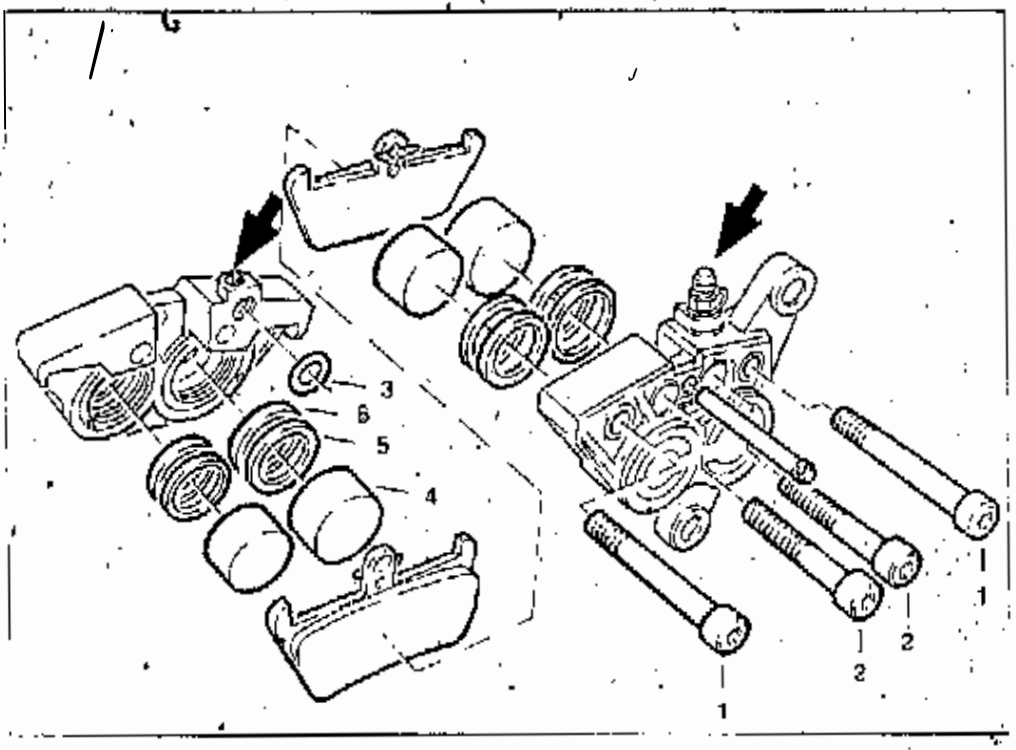
WARNING:
Do not fall short of the minimum of brake pad thickness (arrows).
Brake pads remove and install only by pairs.

Minimum brake pad thickness (on backplate): *1.5 mm*

- Install in the opposite order of work.

NOTE:

When installing:
Press the brake pistons fully back with piston resetting tool BMW No. 34 1 500 (2).

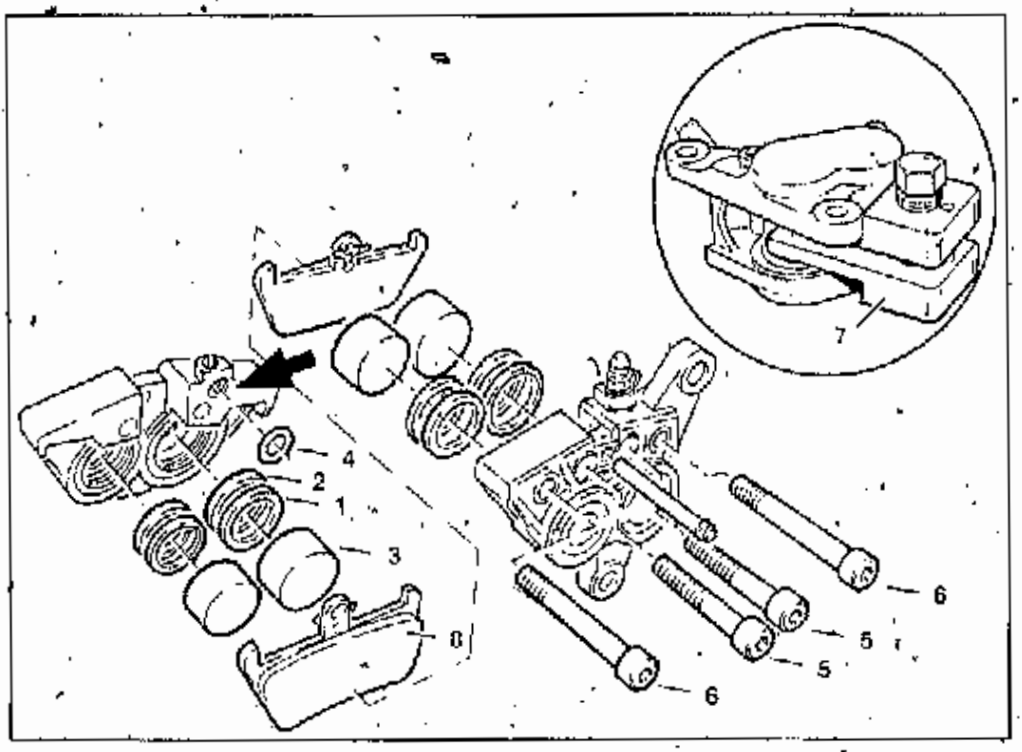


STRIPPING FRONT BRAKE CALIPER

- Remove the brake caliper.
- Remove the brake pads.
- Take the 4 retaining screws (1/2) out of the brake caliper.

> **NOTE:**
>
> The retaining screws (1) are of the micro-encapsulated type.
> Recut the tapped hole with a suitable thread tap, and blow out to remove swarf.
> Clean the screw with a steel wire brush.

- Separate the two halves of the brake caliper.
- Take the O-ring (3) out of the connecting bore.
- Seal the bleed screw and the brake line union (arrows).
- Hold a cloth over the brake pistons.
- Carefully force out the brake pistons (4) with a compressed air gun or line applied to the connecting bores.
- Take the 2 sealing rings (5/6) out of the left/right brake piston bores.
- Inspect the pistons for hairline cracks, score marks or other signs of damage.



ASSEMBLING FRONT BRAKE CALIPER

IMPORTANT

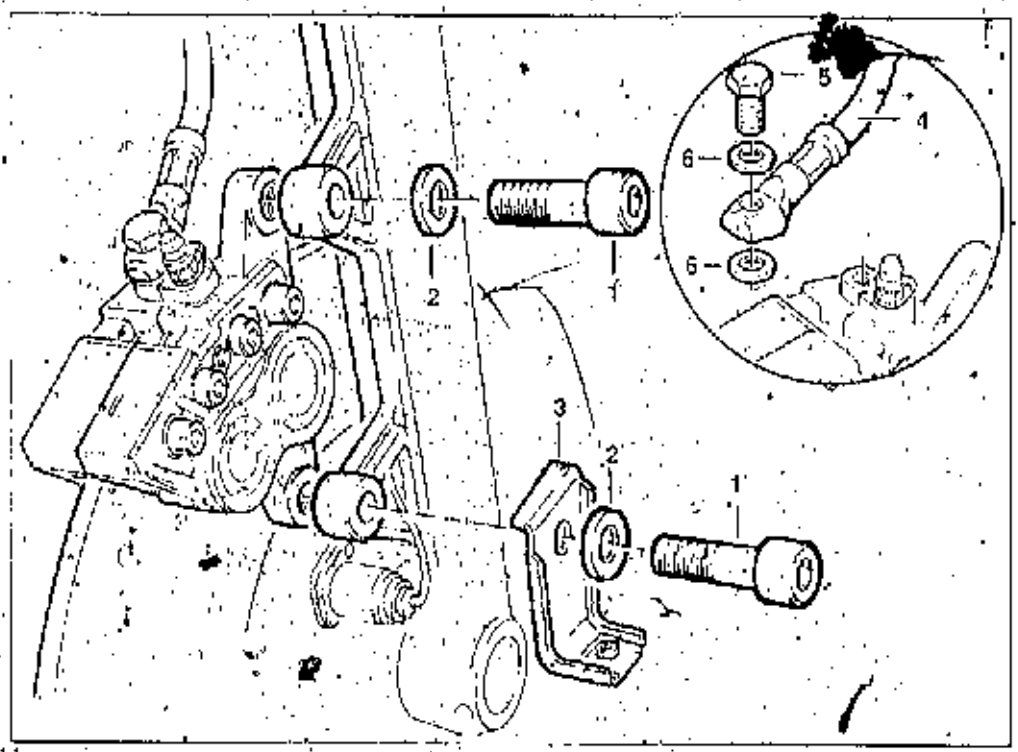
It is easy to tilt the brake pistons. Install them with great care.
Rub a thin layer of brake fluid on to the brake pistons and sealing rings.

- Insert two new sealing rings (1/2) into the left/right brake piston bores.
- Press in the left/right brake pistons with great care, avoiding the use of force.
- Insert a new O-ring (4) into the connecting bore (arrow).
- Fasten the two halves of the brake caliper together with 2 retaining screws (5).
- Tighten the retaining screws to the specified torque.
- Clean retaining screws (6), apply LOCTITE 273 and screw them in.

Tightening torques:

Outer connecting screws	*10 + 5 Nm*
Inner connecting screws	*30 + 5 Nm*

- Press the brake pistons fully back with piston resetting device BMW No. 34 1 500 (7).
- Install the brake pads (8).



INSTALLING FRONT BRAKE CALIPER

IMPORTANT

Do not tilt the brake calipers when removing or installing them, or else the brake pads could be damaged.

- Carefully slide the brake caliper over the brake disc.
- Secure the brake caliper to the fork slider tube with 2 retaining screws, shims and retaining bracket (1/2/3).
- Screw brake line (4) to the brake caliper with the hollow screw and sealing rings (5/6).

Tightening torques

Brake caliper to fork slider bracket [illegible]

Brake pipe to brake caliper [illegible]

- Install the front wheel.

IMPORTANT

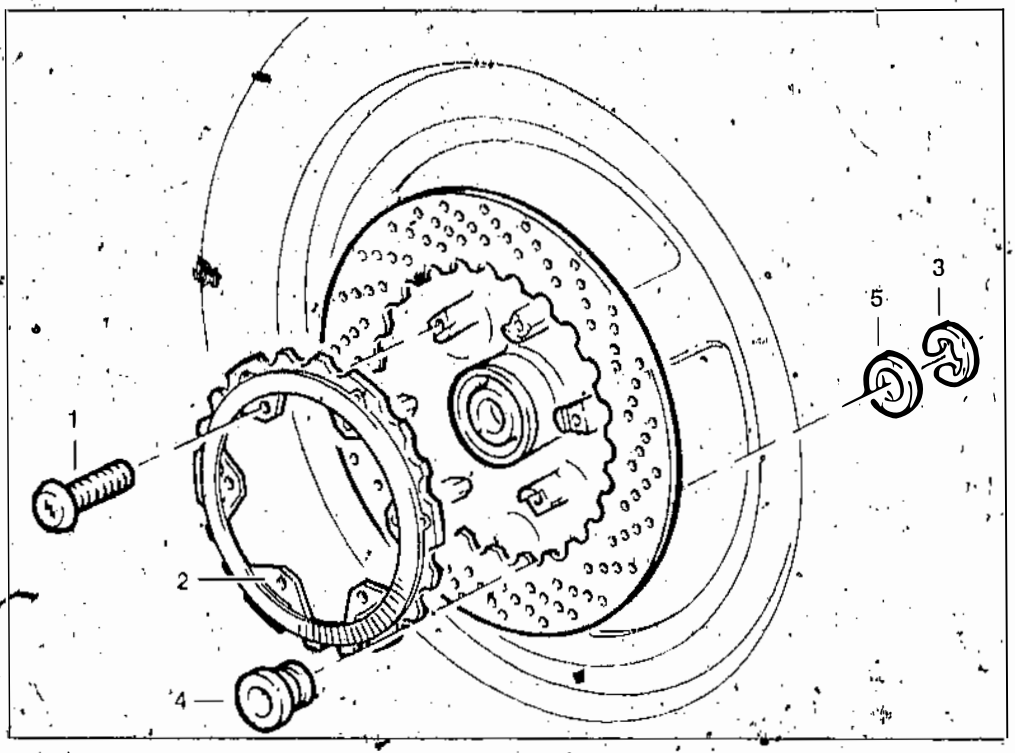
The brake system must be bled after [illegible]

NOTE

Filling and bleeding the brake system is similar to changing the brake fluid.

Tightening torque

Bleed screw 7 + 1 Nm



REMOVING AND INSTALLING BRAKE DISCS

IMPORTANT:
Do not tilt the brake calipers when removing or installing them, or else the brake pads could be damaged.
Never operate the handbrake lever when the front wheel is removed.

- Remove the front wheel.
- Take the 5 retaining screws (1) out of the left/right front brake disc holder.
- Take off the brake disc holder (2) with brake disc.
- Remove the lock washers (3) from the brake discs.
- Take off the rollers/shims (4/5).
- Separate the brake disc from its holder.

IMPORTANT:
Only exchange the brake disc/pulse generating ring as a complete unit.
When renewing, determine and mark the point of minimum axial runout (see Page 5-18).

- Install in the opposite order of work.

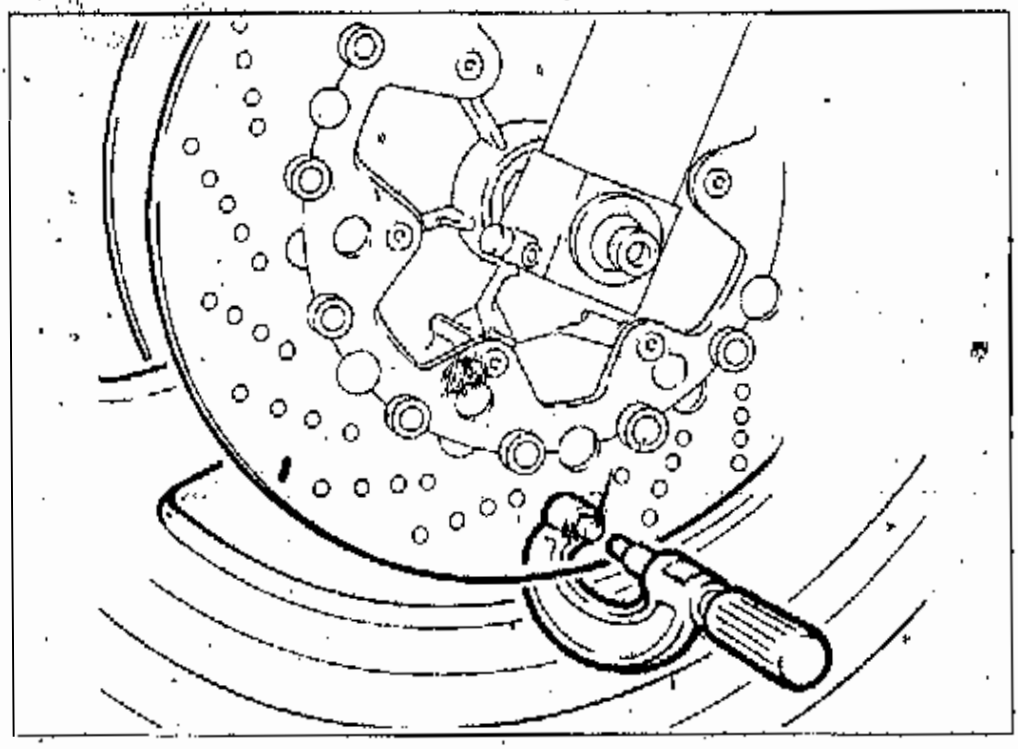
NOTE:
When installing, degrease the brake discs carefully before they are installed.
Do not tilt the brake calipers when installing, or the brake pads may be damaged.

IMPORTANT:
Check sensor gap and adjust if necessary.
Always maintain the stated check dimensions.

- Move the mark to below the sensor surface.
- Check the maximum sensor gap dimension with a feeler gauge, adjust with shims, if necessary.

Tightening torque:
Brake disc to brake disc holder . . . 22 ± 3 Nm

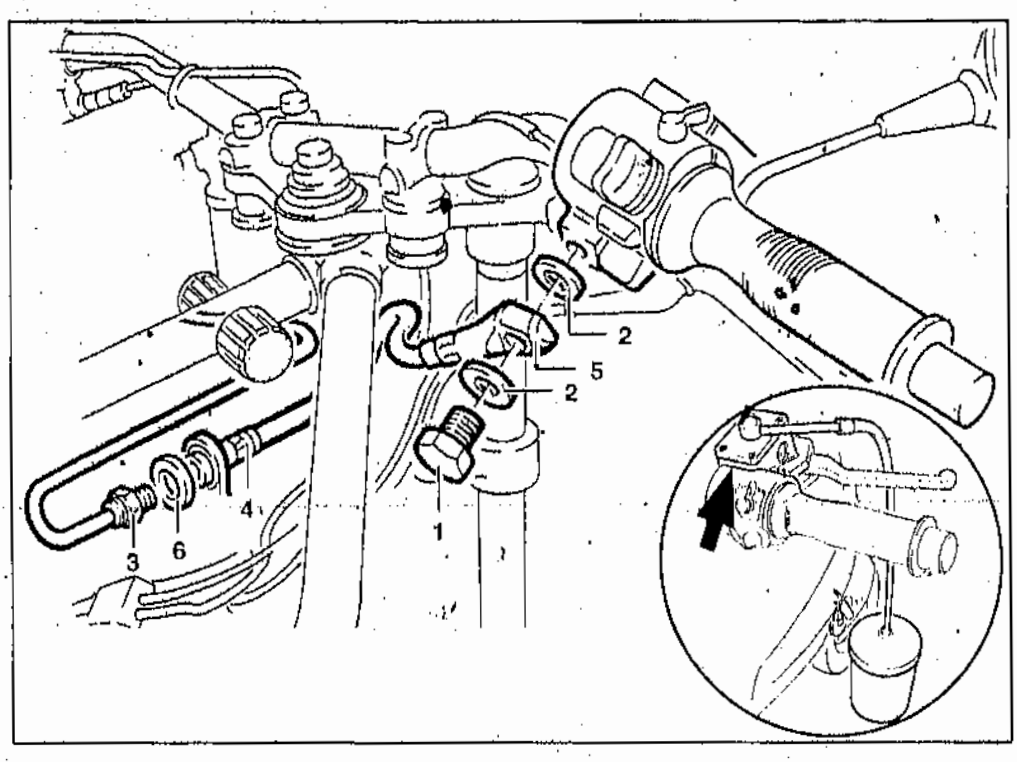
Gap between sensor face and pulse generating ring:
Maximum gap . . . 0.50 - 0.55 mm



CHECKING THICKNESS OF BRAKE DISC

- Place the motorcycle on its centre stand
- Measure brake disc thickness with a micrometer at various points on the disc.
- Renew the brake disc if the minimum thickness is not present

Minimum thickness of brake disc: *4.5 mm*



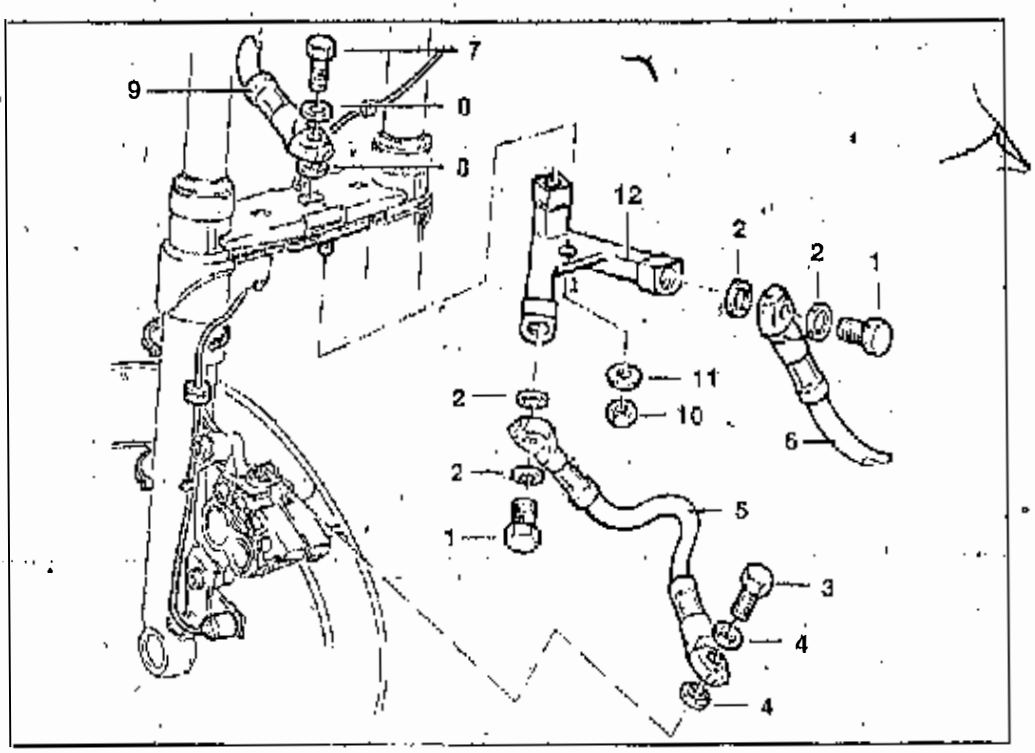
REMOVING AND INSTALLING FRONT BRAKE LINE/DISTRIBUTOR (WITH ABS)

- Take off the dualseat cover/dualseat.
- Remove the left/right kneepad
- Remove the left/right inner fairing cover.
- Separate the plug connector for the ABS plug/auxiliary instruments.
- Remove the front mudguard.
- Remove the fuel tank pad.
- Take off the fuel tank.

WARNING:

Brake fluid attacks painted surfaces. Do not allow it to contact painted parts of the motorcycle.
If brake fluid is drained off, trap it in a suitable vessel.

- Screw Joma adapter No. 0 80 W (arrow) to the brake fluid reservoir.
- Drain the brake circuit with a suitable bleeding device, e.g. Joma 3 L.
- Remove the hollow screw with seals (1/2) at the master cylinder.
- Remove the threaded union (3) for the ABS line at the retaining bracket.
- Pull the connecting piece/brake line (4/5) out of the rubber grommet (6).
- Take off the brake line.



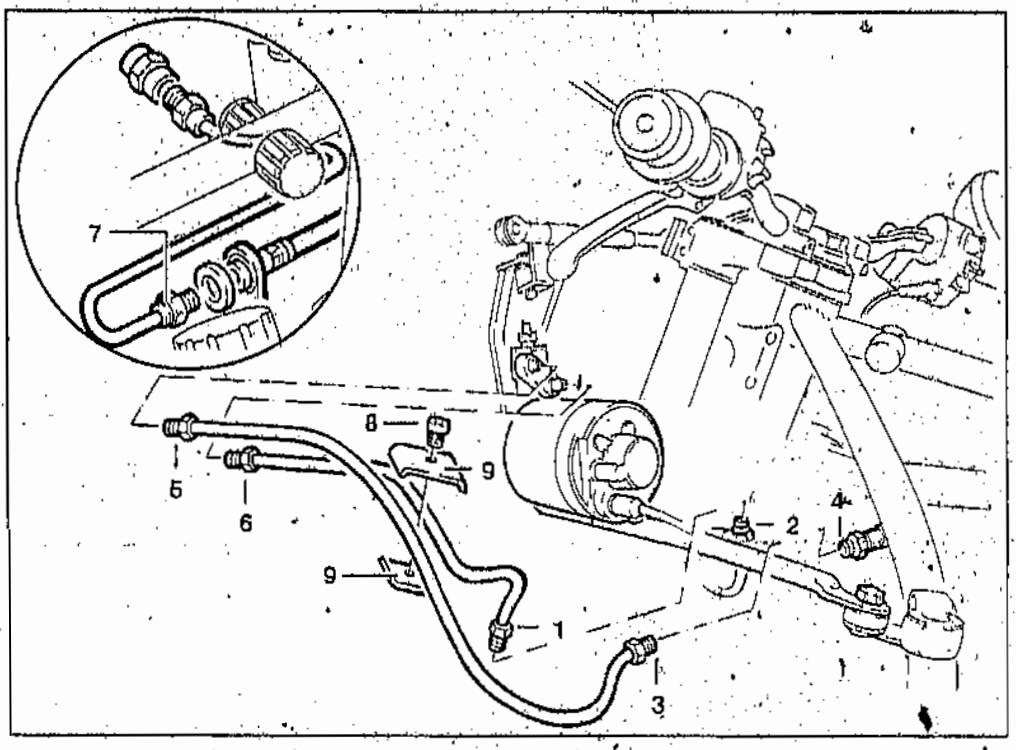
- Remove the 2 hollow screws with seals (1/2) at the distributor (12) under the fork bridge.
- Remove the hollow screw with seals (3/4) at the left/right brake caliper.
- Take off the left/right brake lines (5/6).
- Remove the hollow screw with seals (7/8) at the brake line from the distributor (12) on the fork bridge.
- Unscrew the threaded union for the brake line at the pressure modulator holder.
- Pull the brake line connecting piece out of the rubber grommet.
- Take off the brake line (9).
- Unscrew the retaining nut with washer (10/11) at the distributor pipe.
- Pull the distributor (12) downwards out of the fork bridge.
- Install in the opposite order of work.

WARNING:
The brake system must always be bled after refilling.

Tightening torques:

Distributor to fork bridge	*17 ± 2 Nm*
Brake hose to distributor	*11 ± 1 Nm*
Brake hose to caliper	*7 ± 1 Nm*
Brake hose to master cylinder	*11 ± 1 Nm*
Bleed screw	*7 ± 1 Nm*

- Install the fuel tank.
- Secure the fuel tank pad in position.
- Install the front mudguard.
- Make the plug connections for the ABS plug/auxiliary instruments.
- Screw on the left/right inner fairing covers.
- Screw on the left/right kneepads.
- Attach the dualseat/dualseat cover.



REMOVING AND INSTALLING BRAKE LINE FOR FRONT PRESSURE MODULATOR

- Take off the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Take off the left/right inner fairing cover.
- Separate the plug connections for the ABS plug/auxiliary instruments.
- Remove the fuel tank pad.
- Take off the fuel tank.

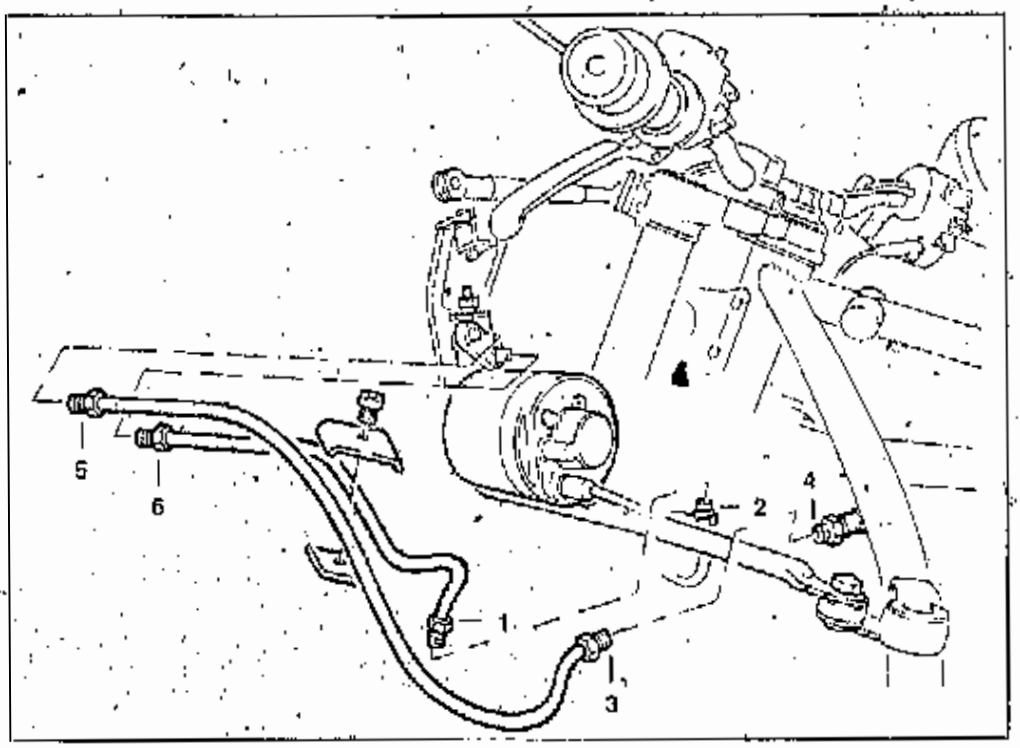
WARNING:
Brake fluid attacks painted surfaces. Do not allow it to contact painted parts of the motorcycle.
If brake fluid is drained off, trap it is a suitable vessel.

- Drain the brake circuit with a suitable bleeding device, e.g. Joma 3 L.
- Unscrew the threaded union (1) for the ABS line at the connecting piece from the retaining angle.
- Pull the connecting piece out of the grommet (2).
- Unscrew the threaded union (3) for the ABS line at the connecting piece from the holder.
- Pull the holder out of the grommet (4).
- Unscrew the threaded union (5) at the pressure modulator from the brake feed line.
- Unscrew the threaded union (6) at the pressure modulator from the brake return line.
- Unscrew threaded union (7).
- Take off the brake lines.
- Take out the retaining screw (8) and detach the brake line holder (9).
- Install in the opposite order of work.

WARNING:
The brake system/pressure modulator must always be bled after refilling.

Tightening torque:

Threaded unions for ABS lines	*7.3 Nm*
Bleed screw	*7 ± 1 Nm*



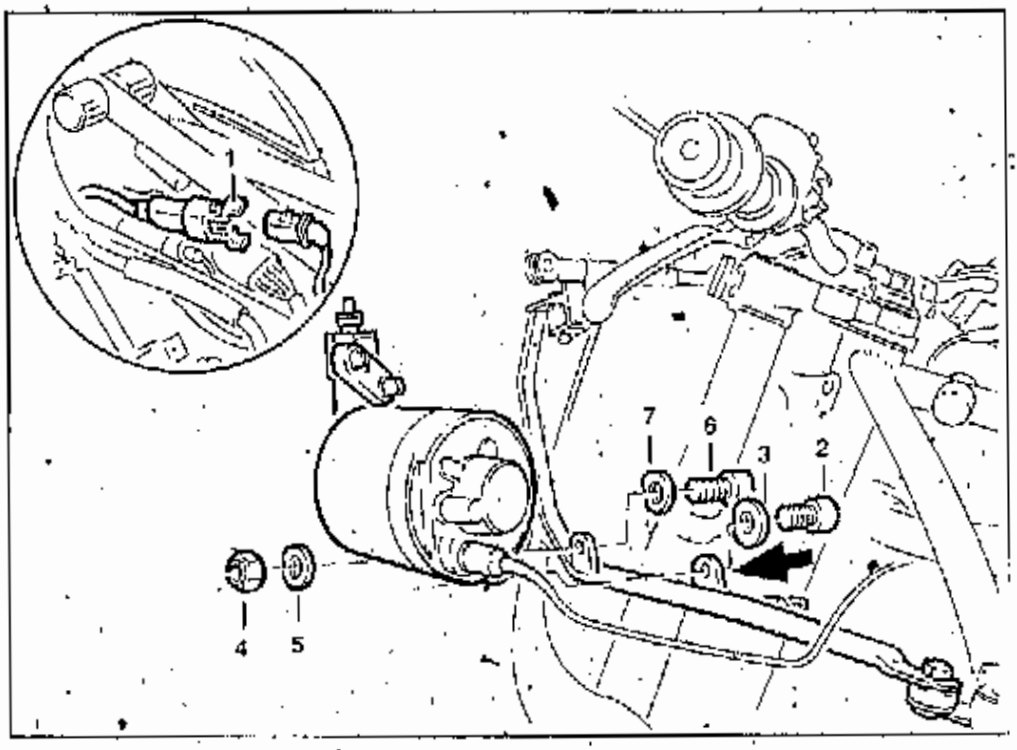
REMOVING AND INSTALLING FRONT PRESSURE MODULATOR

- Take off the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Take off the left/right inner fairing cover.
- Separate the plug connections for the ABS plug/auxillary instruments.
- Remove the engine cover.
- Remove the left/right centre section of the fairing.
- Remove the radiator surround.
- Remove the front mudguard.
- Remove the fuel tank pad.
- Take off the fuel tank.

WARNING:

Brake fluid attacks painted surfaces. Do not allow it to contact painted parts of the motorcycle.
If brake fluid is drained off, trap it is a suitable vessel.

- Drain the brake circuit with a suitable bleeding device, e.g. Joma 3 L.
- Unscrew the threaded union (1) for the ABS line at the connecting piece from the retaining angle.
- Pull the connecting piece out of the grommet (2).
- Unscrew the threaded union (3) for the ABS feed line at the intermediate section of the connecting piece (4).
- Unscrew the threaded union (5) at the pressure modulator from the brake feed line.
- Unscrew the threaded union (6) at the pressure modulator from the brake return line.
- Take off the brake lines



- Separate the plug connector (1) from the pressure modulator connecting line.
- Take out the retaining screw with lock washer (2/3) at the press modulator. Note the earth (ground) cable (arrow) for the pressure modulator.
- Unscrew the retaining nut with lock washer (4/5) at the pressure modulator.
- Take out the retaining screw with lock washer (6/7).
- Install in the opposite order of work.

NOTE:
Make sure that the wire for the pressure modulator connecting line is run correctly.

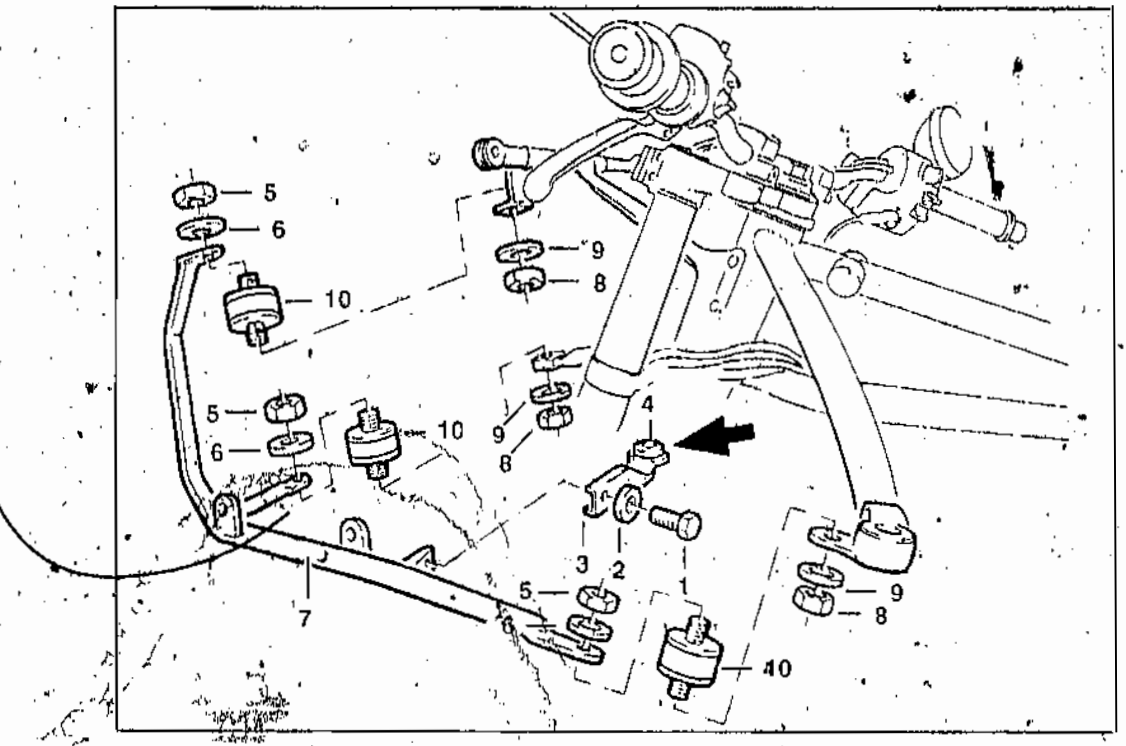
Tightening torque:

Pressure modulator to holder	*17 ± 1 Nm*
Threaded unions for ABS lines	*7.3 Nm*

IMPORTANT:
Always bleed the brake system/pressure modulator after refilling.

Tightening torque

Bleed screw	*7 ± 1 Nm*



DETACHING AND ATTACHING HOLDER FOR FRONT PRESSURE MODULATOR

Tightening torque	
Nut to rubber mounting	*3.8 Nm*
Bleed screw	*7 ± 1 Nm*

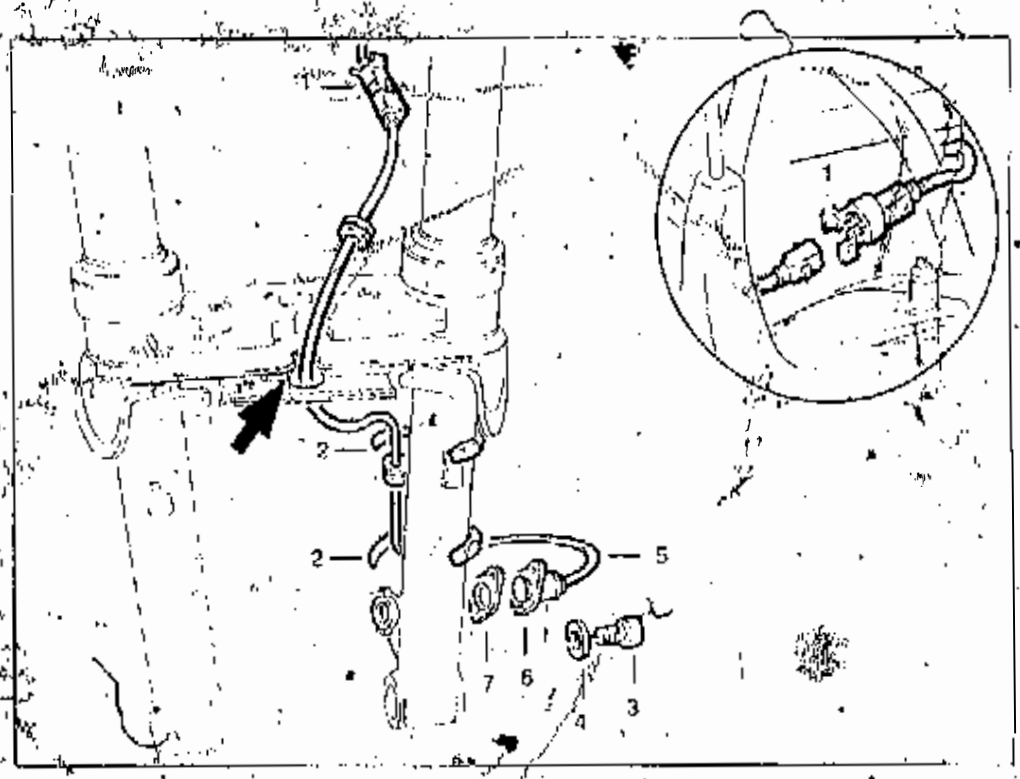
- Remove the pressure modulator.
- Attach the coolant header tank to the fairing holder.
- Take out the retaining screw with lock washer (1/2) at the holder.
- Take off the holder with rubber grommet (3/4).
- Unscrew the 3 retaining nuts with lock washers (5/6) at the holder.
- Take off the holder (7).
- Unscrew the 3 retaining nuts with lock washers (8/9) at the rubber mounting.
- Take off the rubber mounting (10).
- Install in the opposite order of work.
- Halter/Gummitülle (3/4) abnehmen.

NOTE:

When attaching, the grommet should be installed with the broader bead uppermost.

IMPORTANT:

Always bleed the brake system/pressure modulator after refilling.



REMOVING AND INSTALLING FRONT ABS SENSOR

- Remove the left wheel guard panel.
- Remove the left wheel inner fairing cover.
- Remove the front mudguard.
- Separate the plug connection (1) for the ABS sensor.
- Open the 2 cable straps at the sensor cable bridge (arrow).
- Open the (4) cable straps (2) at the front fork oil tryout fork slider tube.
- Take out the 2 torx screws with lock washers (3/4).
- Pull the sensor cable (5) out of the rubber sleeve (arrow) on the fork bridge.
- Take off the sensor with spacing washers (6/7).
- Install in the opposite order of work.

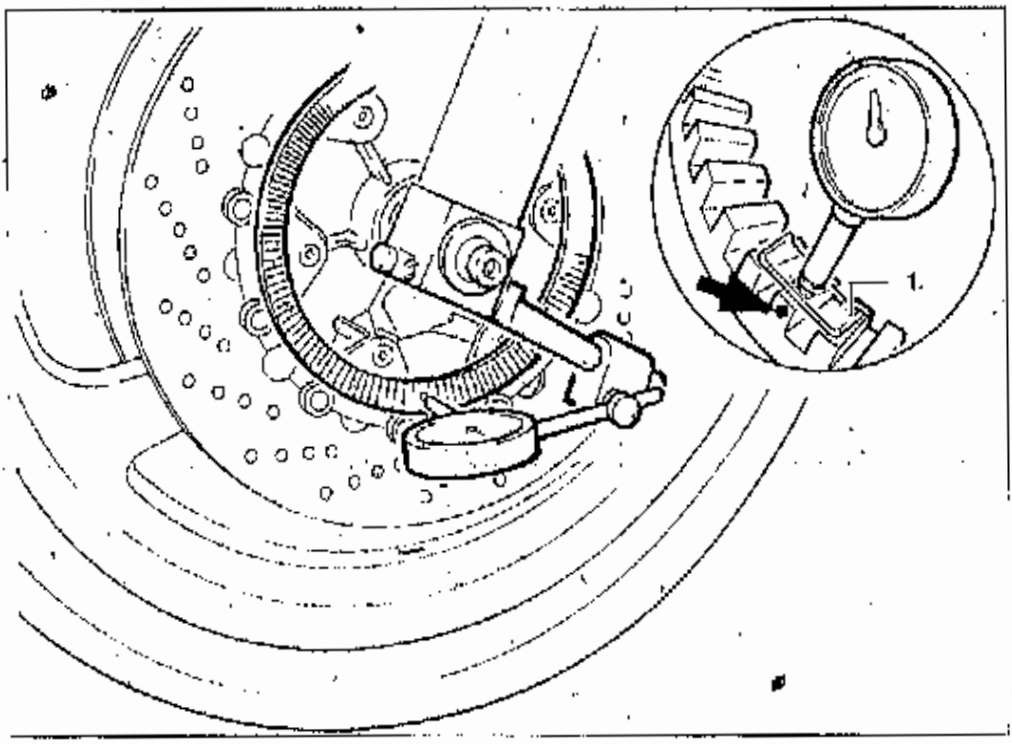
Note:
When installing, run the cable correctly and note correct positions of cable straps.

Tightening torque
Torx screws ... *Nm*

IMPORTANT:
Check gap between sensor face and pulse generating ring and adjust if necessary. Always keep to the stated distance.

- Move the mark (arrow) opposite the sensor.
- Check the maximum sensor gap distance with a feeler gauge.
- Adjust the max. gap with shims if necessary.

Gap between sensor face and pulse generating ring
Maximum ... *0.50 0.55 mm*



CHECKING AND ADJUSTING GAP BETWEEN SENSOR AND FRONT PULSE GENERATING RING

IMPORTANT:

Always check and adjust the sensor gap after
- removing and installing the front wheel
- detaching and attaching the sensor
- detaching and attaching the brake disc holder

Always maintain the stated distance

NOTE:

The mark (arrow) on the edge of the pulse generating ring is the maximum distance. If no mark is visible, determine the maximum distance.
Make sure that the measured surface is always on two teeth of the pulse generating ring.

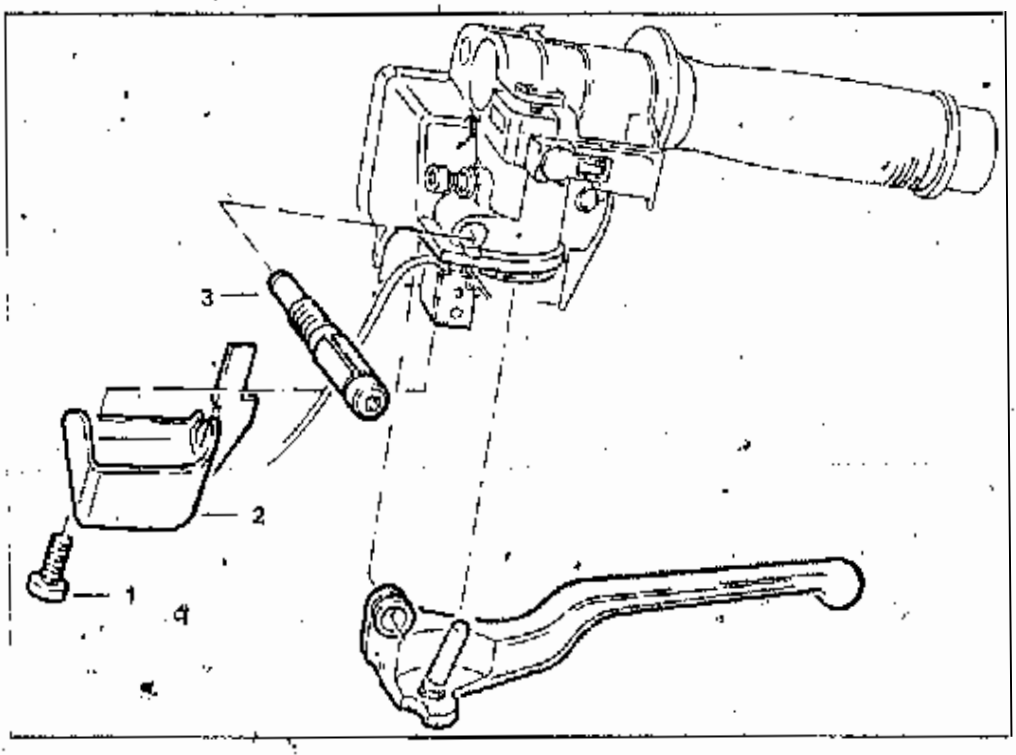
IMPORTANT:

Measure axial runout if a new pulse generating ring is installed. Mark the point of minimum runout.

- Screw the measuring shoe, BMW No. 34 2 510 (1) to the dial gauge.
- Offer up the measuring shoe to the impuls wheel, tension the measuring gauge sensor slightly and zero the measuring gauge
- Turn the front wheel slowly
- Measure axial runout around the entire circumference of the impuls wheel
- Mark the point on the impuls wheel producing the lowest reading on the measuring gauge with a permanent marker (oil paint). The mark on the impuls wheel is the point at which the sensor gap is widest
- Move the mark to below the sensor surface.
- Check the maximum sensor gap dimension with a feeler gauge, adjust with shims if necessary.

Gap between sensor face and pulse generating ring	
Maximum	*0.50 0.55 mm*

Tightening torque	
Torx screws	*4 Nm*



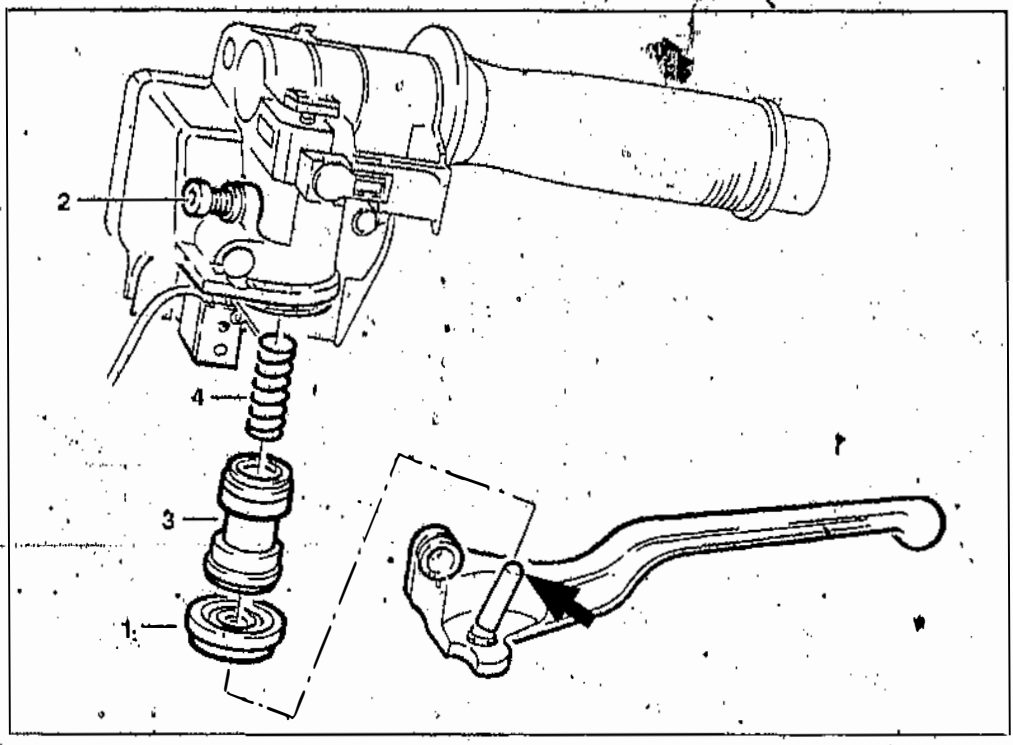
REMOVING AND INSTALLING FRONT MASTER CYLINDER

WARNING:
Brake fluid attacks painted surfaces. Do not allow it to contact painted parts of the motorcycle.
If brake fluid is drained off, trap it in a suitable vessel.

- Drain the brake circuit with a suitable bleeding device, e.g. Joma 3 L.
- Take the retaining screw (1) out of the handbrake lever cover.
- Take off the cover (2).

NOTE:
The handbrake lever retaining screw is secured with TUFLOK BLUE and can be used more than once. The screw/tapped hole do not have to be cleaned.

- Take out the brake lever retaining screw (3).
- Take out the brake lever.



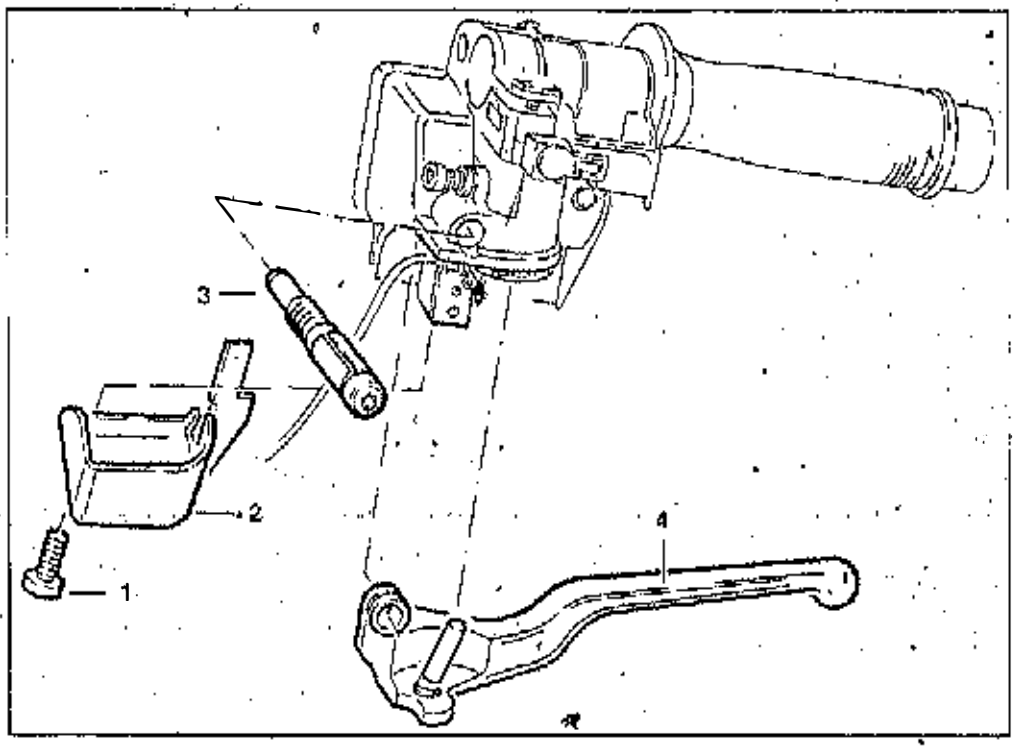
- Carefully pull the sealing sleeve (1) off the master cylinder.

WARNING:
There is a spring acting on the piston.

- Press back the piston in the master cylinder barrel.
- Slacken off the cylinder retaining screw (2).
- Carefully relieve the load on the piston (3) and take it out of the housing with the coil spring (4).
- Check the brake cylinder and sealing rings for damage and renew if necessary.
- Install in the opposite order of work.

NOTE:
When installing, the brake cylinder and sealing rings must only be renewed as a single unit.
Rub a thin layer of brake fluid on to the sealing rings.
Install the brake cylinder with the sealing lips facing the coil spring.
It is easy to tilt the brake cylinder. Take great care when installing.
Apply a small amount of RETINAX A grease to the brake cylinder thrust pin (arrow) on the brake lever.
Make sure that the sealing sleeve is correctly seated.

IMPORTANT:
Always bleed the brake circuit after it has been opened or refilled.

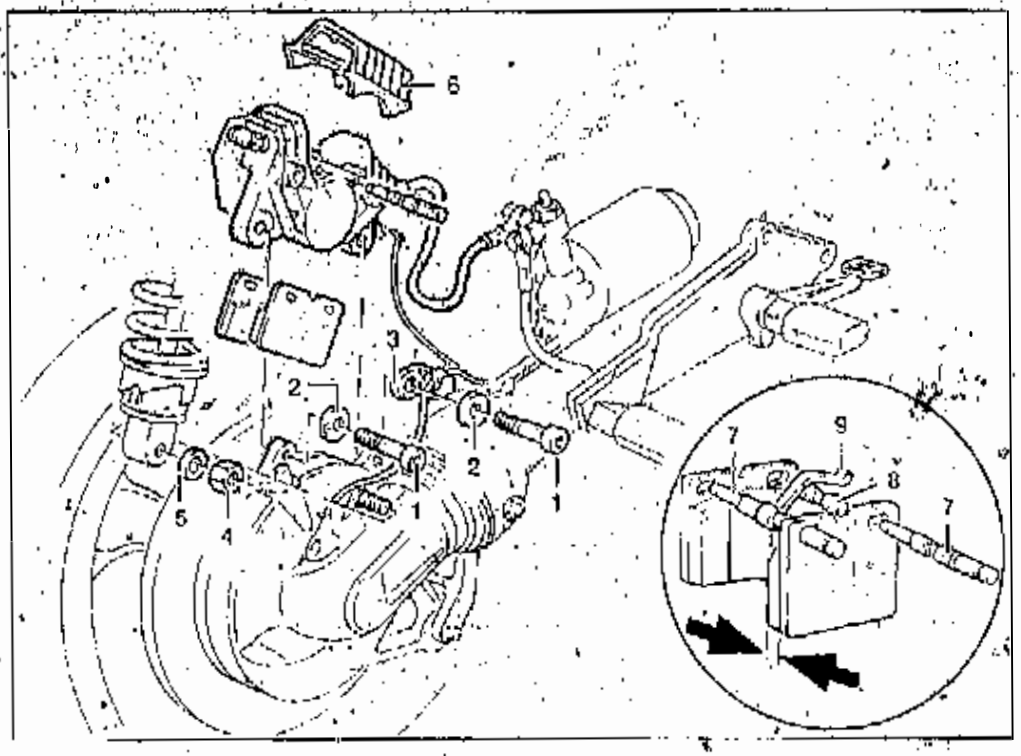


REMOVING AND INSTALLING HANDBRAKE LEVER

- Take the retaining screw (1) out of the handbrake lever cover.
- Take off the cover.

> **NOTE:**
> The handbrake lever retaining screw (3) is secured with TUFLOK BLUE and can be used more than once. The screw/tapped hole do not have to be cleaned.

- Take out the brake lever retaining screw (3).
- Take out the brake lever (4).
- Install in the opposite order of work.



REMOVING AND INSTALLING REAR BRAKE (WITH ABS)

REMOVING AND INSTALLING REAR BRAKE PADS

- Take out the 2 retaining screws with washers and retaining bracket at the brake caliper.
- Unscrew the retaining nut with washer (4/5) at the spring strut
- Pull the spring strut sideways off the stud and push to the rear.
- Take off the brake caliper carefully.
- Remove the protective cap (6).
- Carefully drive the 2 retaining pins (7) out from the wheel side
- Take out the clamp pin and curved spring (8/9).
- Remove the pads downwards

WARNING:
Renew pads if the minimum thickness (arrows) is not present.
Always renew brake pads in pairs.

Minimum brake pad thickness including backplate 1.5 mm

- Install in the opposite order of work

Tightening torque

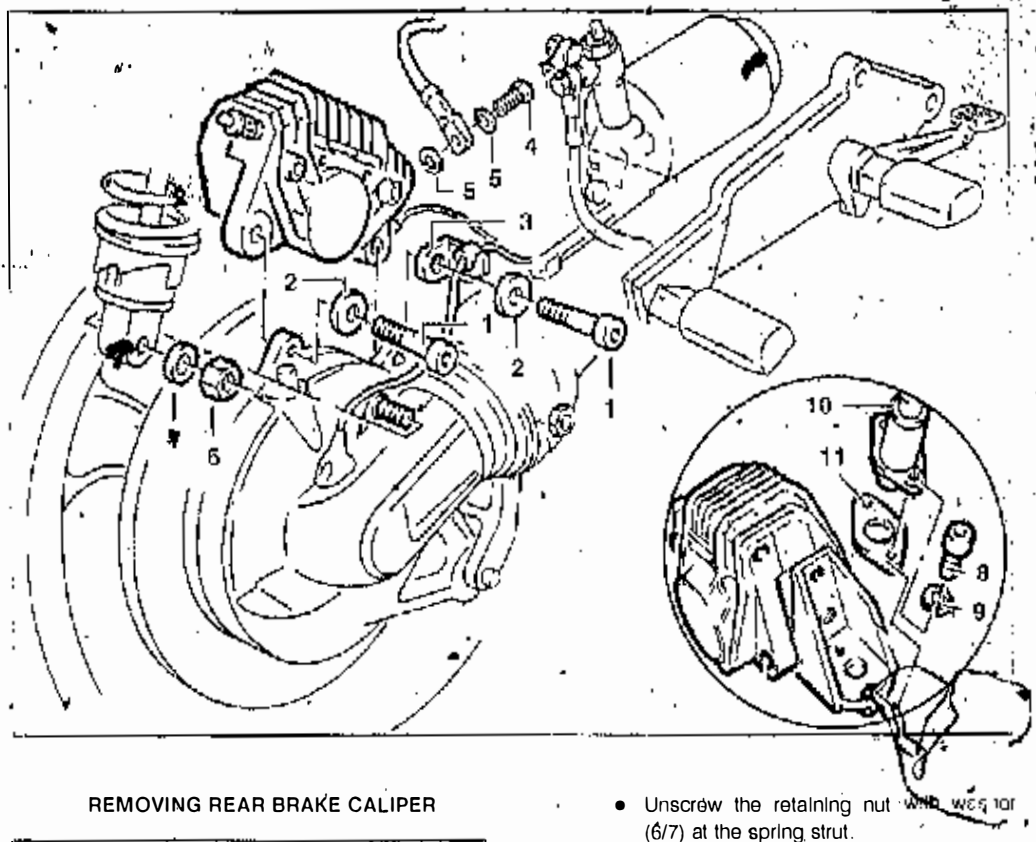
Spring strut to rear wheel drive	51 ... 6 Nm
Brake caliper to rear wheel drive	32 ... 2 Nm

IMPORTANT:
Whenever the brake caliper is removed and installed, check ABS sensor gap and adjust if necessary.
Always keep to the stated distance.

- Move the mark to below the sensor surface
- Check the maximum sensor gap dimension with a feeler gauge, adjust with shims if necessary

Gap between sensor face and pulse generating ring:
Maximum 0.60 - 0.65 mm

Tightening torque
Torx screws 5 Nm



REMOVING REAR BRAKE CALIPER

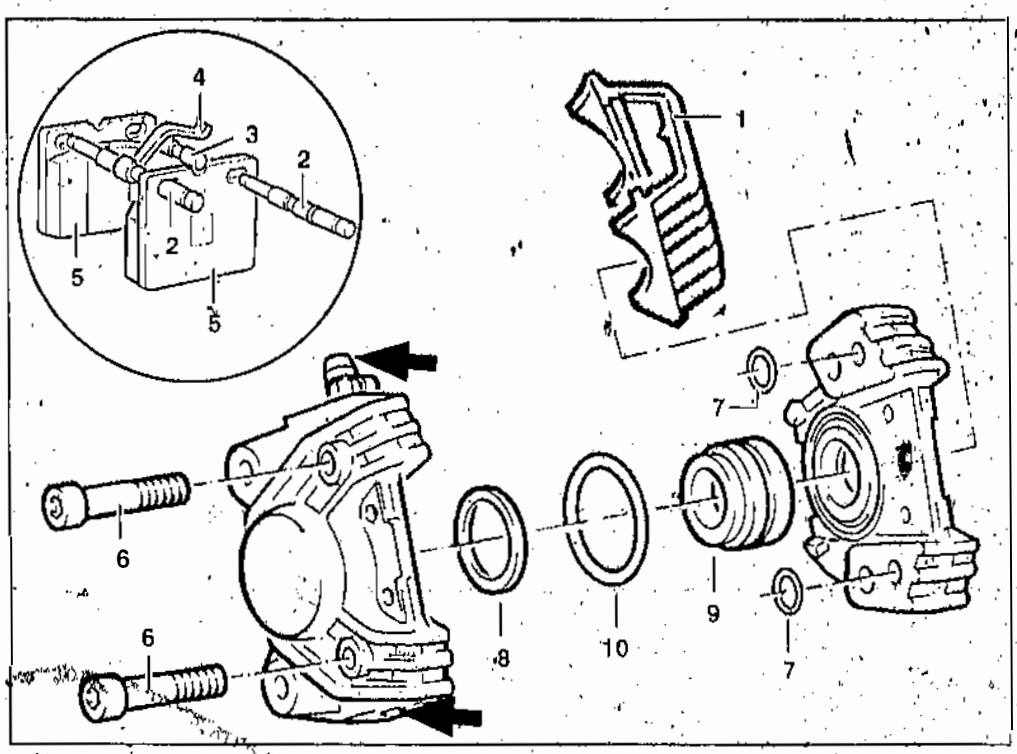
WARNING:

Brake fluid is highly corrosive.
Avoid all contact with the eyes, skin or clothing.
Never keep brake fluid in bottles that have contained drinks.
Use only specially marked vessels.
If brake fluid is accidentally swallowed, the victim must be seen by a physician without delay.

CAUTION:

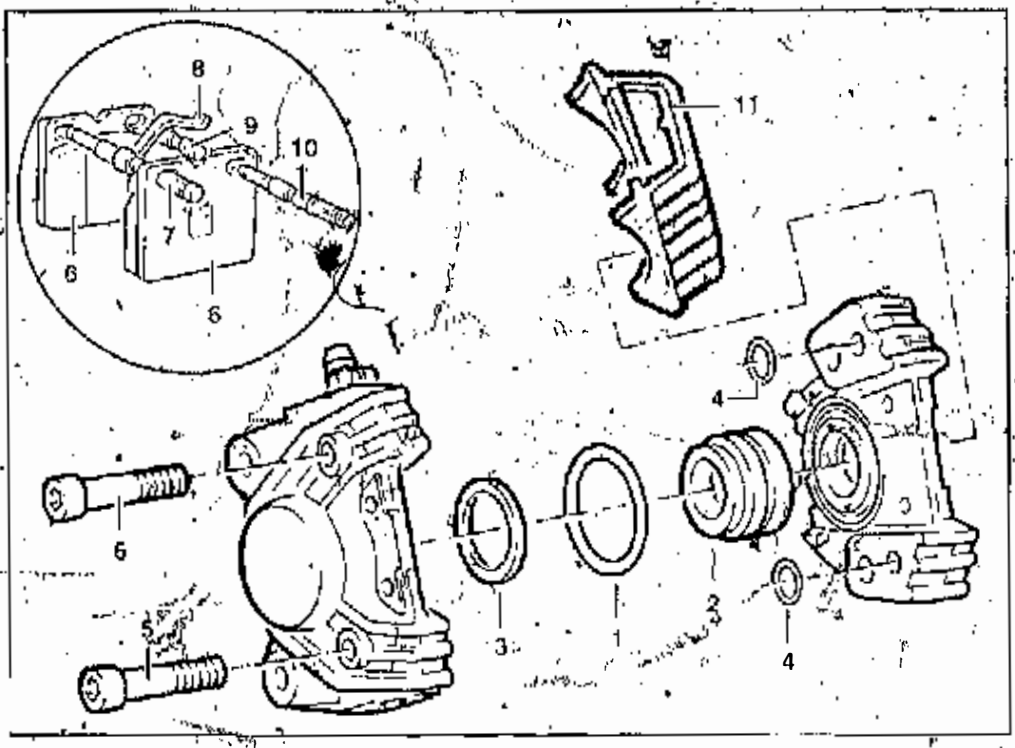
Brake fluid will damage painted surfaces. Keep it away from all painted areas of the motorcycle.
Never re-use brake fluid after it has been drained or siphoned off. Dispose of it accordance with environmental protection laws.

- Drain the brake circuit with a suitable bleeding device, e.g. Joma 3 L.
- Take out the 2 retaining screws with washers and retaining bracket (1/2/3) at the brake caliper.
- Take out the hollow screw with seals (4/5) at the brake caliper.
- Unscrew the retaining nut with washer (6/7) at the spring strut.
- Pull the spring strut sideways off the stud and push to the rear.
- Take off the brake caliper carefully.
- Take out the 2 Torx screws with lock washers (8/9) at the sensor.
- Take off the sensor with spacing washer (10/11).



STRIPPING REAR BRAKE CALIPER

- Take off t protective cap (1).
- Carefully drive out the 2 retaining pins (2) from the wheel side.
- Take out the clamping pin with curved spring (3/4).
- Take out the brake pads (5).
- Take the two retaining screws (6) out of the brake caliper.
- Separate the two halves of the brake caliper.
- Remove the 2 O-rings (7) from the connecting bores.
- Take out the left/right dust seals (8).
- Plug the bleed screw and the brake line union (arrows).
- Hold a cloth over the piston
- Carefully force out the piston (9) using a compressed air gun or line at the connecting bores.
- Take the sealing ring (10) out of the left/right bores.
- Examine the piston for hairline cracks, score marks or other signs of damage.



ASSEMBLING REAR BRAKE CALIPER

NOTE:
Use new sealing rings
Rub the sealing rings and piston with a small amount of brake fluid.

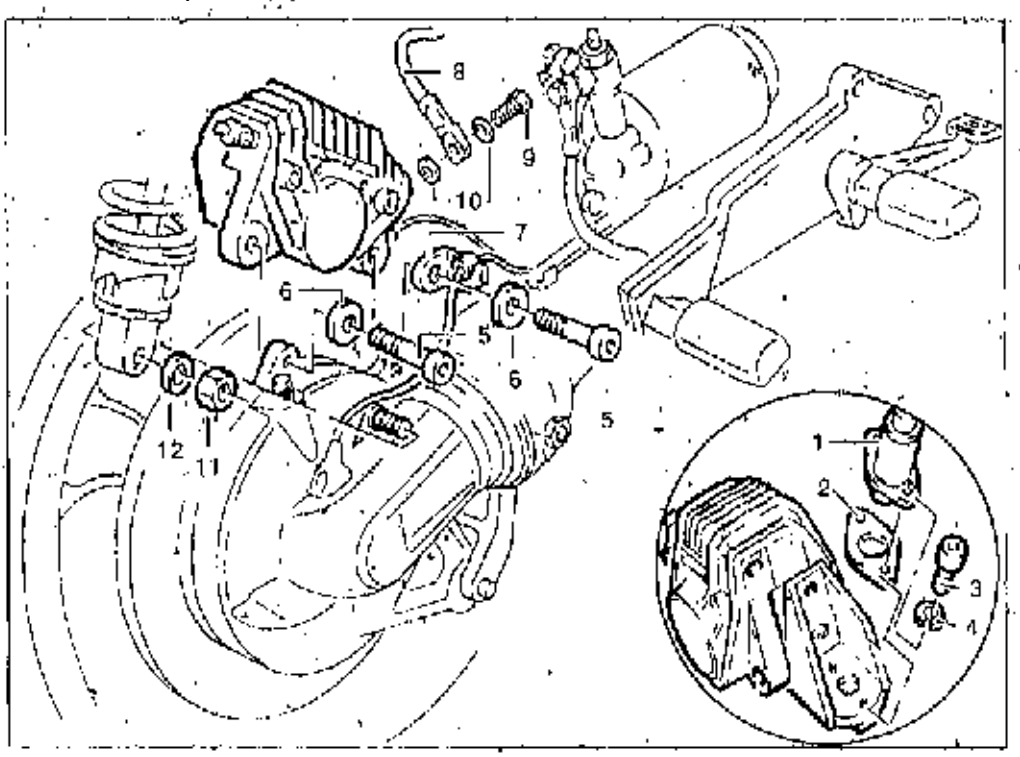
- Insert the sealing rings (1) into the left/right brake piston bores

IMPORTANT:
It is easy to tilt the piston. Install with great care.

- Press the left/right pistons (2) in carefully, without using force.
- Attach the left/right dust seals (3).
- Insert new O-rings (4) into the connecting bore.
- Screw the two halves of the brake caliper together with the 2 retaining screws (5).
- Tighten the retaining screws to the specified torque.

Tightening torque:
Brake caliper retaining screws 30 + 5 Nm

- Insert the brake pads.
- Locate the brake pads (6) with the front retaining pin and the curved spring (7/8).
- Drive the retaining pin in fully, until it locates into position.
- Place the clamping pin (9) for the curved spring in the cutouts on the brake pads.
- Press the curved spring down with a screwdriver.
- Drive the rear retaining pin (10) in fully.
- Insert the protective cap (11).
- Carefully press the pistons back fully in their cylinders with brake piston setting-back tool, MW-No. 34 500.



INSTALLING REAR BRAKE CALIPER

WARNING:
Do not tilt the brake calipers when installing, or the brake pads may be damaged

- Attach the sensor with spacing washer (1/2) to the retaining bracket with 2 Torx screws and lock washers (3/4)
- Push the brake caliper carefully over the brake disc
- Tighten the brake caliper into position with 2 retaining screws, washers and retaining bracket (5/6/7), using the specified tightening torque
- Screw the brake line (8) to the brake caliper with the hollow screw and seals (9/10)
- Raise the rear wheel clear of the ground.
- Push th spring strut on to the stud.
- Screw the retaining nut with washer (11/12) on to secure the spring strut, tightening it to the specified torque.

Tightening torque	
Sensor to retaining bracket	*5 Nm*
Brake caliper to rear wheel drive	*32 ± 2 Nm*
Brake line to caliper	*17 ± 1 Nm*
Spring strut to rear wheel drive	*51 ± 6 Nm*
Bleed screw	*7 ± 1 Nm*

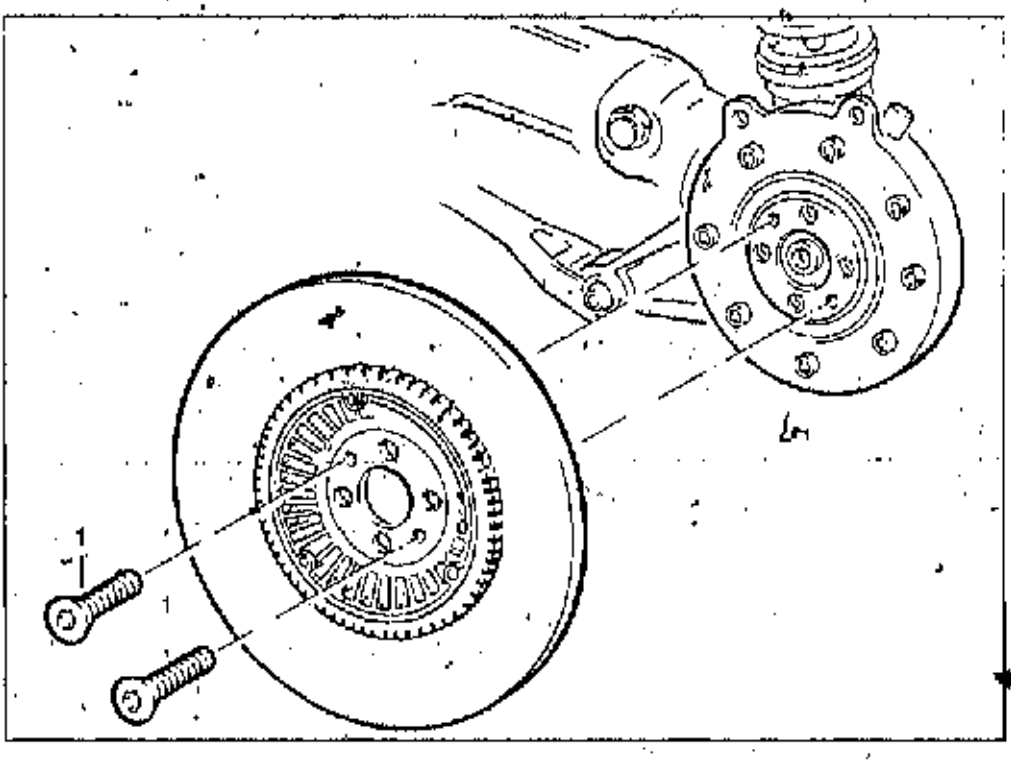
IMPORTANT:
Always bleed the brake circuit after refilling.

IMPORTANT:
Check ABS sensor gap whenever the brake caliper has been removed and installed, and adjust if necessary. Always maintain the specified gap

- Move the mark to below the sensor surface.
- Check the maximum sensor gap dimension with a feeler gauge, adjust with shims if necessary

Gap between sensor face and pulse generating ring:

Maximum	*0.60 - 0.65 mm*



REMOVING REAR BRAKE DISC

- Take off dualseat cover/dualseat.
- Remove the licence plate holder.

WARNING:
Do not tilt the brake caliper when removing, or the brake pads may be damaged.

- Remove the brake caliper.

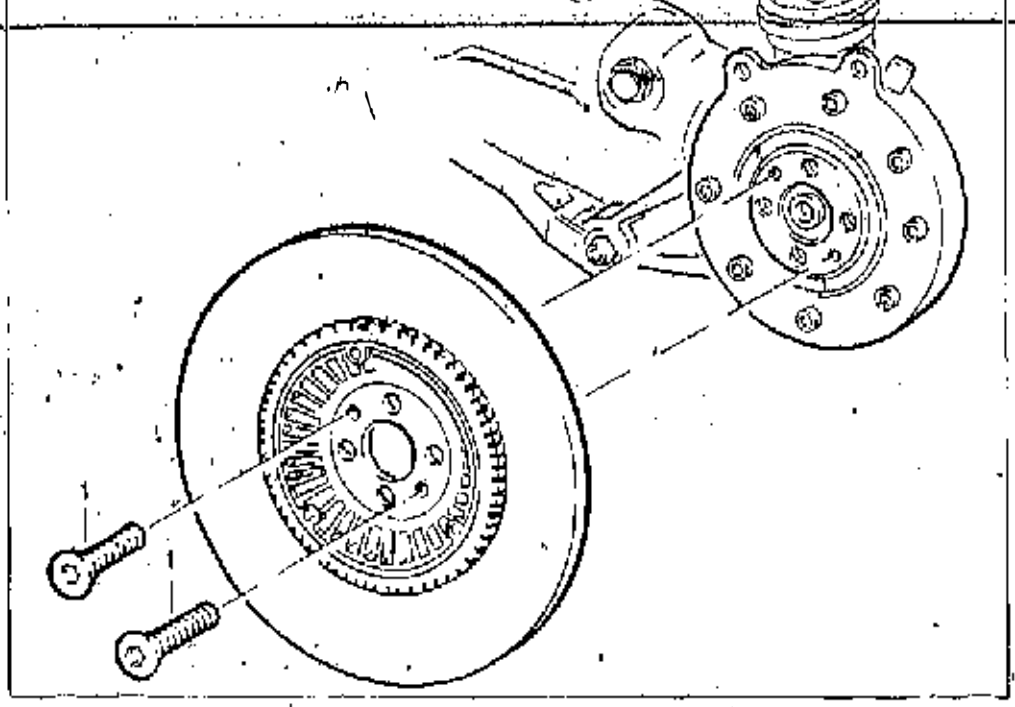
WARNING:
Never operate the brake pedal when the rear wheel has been removed.

- Remove the rear wheel.

NOTE:
The retaining screws (1) are of the micro-encapsulated type.

- Take the 2 retaining screws (1) out of the brake disc holder.
- Take off the brake disc holder with brake disc and pulse generating ring.

IMPORTANT:
The brake disc and pulse generating ring must only be renewed as a complete unit.



INSTALLING REAR BRAKE DISC

IMPORTANT:
Degrease the brake disc thoroughly before installing.

- Clean the retaining screws (1) with a steel wire brush
- Recut the threaded holes with a suitable tap, and blow clean
- Apply a thin coat of LOCTITE 273 to the retaining screws (1)
- Screw the brake disc holder to the rear wheel drive and tighten to the specified torque
- Install the rear wheel and tighten to the specified torque.
- Install the brake caliper and tighten to the specified torque
- Install the spring strut and tighten to the specified torque.
- Install the licence plate holder.
- Attach the dualseat/dualseat cover

Tightening torque		
Brake disc holder to rear wheel drive	*21*	*2 Nm*
Rear wheel studs	*105*	*4 Nm*
Brake caliper to rear wheel drive	*32*	*2 Nm*
Spring strut to rear wheel drive	*51*	*6 Nm*

IMPORTANT:
Check ABS sensor gap whenever the brake caliper has been removed and installed, and adjust if necessary. Always maintain the specified gap

- Offer up the measuring shoe to the impuls wheel, tension the measuring gauge sensor slightly and zero the measuring gauge
- Turn the rear wheel slowly.
- Measure radial runout around the entire circumference of the impuls wheel.

- Mark the point on the impulse wheel projecting the lowest rounding on the mounting groove with a permanent marker (felt pen). The mark on the impulse wheel is the point at which the sensor gap is widest.
- Move the mark to below the sensor slot.
- Check the maximum sensor gap dimension with a feeler gauge, adjust if necessary.

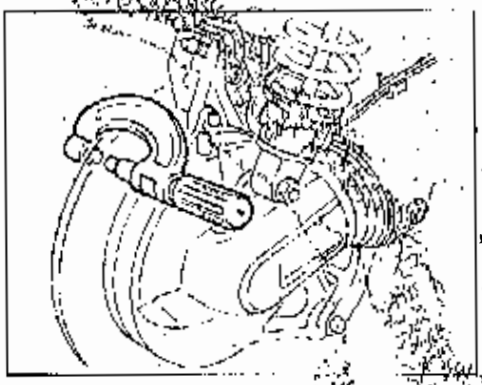
Gap between sensor face and pulse generating ring

Maximum	*0.60 0.65 mm*

Tightening torque

Torx screws	*5 Nm*

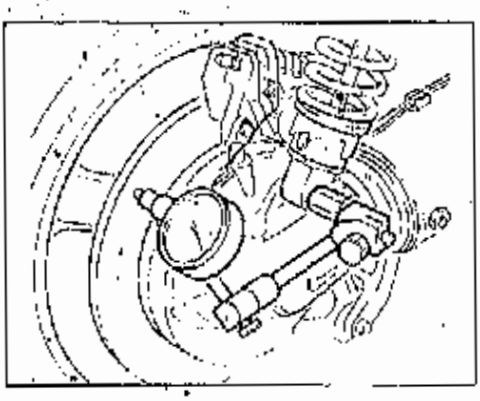
CHECKING THICKNESS OF REAR BRAKE DISC



- Measure brake disc thickness with a micrometer.
- Renew the brake disc if the minimum thickness is not present at all points measured.

Minimum thickness of rear brake disc	*4.57 mm*

CHECKING RUNOUT OF REAR BRAKE DISC

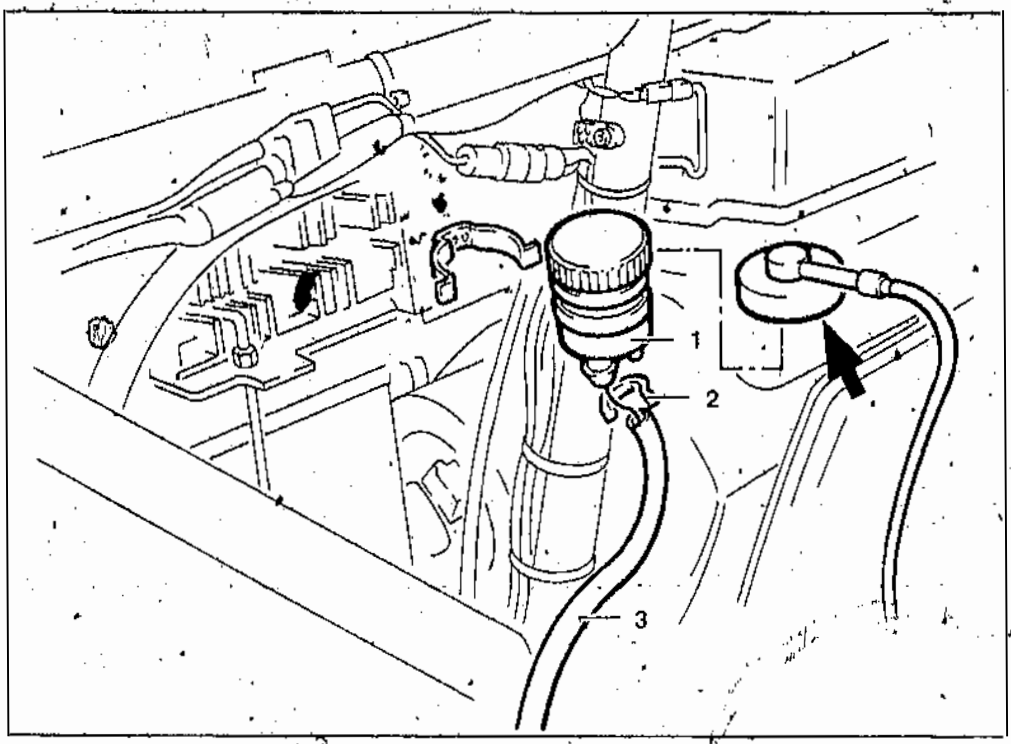


- The rear wheel must turn freely.
- Unscrew the retaining nut with washer at the spring strut.
- Screw the dial gauge with adapter, BMW No. 36 4 600, on to the stud.
- Measure lateral runout.
- Renew the brake disc if the maximum lateral runout is exceeded.
- Install in the opposite order of work.

Maximum lateral runout of rear brake disc	*0.1 mm*

Tightening torque

Spring strut to rear wheel drive	*51 · 6 Nm*



REMOVING AND INSTALLING REAR BRAKE FLUID RESERVOIR

- Take off the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Take off the fuel tank pad.

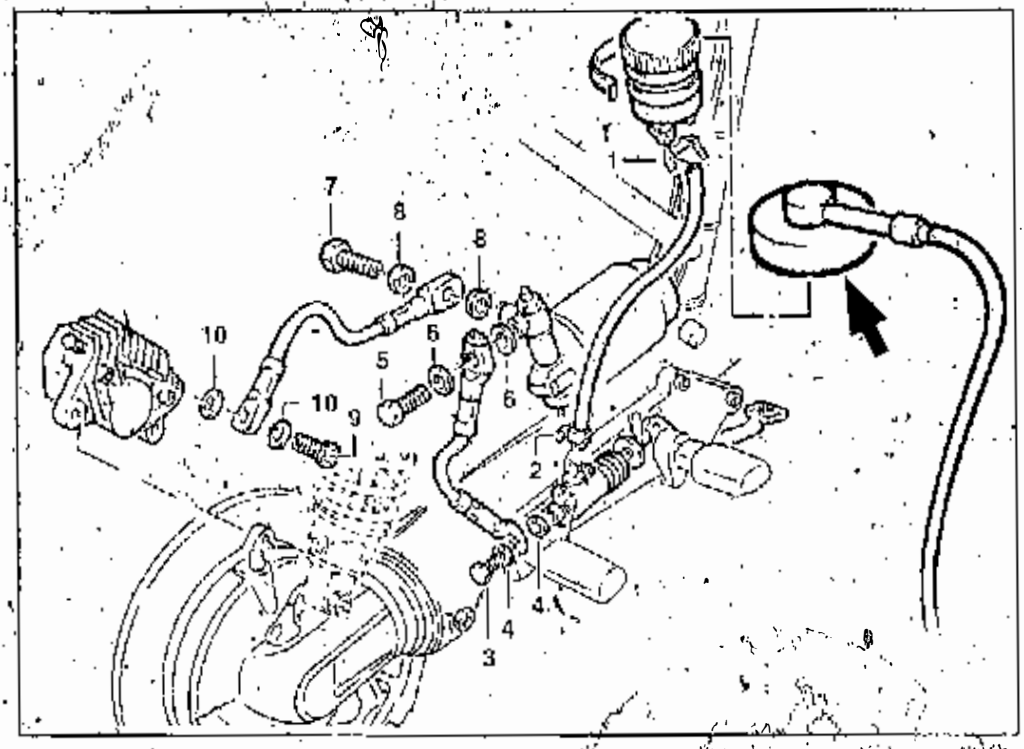
CAUTION:
Brake fluid will damage painted surfaces. Keep it away from all painted areas of the motorcycle.
Never re-use brake fluid after it has been drained or siphoned off. Dispose of it accordance with environmental protection laws.

- Screw Joma adapter, Order No. 0 22 W (arrow), on to brake fluid reservoir.
- Drain the brake system with a suitable bleeding device, e.g. Jom 3 L.
- Detach the r t rear fairing from its mounting.
- Remove the brake fluid reservoir (1) from its clip.
- Take the reservoir out to the right, between the frame struts.
- Cut through the non-reusable hose clip (2) on the brake line with lever-action cutters.
- Pull off the brake line (3).
- Take off the reservoir
- Install in the opposite order of work.

NOTE:
When installing, secure the non-reusable hose clip with special pliers, BMW No. 13 1 500

IMPORTANT:
Always bleed the brake system after refilling.

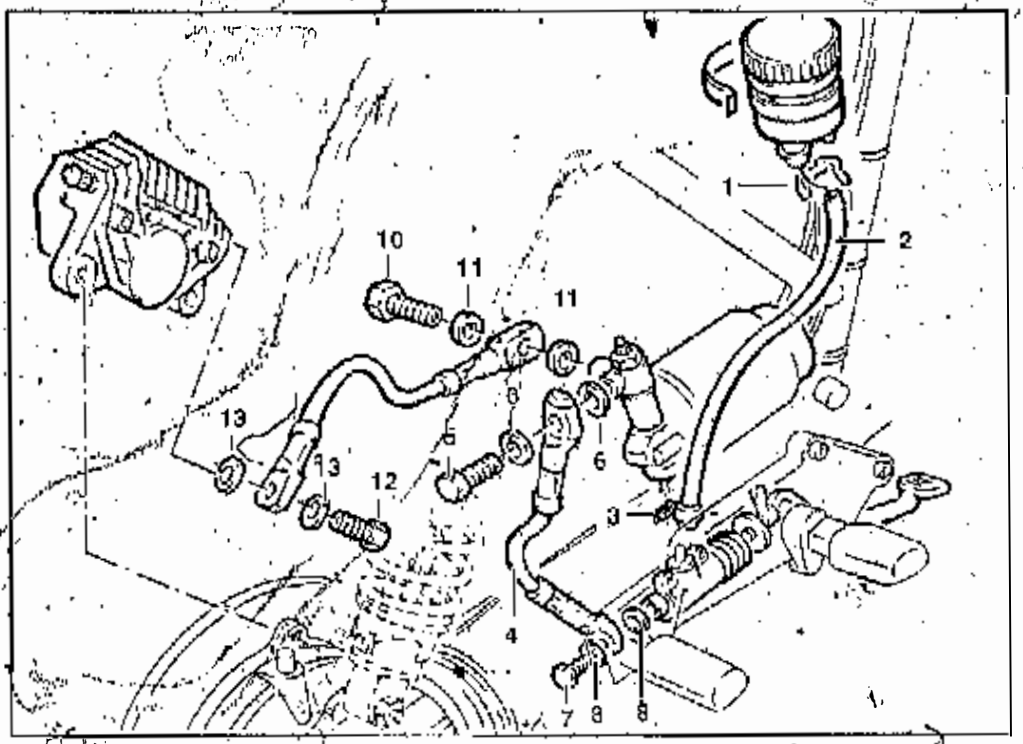
Tightening torque:
Bleed screw 7 ± 1 Nm



REMOVING REAR BRAKE LINE

CAUTION:
Brake fluid will damage painted surfaces. Keep it away from all painted areas of the motorcycle.
Trap drained-off brake fluid in a suitable vessel.

- Screw Jonsa adapter, Order No. 0 22 W (arrow), on to brake fluid reservoir.
- Drain the brake system with a suitable bleeding device, e.g. Jonsa 3 ..
- Cut through the non-reusable hose clip (1) at the reservoir with lever-action cutters.
- Pull off the brake line.
- Slacken off the hose clip (2) at the master cylinder.
- Pull off the brake line.
- Remove the hollow screw with seals (3/4) from the brake feed line at the master cylinder.
- Remove the hollow screw with seals (5/6) from the brake feed line at the pressure modulator.
- Take off the brake line.
- Remove the hollow screw with seals (7/8) from the brake return line at the pressure modulator.
- Remove the hollow screw with seals (9/10) from the brake return line at the brake caliper.
- Take off the brake line.



INSTALLING REAR BRAKE LINE

- Push the pre-installed hose clip and brake line (1/2) on to the stub pipes of the brake fluid reservoir.
- Tighten the clip with special pliers, BMW No. 13 1 500.
- Push the brake line on to the master cylinder stub pipe.
- Secure the brake line with hose clip (3).

IMPORTANT:
Make sure that the swinging arm can move freely.

- Secure the brake feed line (4) to the pressure modulator with hollow screw and seals (5/6).
- Secure the brake feed line to the master cylinder with hollow screw and seals (7/8).

Tightening torque:

Brake hose to master cylinder	*7 ± 1 Nm*
Brake hose to pressure modulator	*7 ± 1 Nm*
Bleed screw	*7 ± 1 Nm*

- Secure the brake return line (9) to the pressure modulator with hollow screw and seals (10/11).
- Secure the brake return line to the brake caliper with hollow screw and seals (12/13).

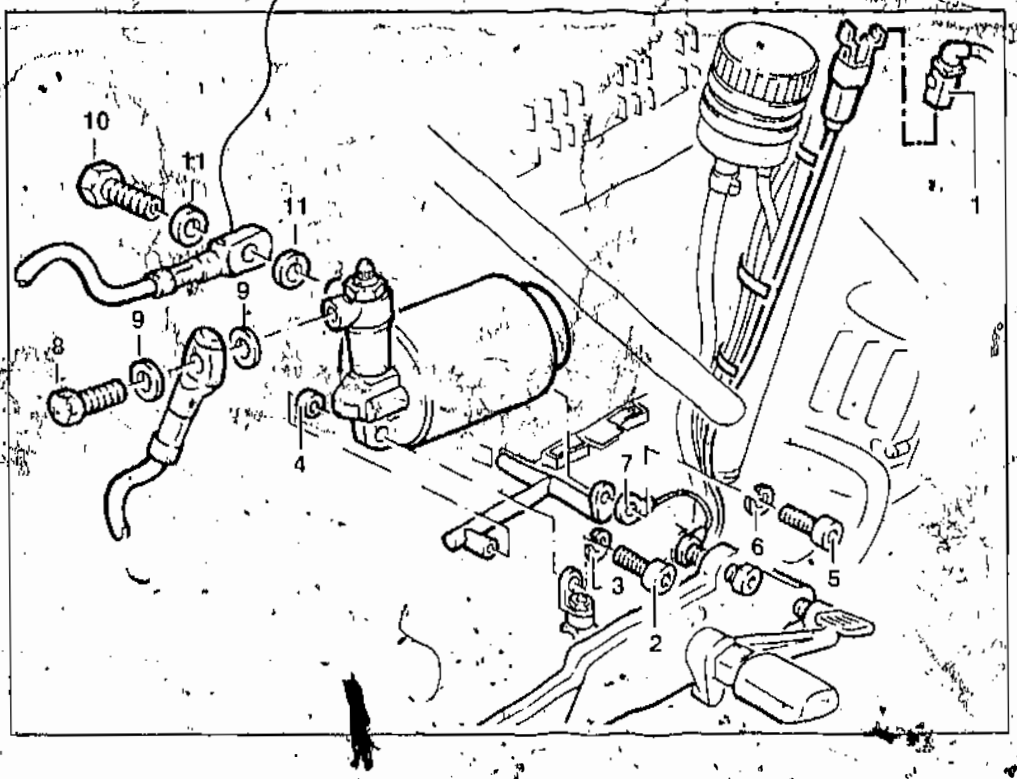
Tightening torque:

Hollow screw to pressure modulator	*7 ± 1 Nm*
Hollow screw to brake caliper	*7 ± 1 Nm*

IMPORTANT:
Always bleed the brake circuit after refilling.

Tightening torque:

Bleed screw	*7 ± 1 Nm*

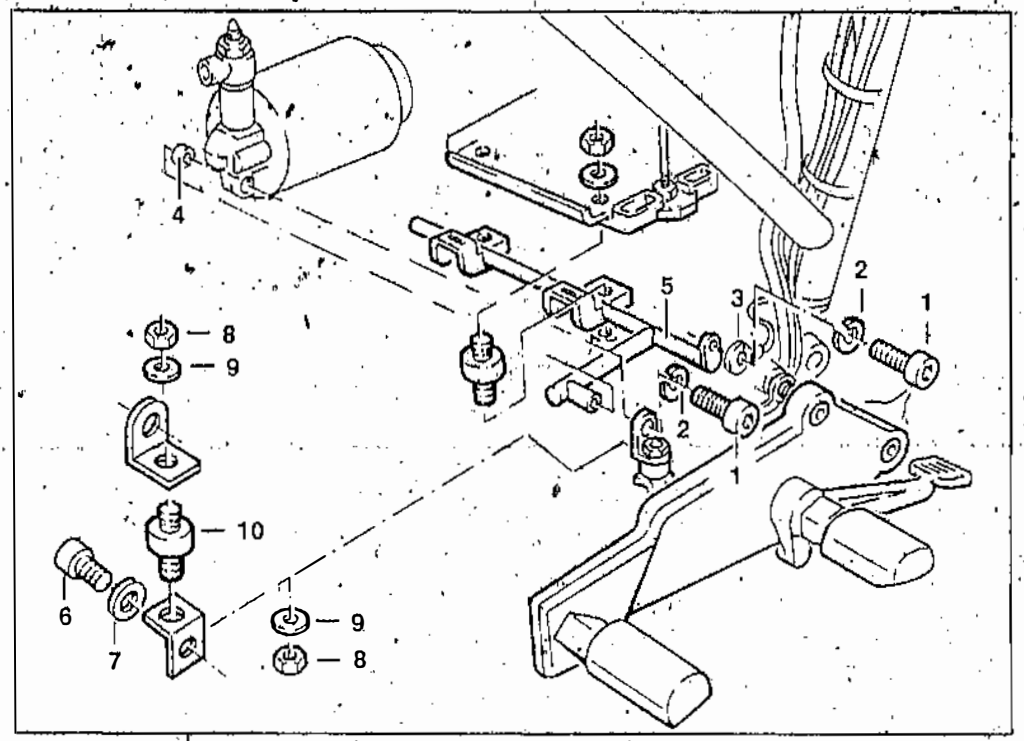


REMOVING REAR PRESSURE MODULATOR

- Take off the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing cover.
- Separate the plug connector for the ABS plug/auxiliary instruments.
- Remove the fuel tank pad.
- Take off the fuel tank.

CAUTION:
Brake fluid will damage painted surfaces. Keep it away from all painted areas of the motorcycle.
Trap drained-off brake fluid in a suitable vessel.

- Drain the brake circuit with a suitable bleeding device, e.g. Joma 3 L.
- Separate the plug connector (1) at the pressure modulator connecting line.
- Pull the cable out downwards.
- Remove the retaining screw with lock washer (2/3) at the left of the pressure modulator. Note spacing bushing (4).
- Remove the retaining screw with lock washer (5/6) at the right of the pressure modulator. Note earth (ground) cable (7).
- Take the pressure modulator out carefully to the right.
- Remove the hollow screws with sealing rings (8/9/10/11) from the brake feed and return lines at the pressure modulator.
- Take off the pressure modulator with connecting line.



REMOVING AND INSTALLING HOLDER FOR REAR PRESSURE MODULATOR

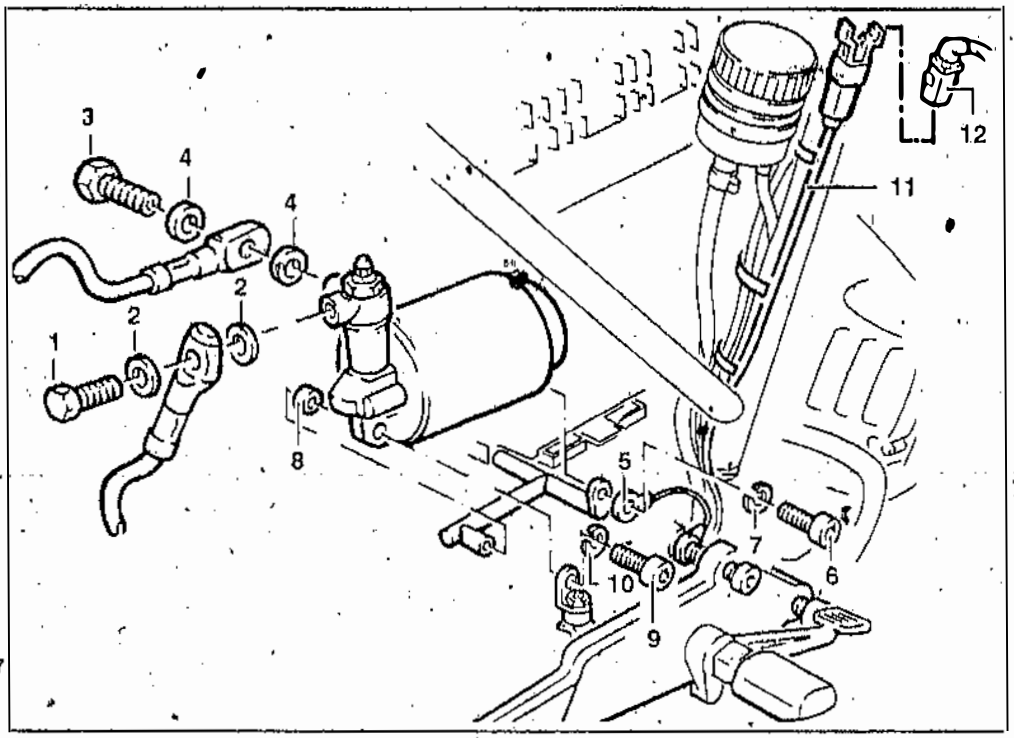
- Remove the ABS control unit.
- Remove the battery.
- Remove the battery holder.
- Remove the two retaining screws with lock washers (1/2) from the pressure modulator holder. Note the earth cable and the spacing bushing (3/4).
- Detach the pressure modulator from its holder.
- Take out the pressure modulator holder (5).
- Remove the retaining screw with washer (6/7) from the holder on the footrest plate.
- Take off the holder.
- Unscrew the retaining nuts with washers (8/9).
- Detach the retaining angle from the rubber mounting (10).
- Install in the opposite order of work.

NOTE:

When installing, note the earth (ground) connection and the spacing bushing at the pressure modulator holder.

Tightening torque:

Pressure modulator to holder	*17 ± 1 Nm*
Holder to footrest plate	*17 ± 1 Nm*
Rubber mounting nut	*3.8 Nm*



INSTALLING REAR PRESSURE MODULATOR

NOTE:
Make sure that the earth (ground) cable is correctly attached and the connecting cable is properly located.

- Attach the brake feed and return lines to the pressure modulator with hollow screws and sealing rings (1/2/3/4).
- Carefully place the pressure modulator in the holder.
- Secure the pressure modulator and earth cable (5) to the holder at the right with retaining screw and lock washer (6/7).
- Insert the spacing bushing (8) between the holder and the pressure modulator.
- Secure the pressure modulator to the left of the holder with the spacing bushing, lock washer and retaining screw (9/10).
- Run the pressure modulator connecting line (11) correctly.
- Make the plug connection (12) for the connecting line.

Tightening torque:

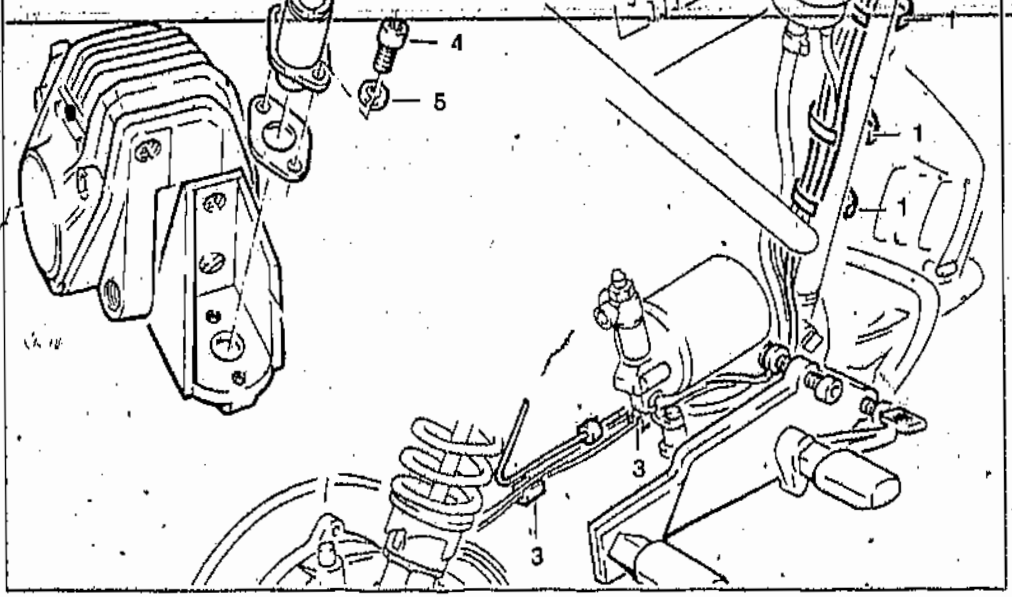
Brake hose to pressure modulator	*7 ± 1 Nm*
Pressure modulator to holder	*17 ± 1 Nm*

IMPORTANT:
Always bleed the brake circuit after refilling.

Tightening torque:

Bleed screw	*7 ± 1 Nm*

- Attach the fuel tank and fairing elements.



REMOVING AND INSTALLING REAR ABS SENSOR

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the fuel tank pad.
- Open the 4 cable straps (1) on the frame.
- Separate the plug connector (2) at the sensor line.
- Slacken off the 3 retaining screws on the right footrest plate.
- Pull the footrest plate out to the right
- Detach the sensor cable from the two clips (3) on the rear swinging arm.
- Take out the two Torx screws with lock washers (4/5) at the sensor, using Torx insert, BMW No. 34.2 500.
- Take off the sensor and sensor cable.
- Install in the opposite order of work.

NOTE:
When installing, note correct cable run and positions of cable straps.

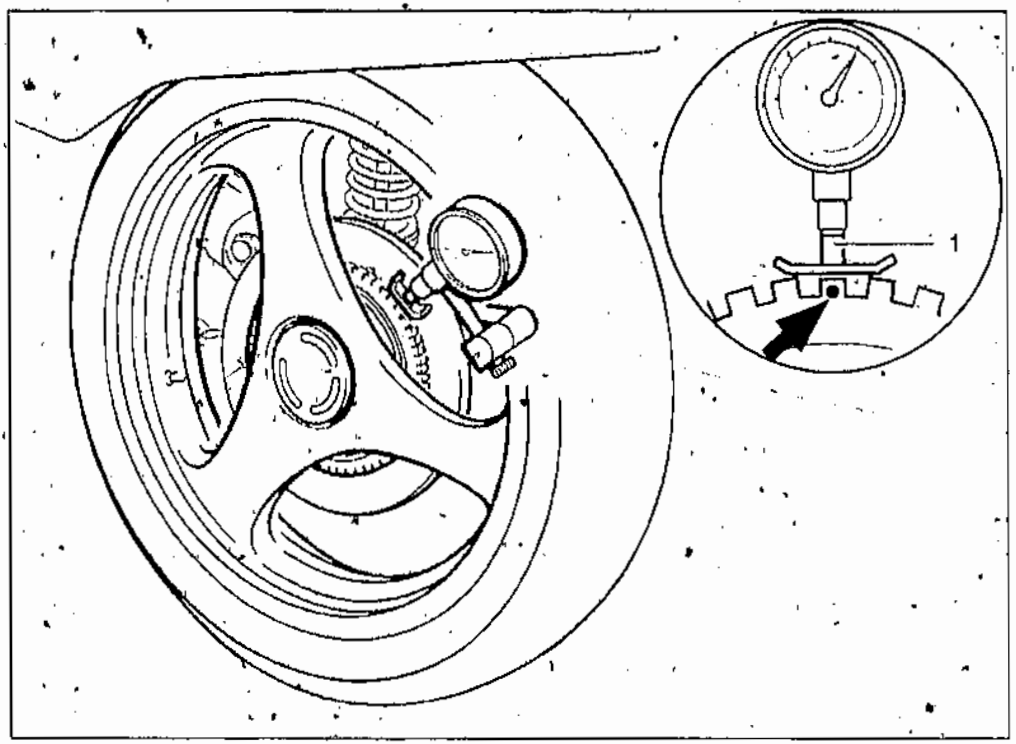
Tightening torque:

Torx screw at sensor	*4 Nm*
Footrest plate to gearbox	*15 ± 2 Nm*

WARNING:
Check sensor gap and adjust if necessary. The stated dimensions must always be maintained.

Distance between sensor face and pulse generating ring:

Maximum	*0.60 - 0.65 mm*
Minimum	*0.20 - 0.25 mm*



CHECKING AND ADJUSTING GAP BETWEEN SENSOR AND PULSE GENERATING RING

IMPORTANT:
Always check the sensor gap and adjust if necessary after
- removing/installing the rear wheel
- removing/installing the brake caliper
- detaching/attaching the sensor
- detaching/attaching the brake disc holder

Always keep to the stated dimensions

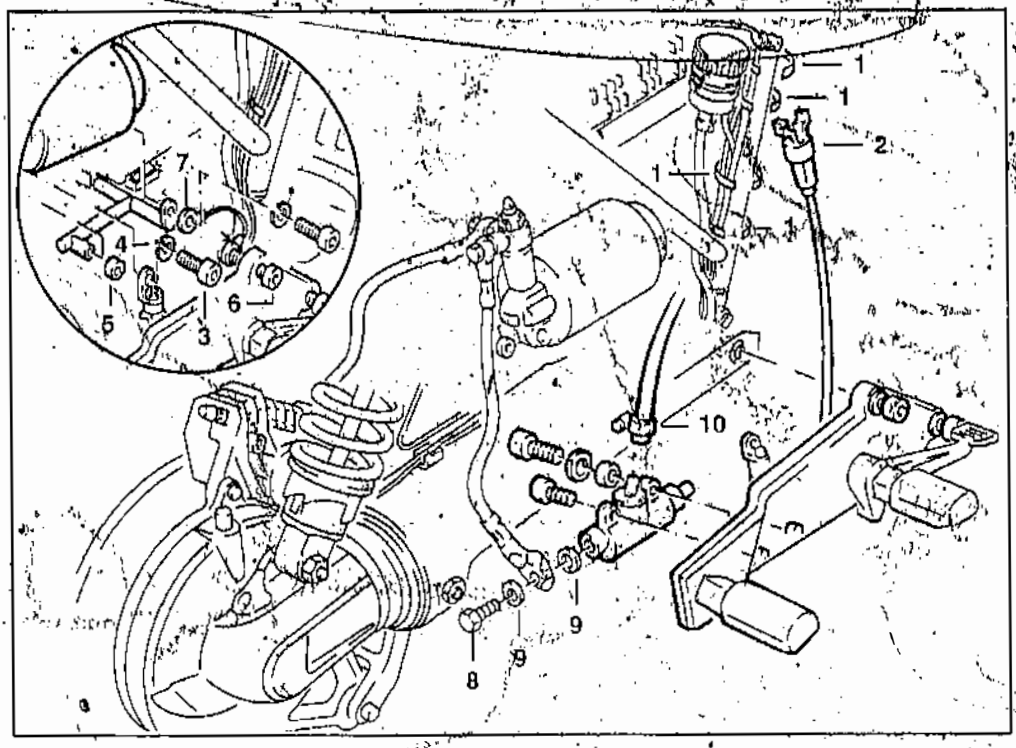
NOTE:
The mark (arrow) on the edge of the pulse generating ring is the maximum distance. If no mark is visible, determine the maximum distance. This is necessary if the brake dis with pulse generating ring is renewed and the mark has to be re-applied. Make sure that the measured surface is always on two teeth of the pulse generating ring

- Screw the measuring shoe, BMW No. 34 2 510 (1) to the dial gauge.
- Offer up the measuring shoe to the impuls wheel, tension the measuring gauge sensor slightly and zero the measuring gauge
- Turn the rear wheel slowly
- Measure axial runout around the entire circumference of the impuls wheel
- Mark the point on the impuls wheel producing the lowest reading on the measuring gauge with a permanent marker (oil paint). The mark on the impuls wheel is the point at which the sensor gap is widest
- Move the mark to below the sensor surface
- Check the maximum sensor gap dimension with a feeler gauge, adjust with shims if necessary

IMPORTANT:
Measure axial runout if a new pulse generating ring is installed.
Renew the brake disc and pulse generating ring only as a complete unit

Gap between sensor face and pulse generating ring

Maximum	*0.60 - 0.65 mm*



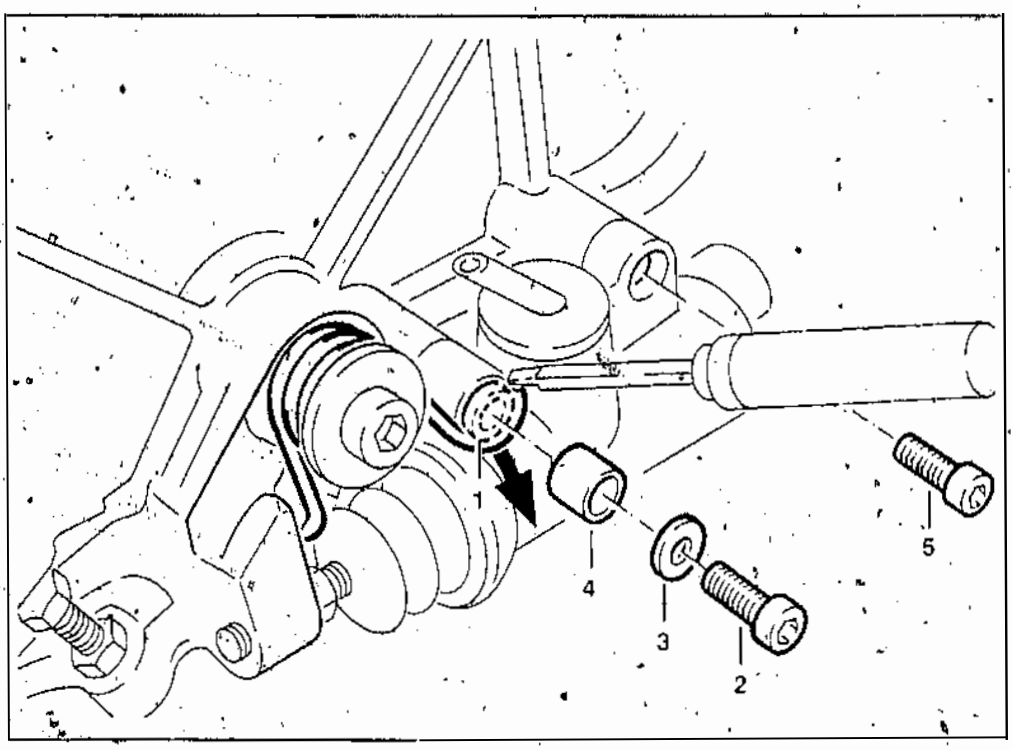
REMOVING AND INSTALLING REAR MASTER CYLINDER

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the fuel tank pad.

CAUTION:

Brake fluid will damage painted surfaces. Keep it away from all painted areas of the motorcycle.
Trap drained-off brake fluid in a suitable vessel.

- Drain the brake circuit with a suitable bleeding device, e.g. Joma 3 L.
- Open the 4 cable straps (1) on the frame.
- Separate the plug connector (2) for the brake light switch.
- Take the 3 retaining screws with lock washers (6) out of the footrest plate. Note the earth (ground) cable (7) attached to the upper retaining screw.
- Take out the hollow screw with sealing rings (8/9) at the master cylinder.
- Detach the fairing element at the footrest plate.
- Slacken off the hose clip (10) for the brake line at the master cylinder.
- Pull off the brake line.
- Take off the footrest plate.



WARNING:
The spiral spring is under tension.

- Press the spiral spring (1) down with a screwdriver blade (arrow).
- Take out the retaining screw with washer (2/3) at the master cylinder.
- Pull out the spacing bushing (4) with pliers.
- Carefully relieve the tension exerted by the spiral spring.
- Take out the retaining screw (5) at the master cylinder.
- Detach the master cylinder from the footrest plate.
- Install in the opposite order of work.

NOTE:
When installing, make sure that the earth (ground) cable is correctly attached and the brake light switch cable properly located
Make sure that the brake line is well clear of the swinging arm

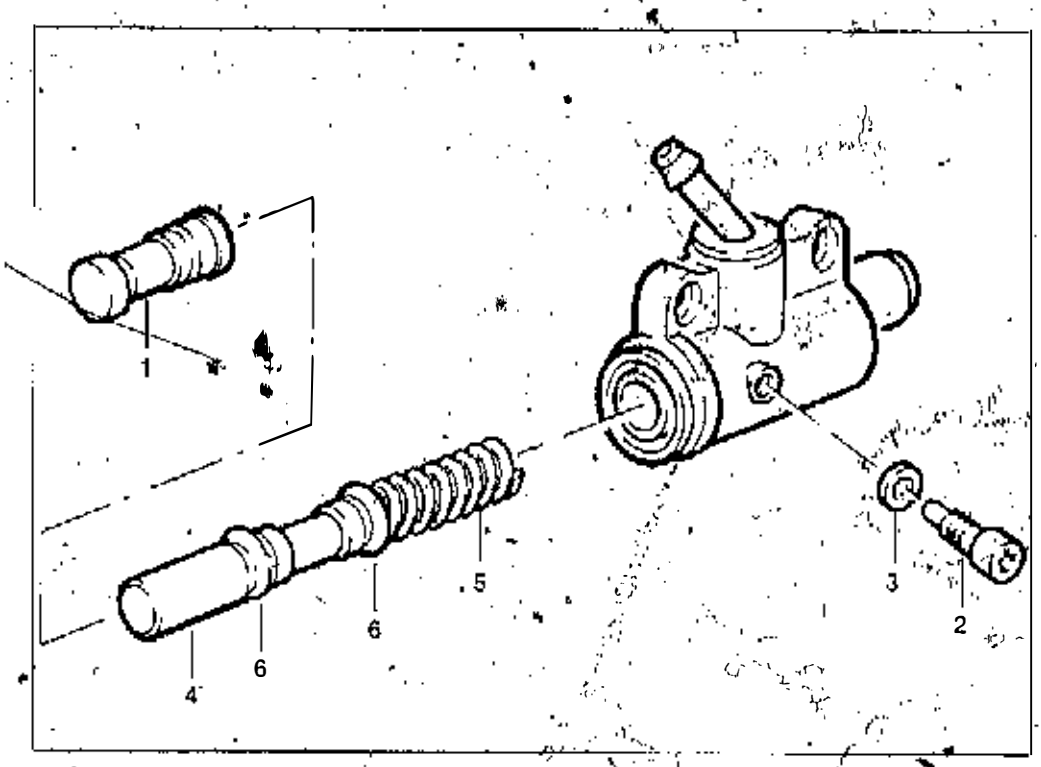
Tightening torque:

Master cylinder to footrest plate	*6 ± 1 Nm*
Brake hose to master cylinder	*11 ± 1 Nm*
Footrest plate to gearbox	*15 ± 2 Nm*
Pressure modulator to holder	*17 ± 1 Nm*

IMPORTANT:
Always bleed the brake circuit after refilling.

Tightening torque:

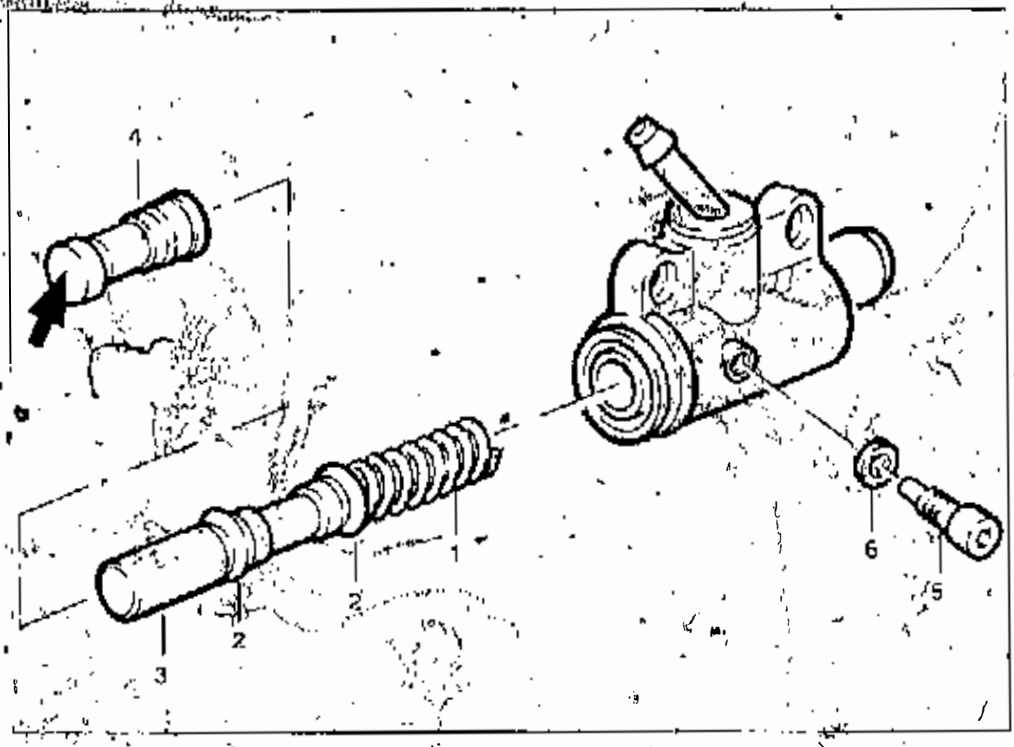
Bleed screw	*7 ± 1 Nm*



STRIPPING REAR MASTER CYLINDER

WARNING:
Spring pressure on piston

- Press the piston back into the master cylinder with thrust pin (1).
- Slacken off the retaining screw with washer (2/3).
- Carefully relieve spring pressure on the piston (4) and take it out of the housing with the coil spring (5).
- Detach the coil spring from the ring groove and remove it.
- Examine brake piston/sealing rings (6) for hairline cracks, score marks or other damage.



ASSEMBLING REAR MASTER CYLINDER

NOTE:
A defective piston should always be renewed as a complete unit with its piston rings.

- Insert the thin conical section of the coil spring (1) into the ring groove on the piston.
- Apply a thin layer of brake fluid to the sealing rings and piston (2/3).

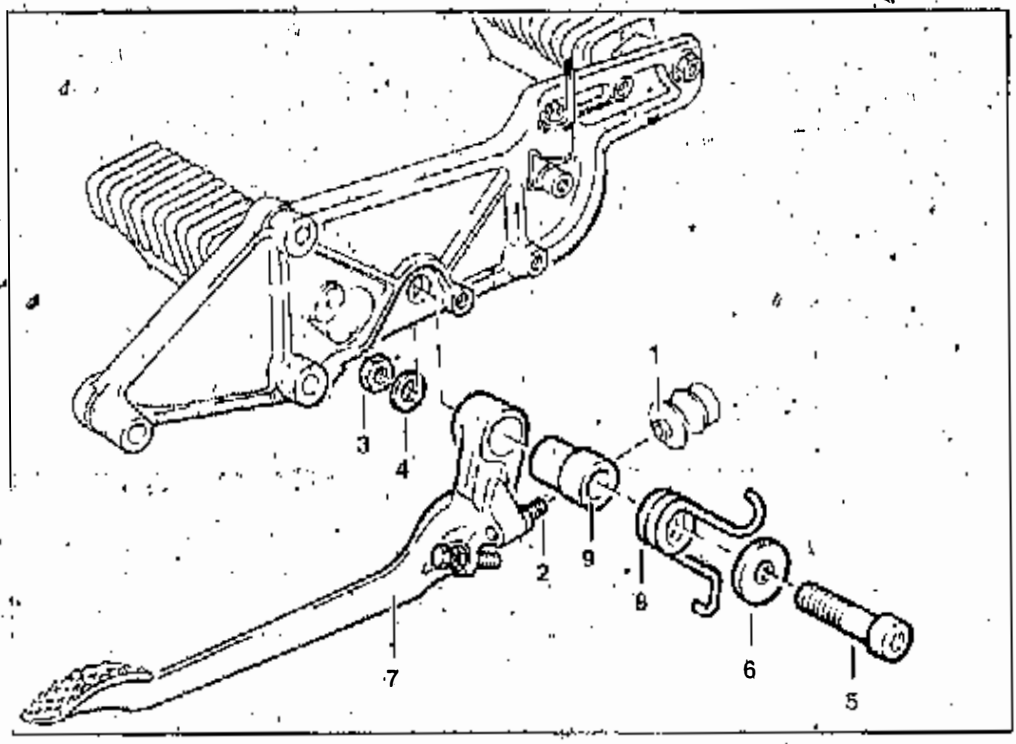
NOTE:
It is easy to tilt the brake piston. Install with great care.

- Insert the piston into the master cylinder.
- Press the piston in fully with thrust pin (4).
- Insert and tighten the retaining screw with washer (5/6).
- Apply a thin coat of RETINAX A grease to the contact face of the thrust pin (arrow).

Tightening torque:
Master cylinder to footrest plate *6 ± 1 Nm*

IMPORTANT:
Always bleed the brake circuit after filling.

Tightening torque:
Bleed screw *7 ± 1 Nm*



REMOVING AND INSTALLING BRAKE PEDAL

- Slacken off the retaining screws at the footrest plate.
- Pull the footrest plate outwards.
- Pull off the sealing sleeve (1) at the adjusting screw (2).

WARNING:
Spiral spring is under tension.

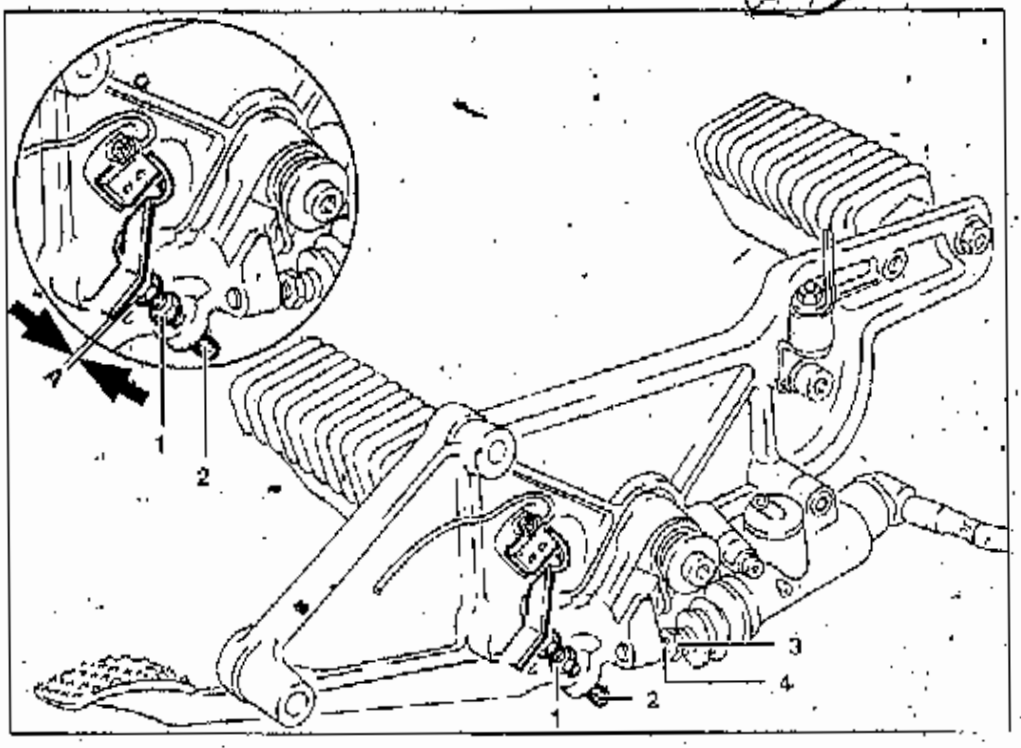
- Unscrew the retaining nut with washer (3/4).
- Pull out the retaining screw and washer (5/6) carefully.
- Take off the brake pedal, spiral spring and pivot bushing (7/8/9).
- Install in the opposite order of work.

NOTE:
When installing, grease the pivot bushing with app. 0.5 g of RETINAX A.
Apply a thin coat of RETINAX A to the contact taper of the thrust pin.
Make sure that the sealing sleeve is correctly seated.

- After installing, check brake pedal adjustment and correct if necessary.

Tightening torque:

Brake pedal to footrest plate	*25 ± 3 Nm*
Footrest plate to gearbox	*15 ± 2 Nm*



ADJUSTING BRAKE PEDAL

- Slacken off the locknut (1)
- Make the basic adjustment (arrows) at adjusting screw (2).

Basic adjustment:
Distance A *9 mm*

- Tighten the locknut.
- Maintain a gap of 0.2 mm between the brake pedal adjusting screw and the footrest plate with a feeler gauge.
- Turn the adjusting screw (3) on the master cylinder until slight resistance is felt at the stop bufferwhen the brake pedal is operated.
- Tighten locknut (4) on the adjusting screw and pull out the feeler gauge.
- Check that the setting has not altered.
- The brake light must come on as soon as the rear brake begins to retard the wheel.

Tightening torque:
Adjusting screw at master cylinder *18 ± 2 Nm*

TROUBLESHOOTING

FRONT AND REAR BRAKES

Brake judders or vibrates.

Check brake pads.
Are brake pads worn/damaged?
- yes → Renew brake pads.

Brake pedal feels soft/spongy.

Check brake fluid level.
Is brake fluid level too low?
- yes → Top up brake fluid to MAX mark.
- no

Check brake system.
Is air trapped in brake system?
- yes → Bleed the brake system.
- no

Inspect brake system.
Are there any leaks in the brake system?
- yes → Eliminate leaks.

Brake pedal stiff to move/excessively firm.

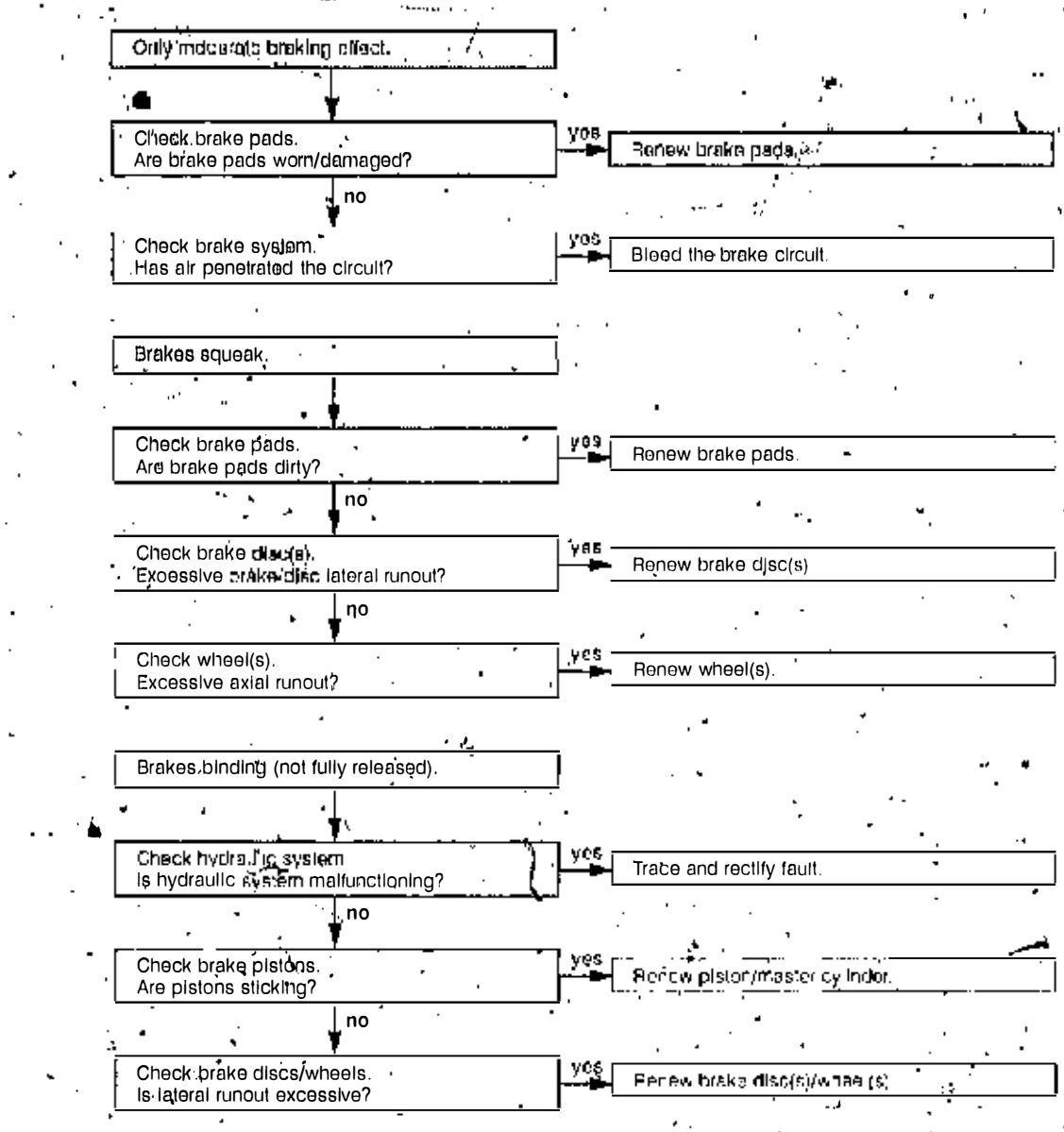
Check brake pads.
Are brake pads glazed over/badly worn?
- yes → Renew brake pads.
- no

Check brake pistons/cylinders.
Are pistons partly seized/stiff in cylinders?
- yes → Renew affected piston/cylinder.
- no

Check brake system.
If feed from brake fluid reservoir blocked?
- yes → Clean brake fluid reservoir/brake line.

Brake fade when brakes are applied hard.

Check brake fluid.
Is brake fluid overdue for renewal?
- yes → Renew brake fluid.


Only moderate braking effect.
Check brake pads.
Are brake pads worn/damaged?
yes
Renew brake pads.
no
Check brake system.
Has air penetrated the circuit?
yes
Bleed the brake circuit.
Brakes squeak.
Check brake pads.
Are brake pads dirty?
yes
Renew brake pads.
no
Check brake disc(s).
Excessive brake disc lateral runout?
yes
Renew brake disc(s)
no
Check wheel(s).
Excessive axial runout?
yes
Renew wheel(s).
Brakes binding (not fully released).
Check hydraulic system
Is hydraulic system malfunctioning?
yes
Trace and rectify fault.
no
Check brake pistons.
Are pistons sticking?
yes
Renew piston/master cylinder.
no
Check brake discs/wheels.
Is lateral runout excessive?
yes
Renew brake disc(s)/wheel(s)

6. SUSPENSION

- Steering
- Telescopic fork
- Frame
- Wheels and tyres
- Rear wheel drive

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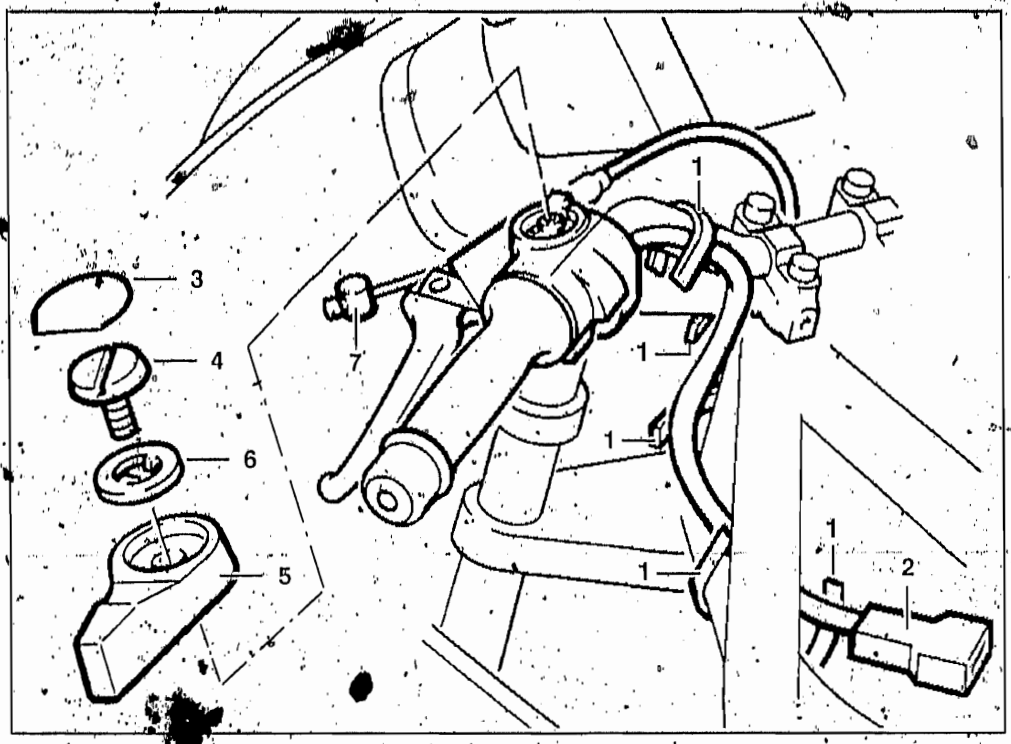
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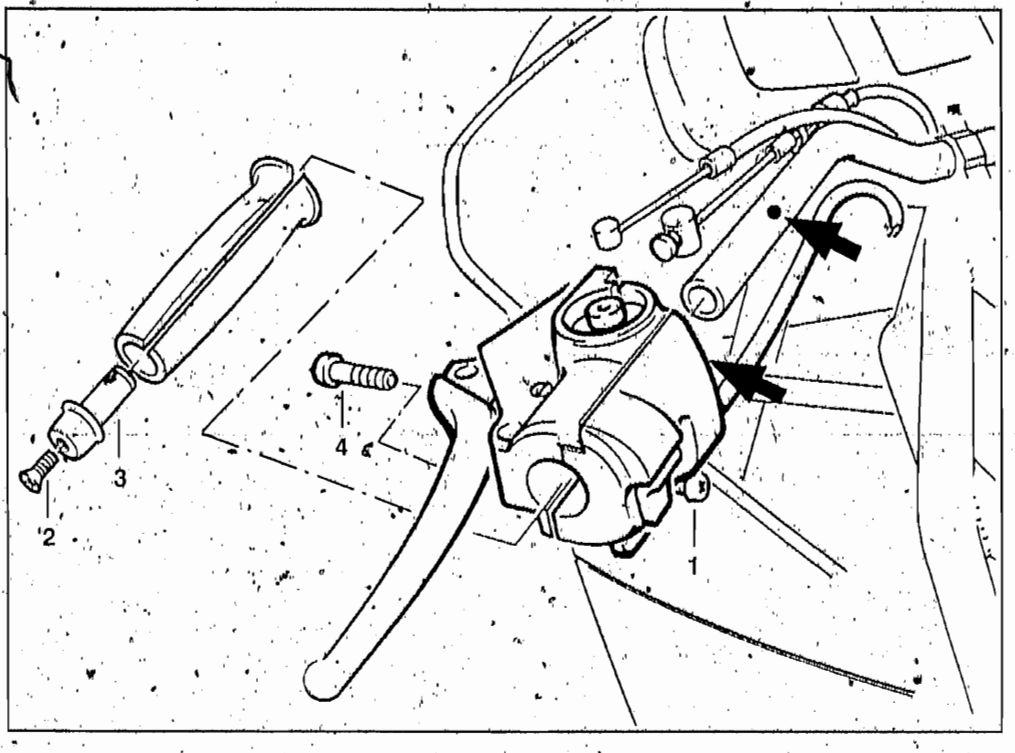
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REMOVING AND INSTALLING - LEFT HANDLEBAR FITTING

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing covers.
- Remove the fuel tank pad.
- Take off the fuel tank.
- Remove the handlebar cover.
- Open the 5 cable straps (1).
- Separate the plug connector (2) for the clutch switch under the fuel tank.
- Disconnect the clutch cable at the release lever.
- Carefully lever off the plastic cap (3) at the cold-start lever with a screwdriver.
- Take out the retaining screw (4).
- Take off the cold-start lever. Note washer (6).
- Disconnect the cold-start cable.
- Pull up the clutch lever.
- Press the nipple (7) downwards out of the clutch lever with a suitable drift.
- Push the nipple back over the clutch cable and disconnect it.
- Pull the clutch cable out of the handlebar fitting.



- Take out the retaining screw (1) for the switch plate at the handlebar fitting.
- Take out the retaining screw (2) for the handlebar weight at the end of the handlebar.
- Pull out the handlebar weight (3).
- Cut along the rubber grip to open it out and pull it off.
- Loosen the clamp screw (4) on the fitting body.
- Pull the handlebar fitting off the handlebar.
- Install in the opposite order of work.

NOTE:

When installing, attach the rubber grip with app. 0.5 g of LOCTITE 409.
Grease the detent plate/mount for the clutch cable with RETINAX A.
Attach the handlebar fitting so that its edge is aligned with the punch mark (arrow) on the handlebar.

IMPORTANT:

Always check clutch cable play and adjust if necessary.
The setting of the cold-start device must also be checked and adjusted if necessary.

Tightening torque:

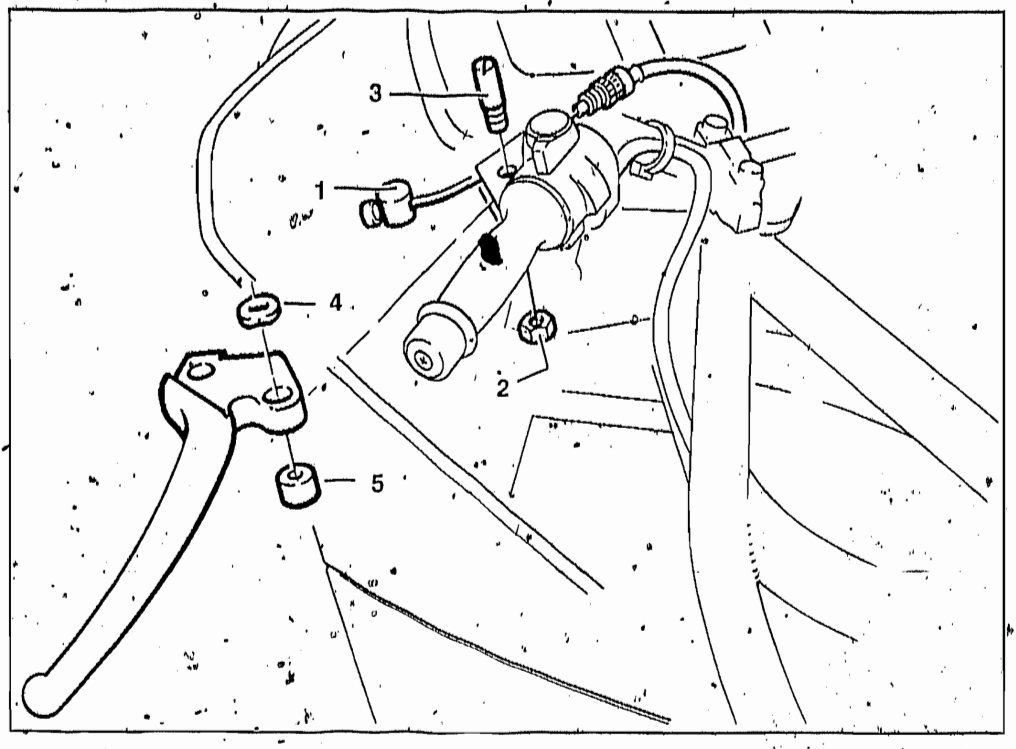
Clamp screw	*5.4 Nm*

Installed values:

Clutch cable play at handlebar lever	*4 ± 0.5 mm*
Cable length at release lever	*75 ± 1 mm*

Cold-start device:

Distance A	*1.6 mm*
Distance B	*2.5 mm*



REMOVING AND INSTALLING CLUTCH LEVER

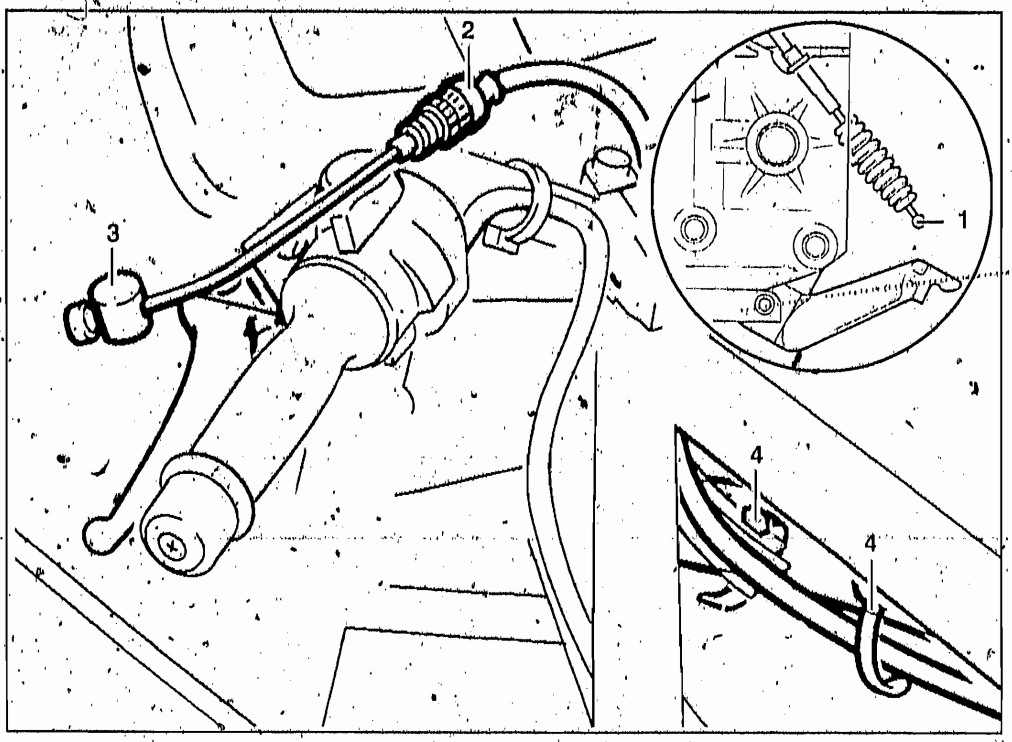
- Disconnect the wire cable at the release lever.
- Pull up the clutch lever on the handlebar.
- Press the nipple (1) out of the lever.
- Push the nipple back over the clutch cable and disconnect.
- Take out the retaining screw (2) at the clutch lever.
- Take out the shouldered screw (3).
- Take the clutch lever with lock washer (4) out of the handlebar fitting.
- Press out the plastic bushing (5).
- Install in the opposite order of work.

IMPORTANT:

Always check clutch cable play and adjust if necessary.
Adjust to compensate for wear only at the release lever adjusting screw.

Adjusting values:

Clutch lever play (at handlebar lever) 4 ± 0.5 mm
Wire cable length at release lever 75 ± 1 mm



REMOVING AND INSTALLING CLUTCH CABLE

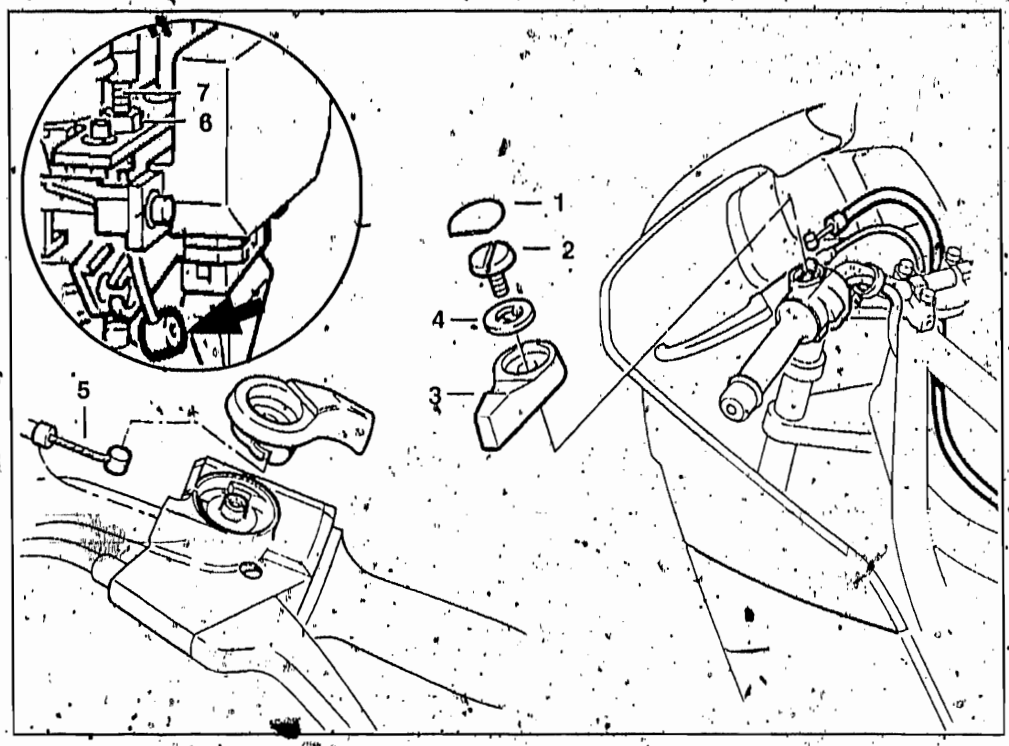
- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing covers.
- Remove the fuel tank pad.
- Take off the fuel tank.
- Take off the handlebar cover.
- Disconnect the clutch cable (1) at the release lever.
- Pull off the dust gaiter (2) at the adjusting screw.
- Pull up the clutch lever.
- Press the nipple (3) out of the lever.
- Push the nipple back over the clutch cable and disconnect it.
- Open the two cable straps (4) on the right frame tube.
- Pull the wire cable out downwards between the top right of the radiator and the frame.
- Install in the opposite order of work.

IMPORTANT:

Check that the wire cable is located correctly.
Always check clutch cable play and adjust if necessary.
Adjust to compensate for wear only at the release lever adjusting screw.

Adjusting values:

Clutch lever play (at handlebar lever)	*4 ± 0.5 mm*
Wire cable length at release lever	*-75 ± 1 mm*



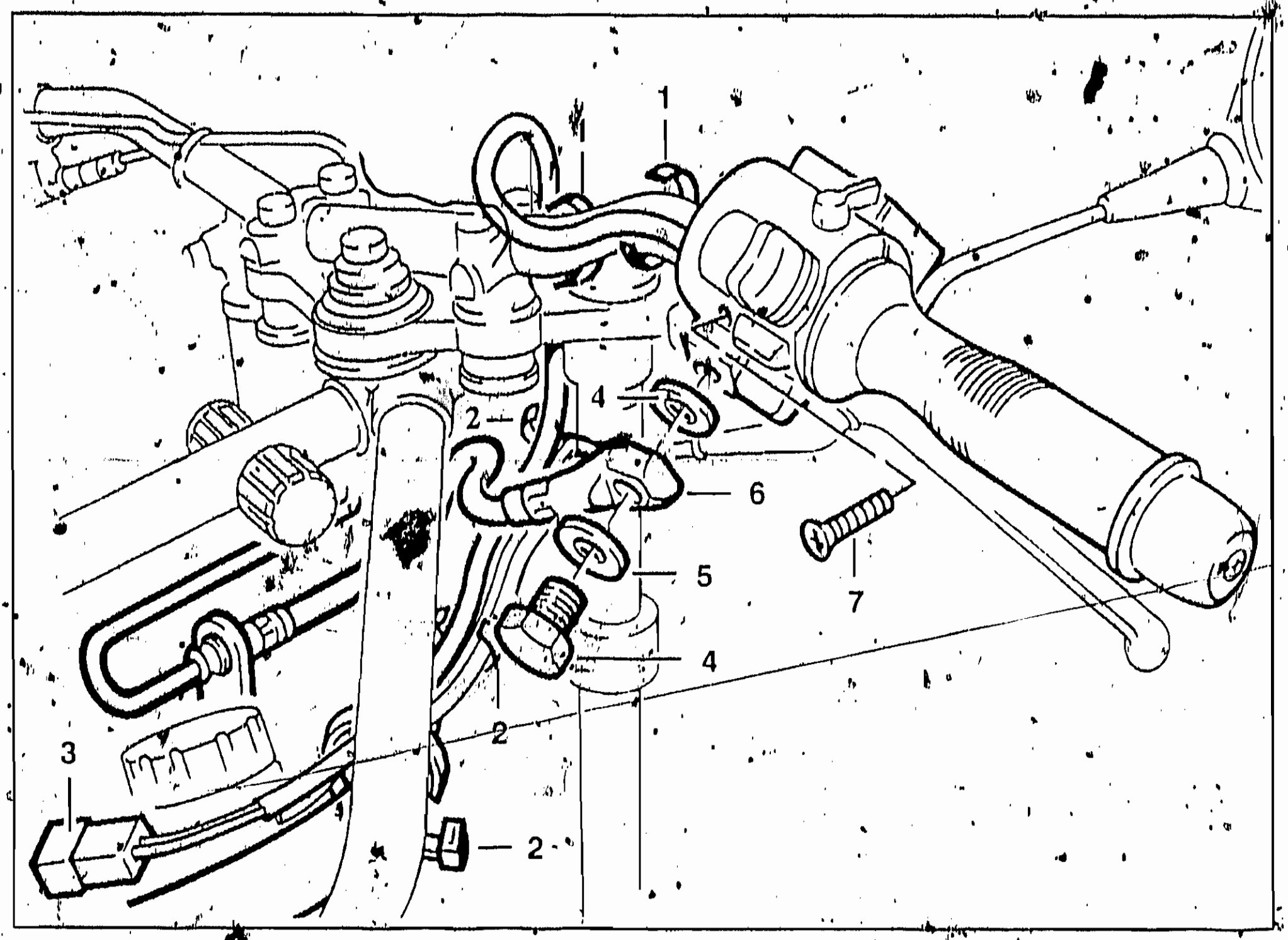
REMOVING AND INSTALLING COLD-START CABLE

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing covers.
- Remove the left centre section of the fairing.
- Remove the fuel tank pad.
- Detach the fuel tank.
- Detach the handlebar coyer.
- Carefully lever off the plastic cap (1) at the cold-start lever with a screwdriver.
- Take out the retaining screw (2).
- Lift off the lever (3). Note washer (4).
- Disconnect the wire cable (5).
- Guide the cable out through the slot at the side.
- Open the three cable straps.
- Loosen the locknut (6) on the adjusting screw of the throttle butterfly assembly.
- Take out the adjusting screw (7).
- Press the wire cable (arrow) forwards past the angle on the lever, and disconnect it.
- Pull the wire cable out downwards between the top right of the radiator and the frame.
- Install in the opposite order of work.

IMPORTANT:
When installing, avoid damage to the wire cable.
Always check the setting of the cold-start system and adjust if necessary.

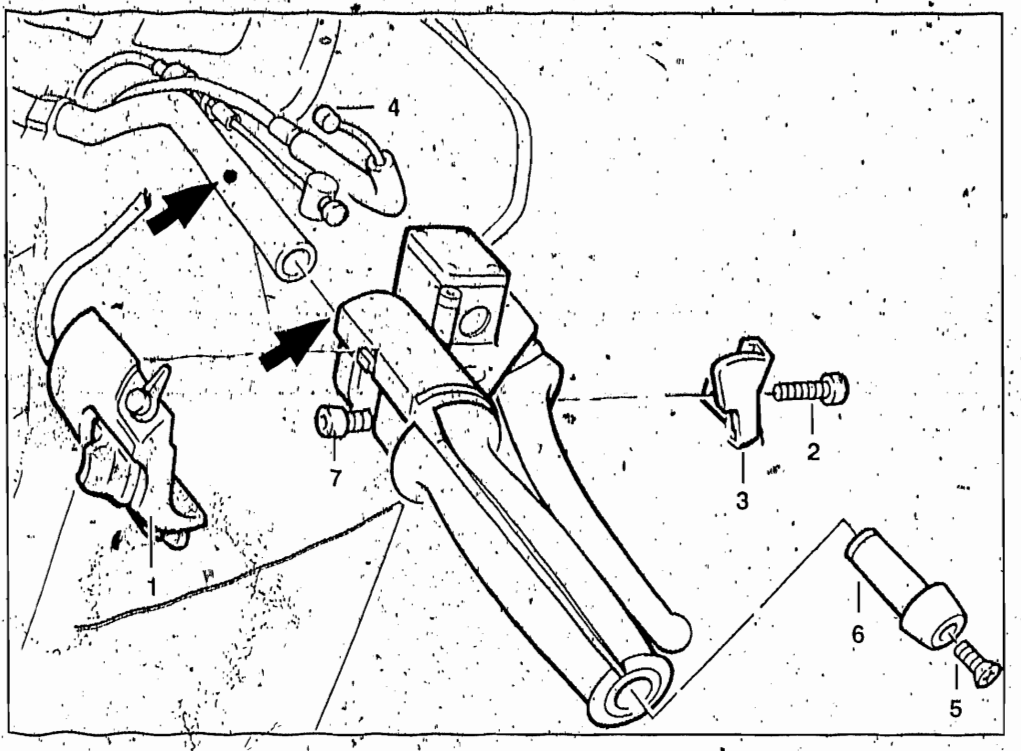
Cold-start system:

Distance A	*1.6 mm*
Distance B	*2.5 mm*



REMOVING AND INSTALLING RIGHT HANDLEBAR FITTING

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing covers.
- Remove the fuel tank pad.
- Take off the fuel tank.
- Take off the handlebar cover.
- Open the 2 cable straps (1) on the handlebar.
- Open the 3 cable straps (2) for the switch cable.
- Separate the plug connector (3) for the brake light switch.
- Take out the hollow screw with seals (4/5) at the reservoir.
- Detach the brake line (6).
- Seal the hole with a screw plug.
- Take out the switch plate retaining screw (7) at the handlebar fitting.



- Take off the switch plate (1).
- Remove the retaining screw (2) from the twistgrip cover. Take off the cover (3).
- Disconnect the wire cable (4) at the nipple.
- Take out the retaining screw (5) for the handlebar weight at the end of the handlebar.
- Pull out the weight (6).
- Slacken off the clamp screw (7) on the body of the fitting.
- Pull the fitting off the handlebar.
- Cut along the rubber handgrip and pull it off.
- Install in the opposite order of work.

NOTE:

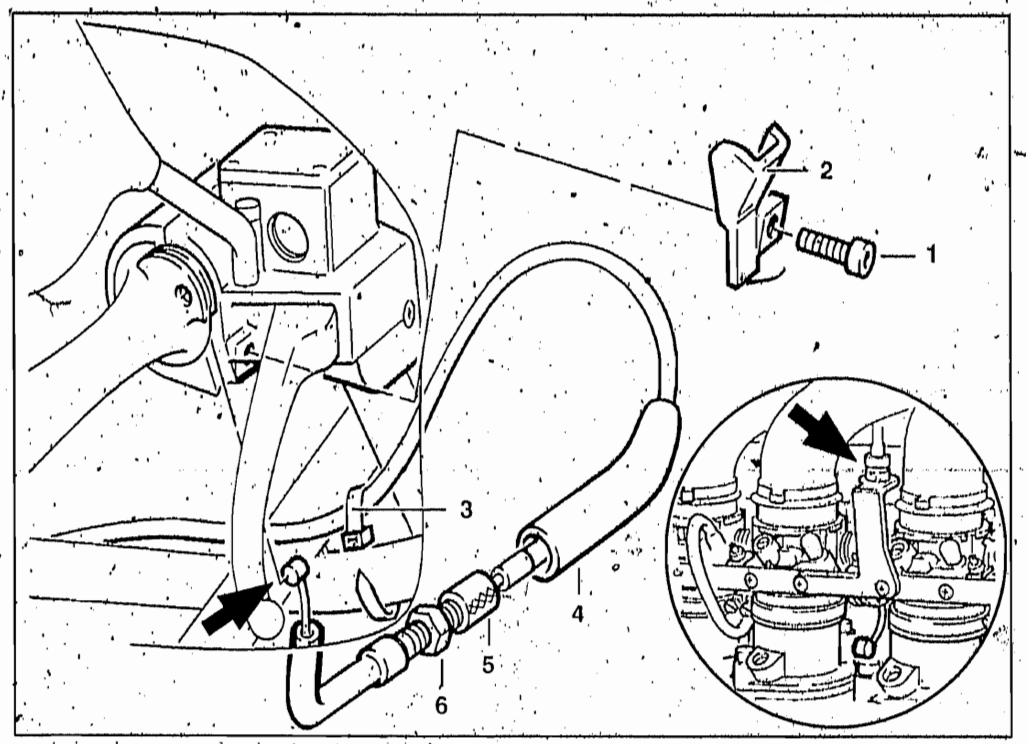
When installing the throttle cable, do not kink it.
Close the twistgrip fully.
Pull the cable fully out at the nipple and connect it.
The edge (arrow) of the handlebar fitting must be installed flush with the punch mark (arrow) on the handlebar.
Attach the rubber handgrip with app. 0.5 g of LOCTITE 409.
Check play in the throttle cable and adjust if necessary.

IMPORTANT:

The brake system must always be bled after it has been opened or refilled.

Tightening torque:	
Brake line to reservoir	*7 ± 1 Nm*
Bleed screw	*7 ± 1 Nm*
Clamp screw	*5.4 Nm*

Throttle cable play:	
Desired value	*1 mm*



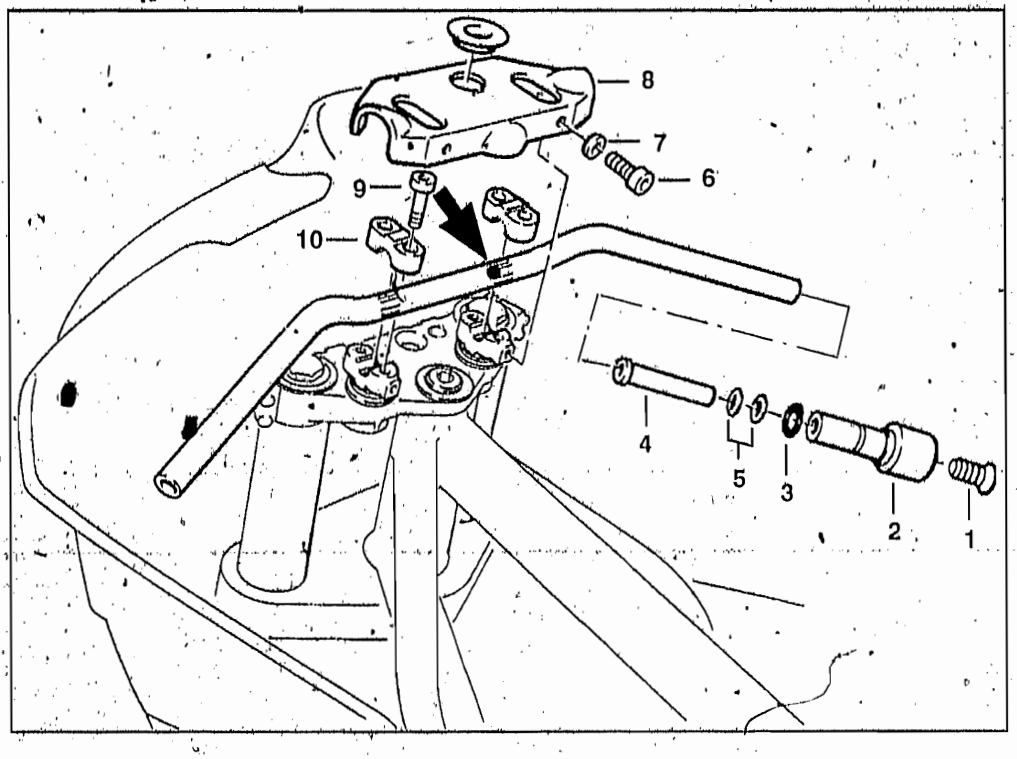
REMOVING AND INSTALLING THROTTLE TWISTGRIP CABLE

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing covers.
- Remove the left centre section of the fairing.
- Remove the fuel tank pad.
- Take off the fuel tank.
- Take off the handlebar cover.
- Remove the retaining screw (1) from the throttle twistgrip cover.
- Take off cover (2).
- Disconnect the wire cable (arrow) at the nipple.
- Turn the cam disc at the throttle butterfly rail inwards.
- Disconnect the wire cable (arrow) at the slot in the holder on the throttle butterfly rail.
- Remove the wire cable from its reaction mount.
- Open the cable strap (3) on the right steering head frame tube.
- Pull the wire cable out upwards.
- Install in the opposite order of work.

NOTE:
When installing the throttle cable, do not kink it.
Connect the cable to the cam disc first.
Close the twistgrip fully.
Pull the cable fully out at the nipple and connect it.

- Push back the sleeve (4).
- Adjust cable play at the adjusting screw (5) to the nominal value.
- Tighten locknut (6).
- Push the sleeve back on.

Cable play:
Nominal value *1 mm*



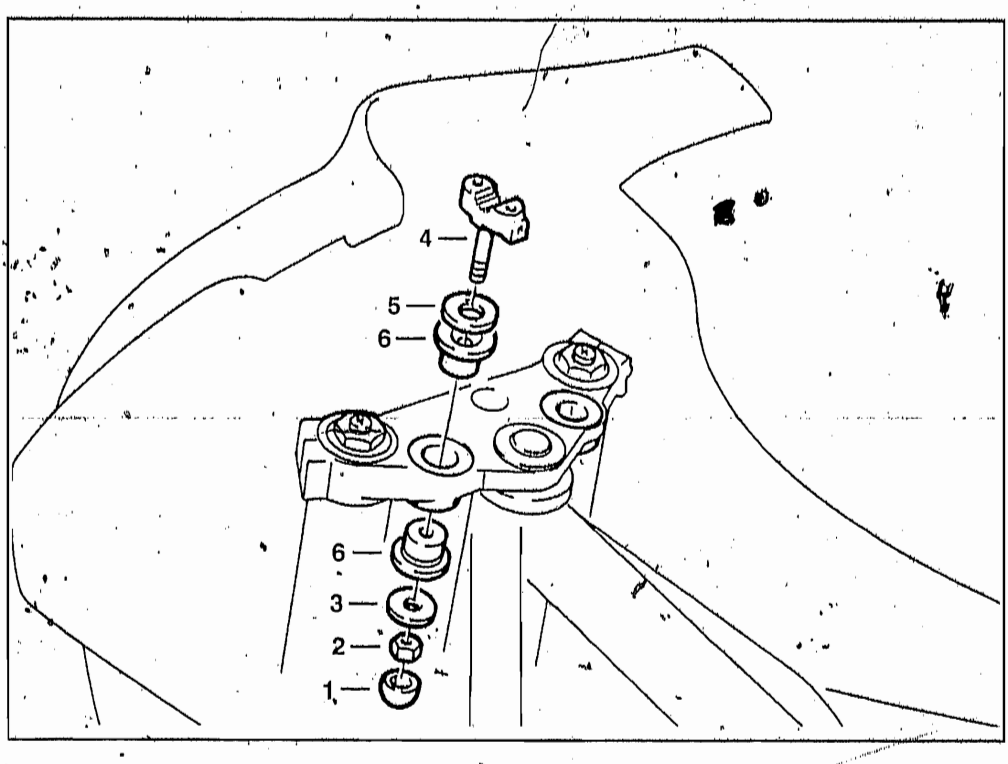
REMOVING AND INSTALLING HANDLEBAR

- Take out the retaining screw (1) for the handlebar weight at the left/right.
- Pull the handlebar weight out of the end of the handlebar at the left/right. Note the sealing ring (3).
- Pull the threaded sleeve (4) with screw out of the handlebar. Note the sealing rings (5).
- Take off the left handlebar fitting.
- Take off the right handlebar fitting.
- Remove the 2 retaining screws with washers (6/7) at the handlebar cover.
- Take off the handlebar cover (8).
- Remove the 4 retaining screws (9) from the upper clamp blocks.
- Take off the upper clamp blocks (10).
- Take off the handlebar.
- Install in the opposite order of work.

NOTE:

When installing, the punch mark (arrow) must be between the two halves of the clamp block.
Make sure that the electrical and wire cables are correctly located.

Tightening torque:
Clamp block halves 22 ± 2 Nm



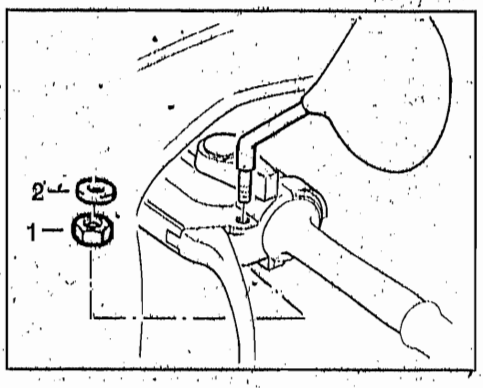
REMOVING AND INSTALLING LOWER CLAMP ON FORK BRIDGE

- Lever off the protective caps (1).
- Unscrew the retaining nut (2) at the left/right lower clamp block.
- Take off the left/right spacing washer (3).
- Pull the clamp (4) with spacing washer (5) out upwards at the left/right.
- Pull the left/right damper (6) out upwards/downwards.
- Install in the opposite order of work.

Tightening torque:

Clamp to upper fork bridge	*16 ± 2 Nm*
Two halves of clamp	*22 ± 2 Nm*

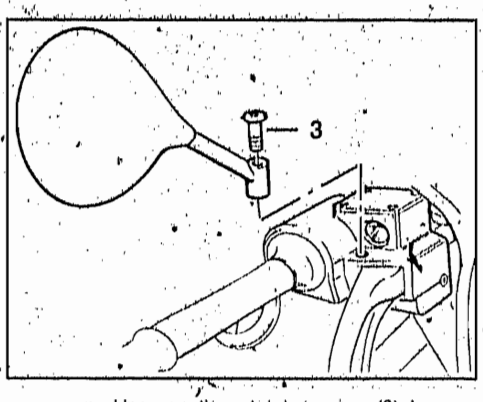
DETACHING AND ATTACHING LEFT MIRROR



- Unscrew the retaining nut with lock washer (1/2).
- Take the mirror out of the hole.
- Install in the opposite order of work.

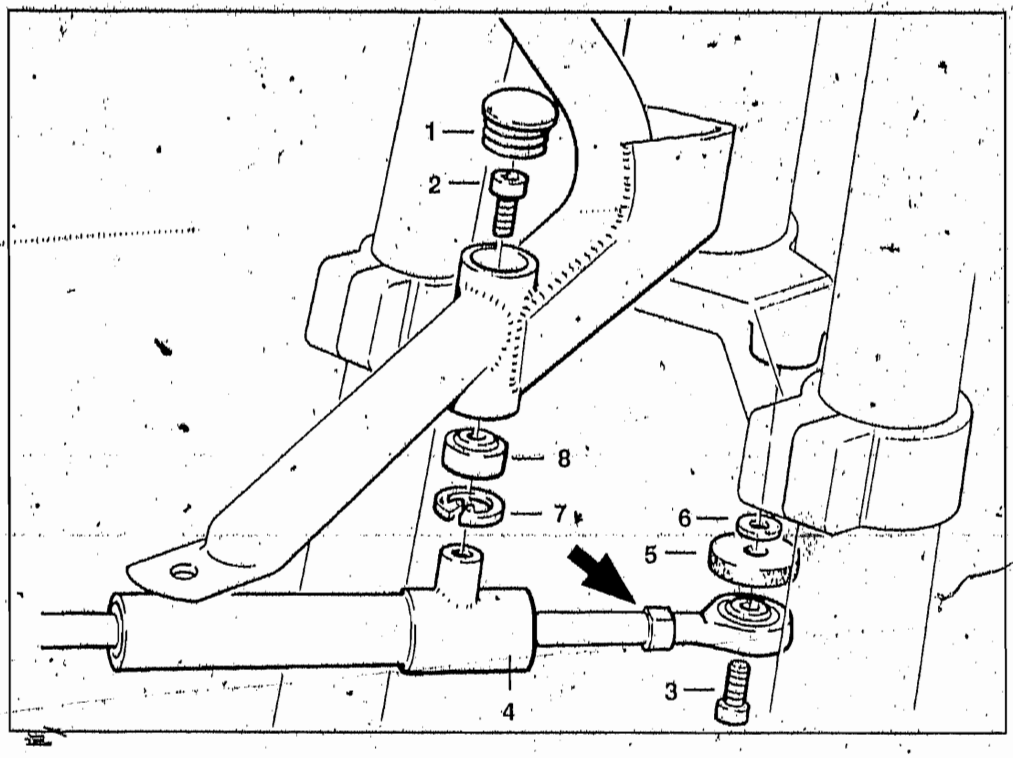
Tightening torque:
Mirror to handlebar fitting *15 ± 3 Nm*

DETACHING AND ATTACHING RIGHT MIRROR



- Unscrew the retaining screw (3).
- Take off the mirror.
- Install in the opposite order of work.

Tightening torque:
Mirror to handlebar fitting *15 ± 3 Nm*



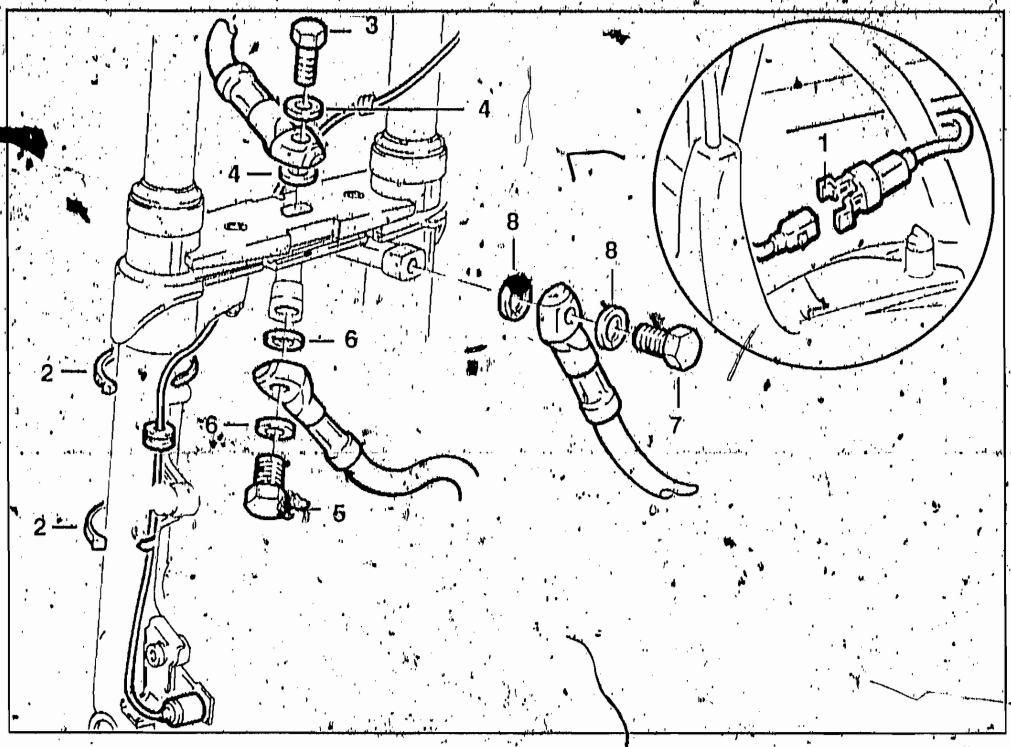
REMOVING AND INSTALLING STEERING DAMPER

- Remove the dualseat cover/dualseat.
- Remove the left kneepad.
- Remove the left inner fairing cover.
- Separate the plug connectors for the auxiliary instruments.
- Lever the plastic cover (1) out of the fairing holder.
- Take out the retaining screw (2) for the steering damper.
- Take out the retaining screw (3) from the lower fork bridge.
- Take off the steering damper (4).
- Remove the felt ring with washer (5/6) from the steering damper.
- Remove the circlip (7) at the pivot bearing.
- Drive the pivot bearing (8) downwards out of its holder with a suitable tube.
- Install in the opposite order of work.

NOTE:
When installing, secure the piston rod head (arrow) with 0.01 g of LOCTITE 242 if it was removed.

Tightening torque:

Pivot head to piston rod	*6.9 Nm*
Steering damper to fairing holder	*6.9 Nm*
Steering damper to lower fork bridge	*6.9 Nm*



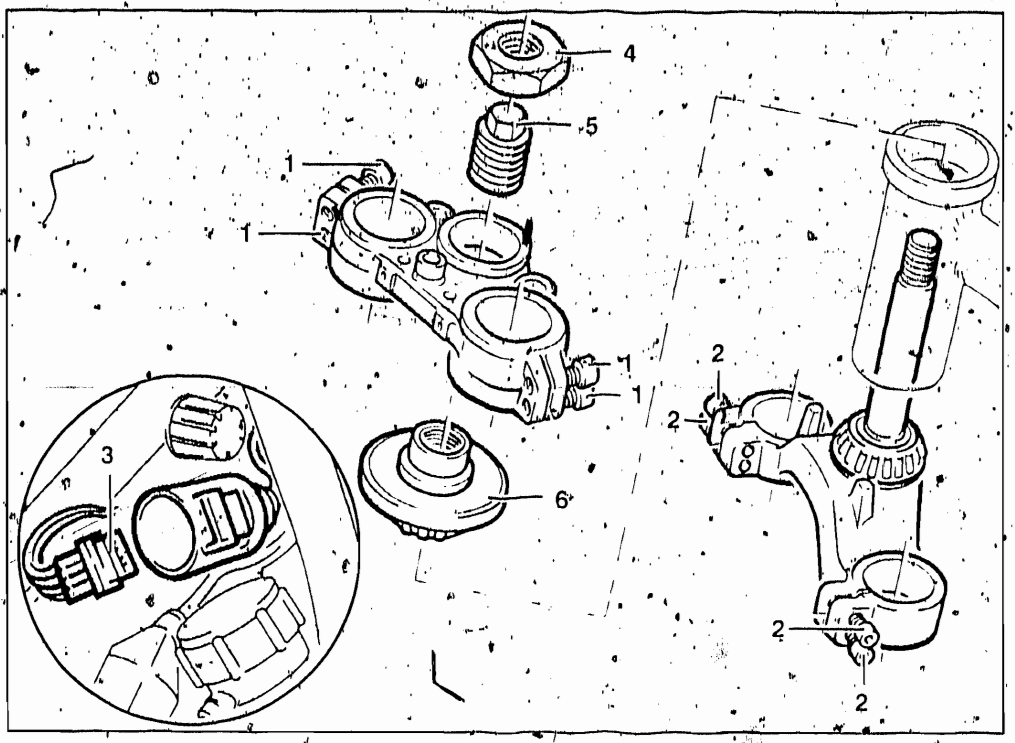
REMOVING TELESCOPIC FORK

REMOVING UPPER/LOWER FORK BRIDGE

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing covers.
- Separate the plug connectors for the auxiliary instruments.
- Remove the engine fairing.
- Remove the front mudguard.
- Remove the fuel tank pad.
- Take off the fuel tank.
- Take off the instrument cluster.
- Remove the left/right brake caliper.
- Raise the motorcycle under its sump with special lifting device BMW No. 00 1 510 until the front wheel is clear of the ground.
- Take out the front wheel.
- Separate the ABS sensor plug connector (1).
- Open the 2 cable straps (2) on the brake and ABS lines.

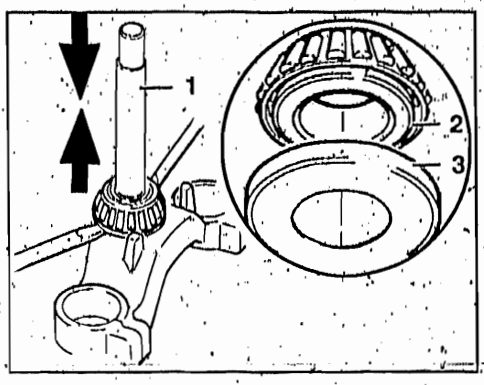
WARNING:
Brake fluid damages painted surfaces.
Keep it away from the motorcycle's paintwork.
Trap drained brake fluid in a suitable vessel.

- Drain the brake circuit with a suitable brake bleeding device, e.g. Joma 3 L.
- Remove the hollow screw with sealing rings (3/4) for the brake line at the distributor.
- Remove the hollow screws with sealing rings (5/6/7/8) for the brake lines at the left/right distributor pipe.
- Seal the exposed holes.



- Slacken off the 2 clamp screws at left/right (1) on the upper fork bridge
- Slacken off the 2 clamp screws at left/right (2) on the lower fork bridge.
- Pull the fixed tube out downwards.
- Take off the handlebar cover.
- Unscrew and remove the upper clamps.
- Lift off the complete handlebar and set it down farther forwards.
- Unscrew the steering damper/push it into the upper section of the fairing.
- Separate the ignition switch plug connector (3).
- Open the 2 cable straps.
- Pull out the ignition cable forwards.
- Slacken off the hex nut (4) on the steering head.
- Slacken off the locking tube (5).
- Unscrew/screw in the locking tube/hex nut in parallel.
- Take off the locking tube/hex nut.
- Slacken off the adjusting ring (6) on the steering head tube.
- Take off the upper fork bridge.
- Pull the lower fork bridge out of the steering head tube.

REMOVING LOWER TAPER ROLLER BEARING

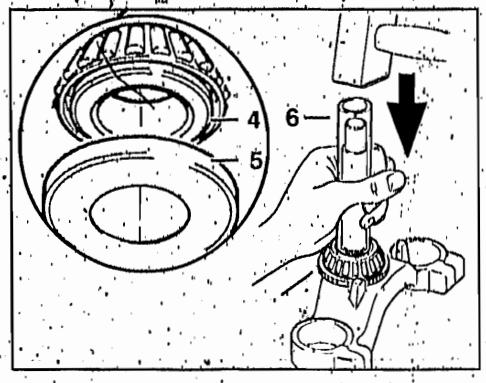


- Using a hand press, force the steering tube (1) out of the fork bridge/about 5 millimetres back (arrows).

NOTE:
Use a wooden underlay when forcing out.

- Press the taper roller bearing (2) off with 2 large screwdrivers.
- Take off the bearing/dust seal (3).

INSTALLING LOWER TAPER ROLLER BEARING



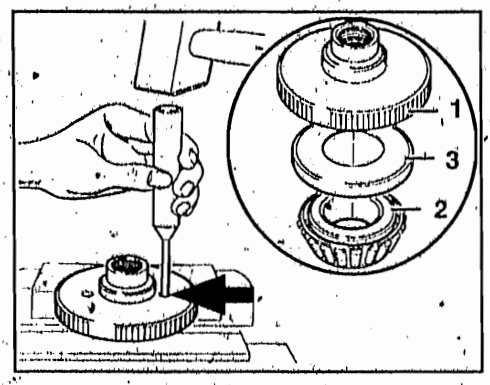
CAUTION:
Wear protective gloves when handling parts that have been heated.

NOTE:
Check the temperature with a "Thermo chrom" pin.

- Heat the taper roller bearing (4) to 80° C.
- Install the bearing with dust seal (5) on the steering head tube.
- Drive the bearing uniformly on as far as possible (arrow), using a suitable tube if necessary.
- Apply app. 2 g of RETINAX A grease to the bearing.

IMPORTANT:
There must be no play at the dust seal between the bearing and the fork bridge.

REMOVING UPPER TAPER ROLLER BEARING



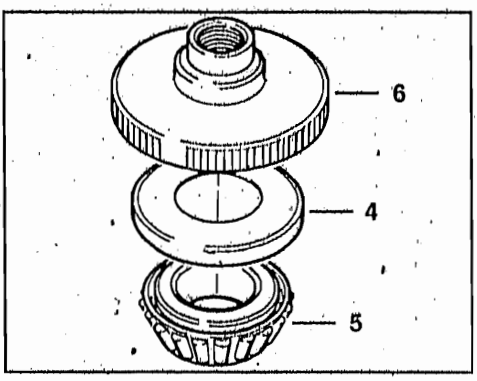
CAUTION:
Wear protective gloves when handling parts that have been heated.

NOTE:
Measure the temperature with a "Thermochrom" pin.

- Heat the adjusting ring (1) to 80°C.
- Using a suitable drift, force the taper roller bearing with dust seal (2/3) evenly down through the holes (arrow) in the adjusting ring on the bearing mount.

WARNING:
The outer bearing race and the bearing are matched components and must always be renewed as a pair.

INSTALLING UPPER TAPER ROLLER BEARING



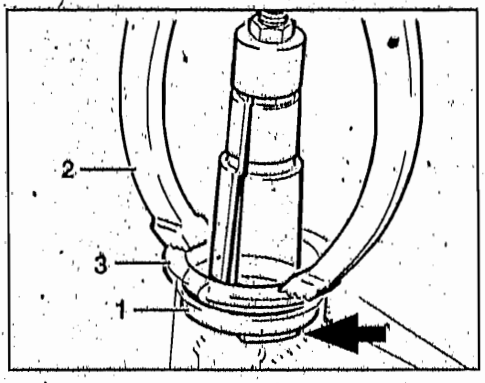
CAUTION:
Wear protective gloves when handling parts that have been heated.

NOTE:
Measure the temperature with a "Thermochrom" pin.

WARNING:
The outer bearing race and the bearing are matched components. Do not confuse these parts. There must be no play at the dust seal between the bearing and the adjusting ring.

- Use a new dust seal (4).
- Heat the taper roller bearing (5) to 80° C.
- Press the dust seal and bearing on to the bearing mount of the adjusting ring (6).
- Grease the bearing with app. 2 g of RETINAX A.

REMOVING OUTER BEARING RACE FROM STEERING HEAD

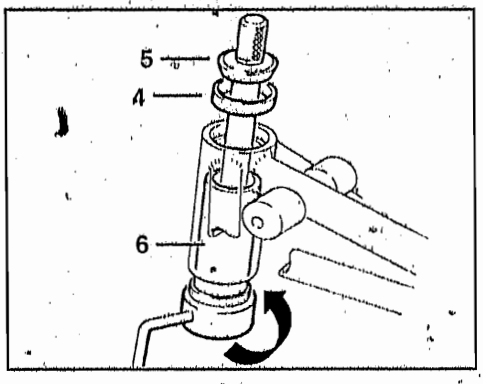


NOTE:
Make sure that the locating lug is between the bearing seat and the outer bearing race (arrow).

- Pull the outer bearing race (1) out of the upper/lower steering head with a Kukko puller, BMW No. 00 5 560 (2) and a thrust ring, BMW No. 31 4 800 (3).

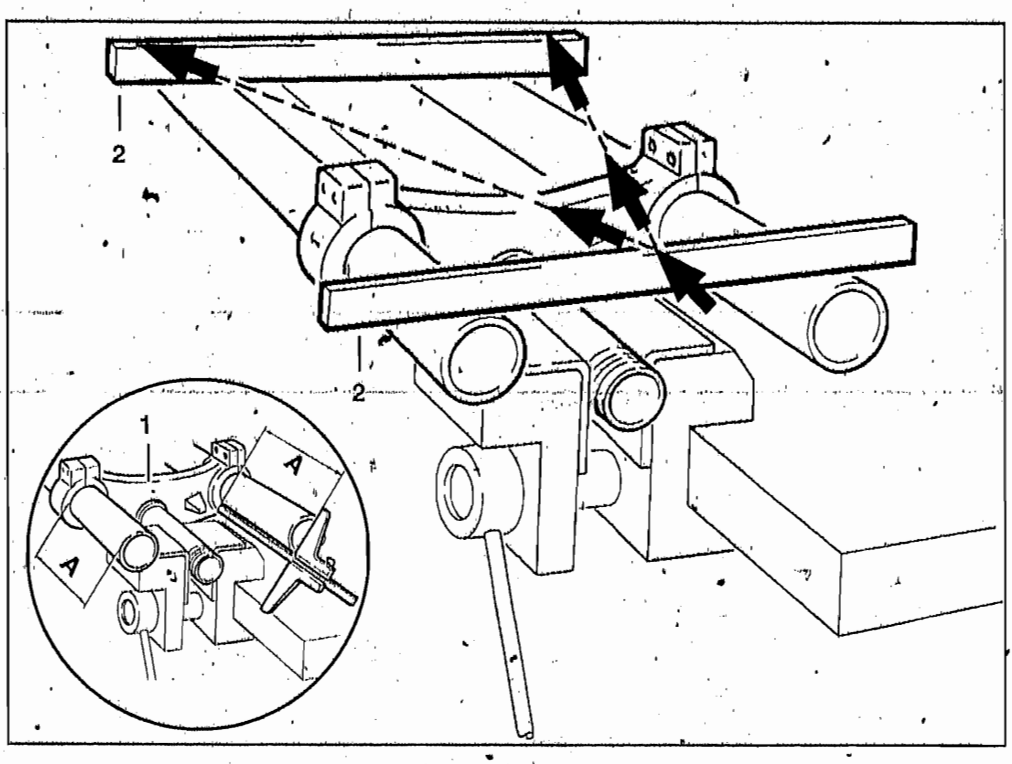
WARNING:
The outer bearing race and bearing are a matched pair. Always renew them as a single unit.

INSTALLING OUTER BEARING RACE IN STEERING HEAD



WARNING:
The outer bearing race and bearing are a matched pair. Do not confuse them with other parts.

- Pull the outer bearing race (4) in fully using the spindle of frame checking gauge BMW No. 46 5 604/605 (5) and spacer, BMW No. 31 4 820 (6).



CHECKING LOWER FORK BRIDGE

NOTE:
Note the installed length for checking the fixed fork tubes.
Measure from the upper edge of the fixed tube to the lower edge of the lower fork bridge.

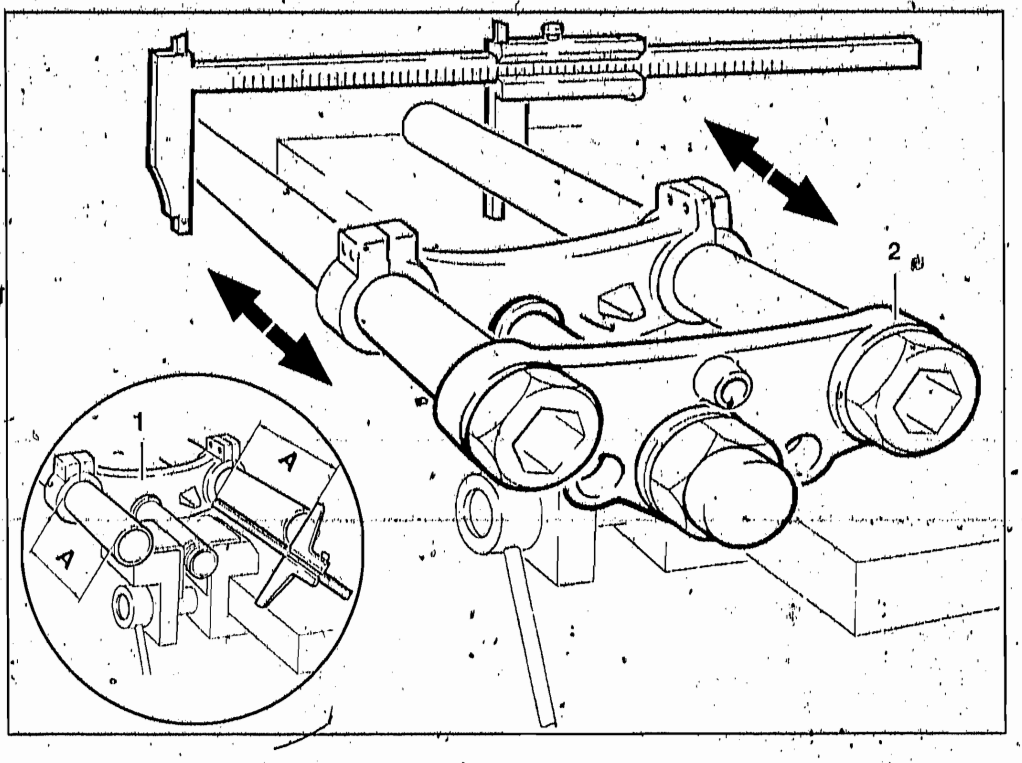
- Install two new fixed tubes in the lower fork bridge (1), to the correct installed length (A) for checking.

Installed length for checking (A):
Fork bridge to fixed tube *app. 221 mm*

NOTE:
Use a vise with soft jaws.

- Clamp the fork bridge with the steering tube into the vise.
- Place two straightedges, BMW No. 31 4 620 (2), over the ends of the fixed tubes.
- Look across the straightedges in the direction of the arrows to detect any distortion.

IMPORTANT:
The fork bridge must be renewed if any distortion is detected.



CHECKING PARALLELISM OF FIXED TUBES

- Install the fixed tubes in the lower fork bridge (1) to the correct length (A) for checking.

Installed length for checking (A):
Fork bridge to fixed tube *app. 221 mm*

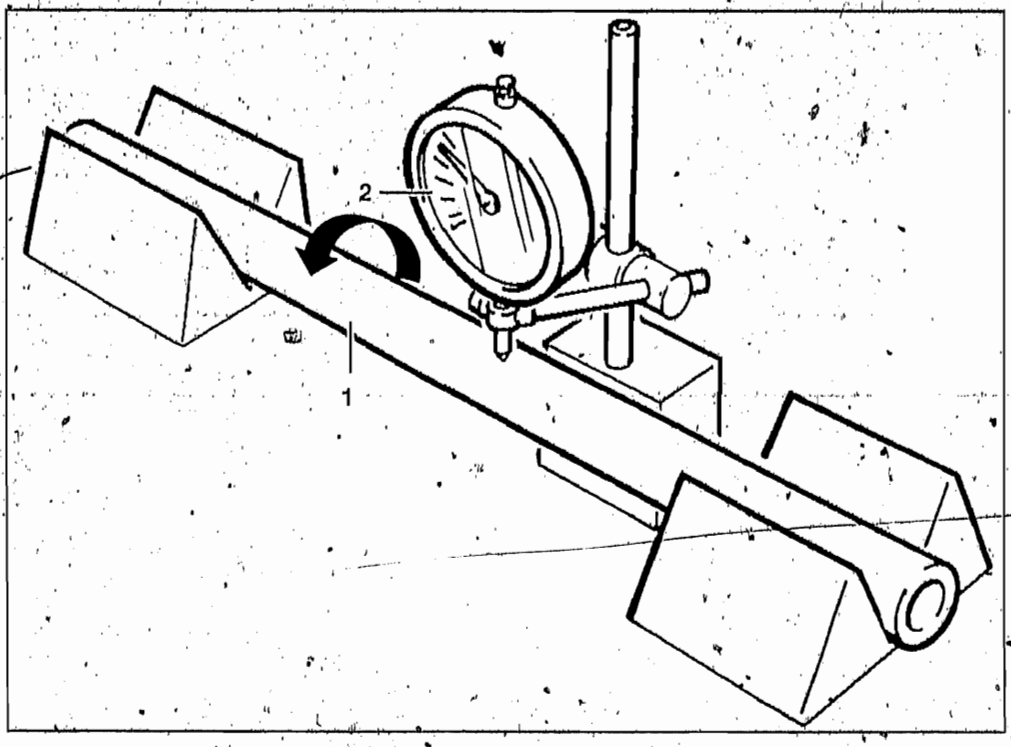
> **NOTE:**
> It should be easy to slide the upper fork bridge on to the fixed tube/steering head.

- Install the upper fork bridge (2) so that the fixed tubes project 6 mm beyond the fork bridge.

> **NOTE:**
> Use a vise with soft jaws.

- Clamp the fork bridge with steering tube into the vise.
- Using sliding calipers of suitable size, check that the fixed tubes are precisely parallel.
- Check that the steering tube is aligned with the fixed fork tubes (arrows).

> **IMPORTANT:**
> If there is any departure from parallel, also check the fixed tubes for runout.
> If they are not parallel or if runout is detected, always renew the upper/lower fork bridge/fixed fork tubes.



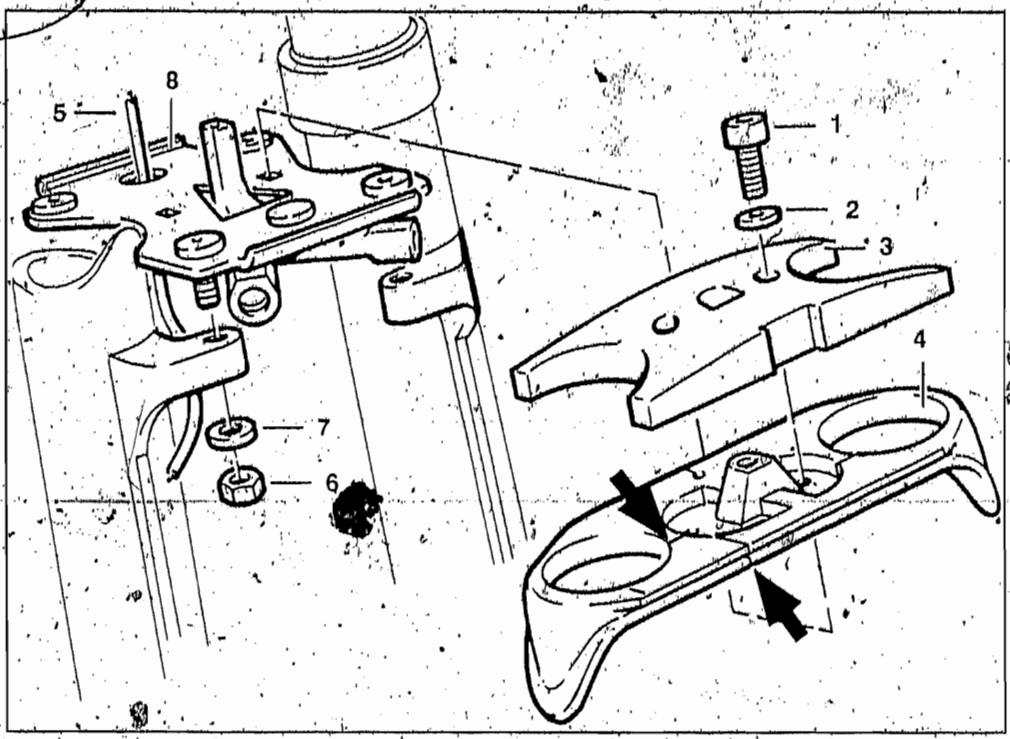
CHECKING FIXED FORK TUBE

Permissible runout:
Fixed fork tube *0.15 mm*

IMPORTANT:
If the telescopic fork has been damaged, check the lower fork bridge/fixed tubes/ slider tubes for cracks.

- Place the ends of the fixed tube (1) on vee guides or centres.
- Slowly rotate the fixed tube (arrow).
- Measure runout with a dial gauge (2).

IMPORTANT:
Bent fixed tubes must never be straightened for further use. Always renew them or there will be a risk of fatigue fractures.



REMOVING AND INSTALLING FORK STABILIZER

- Remove the two retaining screws with washers (1/2) from the fork stabilizer cover.
- Take off the cover (3).
- Separate the rubber overlay (4) at the left/right joint lines (arrows).
- Remove the ABS sensor cable (5) from the overlay.
- Take off the rubber overlay.
- Unscrew the 4 retaining nuts with washers (6/7) from the fork stabilizer.
- Take off the stabilizer (8).
- Install in the opposite order of work.

NOTE:

When installing, first screw on the retaining nuts handtight.
Compress the fork several times.
Tighten the nuts finally in alternating steps, working in a crosswise pattern.

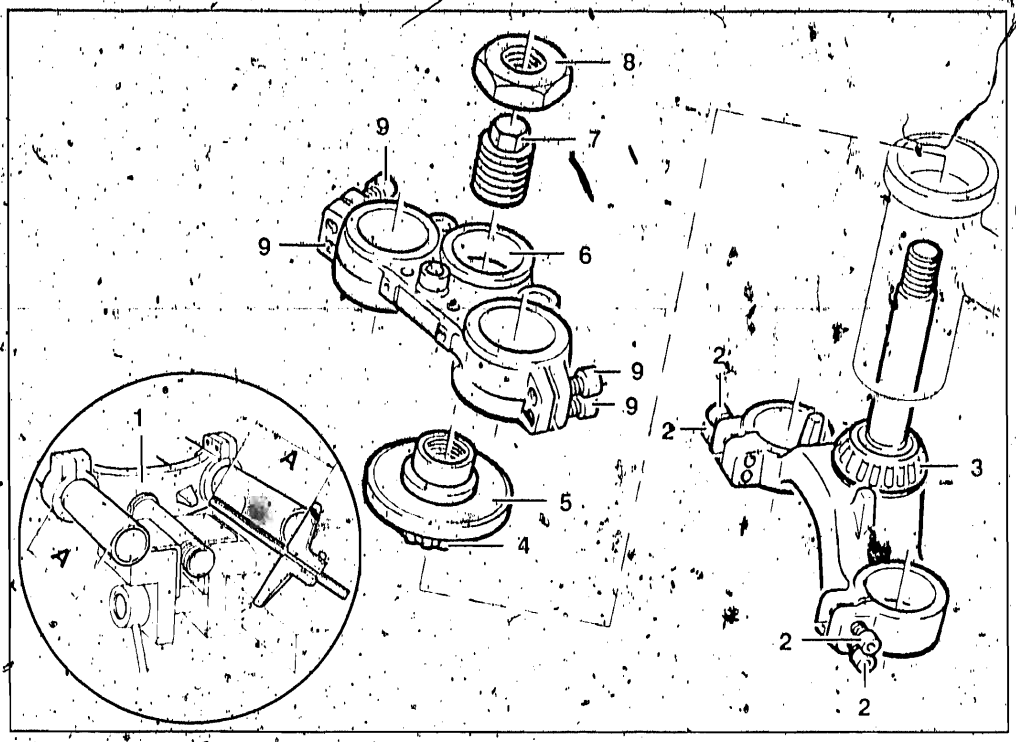
Tightening torque	
Fork stabilizer to slider tube	*21 ± 2 Nm*
Hollow screw for	
brake line at distributor pipe	*7 ± 1 Nm*
Brake line to distributor pipe	*7 ± 1 Nm*
Bleed screw	*7 ± 1 Nm*

IMPORTANT:

Always bleed the brake system after it has been opened or refilled.

NOTE:

Removal and installation are also possible with the telescopic fork installed on the motorcycle.
Removing and installing:
Remove the hollow screw with sealing rings at the left/right brake caliper distributor pipe.
Remove the hollow screw with sealing rings at the brake line distributor pipe.
Continue work as described above.



INSTALLING TELESCOPIC FORK

INSTALLING UPPER/LOWER FORK BRIDGE

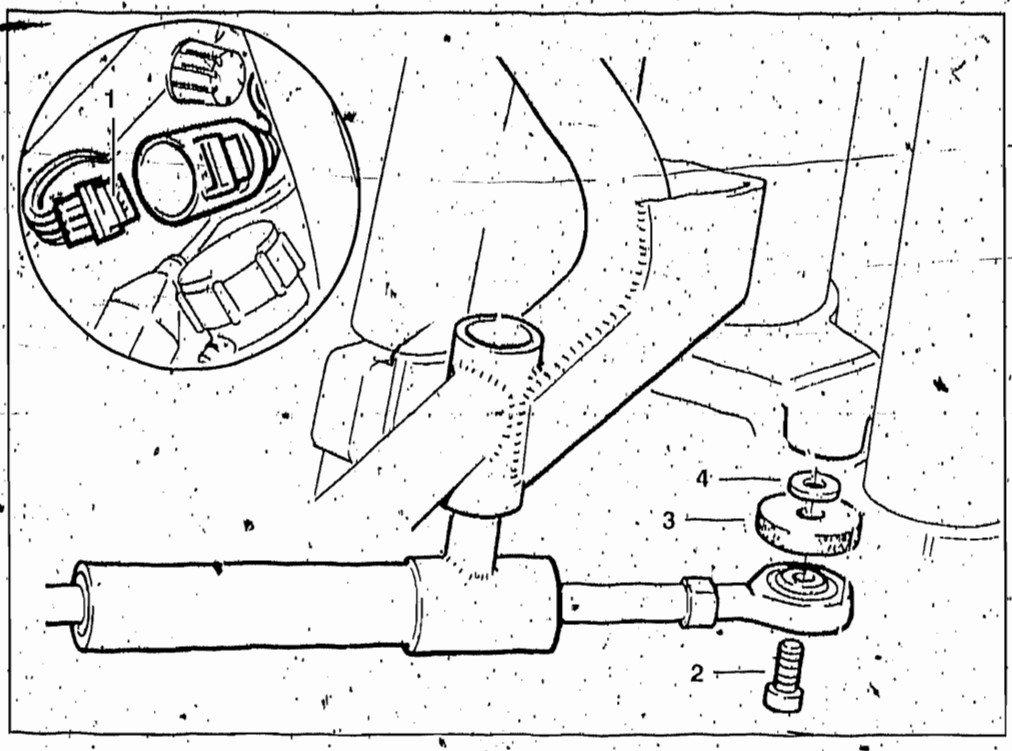
- Attach the lower fork bridge (1) to the fixed fork tubes at the correct installed length (A) for checking.
- Insert the clamp screws (2) at the left/right of the fork bridge, without finally tightening them.

NOTE:
Grease the lower/upper taper roller bearings (3/4) with 2 g each of SHELL RETINAX A.

- Insert the steering tube into the steering head tube.
- Screw the adjusting ring (5) several turns on to the steering tube.
- Install the upper fork bridge (6) on the adjusting ring/steering head tube.
- Install the upper fork bridge so that the fixed fork tubes project by 6 mm above the fork bridge.
- Eliminate play from the upper/lower taper roller bearings by turning the adjusting ring.
- Screw the locking tube/hex nut (7/8) into the adjusting ring and tighten to the specified torque.
- Tighten the clamp screws (2/9) for the upper/lower fork bridge to the specified torque.

Installed length for checking (A):
Fork bridge to fixed fork tube — *app. 221 mm*

Tightening torque:
Clamp screws at fork bridges — *14.9 ± 2 Nm*
Hex nut — *65 ± 5 Nm*
Locking tube — *65 ± 5 Nm*



- Run the ignition switch cable correctly.
- Reconnect the ignition switch plug connector (1).
- Secure the ignition cable with a cable strap.
- Attach the steering damper to the lower fork bridge with a retaining screw (2). Note felt ring and washer (3/4).

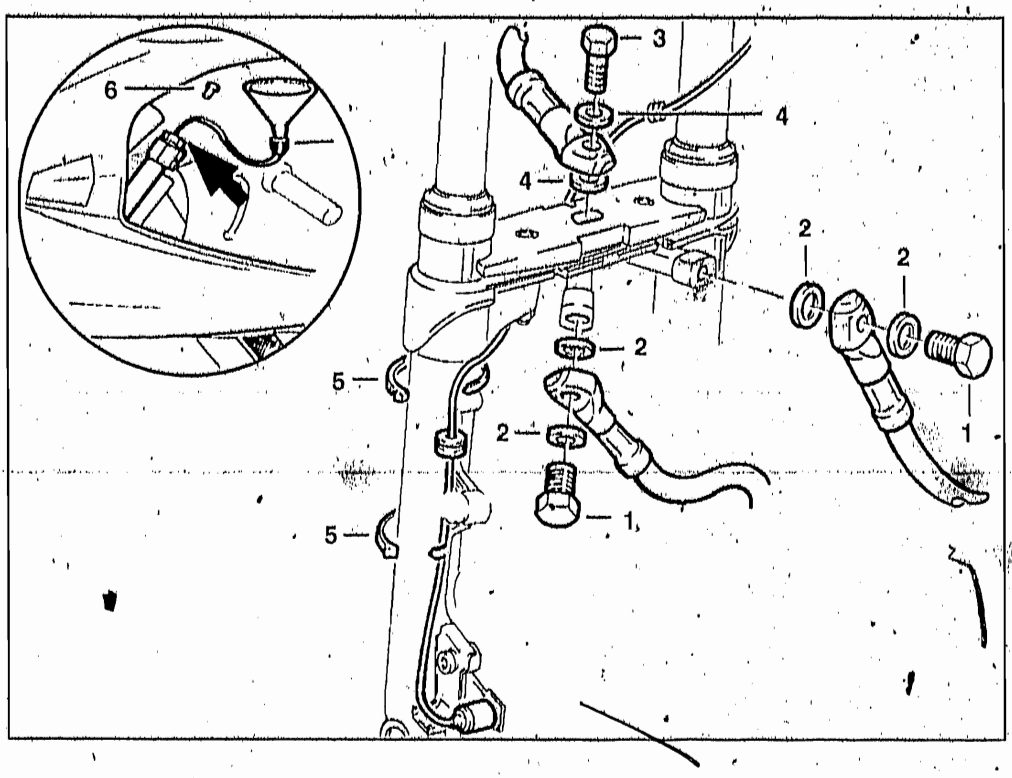
NOTE:

The punch mark on the handlebar must be centrally located between the two halves of the clamp.

- Place the handlebar in the lower halves of the clamps and align it correctly.
- Tighten the clamp block retaining screws.

Tightening torque:

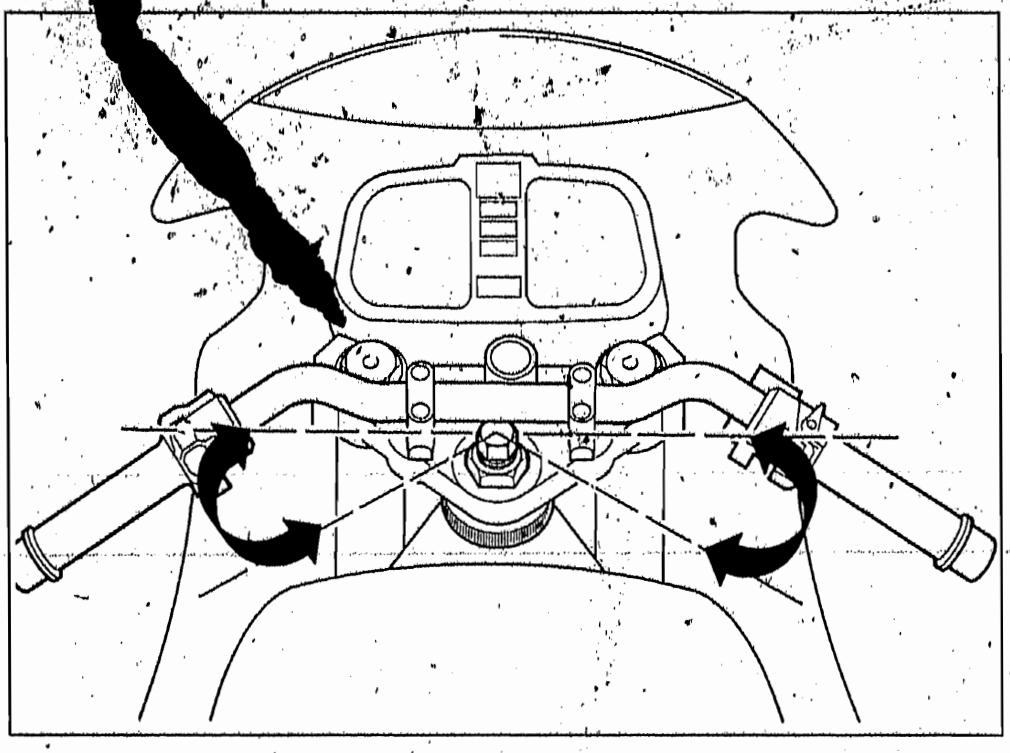
Clamp block halves	*22 ± 2 Nm*
Clamp screws to fork bridges	*14.9 ± 2 Nm*
Steering damper to fork bridge	*6.9 Nm*



NOTE:
The quick-release axle must slide easily into the fork slider tubes.

- Install the front wheel.
- Attach the left/right brake calipers.
- Screw the left/right brake lines to the distributor pipe with hollow screws and seals (1/2).
- Connect the brake line to the distributor pipe with hollow screw and seals (3/4).
- Make the ABS sensor plug connection.
- Secure the ABS/brake lines with two cable straps (5) each.
- Relieve the load on the front wheel.
- Add the specified telescopic fork oil (arrow).
- Screw in the oil filler plug (6).
- Detach the lifting device, BMW No. 00 1 510, from the sump.
- Compress the telescopic fork firmly several times.

NOTE:
Slight stiffness (as when new) is possible after parts have been renewed.
A running-in distance of about 1000 km is needed.
If stiffness persists, strip down and measure the telescopic.



- Check steering head bearing play and adjust if necessary.

NOTE:
When there is no load on the telescopic fork, it should swing round by an equal amount to the left or right (arrows).

- Attach the handlebar cover with 2 retaining screws.
- Install the front mudguard.
- Install the instrument cluster.
- Install the fuel tank and fuel tank pad.
- Attach the fairing elements.
- Attach the dualseat/dualseat cover.

Tightening torque:

Brake caliper to fork slider tube	*32 ± 2 Nm*
Quick-release axle retaining screw	*33 ± 4 Nm*
Clamp screws at fork slider tube	*14 ± 2 Nm*

IMPORTANT:
Always bleed the brake system after opening/refilling.

Tightening torque:

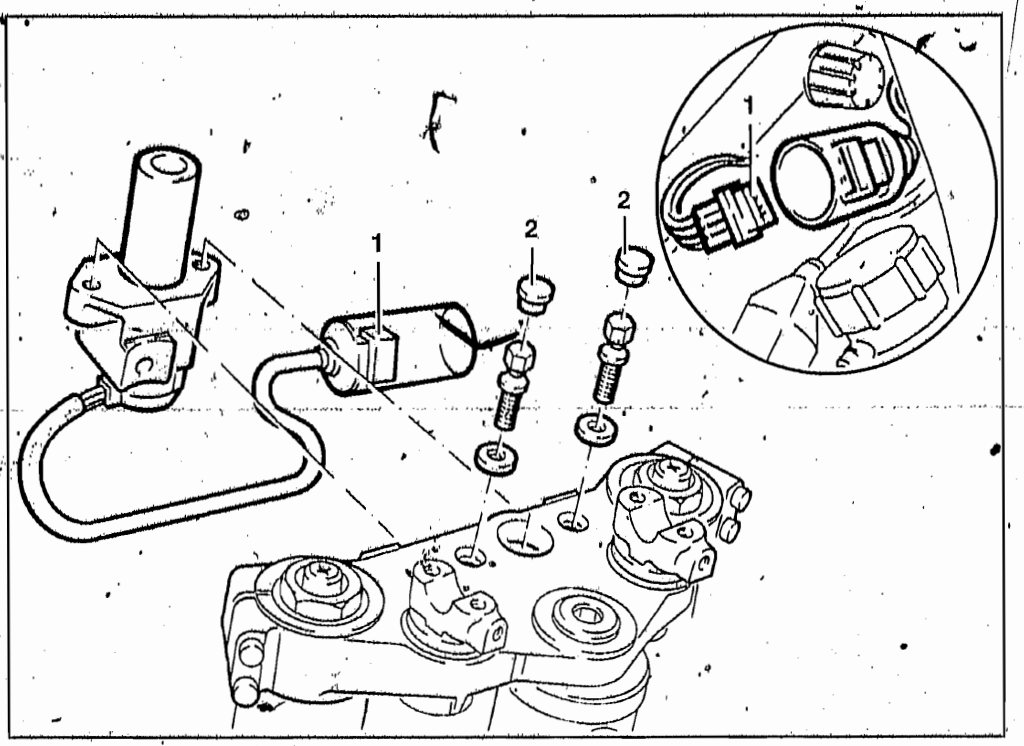
Brake line to distributor pipe	*7 ± 1 Nm*
Bleed screw	*7 ± 1 Nm*

IMPORTANT:
Check the gap between the ABS sensor face and the pulse generating ring whenever a wheel is removed and installed.

- Check gap between sensor face and pulse generating ring.

Gap between sensor face and pulse generating ring:

Maximum	*0.50 - 0.55 mm*
Minimum	*0.30 - 0.35 mm*

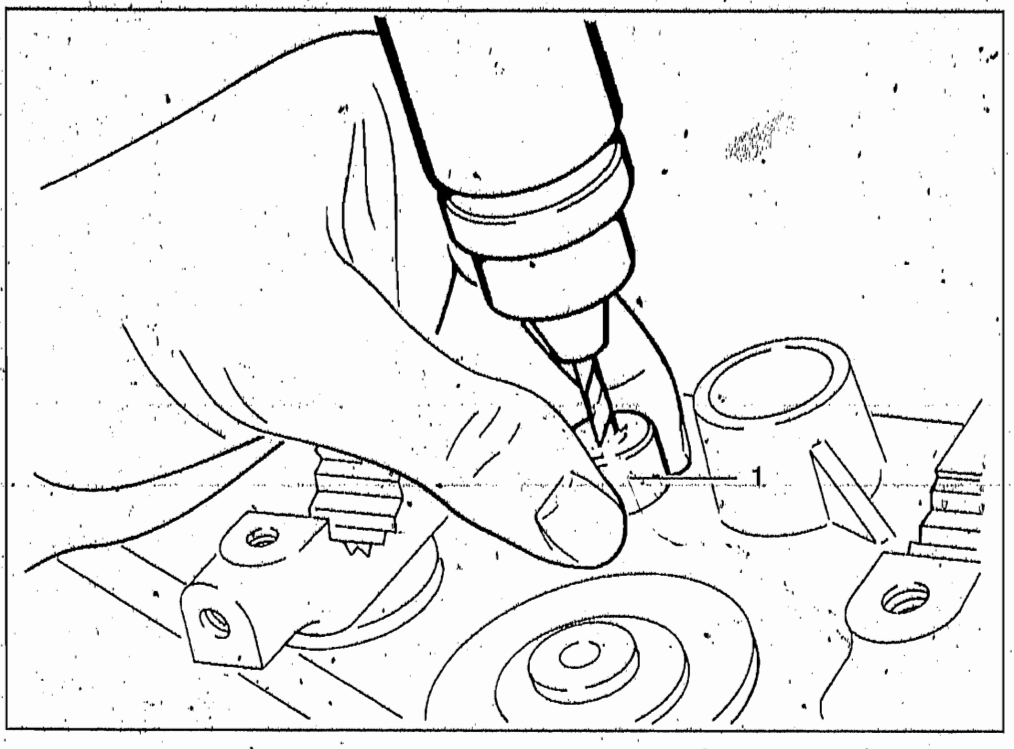


REMOVING AND INSTALLING IGNITION SWITCH/STEERING LOCK

DRILLING OUT IGNITION SWITCH/STEERING LOCK AT UPPER FORK BRIDGE

WARNING:
Switch off the ignition.
Disconnect and insulate the earth (ground) cable at the gearbox.
Disconnect the negative battery terminal before the positive one.

- Remove the left/right kneepad.
- Take off the dualseat.
- Remove the fuel tank pad.
- Take off the fuel tank.
- Separate the multi-pin plug (1) for the ignition switch/steering lock.
- Open the cable straps for the ignition switch/steering lock cable.
- Take off the handlebar cover.
- Take off the handlebar.
- Lever out the 2 caps above the shear bolts (2).
- Loosen the upper fork bridge clamp screws.
- Loosen the hex nut/locking tube at the upper fork bridge.
- Slacken off the adjusting ring.



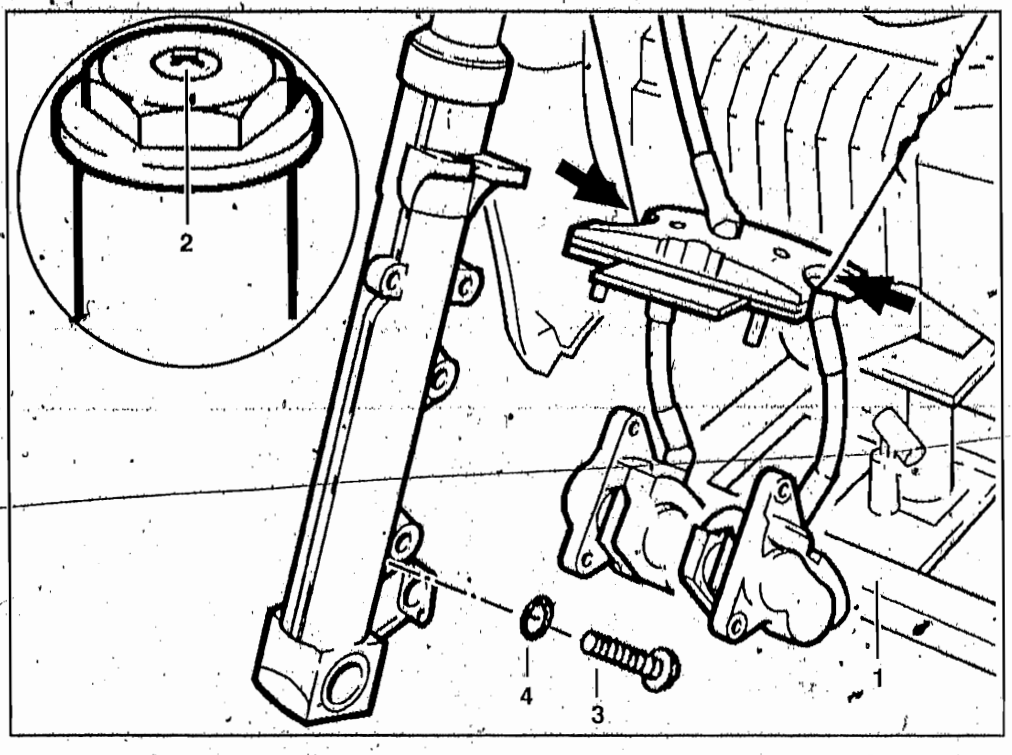
WARNING:
Before drilling out the switch, cover the steering head bearings and the lower fork bridge area most thoroughly to protect them.
Remove all drilling swarf most carefully.

- Insert drilling-out bushing, BMW No. 51 0 500 (1) in the shear bolt holes.
- Pre-drill the shear bolts with a 4 mm dia. bit and take out the drilling bushing.
- Drill into the shear bolts to a maximum depth of 8 mm with an 8 mm dia. bit.
- Remove the ignition switch/steering lock with its cable downwards.
- Install in the opposite order of work.

NOTE:
When installing:
Insert the ignition switch/steering lock into the fork bridge.
Secure with shear bolts.
Note correct cable run and positions of cable straps.
Run the cable so that it is not kinked and cannot rub against any parts of the motorcycle.
Adjust steering bearing play.

Tightening torque.

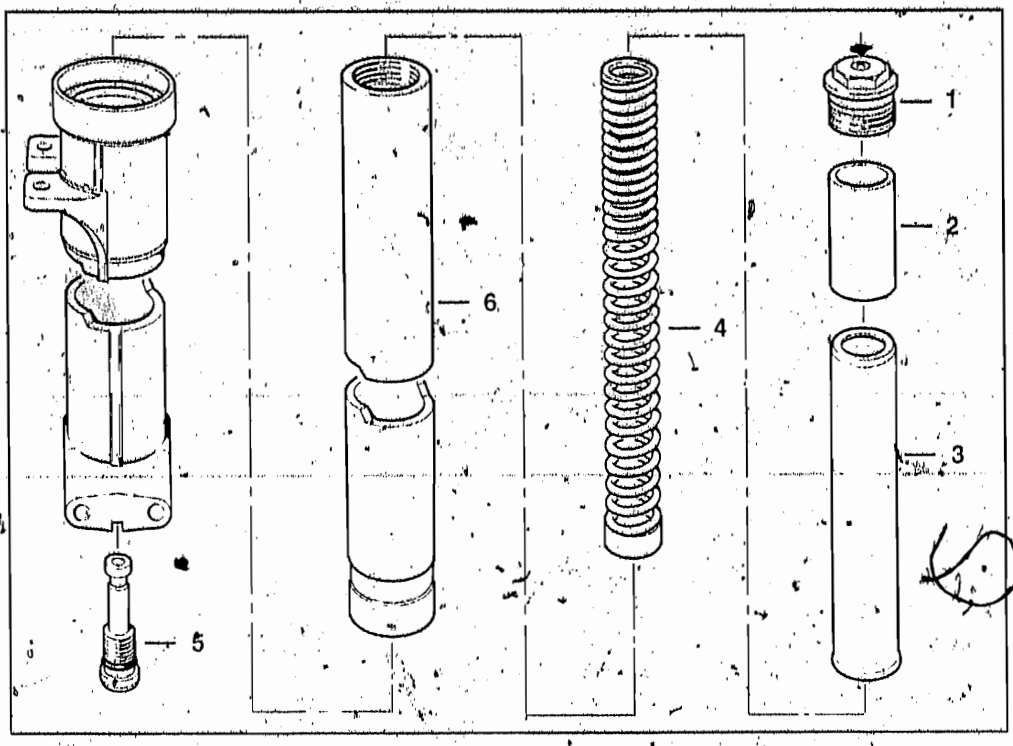
Upper fork bridge clamp screws	*14.0 ± 2 Nm*
Hex nut	*65 ± 5 Nm*
Locking tube	*65 ± 5 Nm*
Clamp block halves	*22 ± 2 Nm*



REMOVING FIXED/SLIDER TUBE

REMOVING FIXED FORK TUBE

- Take off the front mudguard.
- Remove the engine fairing.
- Raise the motorcycle under its sump with BMW No. 00 1 510 lifting device (1) until the front wheel is clear of the ground.
- Remove the front wheel.
- Remove the left kneepad.
- Remove the left inner fairing cover.
- Separate the ABS sensor plug connector.
- Open the 2 cable straps at the sensor line/brake line.
- Open the 2 cable straps for the sensor line on the fork slider tube.
- Pull the sensor line out downwards through the slot in the fork stabilizer.
- Loosen the 2 retaining screws on the fork stabilizer cover.
- Separate the rubber overlay from the slider tubes.
- Unscrew the 4 retaining nuts with washers at the stabilizer.
- Secure the fork stabilizer/distributor/brake caliper (arrows) to the frame.
- Loosen the 4 clamp screws at the upper/lower fork bridge.
- Pull the fixed/slider tubes out downwards/position them in an oil trap vessel.
- Take out the oil filler plugs (2) from the left/right fixed tubes.
- Remove the oil drain plugs with O-rings (3/4) from the left/right slider tubes.
- Allow the oil to drain out.
- Compress the fixed tubes until all the residual oil has been expelled.



NOTE:
Use a vise with soft jaws.

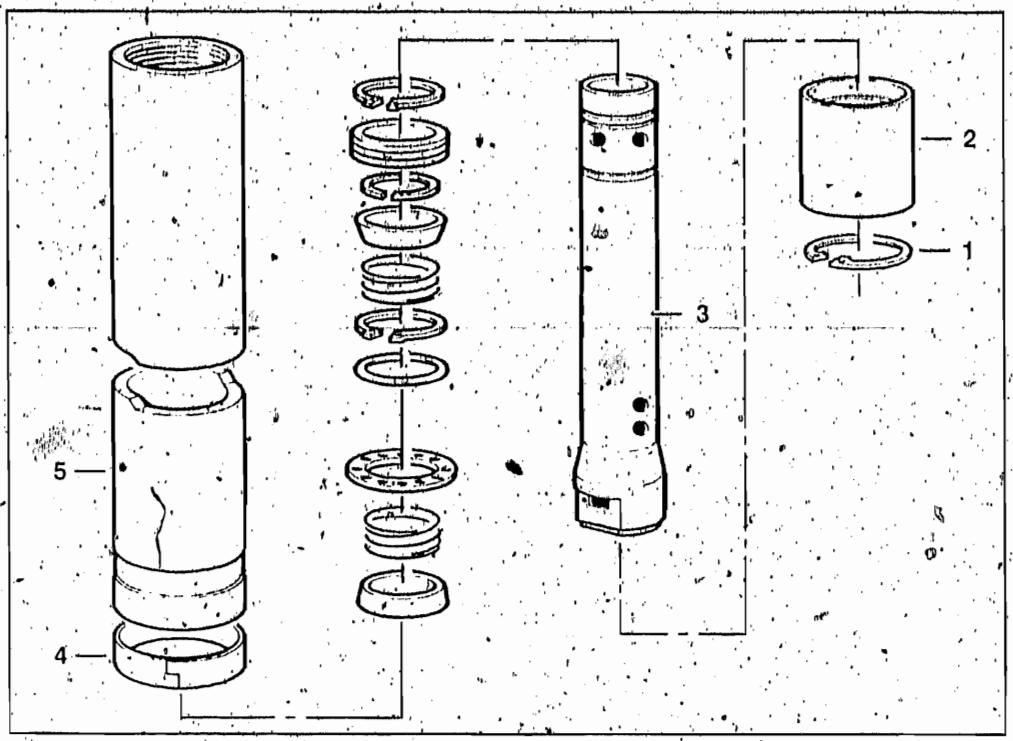
- Clamp the fork slider tube into the vise at the brake caliper mounting lug.

WARNING:
High pressure is exerted on the spring cap.

- Unscrew and remove the upper spring cap (1).
- Take out the spacing tube, support tube and suspension spring (2/3/4).

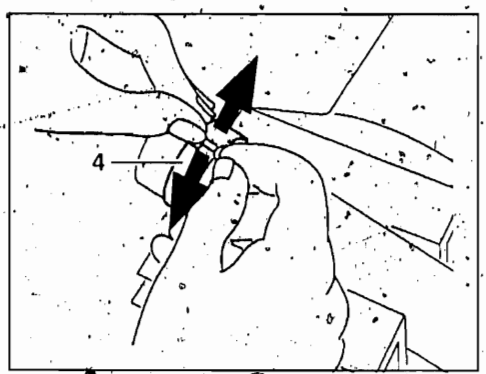
NOTE:
When reclamping in the vise, trap any residual oil which escapes.

- Clamp the fork slider tube into the vise horizontally.
- Unscrew the base valve (5) from the slider tube, preventing the damper from turning if necessary with a triangular scraper.
- Pull the fixed fork tube (6) out of the slider tube, turning it slightly at the same time.

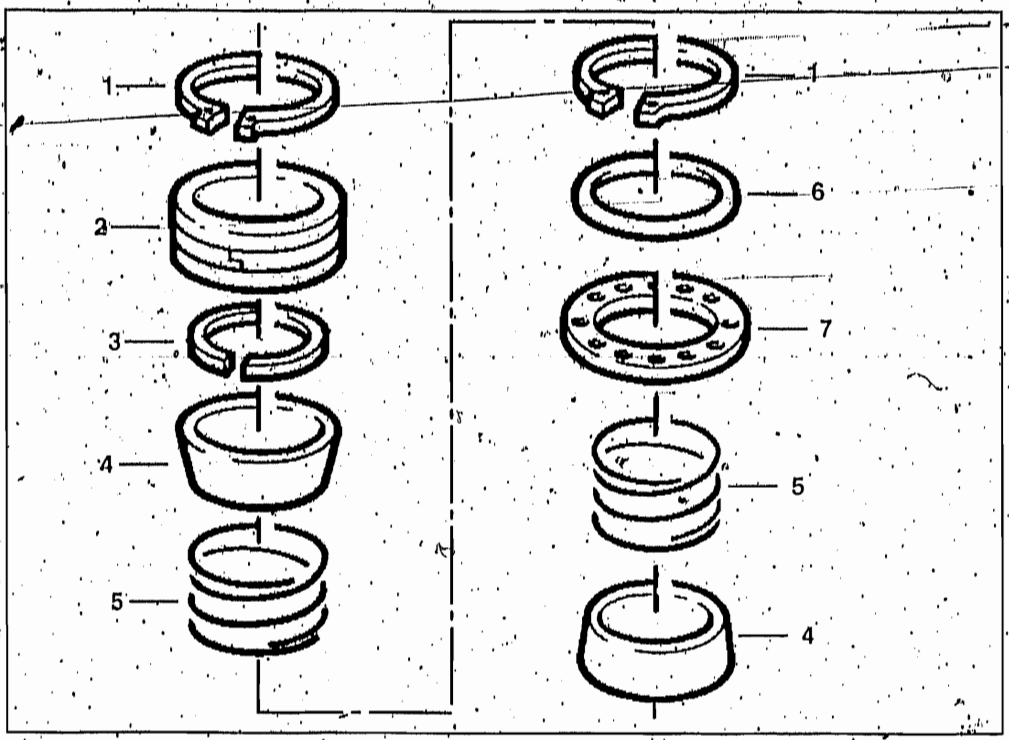


STRIPPING FIXED FORK TUBE

- Take out the circlip (1) with Seeger circlip pliers.
- Pull the valve body (2) out of the fixed tube.
- Pull out the complete damper (3).



- Use the thumbs and index fingers to force the sliding bushing (4) apart (arrows) and pull it off the fixed tube (5).



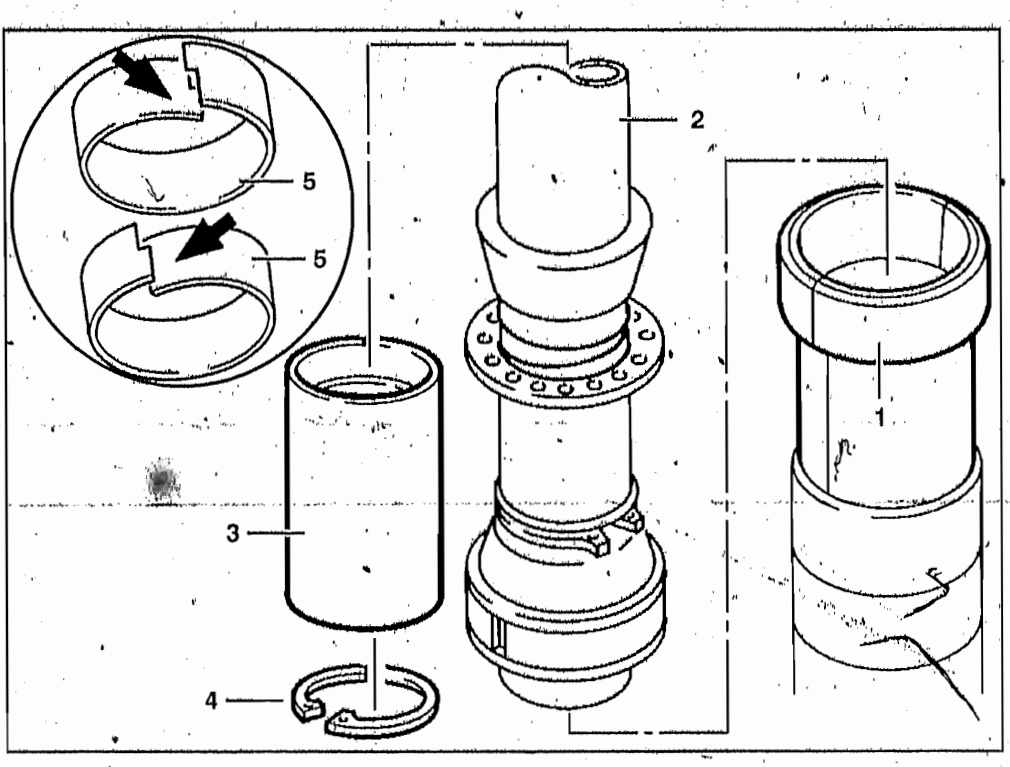
STRIPPING AND ASSEMBLING DAMPER

- Remove circlip (1) from the damper with Seeger circlip pliers.
- Pull off the components in the order stated here.

Part names:

Seeger circlip	(1)
Piston	(2)
Lock ring	(3)
Taper ring	(4)
Coil spring	(5)
O-ring	(6)
Valve disc	(7)

- Renew any damaged parts.
- Install in the opposite order of work.



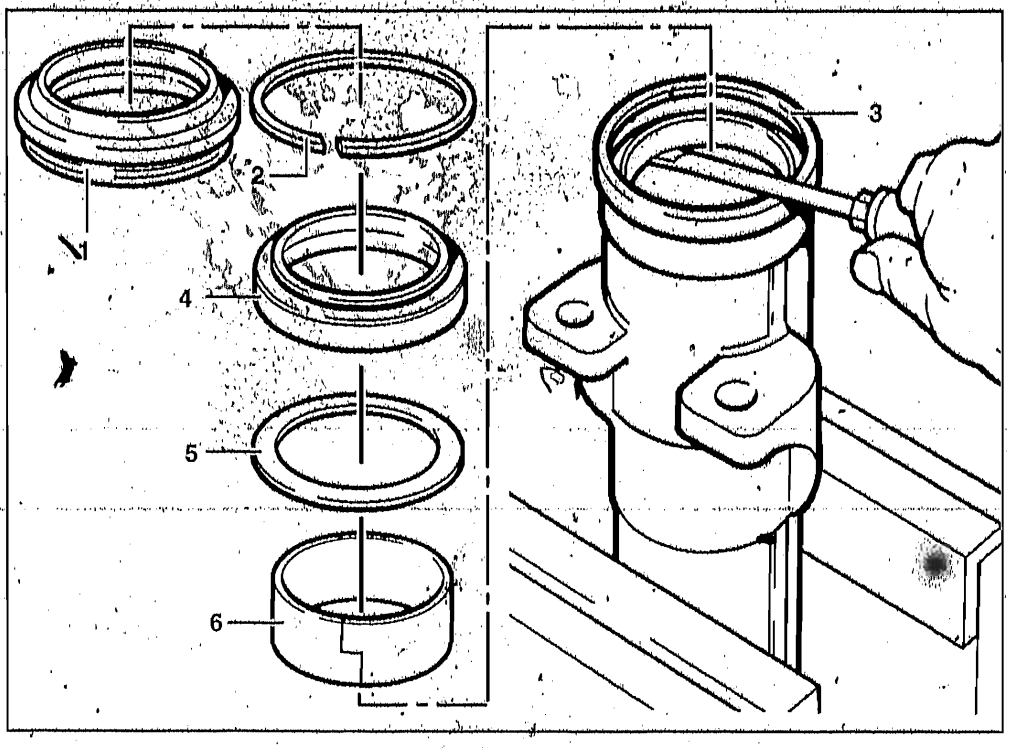
ASSEMBLING FIXED FORK TUBE

NOTE:
Use a vise with soft jaws.

- Clamp the fixed fork tube into the vise.
- Insert slip sleeve, BMW No. 31 4 710 (1) on the non-threaded side.
- Push the piston end of damper (2) through the slip sleeve and take off the sleeve.
- Push the damper in fully.
- Install the valve body (3) with the larger diameter inwards.

WARNING:
Make sure that the circlip engages fully in its groove.

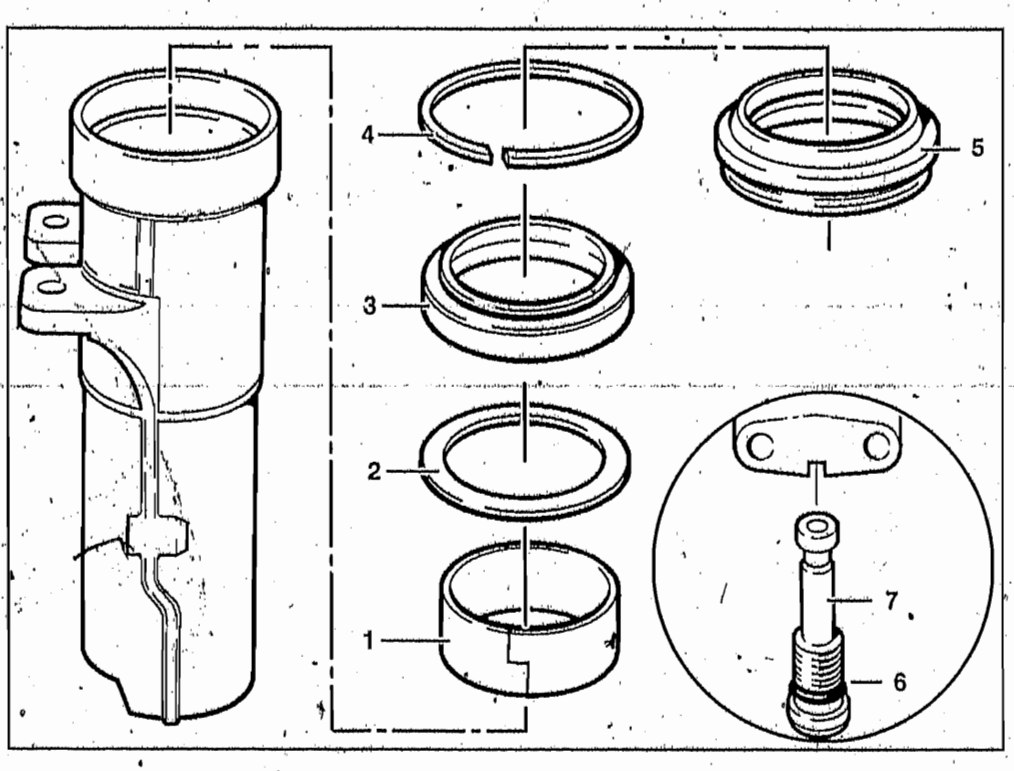
- Secure the valve body in the fixed tube with the circlip (4).
- Check fixed tube sliding bushing (5) for damage or wear, and renew if necessary.
- Press the sliding bushing together slightly (arrow) to obtain the necessary preload.
- Push the sliding bushing on to the fixed tube.



STRIPPING SLIDER TUBE

NOTE:
Use a vise with soft jaws.

- Clamp the fork slider tube into the vise vertically at the brake caliper mounting points.
- Lever out the dust sleeve (1) from the outside with a blunt knife.
- Lever out the snap ring (2) for the sealing ring with a small screwdriver.
- Place protective ring, BMW No. 31 3 610, over slider tube.
- Lever out the shaft sealing ring (4) with a slightly rounded-off screwdriver blade.
- Take out the steel ring (5).
- Pull the sliding bushing (6) out of the fork slider tube using both index fingers.
- Check the sliding bushing for damage or wear and renew if necessary.



ASSEMBLING AND INSTALLING SLIDER TUBE

- Install the sliding bushing (1).
- Place the steel washer (2) inside the slider tube.
- Grease the shaft sealing ring (3) lightly.

> **NOTE:**
> The annular spring on the shaft sealing ring must face up.

- Drive in the shaft sealing ring with BMW No. 31 3 600 drift and BMW No. 00 5 500 handle.
- Insert the snap ring (4).

> **NOTE:**
> Make sure that the snap ring is fully located in its groove.

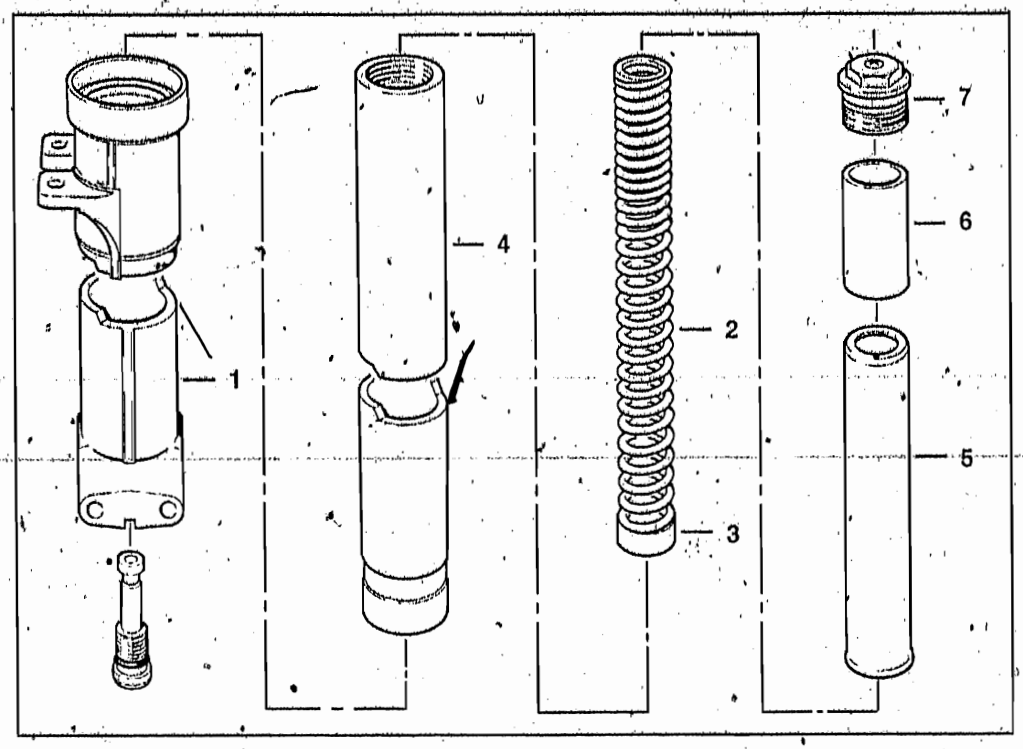
- Apply app. 2 g of GLEITMO 805 or SHELL RETINAX A to sleeve (5).
- Press the sleeve into the slider tube by hand.
- Grease the slider tube lightly where it runs on the fixed tube.
- Push the fixed tube into the slider tube, turning it slightly at the same time.

> **NOTE:**
> Make sure that the O-ring (6) at the base valve is in good condition.

- Screw in the base valve (7) to connect the damper with the slider tube.

Tightening torque:

Base valve	*47 ± 3.5 Nm*



- Clamp the fork slider tube (1) vertically in the vise.
- Insert the suspension spring (2) with spring cap (3) into the fixed tube (4) from below.
- Insert the support tube and spacer (5/6).
- Guide the fixed tube with the slider tube through the lower and into the upper fork bridge.

NOTE:
The fixed tubes must project 6 mm above the upper fork bridge.
The quick-release axle must slide in easily.

- Tighten the clamp screws to the specified torque.
- Tighten the left/right oil drain plugs; use new O-rings if necessary.
- Fill the telescopic fork legs with the specified amounts of oil.

IMPORTANT:
Use only approved grades of oil.

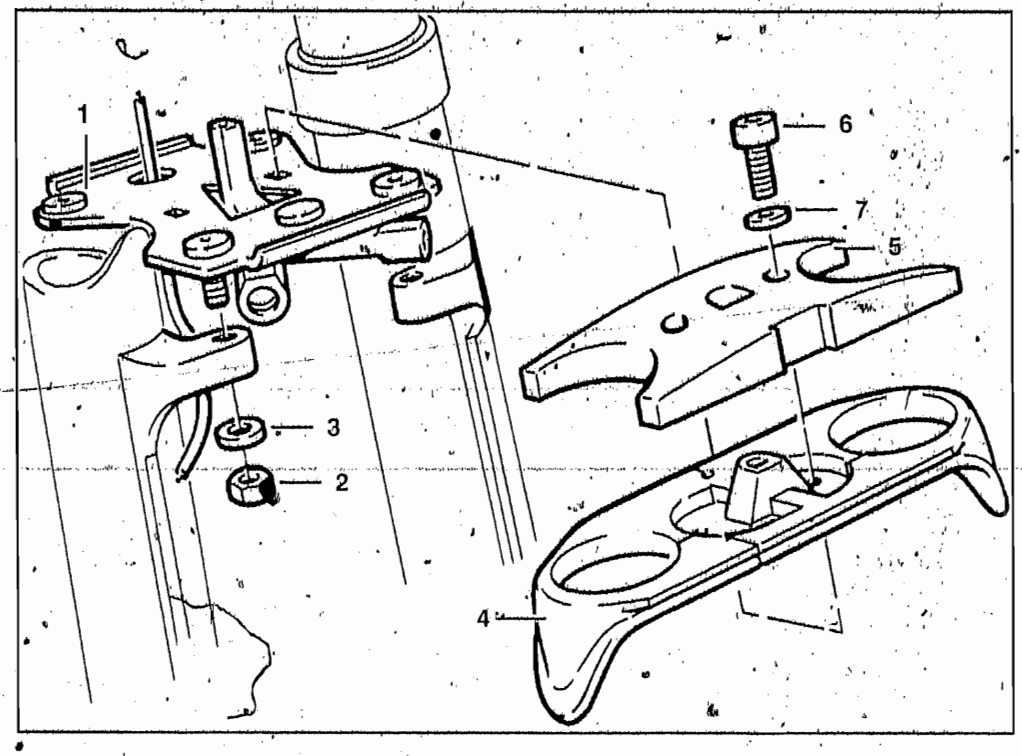
- Screw in and tighten the spring cap (7).
- Install the front wheel.
- Tighten the quick-release axle retaining screw (machine screw).
- Tighten the clamp screws on the left side only.

Tightening torque:

Upper/lower clamp screws	*14.9 ± 0.2 Nm*
Oil drain plug	*20 ± 4 Nm*
Spring cap	*20 ± 4 Nm*
Oil filler plug	*14 ± 1.4 Nm*
Machine screw	*33 ± 4 Nm*
Clamp screw	*14 ± 2 Nm*
Brake caliper to slider tube	*32 ± 2 Nm*

Oil content:

Each fork leg	*0.40 - 0,01 l*



- Install the fork stabilizer (1).
- Screw on the retaining nuts with washers (2/3) but do not tighten them fully.
- Install the rubber overlay (4).
- Install the left/right brake calipers.
- Connect the brake lines to the distributor pipe with the hollow screws and sealing rings.
- Remove the support from under the sump.
- Compress the telescopic fork several times.
- Tighten the right clamp screws.
- Tighten the fork stabilizer retaining nuts in successive stages, working in a crosswise pattern.
- Install the front mudguard.
- Attach the fork stabilizer cover (5) with 2 retaining screws and washers (6/7).

Tightening torque:

Fork stabilizer to slider tube	*21 ± 2 Nm*
Clamp screw	*14 ± 2 Nm*
Brake caliper to slider tube	*32 ± 2 Nm*
Brake hose to distributor pipe	*7 ± 1 Nm*
Bleed screw	*7 ± 1 Nm*

IMPORTANT:
Always bleed the brake system after it has been opened or refilled.

IMPORTANT:
Check the gap between the ABS sensor and the pulse generating ring whenever a wheel is removed and installed.

Gap between sensor wheel and pulse generating ring:

Maximum	*0.50 - 0.55 mm*
Minimum	*0.30 - 0.35 mm*

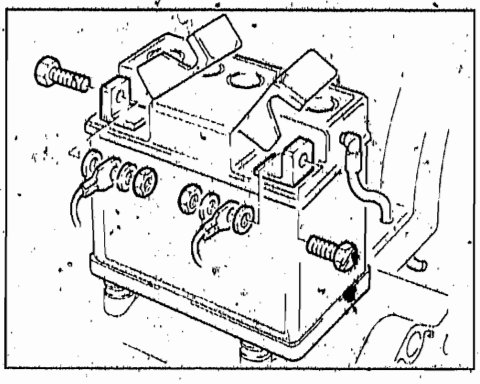
REMOVING FRAME (WITH ABS)

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Removing tool compartment cover.
- Remove the left/right inner fairing covers.
- Separate the plug connectors for the auxiliary instruments.
- Remove the engine fairing.
- Remove the left/right centre sections of the fairing.
- Pull the cable shoes off the horn.
- Detach the horn mounting with horn.
- Remove the radiator surround.
- Separate the plug connectors for the left/right flashing turn indicators.
- Separate the plug connectors for the parking lights.
- Pull off the headlight plug.
- Remove the upper section of the fairing.
- Detach the multi-pin plug from the instrument cluster.
- Take off the instrument cluster.
- Take the brake and rear lights out of the rear fairing.
- Pull off the plug connections for the left/right flashing turn indicators at the rear fairing.
- Detach the rear fairing with support section/mounting/rear light.
- Remove the fuel tank pad.
- Take off the fuel tank.
- Detach the mounting for the upper section of the fairing.
- Detach the mountings for the centre/left sections of the fairing.
- Detach the mounting for the radiator surround.
- Detach the intake air line to the lower section of the air cleaner housing.
- Take off the left/right air guides.
- Remove the dualseat catch mounting.

WARNING:

Switch off the ignition. Disconnect/insulate the earth (ground) cable at the gearbox.

- Open the cable straps/separate the plug connectors on/for:
  Hall-effect trigger
  Oil pressure switch
  Handbrake/foot brake light switches
  Gearbox switch
  Clutch switch
  Left/right handlebar fittings
  Ignition/light switch
  Brake light switch
  Fuel level indicator
  Ignition output stage
  Choke switch
  CO potentiometer
  Inductive signal transmitter
  Front/rear pressure modulators
  Front/rear sensors
- Remove the MOTRONIC control unit.
- Remove the ABS control unit.
- Detach the multi-pin plug from the ignition output stage.

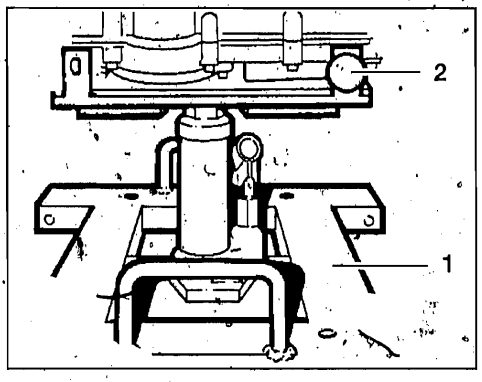


- Disconnect the positive battery lead.
- Remove the battery.
- Separate the plug connection for the engine wiring harness.
- Open the cable straps on the frame for the engine wiring harness.
- Pull off the plug at the alternator.
- Disconnect the positive lead at the starter motor.
- Remove the rear mudguard.

WARNING:
Brake fluid is highly corrosive.
Avoid any contact with the eyes, skin or clothing.
Never keep brake fluid in bottles previously used for drinks.
Keep it only in specially marked containers.
If brake fluid is swallowed accidentally, the victim must be seen by a physician at once.

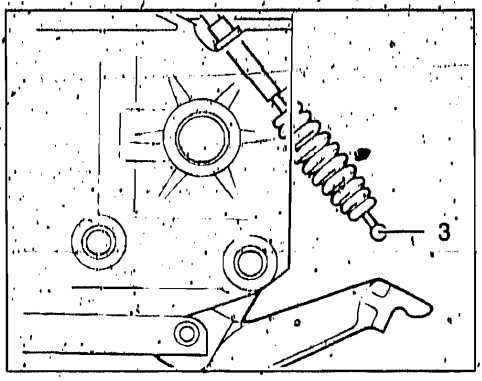
CAUTION:
Brake fluid damages painted surfaces.
Keep it away from painted areas on the motorcycle.
Never re-use brake fluid which has been drained or siphoned off. Dispose of it in accordance with environmental protection laws.

- Drain the front brake circuit with the Joma bleeding device.
- Detach the brake line from the distributor pipe on the fork stabilizer.
- Detach the brake lines at the pressure modulator/threaded union for front brakes.
- Detach the pressure modulator holder. Note the earth (ground) connection for the pressure modulator.
- Take off the holder with the pressure modulator.
- Drain the cooling system.
- Detach the coolant hoses from the radiator.
- Separate the plug connector for the fan motor.
- Remove the radiator.
- Remove the radiator air guide.
- Detach the coolant filler pipe/overflow hose from the frame.

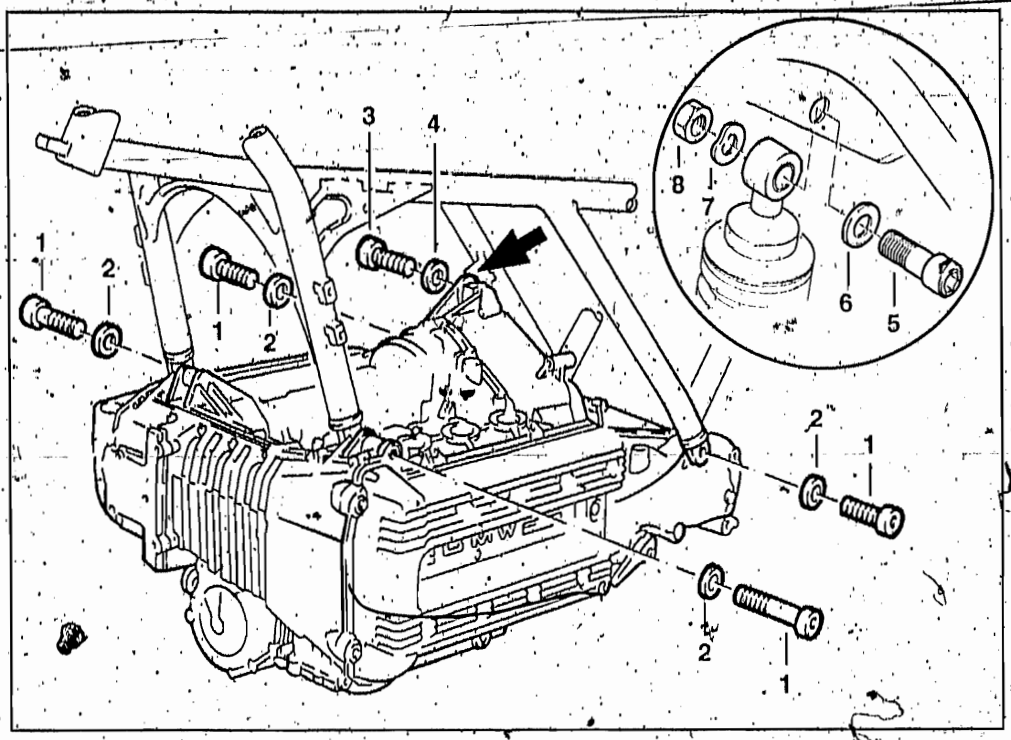


- Secure the lifting device, BMW No. 00 1 510 (1) to the sump with the four knurled screws (2).

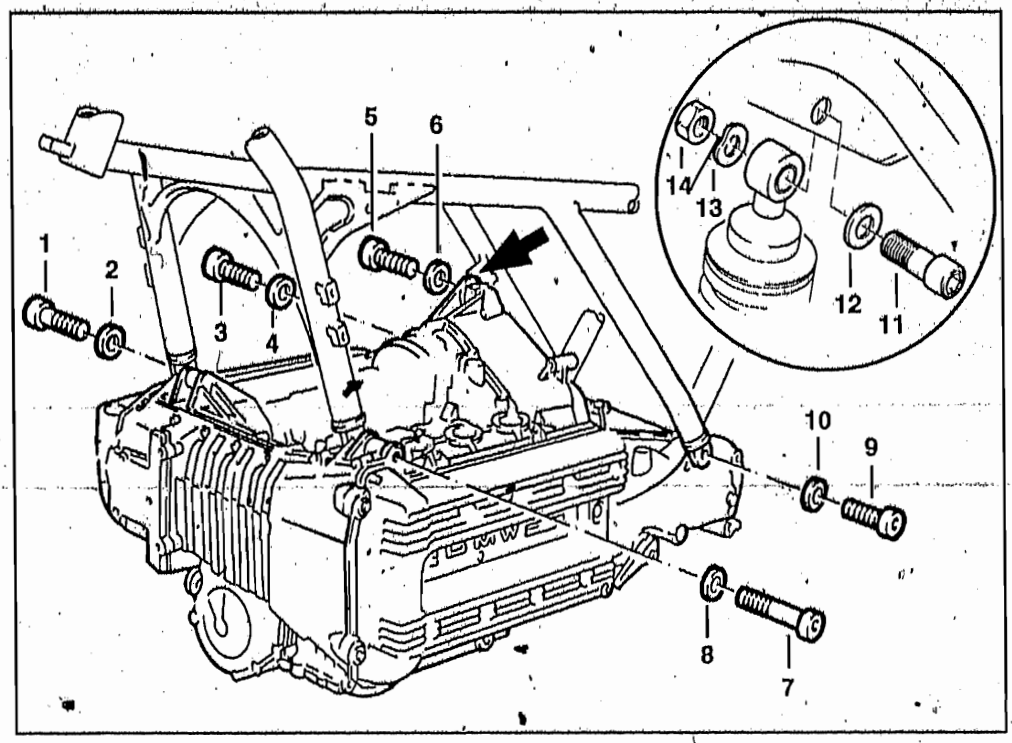
- Take off the handlebar cover.
- Open the cable straps for the wire cables and electrical wiring.



- Disconnect the clutch cable (3) at the release lever.
- Slacken off the cold start cable at the throttle butterfly switch.
- Disconnect the cable at the choke lever.
- Disconnect the throttle cable at the throttle butterfly assembly.
- Detach the steering damper from the lower fork bridge.
- Take off the handlebar.
- Slacken off the clamp screws at the upper fork bridge.
- Unscrew the hex nut/thrust tube.
- Unscrew the adjusting ring.
- Pull the upper fork bridge/adjusting ring off the fixed fork tubes.
- Remove the telescopic fork with front wheel.



- Take out the four retaining screws with washers (1/2) at the engine/gearbox.
- Remove the retaining screw with washer (3/4) at the intermediate flange. Note the spacing washer (arrow) between the frame and the lug on the intermediate flange.
- Remove the retaining screw/washer/spring washer/nut (5/6/7/8) from the top of the spring strut.
- Lift the frame off the engine/gearbox and set it down on the workbench.
- Detach the fuel collector from the frame.
- Open the cable straps on the frame wiring harness.
- Detach the earth (ground) connection at the frame.
- Remove the frame wiring harness.
- Remove the upper/lower outer bearing races at the steering head bearings.
- Pull all rubber bushings off the frame.
- Pull off the front/rear rubber support blocks for the fuel tank.
- Remove all sheet-metal and cage nuts.



INSTALLING FRAME (WITH ABS)

WARNING:

The wiring harness must be absolutely free from kinks and point of possible abrasion.
Plug connectors should not touch the frame.
Note the correct positions of the cable straps.

NOTE:

Keep the earth (ground) connection area free of paint. Apply a thin layer of CENTOPLEX 3 CU contact grease to it.
When installing the wiring harness, start from the middle and work forwards and backwards.

- Install the frame wiring harness and secure with cable straps.
- Place the frame in position on the engine/gearbox.
- Insert and tighten 2 retaining screws with washers (1/2/3/4).
- Measure the gap (arrow) between the frame and the lug on the intermediate flange.
- Equalize the gap with shims.

NOTE:

A gap of max. 0.25 mm should remain.

- Insert and tighten the retaining screw with washer (5/6).
- Insert and tighten the 2 retaining screws with washers (7/8/9/10).
- Secure the spring strut to the frame with the retaining screw, washer, spring washer and nut (11/12/13/14).

Tightening torque:

Earth (ground) connection on frame wiring harness	*8.8 Nm*
Frame to motor, intermediate flange and gearbox	*45 - 6 Nm*
Spring strut to frame	*51 ± 6 Nm*

- Insert sheet-metal and cage nuts.
- Attach rubber supports for fuel tank at front and rear.
- Attach rubber mountings.
- Attach fuel collector to frame; run the hose correctly.

NOTE:
Do not confuse the upper and lower steering head bearing races.

- Install the upper/lower steering head bearing races.
- Insert the adjusting ring into the upper fork bridge from below.
- Place the upper fork bridge on the steering tube.
- Install the complete telescopic fork with front wheel.
- Push the upper fork bridge on to the fixed tubes. Note that the correct installed height is 6 mm below the ends of the fixed tubes.
- Screw in the adjusting ring.
- Screw in the locking tube/hex nut.
- Tighten the clamp screws on the upper fork bridge.

Tightening torque:
Clamp screws at fork bridge *14.9 ± 2 Nm*

- Install the handlebar.

Tightening torque:
Handlebar clamps *22 ± 2 Nm*

NOTE:
When there is no load on the telescopic fork, it must swing round uniformly to either left or right.

- Adjust the steering head bearings.

Tightening torque:
Hex nut *65 ± 5 Nm*
Locking tube *65 ± 5 Nm*

- Attach the steering damper to the lower fork bridge.

Tightening torque:
Steering damper to lower fork bridge *6.9 Nm*

NOTE:
Make sure that the wire cables are not kinked or excessively taut when the steering is turned.
Run the wiring on the outside and the wire cables on the inside along the wiring.
Note the correct cable strap positions.

- Connect the clutch cable to the release lever.
- Connect the throttle cable to the throttle assembly.
- Connect the wire cable for the cold-start device.
- Secure the wire cables and electrical wiring with cable straps.

NOTE:
The throttle cable must have 1 mm of play at the handlebar fitting.

- Adjust the wire cables.
- Check and adjust clutch operating clearance.
- Screw on the handlebar cover.
- Lower and remove the lifting device.
- Install the rear mudguard.

- Attach the coolant filler pipe/overflow hose. Make sure the hose is run correctly.
- Install the radiator air guide.
- Install the radiator.
- Connect the coolant hoses to the radiator.

Tightening torque:

Filler pipe to frame	
Radiator to frame	*8.5 ± 1 Nm*
Drain plug	*9 Nm*

- Make the plug connection for the fan motor.
- Add coolant to the system.

WARNING:
Use only approved grades of antifreeze/ corrosion inhibitor.
These must be free from nitrides.
Never fill beyond the lower edge of the filler pipe.
Note correct concentration.

Content:

Header tank	*2.8 + 0.4 l*

Concentration (for protection down to –28° C):

Antifreeze	*40 %*
Water	*60 %*

Concentration in Scandinavian countries:

Antifreeze	*50 %*
Water	*60 %*

- Bleed the cooling system.
- Connect the positive lead to the starter motor.

Tightening torque:

Cable to starter motor	*4 – 6 Nm*

- Make the plug connection at the alternator.

WARNING:
The engine wiring harness must be installed without any kinks or points of potential abrasion.
Plug connectors must not touch the frame.
Note the correct cable strap positions.

- Install the engine wiring harness and secure with cable straps.
- Make the plug connection to the engine wiring harness.
- Install the battery.
- Connect the multi-pin plug to the ignition output stage.
- Connect the positive battery lead.
- Connect the battery earth (ground) strap to the gearbox.
- Install and connect the ABS control unit.
- Install and connect the MOTRONIC control unit.
- Attach the dualseat catch mounting.
- Screw on the holder for the left centre section of the fairing.
- Attach the holder with the front pressure modulator; note the earth (ground) connection.
- Connect the brake lines to the pressure modulator/threaded union.
- Screw the brake line from the distributor pipe to the fork stabilizer.

IMPORTANT:
Always bleed the brake system after refilling.

- Fill and bleed the front brake system.

Tightening torque:

Brake line to pressure modulator	*7.3 Nm*
Threaded union for ABS line	*7.3 Nm*
Brake line to distributor pipe	*11 ± 1 Nm*
Hollow screw	*7 ± 1 Nm*
Bleed screw	*7 ± 1 Nm*

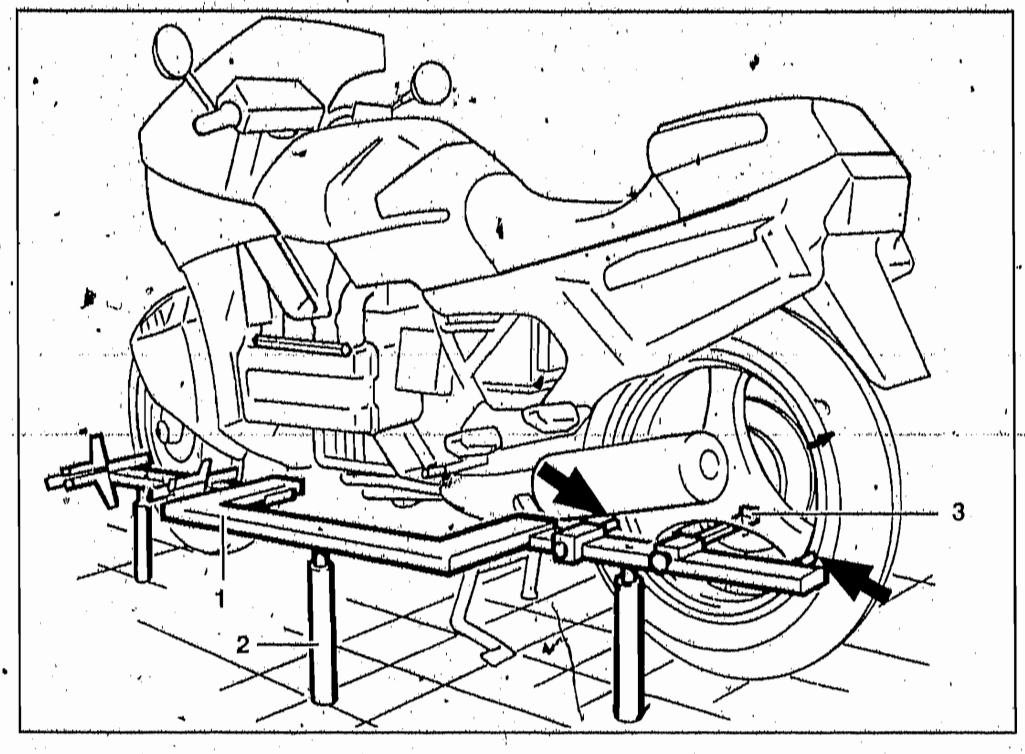
IMPORTANT:
Note correct positions of cable straps for plug connectors.

- Make the following plug connections and secure the cable straps where required:
  Hall-effect trigger
  Oil pressure switch
  Handbrake/foot brake light switches
  Gearbox switch
  Clutch switch
  Left/right handlebar fittings
  Ignition/light switch
  Brake light switch
  Fuel level indicator
  Ignition output stage
  Choke switch
  CO potentiometer
  Inductive signal transmitter
  Front/rear pressure modulators
  Front/rear sensors
- Install the left/right air guides.
- Attach the intake air duct for the lower part of the air cleaner housing.
- Screw on the holder for the radiator surround.
- Screw on the holder for the right centre section of the fairing.
- Screw on the holder for the upper section of the fairing.

Tightening torque:
Fairing holders to frame 9 Nm

- Install the fuel tank.
- Attach the fuel tank pad.
- Attach rear fairing with support section, holder and rear light.
- Connect wiring to left/right flashing turn indicators.
- Connect the brake and rear lights.
- Attach the instrument cluster.
- Connect the multi-pin plug to the instrument cluster.
- Attach the upper section of the fairing.
- Connect the parking light and headlight.
- Connect the left/right flashing turn indicators.
- Attach the radiator surround.
- Attach the horn mounting.
- Connect cable shoes to horn.
- Attach left/right centre sections of fairing.
- Attach engine fairing.
- Make the plug connections to the auxiliary instruments.
- Attach the left/right inner fairing covers.
- Install the tool compartment cover.
- Attach the left/right kneepads.
- Attach the dualseat/dualseat cover.





MEASURING WHEEL ALIGNMENT

FRONT AND REAR WHEELS WITH DIFFERENT RIM WIDTHS

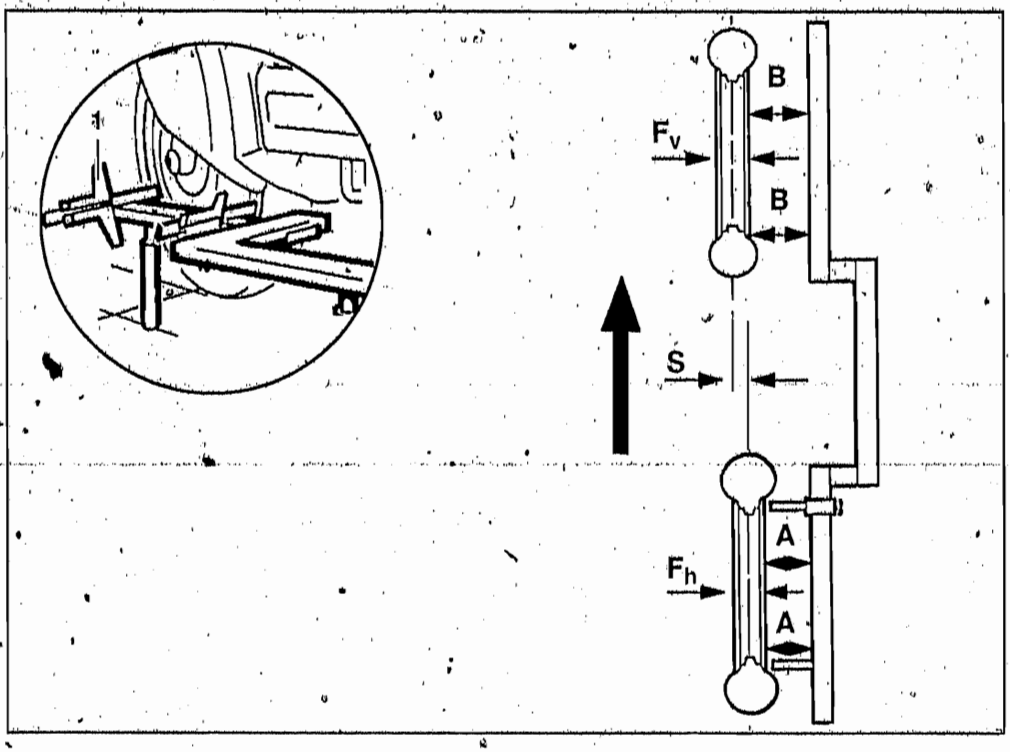
IMPORTANT:
Determine the precise overall wheel rim width before every measurement.

NOTE:
The measurement can be carried out on the left or right side of the motorcycle.
Measuring on the right:
Detach the Paralever strut from the rear wheel drive.
Align the gauge with the motorcycle's longitudinal axis.
Measuring on the left:
Fold down the side stand and tie it to the frame.
Turn wheel alignment gauge supports (2) only through 180 degrees. Do not reposition the gauge itself.

- Place the motorcycle on a flat floor or on a hoist.
- Remove the engine cover.
- Attach the wheel alignment gauge (1), BMW No. 36 3 920, to the right or left side of the motorcycle.
- Adjust the three supports so that the measuring plane is as close as possible to the wheel centre. The gauge must be free to move when it is slid up to the motorcycle.

IMPORTANT:
The measuring stops must not touch the tyres.

- Place the measuring stops (arrows) against the outer edge of the wheel rim.
- Connect the tension hook (3) to a cast wheel spoke.
- Carefully pull the wheel alignment gauge in towards the rear wheel.



- Measure wheel alignment offset S with a depth gauge (1) and calculate the value.

Wheel alignment offset:
Permitted value of "S" 3 mm

EXAMPLE:

Formula: $A + \frac{F_h}{2} - \left(B + \frac{F_v}{2}\right) = S$

Fixed value = half width of wheel rim

A = 50 mm

$\frac{F_h}{2}$ = 44,5 mm

$A + \frac{F_h}{2}$ = 94,5 mm

Measured val = half width of wheel rim

B = 52 mm

$\frac{F_v}{2}$ = 41 mm

$B + \frac{F_v}{2}$ = 93 mm

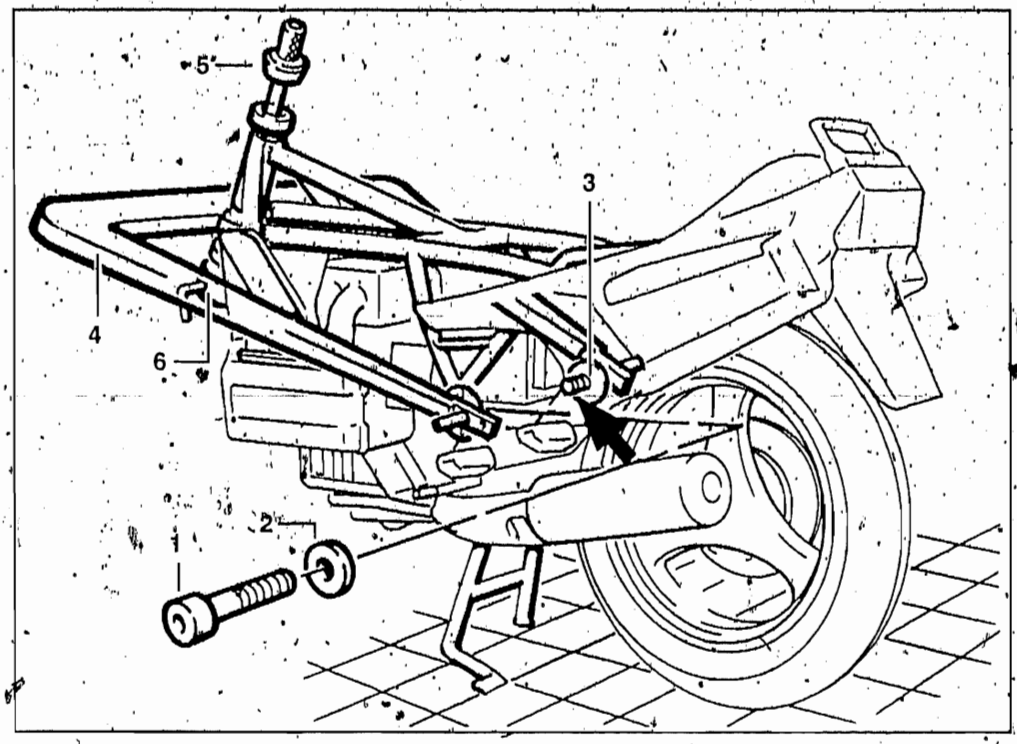
Fixed value - Measured val = S

94,5mm - 93 mm

Wheel alignment offset :

S = 1,5 mm

NOTE:
Measured value:
If preceded by negative sign (-):
wheel offset to left
If precedes by a positive sign (+):
wheel offset to right



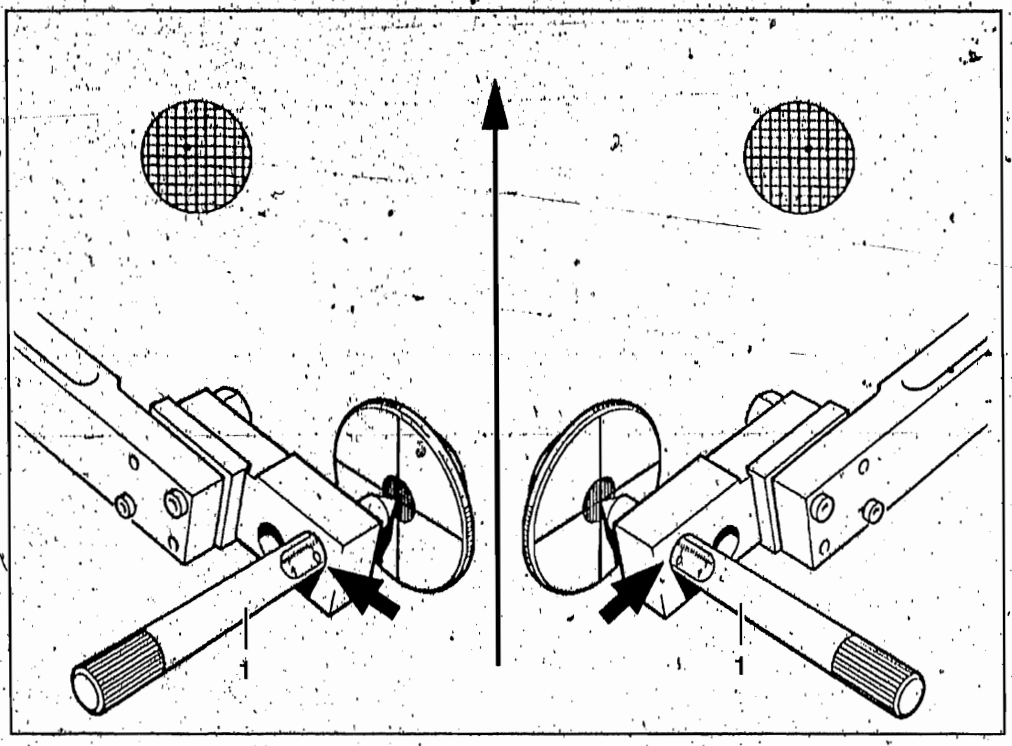
CHECKING FRAME

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing covers.
- Separate the plug connectors for the auxiliary instruments.
- Remove the engine fairing.
- Remove the upper section of the fairing.
- Remove the left/right fairing holders.
- Remove the pressure modulator holder.
- Take off the pressure modulator.
- Remove the coolant header tank.
- Remove the front mudguard.
- Remove the front wheel.
- Remove the telescopic fork.
- Remove the lower/upper fork bridge.

NOTE:

Leave the upper/lower outer races for the taper roller bearings in position in the steering head.

- Remove the rear engine retaining screws with washers (1/2).
- Screw in adapter (arrow), BMW No. 46 5 606.
- Screw measuring discs (3) on to adapter in the same plane.
- Offer up frame alignment gauge (4), BMW No. 46 5 600, to the bottom of the steering head.
- Insert the spindle (5) into the steering head and frame alignment gauge.
- Clamp the frame and the alignment gauge together by tightening nut (6).



- Grease the measuring rods (1) lightly.
- Insert the measuring rods into the rear holes (arrows) of the frame alignment gauge.
- Align the gauge correctly.

NOTE:
When the gauge is correctly aligned, the same value should be shown on the left and right scales when the pointers just touch the measuring discs.

- The frame is in good condition if:
  The measuring points at left and right are at approximately the same points within the tolerance circles.
- Attach/install in the reverse order of work.

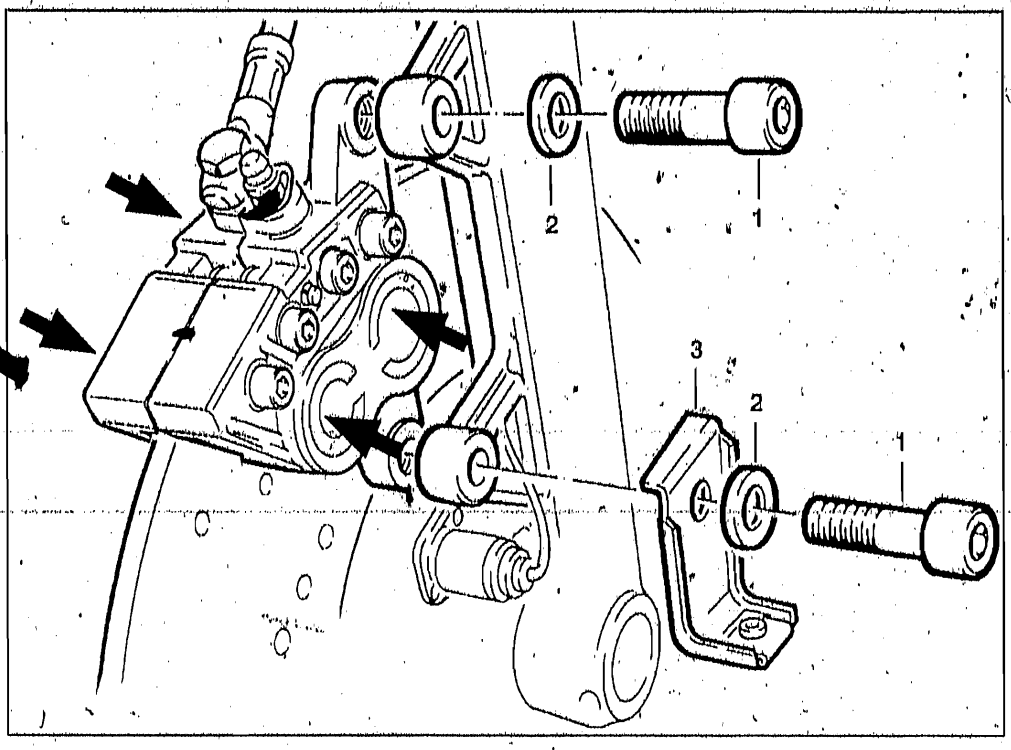
Maximum deviation:
Left/right *2 mm (= 2 boxes)*

IMPORTANT:
Always bleed the brake system after opening/filling.

IMPORTANT:
Whenever a wheel is removed and installed, check the gap between the ABS sensor and the pulse generating ring.

Gap between sensor and pulse generating ring:

Maximum	*0.50 - 0.55 mm*
Minimum	*0.30 - 0.55 mm*



REMOVING AND INSTALLING FRONT WHEEL (WITH ABS)

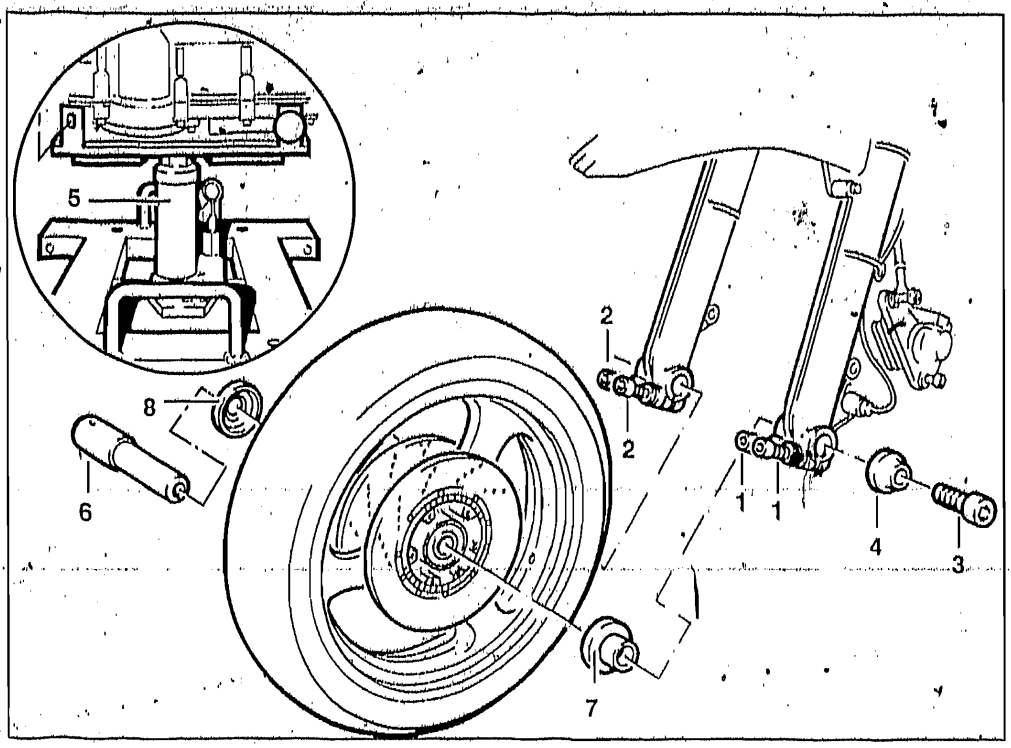
REMOVING FRONT WHEEL

- Remove the front mudguard.
- Remove the engine fairing.
- Mask off the left/right brake calipers at the inside top with adhesive tape.
- Remove the 2 retaining screws with washers and retaining bracket (1/2/3) from the left/right brake caliper.

WARNING:
Do not tilt the brake caliper when removing or installing it, or the brake pads may be damaged.
Always keep to the work sequence stated here.

- Carefully press the brake caliper inwards, keeping it parallel (arrow).
- Pass the brake caliper rearwards over the retaining lugs on the slider tube.
- Carefully press the brake caliper outwards, keeping it parallel (arrow).
- Lift the brake caliper away from the brake disc with great care.

WARNING:
Do not operate the handbrake when the brake calipers or the front wheel are removed.



WARNING:

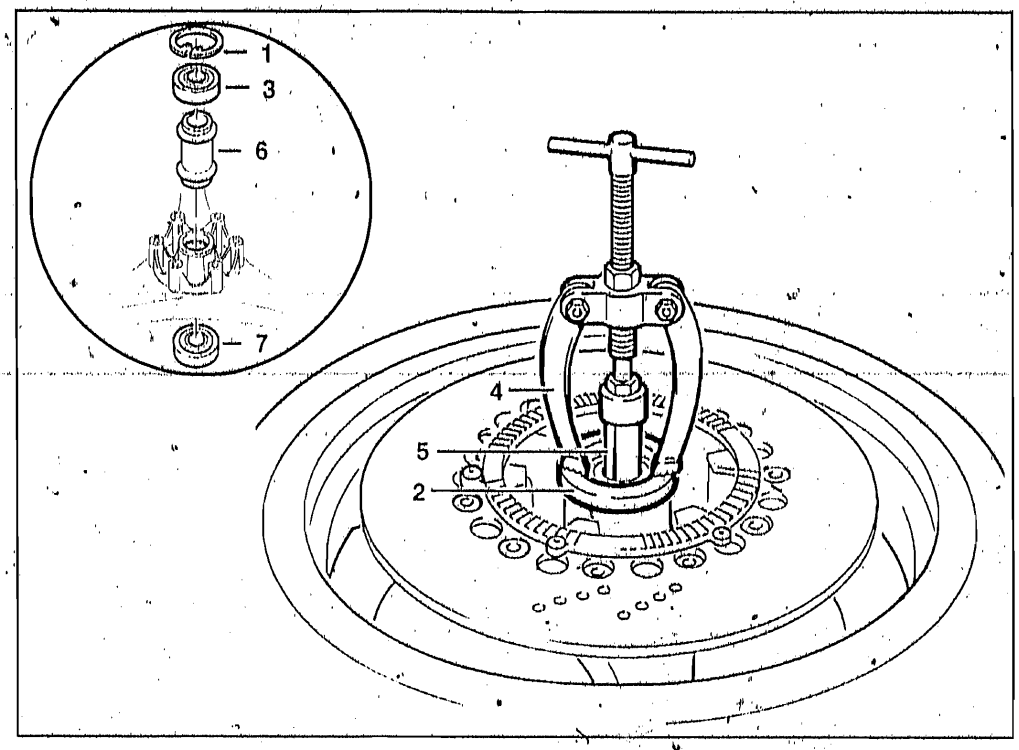
Do not operate the handbrake when the brake calipers or the front wheel are removed.

- Slacken off the 2 clamp screws (1/2) on the left/right slider tubes.
- Take out the retaining screw with taper washer (3/4) at the quick release axle.
- Raise the motorcycle with the lifting device, BMW No. 00 1 510 (5) until the front wheel is clear of the ground.
- Pull out the quick release axle (6).
- Take out the spacing bushings (7/8) at left and right.
- Take the front wheel out forwards.

IMPORTANT:

Check the gap between the ABS sensor and the pulse generating ring every time the wheel is removed and installed.

Gap between sensor and pulse generating ring:
Maximum *0.50 - 0.55 mm*



REMOVING AND INSTALLING WHEEL BEARINGS

- Release circlip (1).
- Place a spacing ring (2) between the wheel hub and the claws of the internal puller.
- Pull out the wheel bearing with internal bearing puller, BMW No. 00 8 570 (4) and insert 21/4, BMW No. 00 8 573 (5).
- Take out the spacing sleeve (6).
- Take off the brake discs.
- Thoroughly degrease the bearing seat/ seat contact face.
- Secure the new wheel bearings with LOCTITE 638.

NOTE:
When installing, check temperature with "Thermochrom" pin.
Install the thicker bearing (3) on the left, looking forwards.

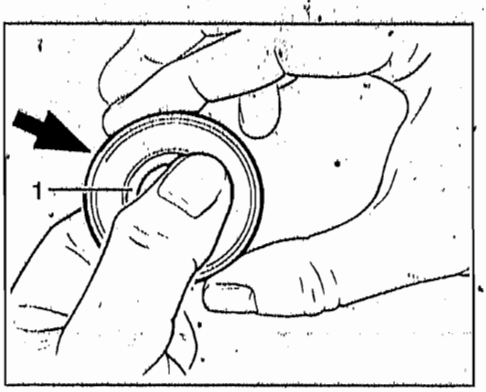
- Heat the wheel hub to 100° C.
- Press the bearings in fully.
- Install the brake discs.

Tightening torque:	
Brake disc to front wheel	*22 ± 6 Nm*
Brake caliper to fork slider tube	*32 ± 2 Nm*
Retaining screw at quick-release axle	*33 ± 4 Nm*
Clamp screws at slider tube	*14 ± 2 Nm*

IMPORTANT:
Check the gap between the ABS sensor and the pulse generating ring every time the wheel is removed and installed.

Gap between sensor and pulse generating ring:	
Maximum	*0.50 - 0.55 mm*

CHECKING WHEEL BEARINGS



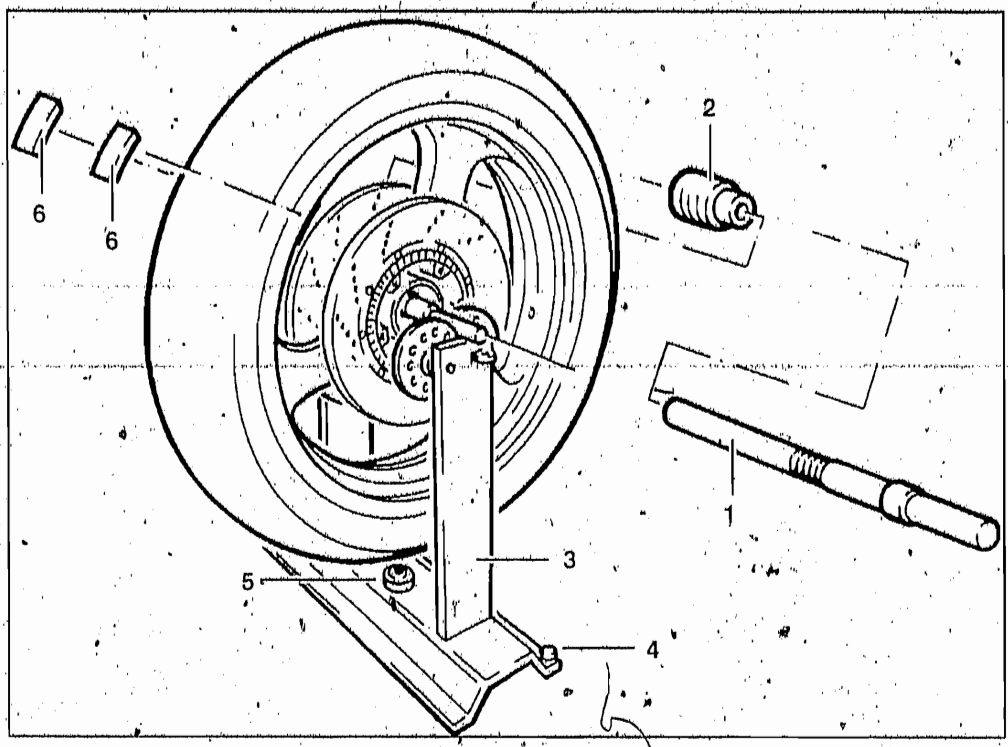
- Check that the outer race (arrow) is firmly seated in the hub.
- Turn the inner wheel bearing race (1) by hand. The bearing must rotate uniformly and without clicking noises.

NOTE:
If a wheel bearing is defective, both bearings must be renewed as a pair.

- Thoroughly degrease the bearing seat and its contact face.
- Secure the new wheel bearings with LOCTITE 638.

IMPORTANT:
Check the gap between the ABS sensor and the pulse generating ring every time the wheel is removed and installed.

Gap between sensor and pulse generating ring:
Maximum *0.50 - 0.55 mm*



STATIC BALANCING OF FRONT WHEEL

- Insert the balancing shaft, BMW No. 36 3 614 (1) through the wheel bearings.
- Slightly preload the bearings with knurled nut (2).
- Align the balancing device, BMW No. 36 3 600 (3) with the knurled screws and bubble gauge on the baseplate (4/5).
- Mount the wheel on the balancing device.
- Allow the wheel to turn until it comes to a standstill at its point of equilibrium.

NOTE:
The heaviest point on the wheel will then be at the bottom.
Attach the balance weight opposite this point.

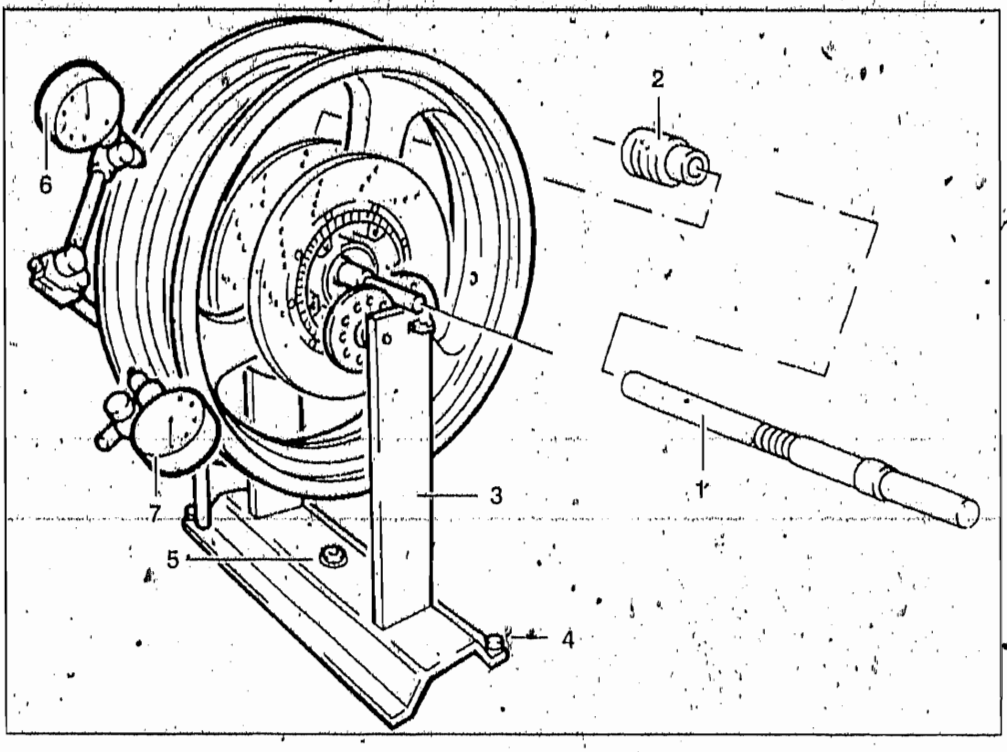
- Clean and degrease the wheel rim at the appropriate point.

WARNING:
Maximum balance weight is 60 g.
If a heavier weight is necessary, renew the wheel.

- Attach the weights with adhesive in pairs on the left and right of the rim.
- Check the wheel and repeat the static balancing process if necessary.

IMPORTANT:
Check the gap between the ABS sensor and the pulse generating ring every time the wheel is removed and installed.

Gap between sensor and pulse generating ring:	
Maximum	*0.50 - 0.55 mm*



CHECKING WHEEL RIM RUNOUT

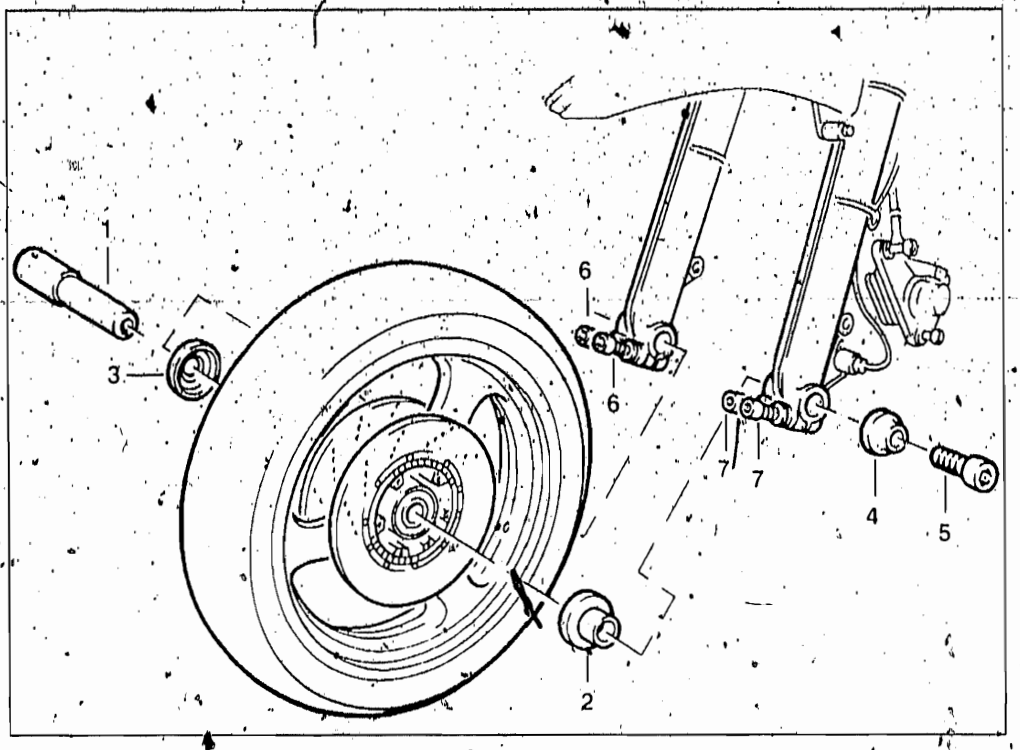
- Remove the tyre
- Insert the balancing shaft, BMW No. 36 3 614 (1) through the wheel bearings
- Slightly preload the bearings with knurled nut (2)
- Align the balancing device, BMW No. 36 3 600 (3) with the knurled screws and bubble gauge on the baseplate (4/5)
- Mount the wheel on the balancing device
- Attach dial gauge (6) to the rim shoulder to measure radial runout
- Attach dial gauge (7) to measure axial runout
- Turn the wheel slowly
- Check radial and axial runout

IMPORTANT:
The wheel must be renewed if a maximum value is exceeded.

Max. value for wheel rim runout
Radial/axial 0.5 mm

IMPORTANT:
Check the gap between the ABS sensor and the pulse generating ring every time the wheel is removed and installed.

Gap between sensor and pulse generating ring, Maximum 0.60 - 0.55 mm

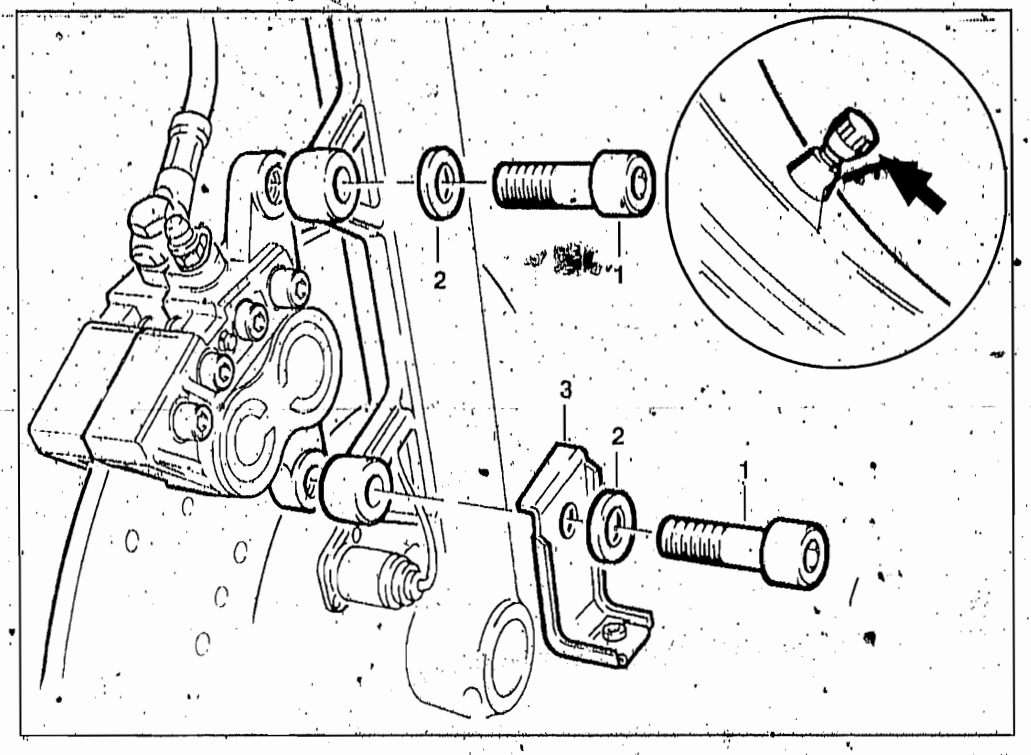


INSTALLING FRONT WHEEL

- Roll the front wheel into position between the fork slider tubes
- Apply a thin coat of Molykote paste to the quick release axle (1)

> **NOTE:**
> Wide spacing bushing on left looking forwards
> Narrow spacing bushing on right looking forwards

- Insert the quick release axle with spacing bushings from the right, looking forwards.
- Offer up taper washer (4) to the quick release axle.
- Insert retaining screw (5).
- Tighten the retaining screw to the specified torque.
- Tighten the 2 clamp screws on the right slider tube to the specified torque.
- Remove the support from under the sump.
- Compress the telescopic fork firmly several times.
- Tighten the 2 clamp screws (7) on the left slider tube to the specified torque.



IMPORTANT:

Do not tilt the brake calipers when installing, or the brake pads may be damaged.

- Push the left/right brake calipers carefully on to the brake discs.
- Secure the left/right brake calipers to the slider tubes with retaining screws, washers and retaining bracket (1/2/3).
- Tighten the retaining screws to the specified torque.

Tightening torque

Brake disc to front wheel	*22 ± 3 Nm*
Brake caliper to fork slider tube	*32 ± 2 Nm*
Retaining screw at quick-release axle	*33 ± 4 Nm*
Clamp screws at slider tube	*14 ± 2 Nm*

- Screw on the engine fairing.
- Install the front mudguard.

IMPORTANT:

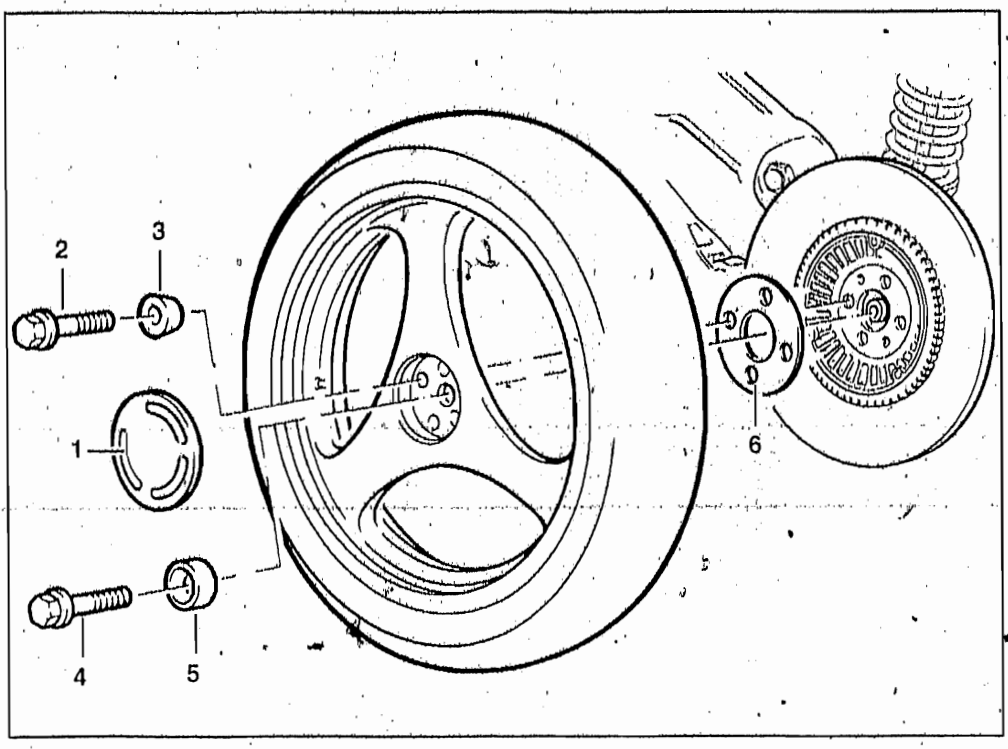
Check the gap between the sensor surface and the impuls wheel each time the brake disc has been removed and reinstalled. If the front wheel is renewed and the same brake disc mounting re- used, axial runout must be measured and a fresh mark made. Remove the the privious marking.

- Measure axial runout of the impuls wheel using measuring gauge holder, BMW No. 00 2 500, measuring gauge, BMW No.00 2 510 and measuring shoe, BMW No. 34 2 510.
- Offer up the measuring shoe to the impuls wheel, tension the measuring gauge sensor slightly and zero the measuring gauge.
- Turn the front wheel slowly.

- Measure axial runout around the entire circumference of the impuls wheel.
- Mark the point on the impuls wheel producing the lowest reading on the measuring gauge with a permanent marker (oil paint). The mark on the impuls wheel is the point at which the sensor gap is widest.
- Move the mark to below the sensor surface.
- Check the maximum sensor gap dimension with a feeler gauge, adjust with shims if necessary.

Gap between sensor and pulse generating ring:
Maximum *0.50 0.55 mm*

Tightening torque:
Torx screws *4 Nm*



REMOVING AND INSTALLING REAR WHEEL (WITH ABS)

REMOVING REAR WHEEL

- Take off rear fairing/dualseat.
- Take off licence plate holder.
- Unscrew the retaining nut with washer from the spring strut.
- Pull the spring strut off the stud to the side and swing it away to the rear.

IMPORTANT:
Do not tilt the brake caliper when installing, or the brake pads may be damaged.

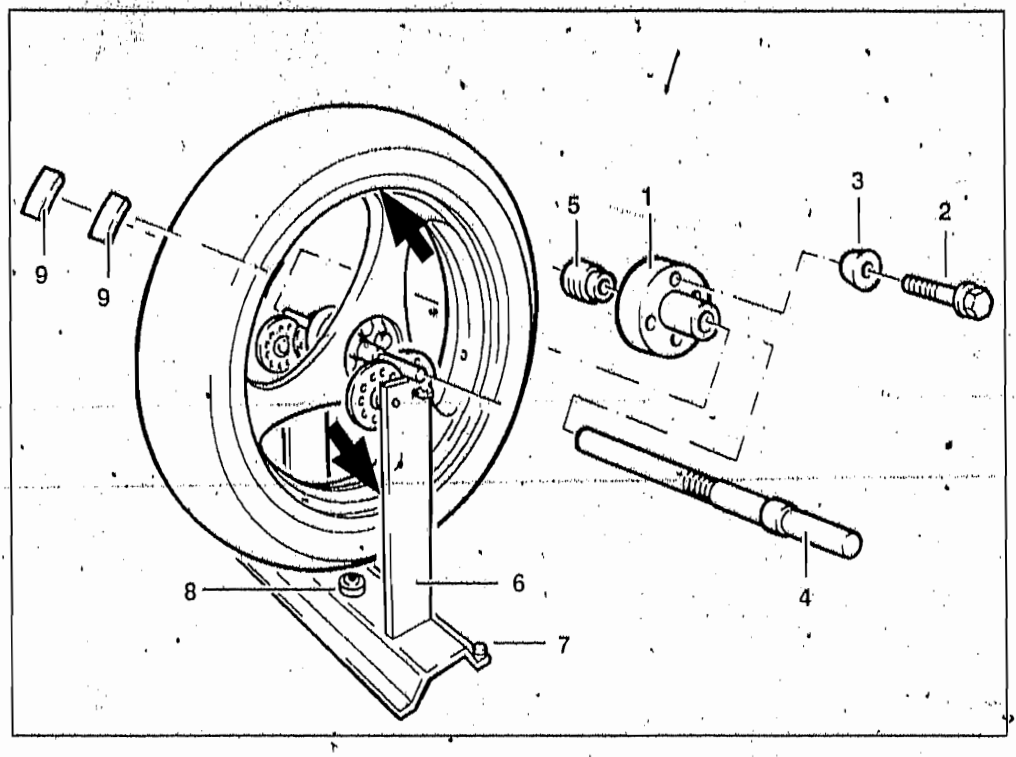
- Take off the brake caliper.

WARNING:
Do not operate the brake pedal when the rear wheel is removed.

- Pull out the cap (1) with an angled screwdriver.
- Take out the 4 wheel studs with taper sleeves (2/3).
- Take out the central screw and sleeve (4/5).
- Take off the brake disc.
- Roll the rear wheel out to the rear.
- Remove the spacing washers (6) from the centering shoulder.

IMPORTANT:
Check the gap between the ABS sensor and the pulse generating ring every time the wheel is removed and installed.

Gap between sensor and pulse generating ring
Maximum *0,50 - 0,55 mm*



STATIC BALANCING OF REAR WHEEL

- Remove the rear wheel.
- Screw the balancing mount, BMW No. 36 3 613 (1), to the centering shoulder with the 4 wheel studs and taper sleeves (2/3).
- Insert the balancing shaft, BMW No. 36 3 614 (4) through the wheel.
- Slightly preload the shaft with knurled screw (5).
- Align the balancing device, BMW No. 36 3 600 (6) with the knurled screws and bubble gauge on the baseplate (7/8).
- Mount the wheel on the balancing device.
- Allow the wheel to turn until it comes to a standstill at its point of equilibrium.

NOTE:
The heaviest point on the wheel will then be at the bottom.
Attach the balance weight opposite this point (arrow).

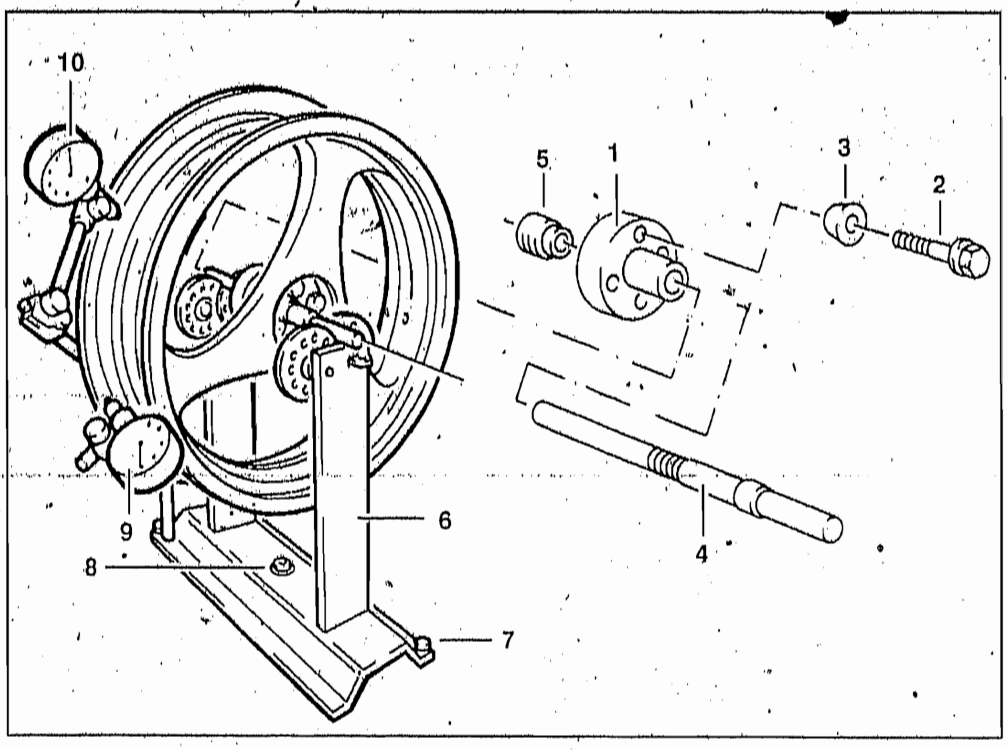
- Clean and degrease the wheel rim at the appropriate point.

WARNING:
Maximum balance weight is 60 g!
If a heavier weight is necessary, renew the wheel.

- Attach the weights (9) with adhesive in pairs on the left and right of the rim.
- Check the wheel and repeat the static balancing process if necessary.

IMPORTANT:
Check the gap between the ABS sensor and the pulse generating ring every time the wheel is removed and installed.

Gap between sensor and pulse generating ring:
Maximum 0.60 - 0,55 mm



CHECKING WHEEL RIM RUNOUT

- Remove the rear wheel.
- Take off the tyre.
- Screw the balancing mount, BMW No. 36 3 613 (1), to the centering shoulder with the 4 wheel studs and taper sleeves (2/3).
- Insert the balancing shaft, BMW No. 36 3 614 (4) through the wheel.
- Slightly preload the shaft with knurled screw (5).
- Align the balancing device, BMW No. 36 3 600 (6) with the knurled screws and bubble gauge on the baseplate (7/8).
- Mount the wheel on the balancing device.
- Attach dial gauge (9) to the rim shoulder to measure radial runout.
- Attach dial gauge (10) to measure axial runout.
- Turn the wheel slowly.
- Check radial and axial runout.

IMPORTANT:
The wheel must be renewed if a maximum value is exceeded.

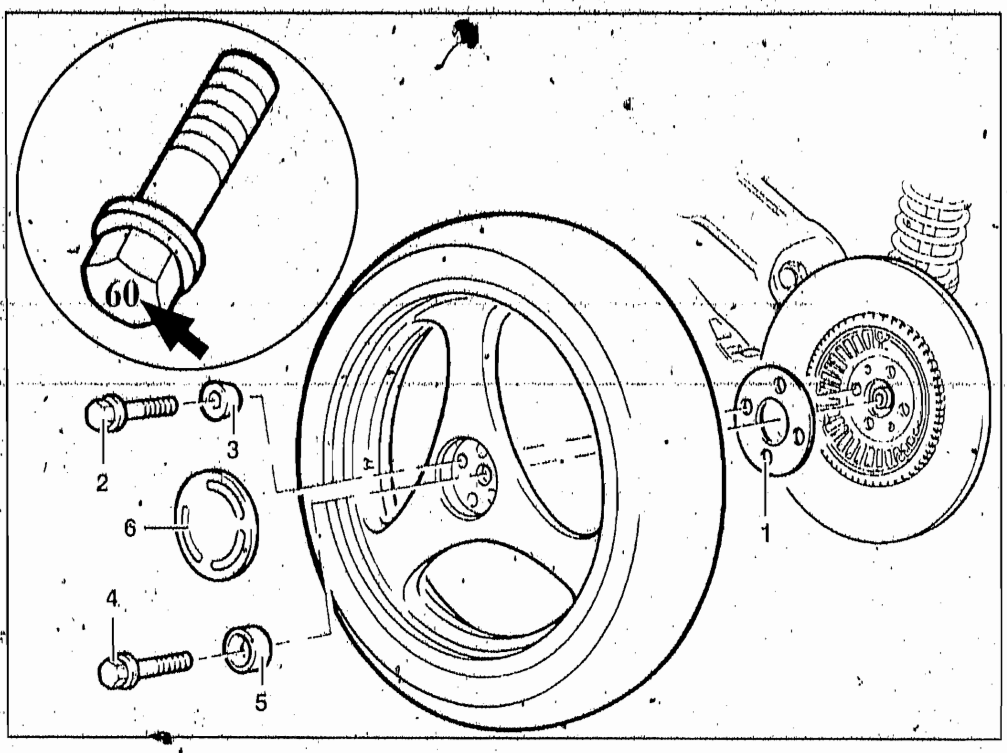
Max. value for wheel rim runout:
Radial/axial: *0.5 mm*

- Install the rear wheel. Note correct tightening torques.

IMPORTANT:
Check the gap between the ABS sensor and the pulse generating ring every time the wheel is removed and installed.

- Check gap between sensor and pulse generating ring.

Gap between sensor and pulse generating ring:
Maximum *0.60 0.65 mm*



INSTALLING REAR WHEEL

- Install the brake disc.

NOTE:
Keep the contact faces between the rear wheel and the rear wheel drive free of grease.

- Push spacing washer (1) on to the rear wheel centering shoulder.
- Insert the rear wheel with centering shoulder into the rear wheel drive.

IMPORTANT:
Only use wheel studs with length code 60 (arrow).

- Insert the 4 wheel studs with taper sleeves (2/3) and screw up handtight in a crosswise pattern.
- Insert the central screw with sleeve (4/5) handtight.
- Tighten the 4 wheel studs to a torque of 50 Nm.
- Tighten the central screw to the specified torque.
- Tighten the 4 wheel studs to the specified torque.
- Check the tightening torques of all screws.
- Insert the cap (6).

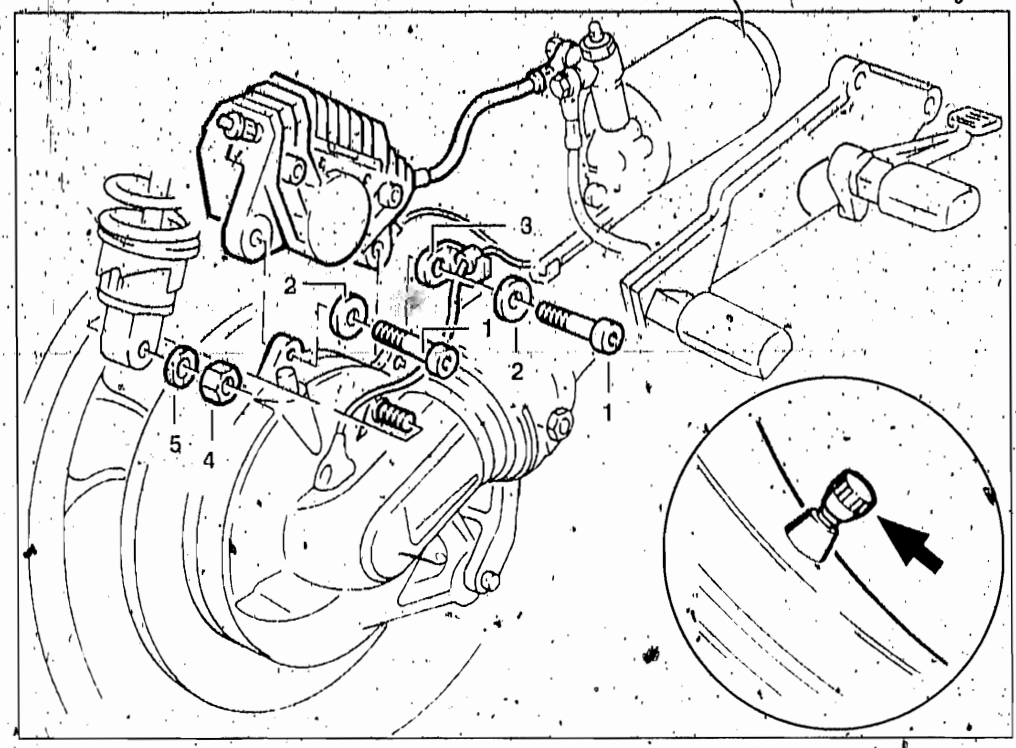
Tightening torque

Initial torque	*50 Nm*
Wheel studs/central screw	*105 Nm*

IMPORTANT:
Radial runout must be measured again each time the brake disc has been removed and reinstalled. Mark the point on the impuls wheel producing the lowest reading on the measuring gauge with a permanent marker (oil paint). Remove the previous marking.

- Measure radial runout of the impuls wheel using measuring gauge holder, BMW No. 00 2 500, measuring gauge, BMW No.00 2 510 and measuring shoe, BMW No. 34 2 510.
- Offer up the measuring shoe to the impuls wheel, tension the measuring gauge sensor slightly and zero the measuring gauge.
- Turn the rear wheel slowly.
- Measure radial runout around the entire circumference of the impuls wheel.
- Mark the point on the impuls wheel producing the lowest reading on the measuring gauge with a permanent marker (oil paint). The mark on the impuls wheel is the point at which the sensor gap is widest.
- Move the mark to below the sensor surface.
- Check the maximum sensor gap dimension with a feeler gauge, adjust with shims if necessary.

Tightening torque:
Torx screws 4 Nm



IMPORTANT:
Do not tilt the brake caliper when installing, or the brake pads may be damaged

- Push the brake calipers carefully on to the brake disc.
- Raise the rear wheel and push the spring strut on to its stud.
- Secure the brake caliper with 2 retaining screws, washers and retaining bracket (1/2/3) and tighten to the specified torque.
- Tighten the spring strut retaining nut with washer (4/5) to the specified torque.

Tightening torque:

Brake caliper to rear wheel drive	*32*	*2 Nm*
Spring strut to rear wheel drive	*51*	*6 Nm*
Brake disc to rear wheel drive	*21*	*2 Nm*

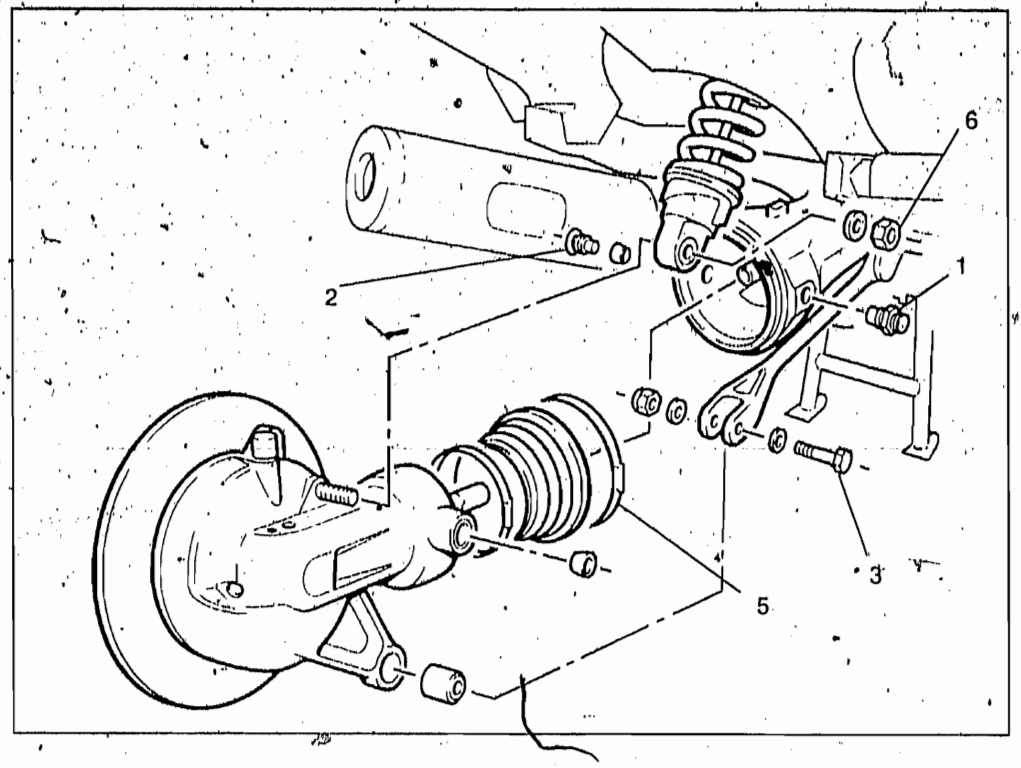
IMPORTANT:
Note the dust cap (arrow) on the valve.

IMPORTANT:
Check the ABS sensor gap every time the wheel is removed and installed, and adjust if necessary. The stated checking dimensions must be adhered to.

Gap between sensor and pulse generating ring:

Maximum	*0.60 - 0.65 mm*
Minimum	*0.20 - 0.25 mm*

- Screw on the licence plate holder.
- Attach the dualseat/rear fairing.

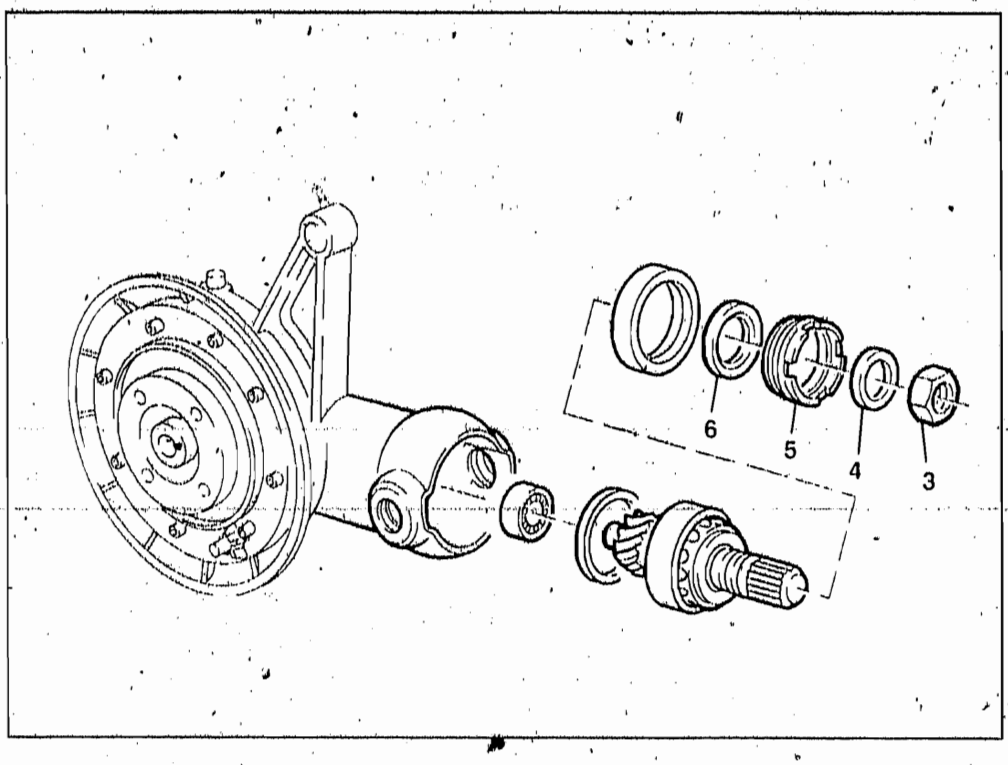


REMOVING, STRIPPING AND ASSEMBLING REAR WHEEL DRIVE

- Drain oil from rear wheel drive
- Remove rear wheel
- Remove brake disc

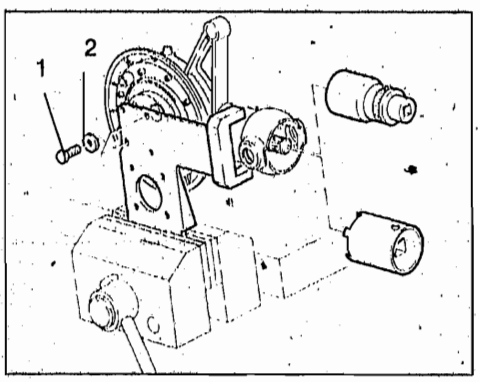
Removing rear wheel drive

- Slightly loosen the free bearing journal (1)
- Loosen the fixed bearing journal (2) and unscrew and remove it carefully.
- Unscrew and remove bearing journal (1).
- Note needle roller bearing inner races.
- Remove the retaining screw for the strut at the rear wheel drive (3).
- Detach the spring strut mounting (6) and pull the spring strut sideways off the stud.
- Pull the rear wheel drive off the drive shaft.



REMOVING, STRIPPING AND ASSEMBLING INPUT PINION

- Clamp the BMW No. 33 1 500 fixture into the vise.



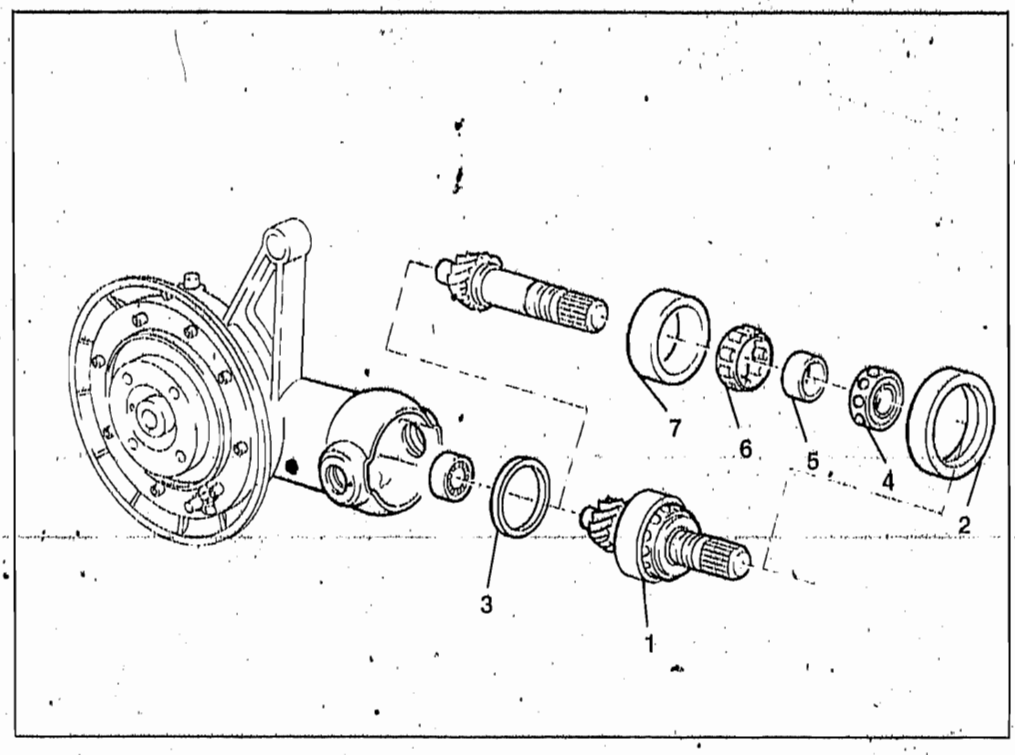
- Secure the crown wheel to the fixture with two retaining screws (1).
- Tighten the retaining screws to the specified torque.

Tightening torque.
Retaining screws *100 Nm*

- Heat nut (3) on the input pinion to app. 100°C and unscrew it.

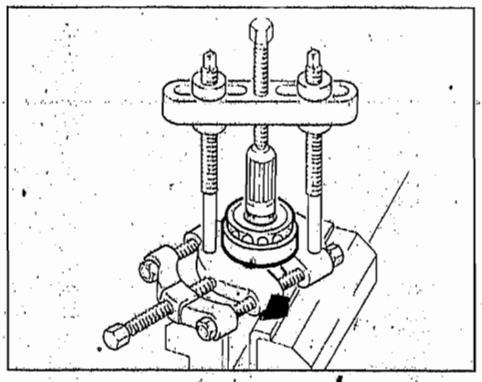
IMPORTANT:
Never use a hammer to free this nut, or the teeth may be damaged.

- Take the thrust ring (4) off the input pinion shaft.
- Heat the neck of the housing to app. 120°C and unscrew threaded ring (5) with pin wrench, BMW No. 33 1 700.
- Take off the threaded ring together with the shaft sealing ring (6).



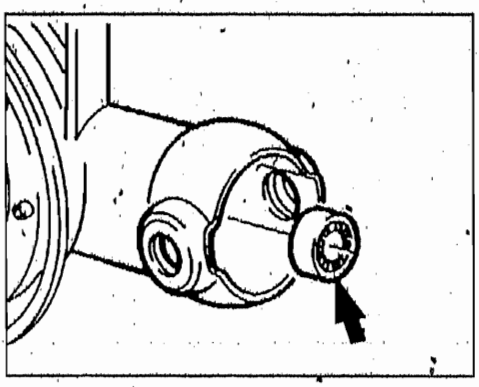
Stripping input pinion

- Heat the input pinion bearing seat to app. 120 ... 130°C.
- Pull out the complete input pinion (1).
- Remove the outer bearing race of the radial thrust bearing (2).
- Take the spacing washer (3) out of the neck of the housing.
- Clamp the input pinion into a vise with soft jaws; the spline tracks should be on top.

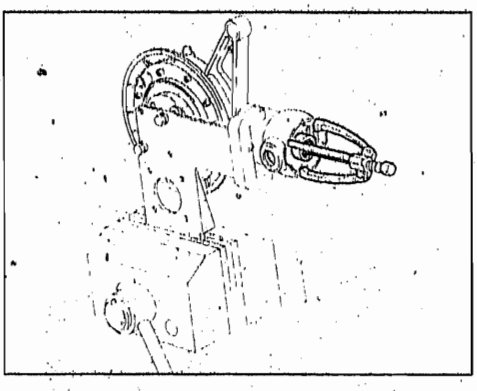


- Attach Kukko puller, BMW No. 00 7 500, under the roller bearing and pull both bearings off the input pinion together.
- Remove the radial and thrust bearing (4), the roller bearing inner race (5), the roller bearing cage (6) and the roller bearing outer race (7) from the input pinion.

Removing needle roller bearing



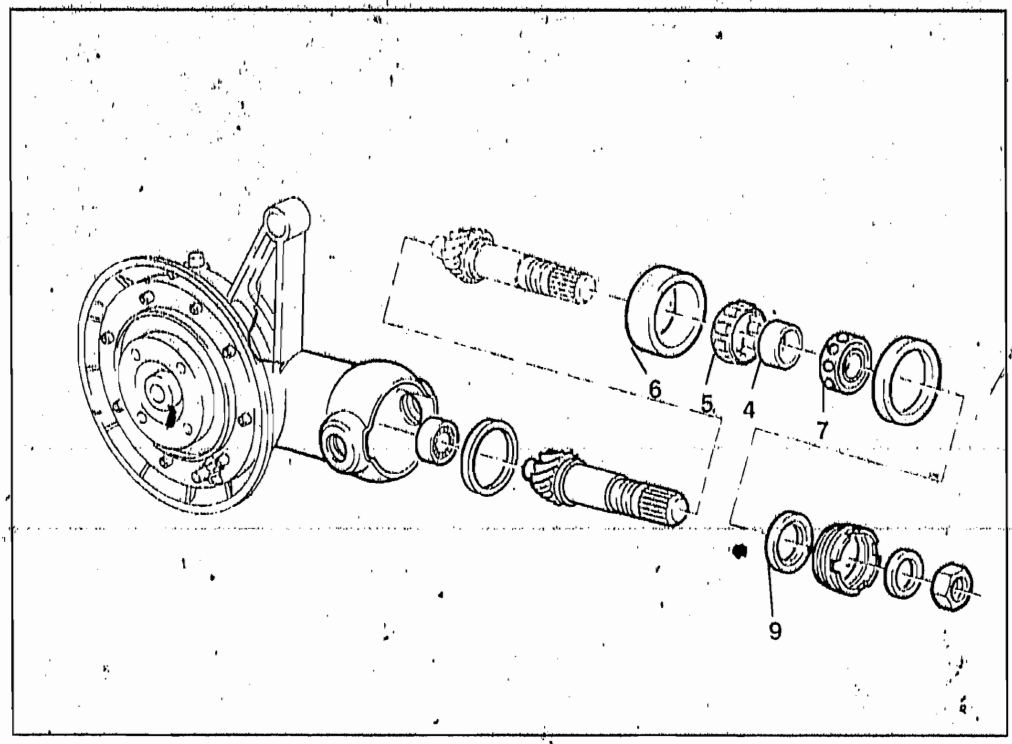
- Split and remove the needle roller cage.
- Heat the rear wheel drive housing to app. 130° C.



- Pull the needle roller bearing (arrow) for the input pinion out of the housing with Kukko internal puller, BMW No. 00 8 573, and reaction strut, BMW No. 00 8 570.

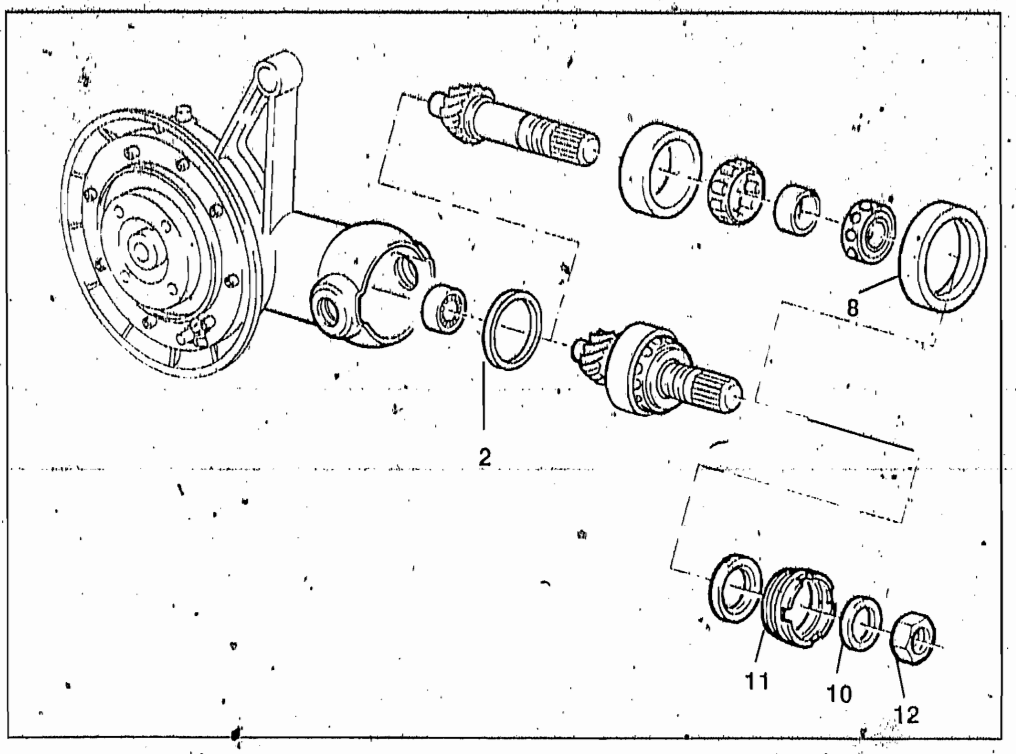
Installing needle roller bearing

- Heat the seat in the housing for the input pinion needle roller bearing to app. 120° C.
- Press the needle roller bearing in with a suitable drift, or use the input pinion itself.



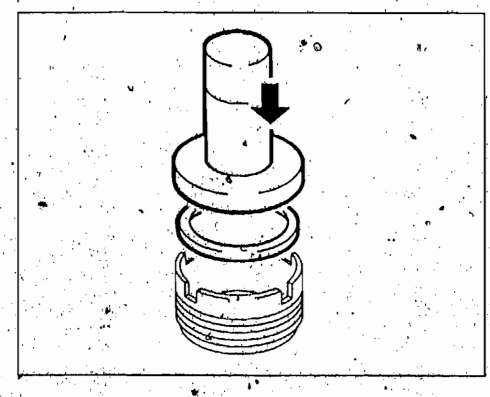
Assembling input pinion

- Heat the inner race (4) of the roller bearing to app. 100° C.
- Push the inner race on to the input pinion (3) as far as possible.
- Place the outer race (6) for the roller bearing on the inner race together with the roller cage (5).
- Heat ball bearing (7) to app. 100° C and place it on the input pinion.
- Heat thrust ring (9) to app. 100° C and place it on the input pinion.
- Allow the input pinion to cool down.



INSTALLING INPUT PINION

- Insert a spacing washer (2) of the previously determined thickness into the neck of the housing.
- Heat the neck of the housing to app. 120° C.
- Insert the input pinion complete with radial and thrust bearing.
- Insert the ball bearing outer race (8).



- Drive a new sealing ring (10) into the threaded ring (11) using BMW No. 33 1 760 drift and BMW No. 00 5 500 handle.
- Coat the threaded ring with Hylomar SQ 32 M; the threads must be free of grease.

NOTE:
The housing must still be at a temperature of 80 - 100° C.
Make sure that the shaft sealing ring lip is correctly seated at the thrust ring.

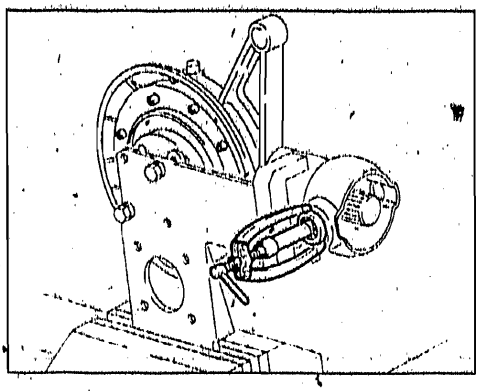
- Screw in the threaded ring with BMW No. 33 1 700 pin wrench and tighten to the specified torque.
- Apply app. 0.1 g of Loctite 273 to the hex nut (12) for the input pinion. The threads must be free of grease.

WARNING:
The nut must not damage the shaft sealing ring.

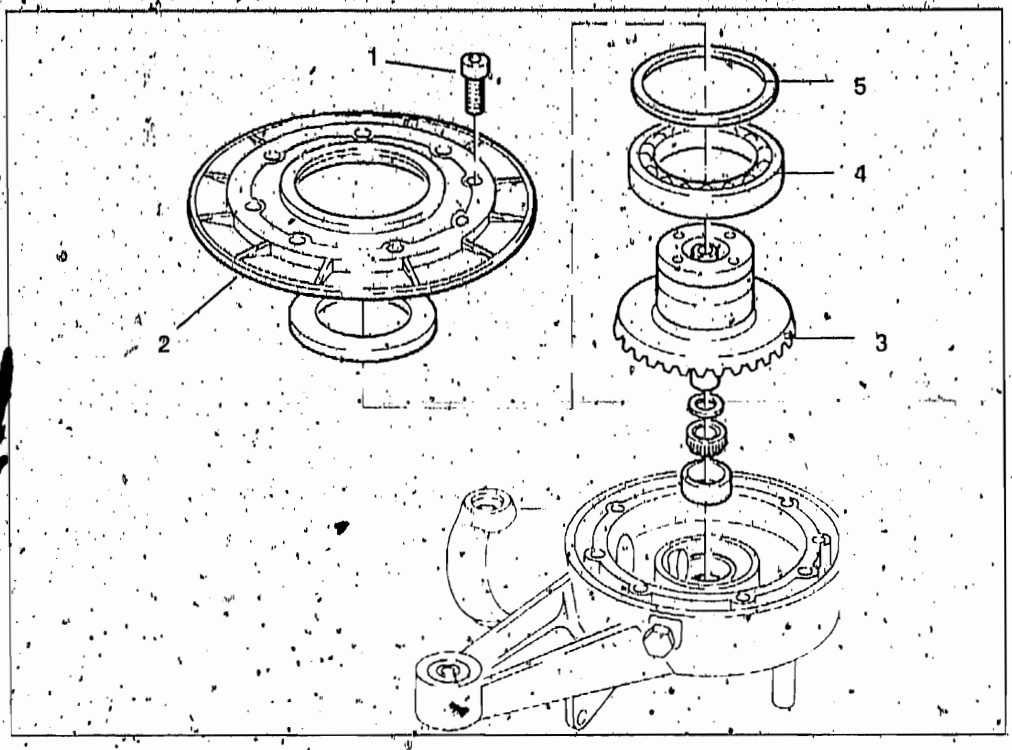
- Screw on the nut and tighten it to the specified torque.

Tightening torque	
Threaded ring	*118 ± 12 Nm*
Input pinion nut	*200 ± 20 Nm*

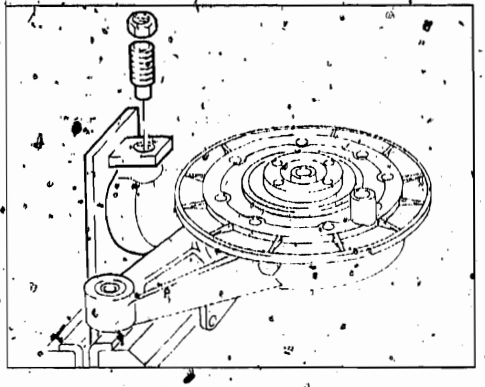
REMOVING AND INSTALLING INPUT PINION NEEDLE ROLLER BEARING



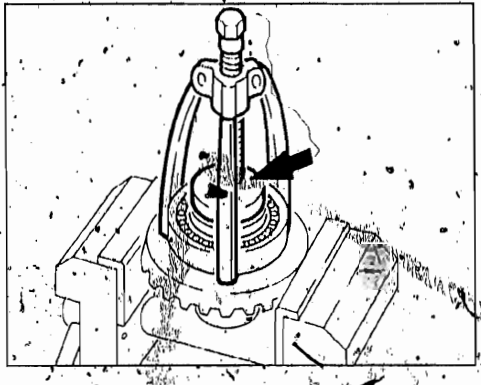
- Pull the left/right needle roller bearings out of the rear wheel drive housing with Kukko internal puller, BMW No. 00 8 573, and reaction strut, BMW No. 00 8 570.
- Heat the neck of the housing to appr. 120° C
- Install the needle roller bearing with its inner race on BMW No. 36 3 700 drift, and press the bearing in



REMOVING CROWN WHEEL

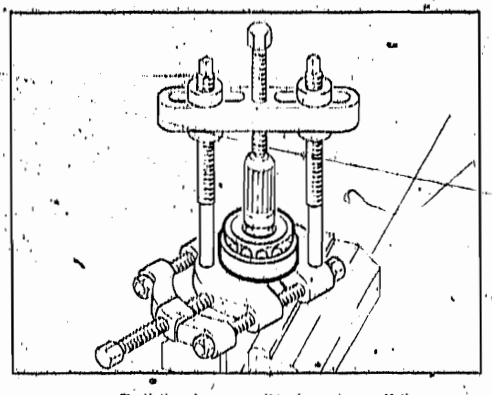


- Clamp the rear wheel drive in a different position.
- Secure the rear wheel drive in BMW No. 33 1 520 fixture with bearing journal and locknut.
- Take out the retaining screws for the housing cover (2).
- Heat the cover to app. 100° C.
- Take off the cover complete with the crown wheel (3) and bearing (4).
- Drive the shaft sealing ring (5) out of the cover with a suitable drift.

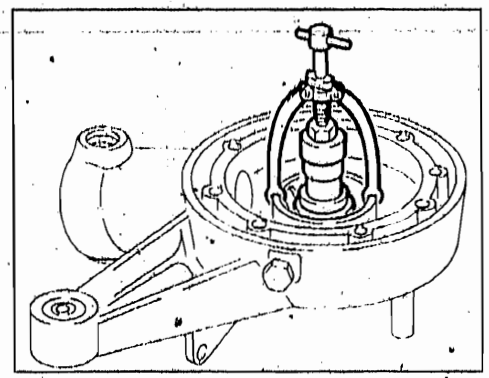


- Clamp the crown wheel into the vise (using soft jaws).
- Insert thrust head BMW No. 33 1 307 (arrow).
- Apply three-arm puller, BMW No. 33 1 830, to the deep-groove ball bearing and pull it off.

NOTE:
Tapping the end of the output spindle sharply with a hammer will release and dislodge the bearing.



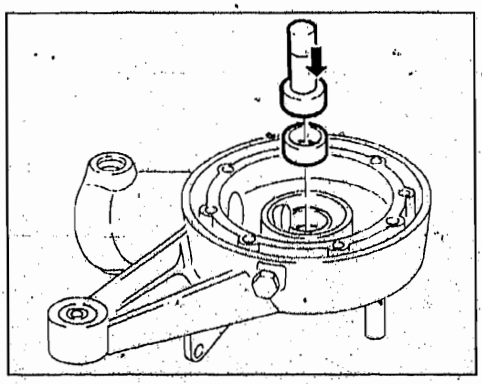
- Pull the taper roller bearing off the crown wheel with Kukko puller, BMW No. 00 7 500.



- Pull out the taper roller bearing shell with Kukko internal puller, BMW No. 00 8 560.

Shim thicknesses available
Taper roller bearing *1.50 ... 2.10 mm*

INSTALLING CROWN WHEEL

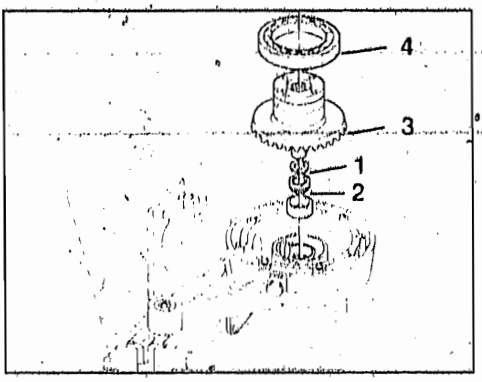


- Heat the housing to app. 80° C.
- Press the bearing shell into the bearing seat with arbor, BMW No. 33 1 880, and hand grip, BMW 00 5 500.

NOTE:
Strike lightly to ensure correct seating.

Shimming crown wheel

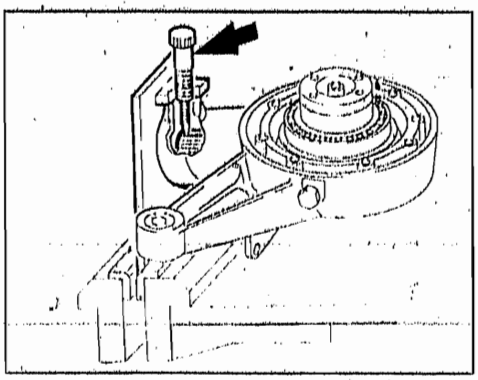
- The crown wheel shims must be recalculated if new parts are installed, for example the taper roller bearing.



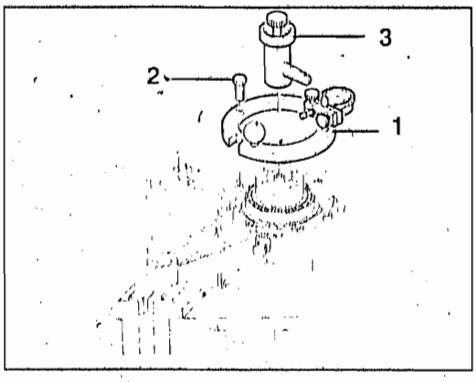
- Place the existing spacing ring (1) on the crown wheel.
- Heat the taper roller bearing (2) to app. 80° C and place it on the crown wheel.
- Insert crown wheel (3) into the housing.
- Heat deep groove ball bearing (4) to app. 80° C and place it on the crown wheel.

Adjusting tooth flank clearance

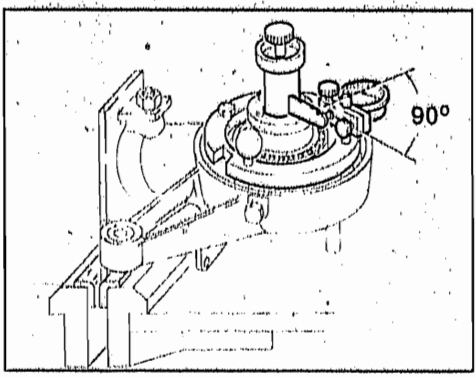
NOTE:
Tooth flank clearance must be checked and corrected if necessary if the taper roller bearing is renewed.



- Secure the rear wheel drive in the BMW No. 33 1 520 fixture with the bearing journal and locknut.
- Prevent the input pinion from turning with the knurled screw (arrow).

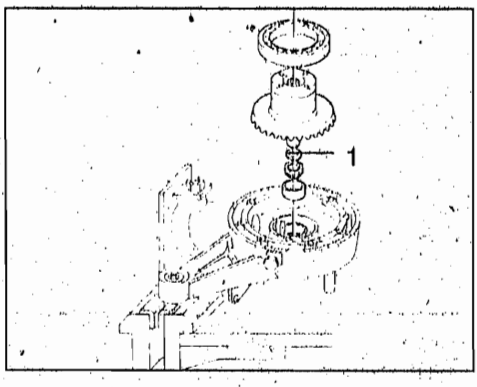


- Attach the measuring device, BMW No. 33 2 600, to the crown wheel together with a dial gauge.
- Secure the measuring ring (1) to the housing with knurled screw (2).
- Attach the measuring arm, BMW No. 33 2 604, to the crown wheel centrally.



- Align the dial gauge and the measuring stop so that the dial gauge sensing pin is at a right angle to the stop.
- Press the crown wheel into the housing with the palm of the hand.
- Check tooth flank clearance (backlash) by turning the crown wheel backwards and forwards slightly at the measuring stop.

NOTE:
Measure tooth flank clearance at three points offset at angles of 120 degrees. To move from one point to the next, loosen the measuring stop, bearing journal and knurled screw slightly. Turn the crown wheel and retighten all items.



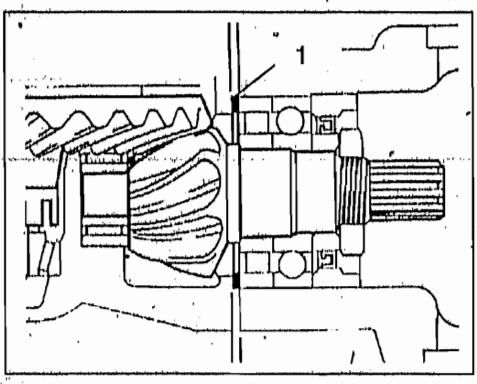
- If tooth backlash is too great, insert thinner spacing rings (1) under the crown wheel taper roller bearing.

- If tooth backlash is too small, insert thicker spacing rings (1) under the crown wheel taper roller bearing.

Tooth flank clearance:
(adjust without oil) *0.07 ... 0.16 mm*
Shim thicknesses available:
(in intervals of 5/100 mm) *1.95 ... 2.80 mm*

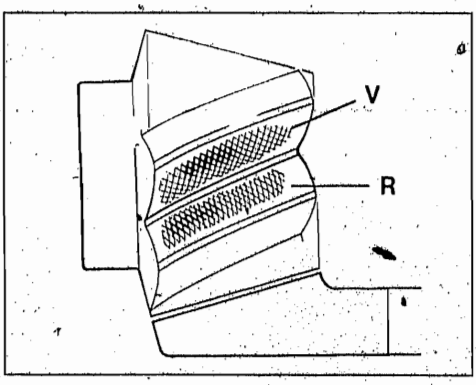
CHECKING CONTACT PATTERN

- If the radial and thrust bearing on the input pinion is renewed, the tooth contact pattern must then be checked.



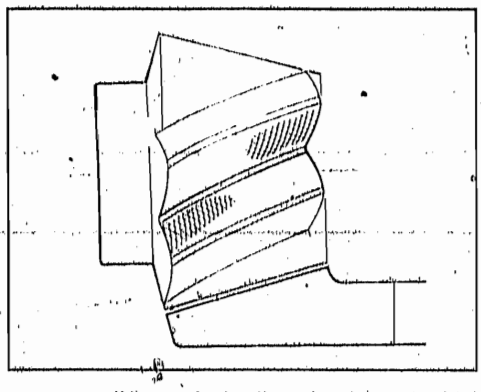
NOTE:
The contact pattern is adjusted by a shim washer (1) at the input pinion.

- Degrease the crown wheel teeth and coat them with engineer's blue or a small amount of white oilbound paint.
- Also degrease the input pinion teeth.
- Install the crown wheel and press it into the housing with the palm of the hand, turning it to and fro several times.

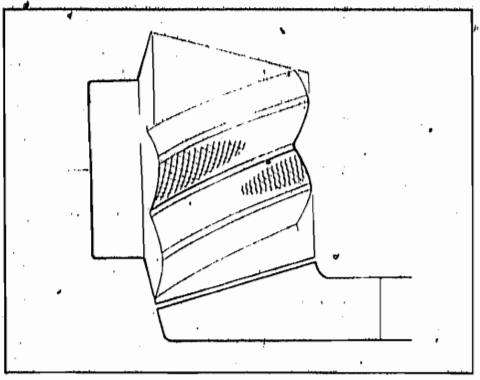


- If the input pinion is installed with the correct spacing washer, the following contact pattern is obtained off-load.
  The contact mark is in the centre of the front flank "V".
  The contact mark is closer to the larger diameter on the rear flank "R".

IMPORTANT:
The teeth must NEVER meet at the small diameter.



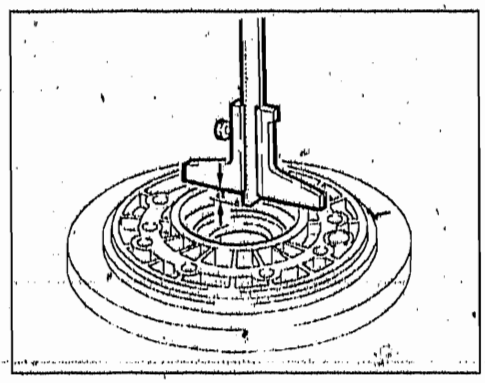
- If the contact pattern shown here is obtained, install a thinner shim washer.



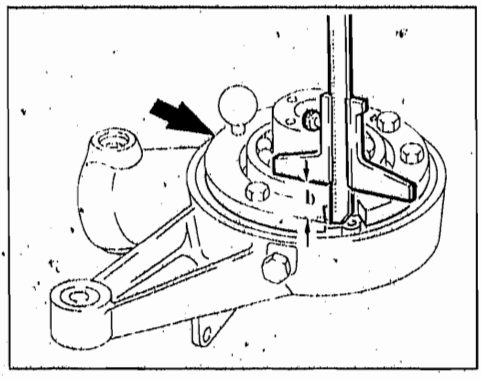
- If this contact pattern is obtained, a thicker shim washer must be installed.

Shimming housing cover

- The housing cover must be correctly shimmed in order to preload the taper roller bearing correctly.



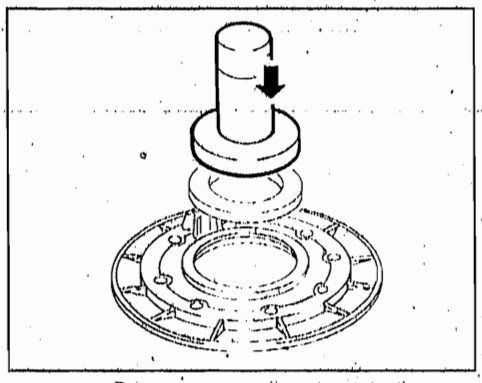
- Using a depth gauge, BMW No. 00 2 500, determine distance "a" from the cover joint face to the base of the ball bearing seat.



- Attach measuring ring (arrow), BMW No. 33 2 601, and lock into position.
- Measure from the outer ball bearing race through the aperture in the measuring ring as far as the housing joint face, and make a note of this distance as value "b".
- Distance "a" minus distance "b" is the required shim washer thickness without preload.

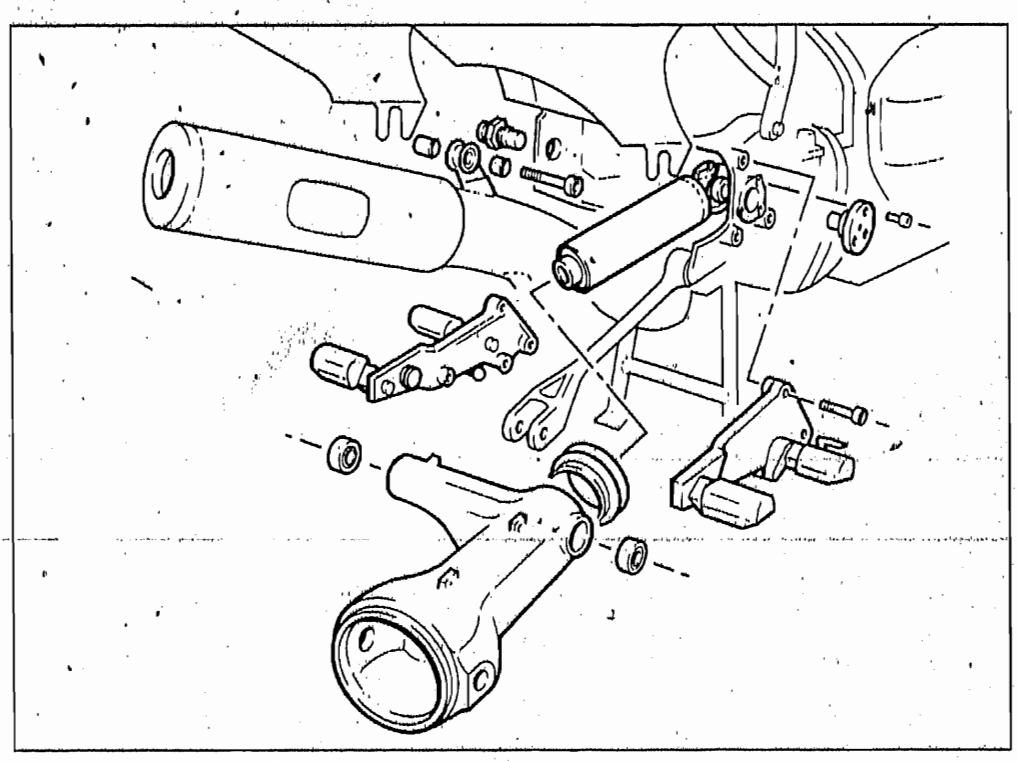
Preload:
0.05 - 0.1 mm = 600 - 1600 Nm

Installing housing cover

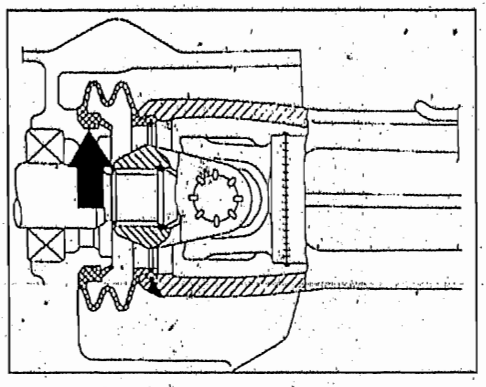


- Drive a new sealing ring into the cover with BMW No. 33 1 860 arbor and BMW No. 00 5 500 handle.
- Insert the cord ring seal.
- Coat the edge of the cover gasket with Loctite 574 sealant.
- Heat the housing cover to app. 80°C.
- Place the cover on the housing.
- Tighten the retaining screws in a crosswise pattern to the specified torque.

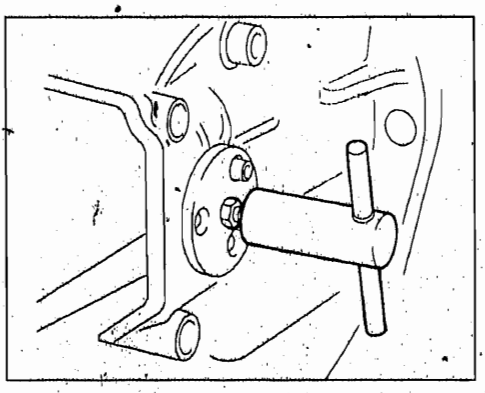
Tightening torque:
Retaining screws 21 ± 2 Nm



INSTALLING REAR SWINGING ARM



- Coat the inside of the flexible gaiter (arrow) with Staburags N3U PTM paste or Optimoly PL paste.
- Push the swinging arm over the drive shaft and press it against the gearbox so that the flexible gaiter can snap into position at the neck of the gearbox.



- Coat the fixed bearing journal with Never-Seez, insert it with special tool BMW No. 25 1 660 and tighten it.

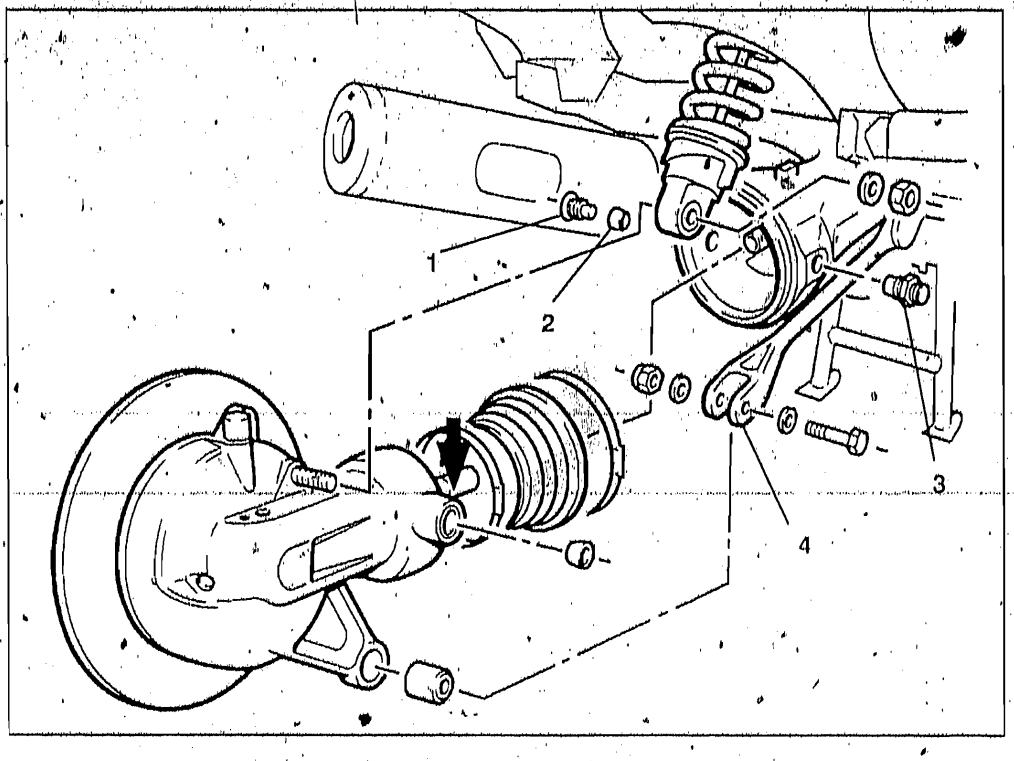
Tightening torque:

Bearing journal to gearbox	*9 ± 1 Nm*

- Also coat the free bearing journal with Never-Seez, screw it in and tighten it.

Tightening torque:

Bearing journal	*7.5 ± 0.5 Nm*
Locknut	*41 ± 3 Nm*



INSTALLING REAR WHEEL DRIVE

- Coat the joint splines (arrow) in the rear wheel drive with Staburags NBU 30 PTM or Optimoly PL paste.
- Install the inner race of the right needle roller bearing with a small amount of grease so that it is held in position as the rear wheel drive is assembled.
- Offer up the rear wheel drive with flexible gaiter to the rear swinging arm and insert the joint into the drive shaft.
- Slide the spring strut lug over the stud on the rear wheel drive, attach the washer and screw the nut on loosely.

WARNING:
The fixed bearing journal (1) is of the micro-encapsulated type and therefore cannot be re-used. Clean the threads on the bearing journal and the swinging arm.

- Apply Never-Seez to the inner race (2) of the left needle roller bearing and place it on the fixed bearing journal. Apply a little Loctite 242 to the threads and screw the bearing journal into the swinging arm.

IMPORTANT:
Make sure that the inner race does not press on the ends of the needle rollers.

Tightening torque
Fixed bearing journal — *105 ± 7 Nm*

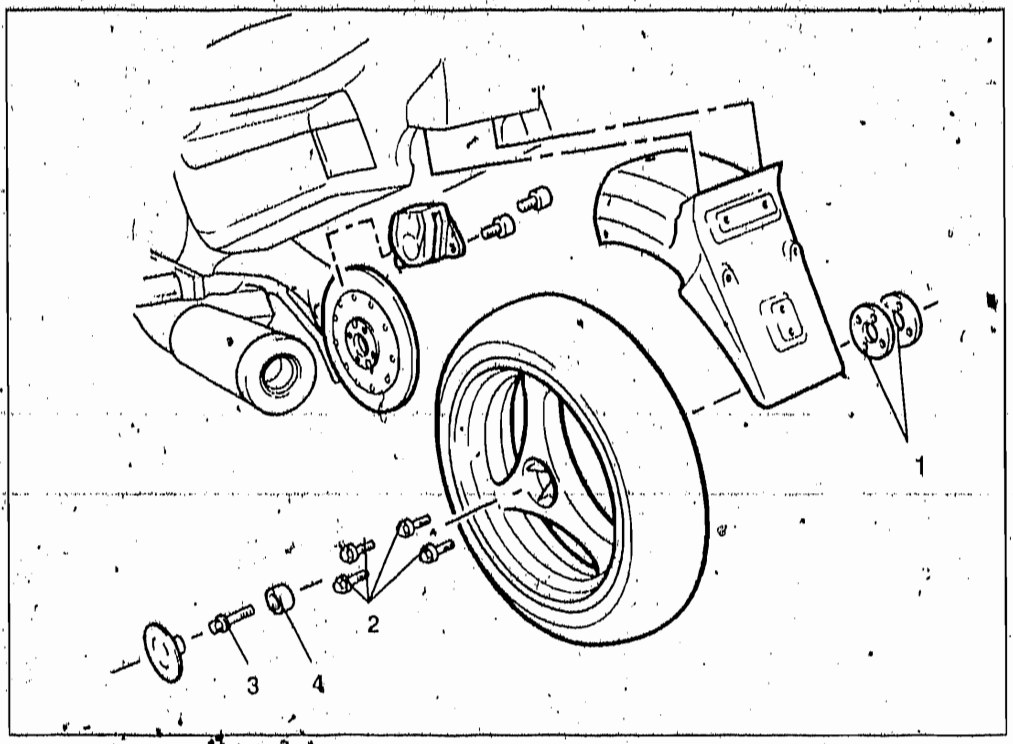
- Coat the front of the free bearing journal with Never Seez and screw it in.

Tightening torque:
Free bearing journal — *7.3 ± 0.5 Nm*
Locknut — *105 ± 7 Nm*

- Install and secure the strut (4). The nut must face the wheel.

Tightening torque:
Strut to rear wheel drive — *33 ± 2 Nm*

- Push the rubber sleeve on to the swinging arm and tighten it with the clamp strap.



INSTALLING REAR WHEEL

- Place spacing washers (1) on the rear wheel centering shoulder
- Insert the rear wheel with centering shoulder into the rear wheel drive
- Screw in the 4 rear wheel studs (2) with taper sleeves handtight. The studs must have the code figure 60 on their heads.
- Insert the central screw (3) with sleeve (4) and screw up handtight.
- Tighten the outer studs in a crosswise pattern to 50 Nm torque, then tighten the central screw to the specified torque.
- Finally tighten the wheel studs to the specified torque.

Tightening torque

Initial value	*50 Nm*
Wheel studs	*105 ± 7 Nm*

Installing brake caliper

- If necessary, press the brake pads apart slightly.
- Avoid damage to the brake pads.
- Push the brake caliper on to the brake disc from the top, and screw into position.

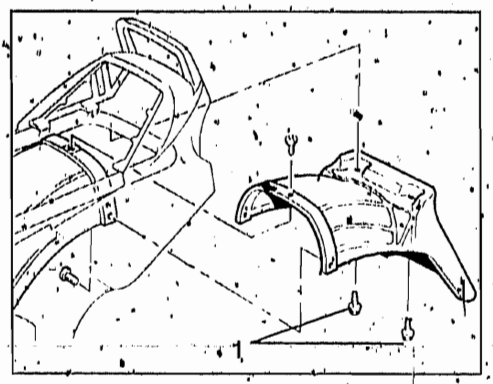
Tightening torque.
Brake caliper to rear wheel drive 32 ... 2 Nm

IMPORTANT:
Radial runout must be measured again each time the brake disc has been removed and reinstalled. Mark the point on the impuls wheel producing the lowest reading on the measuring gauge with a permanent marker (oil paint). Remove the previous marking.

- Measure radial runout of the impuls wheel using measuring gauge holder, BMW No. 00 2 500, measuring gauge, BMW No. 00 2 510 and measuring shoe, BMW No. 34 2 510.
- Offer up the measuring shoe to the impuls wheel, tension the measuring gauge sensor slightly and zero the measuring gauge.
- Turn the rear wheel slowly.
- Measure radial runout around the entire circumference of the impuls wheel.
- Mark the point on the impuls wheel producing the lowest reading on the measuring gauge with a permanent marker (oil paint). The mark on the impuls wheel is the point at which the sensor gap is widest.
- Move the mark to below the sensor surface.
- Check the maximum sensor gap dimension with a feeler gauge, adjust with shims if necessary.

Tightening torque.
Torx screws *4 Nm*

Installing licence plate holder.



- Insert the licence plate holder, insert the retaining screws (1) from the wheel side into the rear section of the frame and tighten them.
- Screw the licence plate holder to the mud guard.
- Install the dualseat.

7. FRAME ATTACHMENTS

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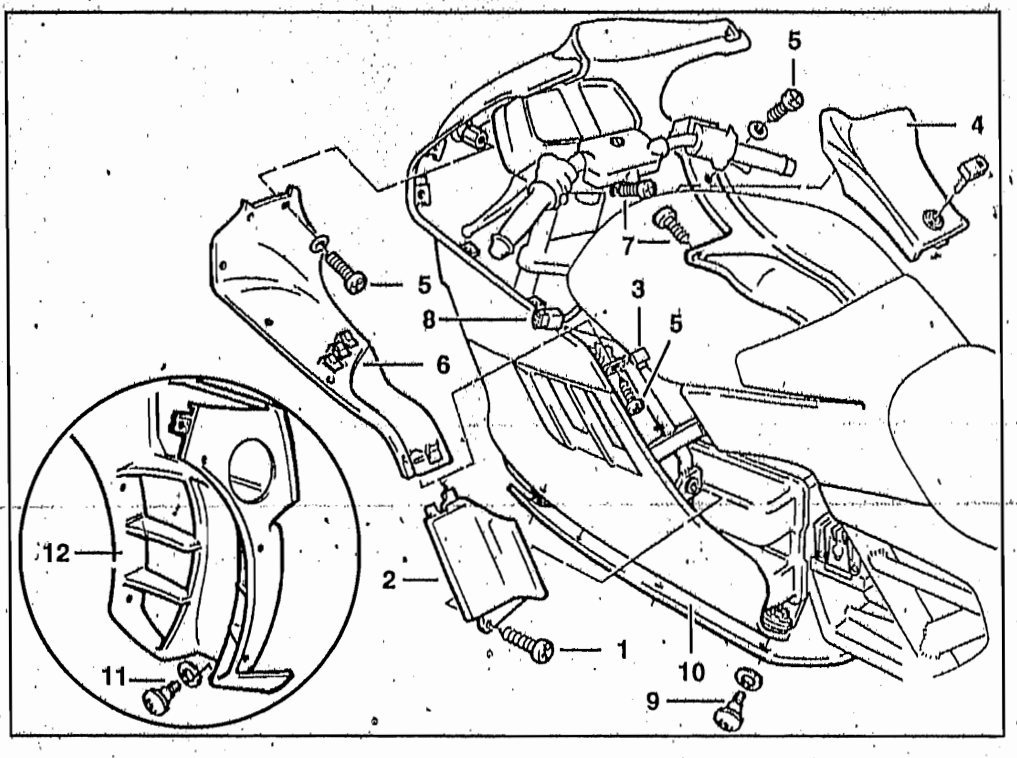
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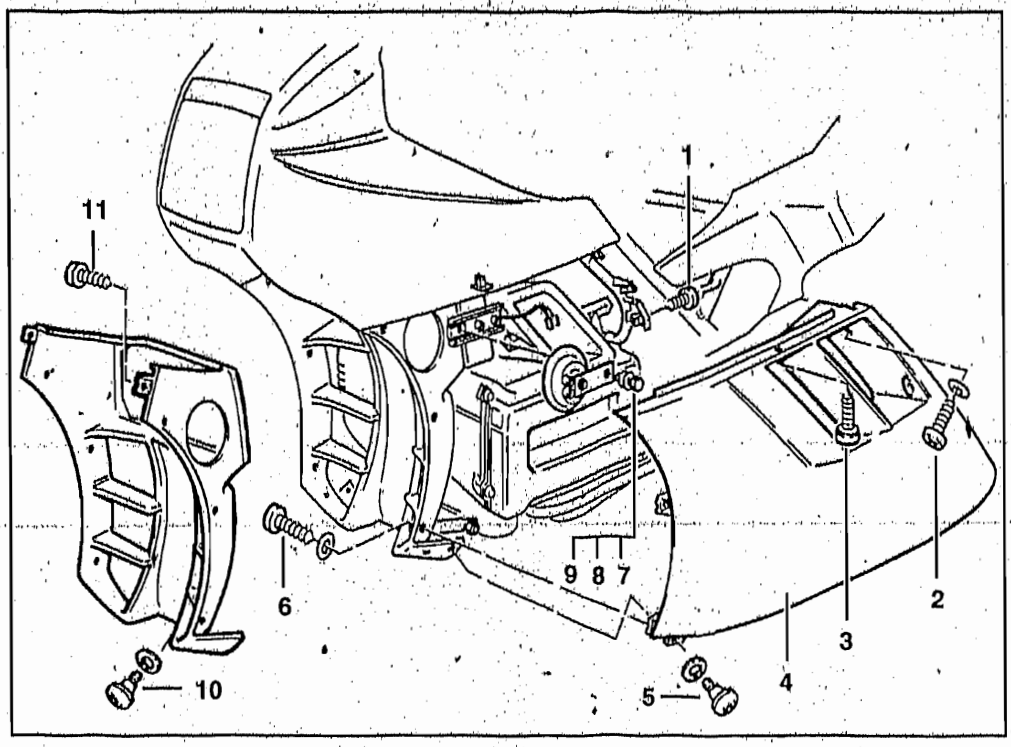
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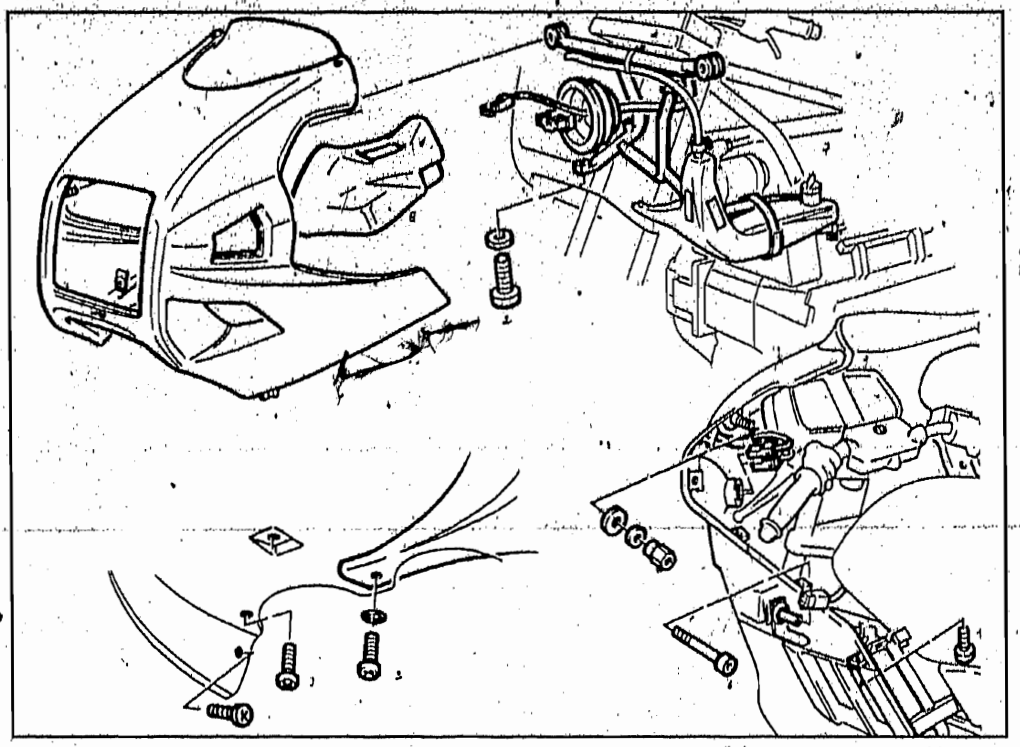
DETACHING AND ATTACHING FRONT SECTION OF FAIRING (WITH ABS)

NOTE:
Do not damage the fairing sections when removing them.

- Remove the retaining screw (1) from the left/right kneepad.
- Pull the left/right kneepad (2) out of holders (3) or take it off.
- Remove the toolkit compartment cover (4).
- Remove the 6 retaining screws (5) from the left/right inner fairing cover (6).
- Remove the 2 retaining screws (7) from the right inner fairing cover.
- Carefully pull the left/right inner fairing cover out of holders (3).
- Separate the plug connections (8) for the auxiliary instruments.
- Take off the left/right inner fairing cover.
- Take the 3 left/right retaining screws (9) out of the engine cover (10).
- Remove the left/right retaining screw (11) from the radiator surround (12).
- Take off the engine cover.



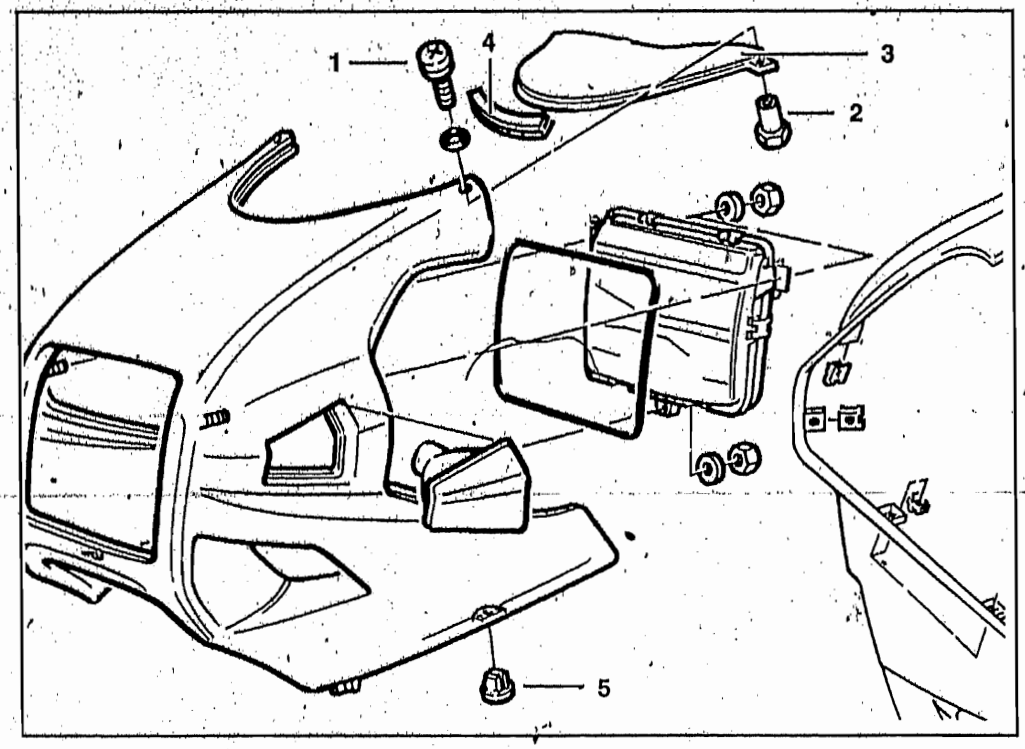
- Remove the retaining screw (1) from the left/right fairing holder.
- Take the 2 retaining screws (2/3) at left/right out of the centre section of the fairing (4).
- Take the retaining screw (5) at left/right out of the centre section of the fairing/radiator surround.
- Take the 3 retaining screws (6) at left/right out of the radiator surround.
- Take off the left/right centre section of the fairing.
- Remove the retaining screw with lock washer and plain washer (7/8/9) from the horn mount.
- Take the horn off outwards.
- Remove the retaining screw (10) from the radiator surround holder.
- Remove the retaining screw (11) at left/right from the radiator surround/upper section of fairing.
- Carefully pull the radiator surround downwards out of the guide plates and take it off.



- Remove the retaining screw (1) at left/right from the upper section of the fairing.
- Remove the 2 retaining screws (2) from the upper section of the fairing, under the headlight.
- Remove the retaining screw (3) at the holder for the coolant header tank.
- Remove the retaining screw (4) at the coolant header tank.
- Pull off the plug connectors at left/right for the flashing turn indicators.
- Remove the 2 retaining screws (5) from fairing holder (6).
- Remove the retaining screw (7) from the coolant header tank.
- Carefully pull the upper section of the fairing forwards off the studs, holding it horizontal.
- Pull off the multi-pin plug for the high and low headlight beams and the rubber sleeve.
- Pull off the plug connections for the parking light.
- Carefully remove the upper section of the fairing.
- Remove the coolant header tank from the fairing.
- Secure the header tank to the fairing holder with wire (8).
- Take out the toolkit holder (9).
- Remove the 2 retaining screws (10).
- Install in the opposite order of work.

NOTE:

Avoid damage to sections of the fairing when attaching.
Make sure that the sheet-metal nuts are correctly located.
Install the fairing free from trapped stresses.
Check gap widths between fairing sections. Make sure that the wiring is correctly located.
Install wiring without kinks or points of potential abrasion.
Note correct positions of cable straps.
Insert the retaining screws for the fairing sections and screw them up handtight only at first.



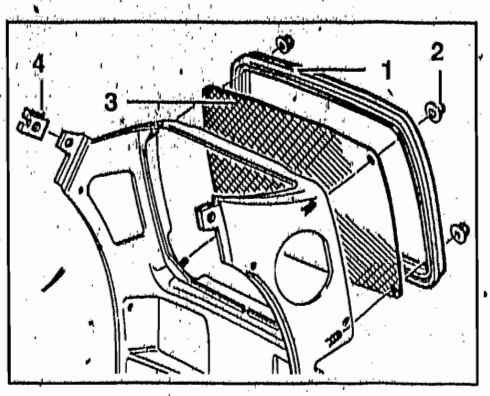
DETACHING AND ATTACHING FAIRING ATTACHMENTS

DETACHING AND ATTACHING FAIRING ATTACHMENTS ON UPPER SECTION OF FAIRING

- Take out the 2 retaining screws with collar nuts (1/2).
- Carefully pull the windscreen (3) out of the guide rail.
- Use a screwdriver to release the sealing strip (4) from the guide rail, and take it out.
- Remove the headlight.
- Remove the left/right flashing turn indicator housing.
- Press the spreader nuts (5) out downwards.
- Install in the opposite order of work.

NOTE:
Do not overtighten the retaining screws.
When installing, locate the sealing strip correctly on the windscreen first.
After this, insert the windscreen with sealing strip into the groove in the fairing.

DETACHING AND ATTACHING ATTACHMENTS ON RADIATOR SURROUND

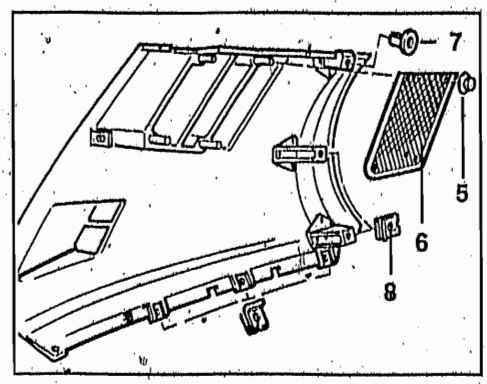


- Pull off the seal (1).
- Unscrew the 4 radiator grille retaining nuts (2).
- Carefully detach the grille (3) from the threaded pins.
- Take off the sheet-metal nuts (4).
- Install in the opposite order of work.

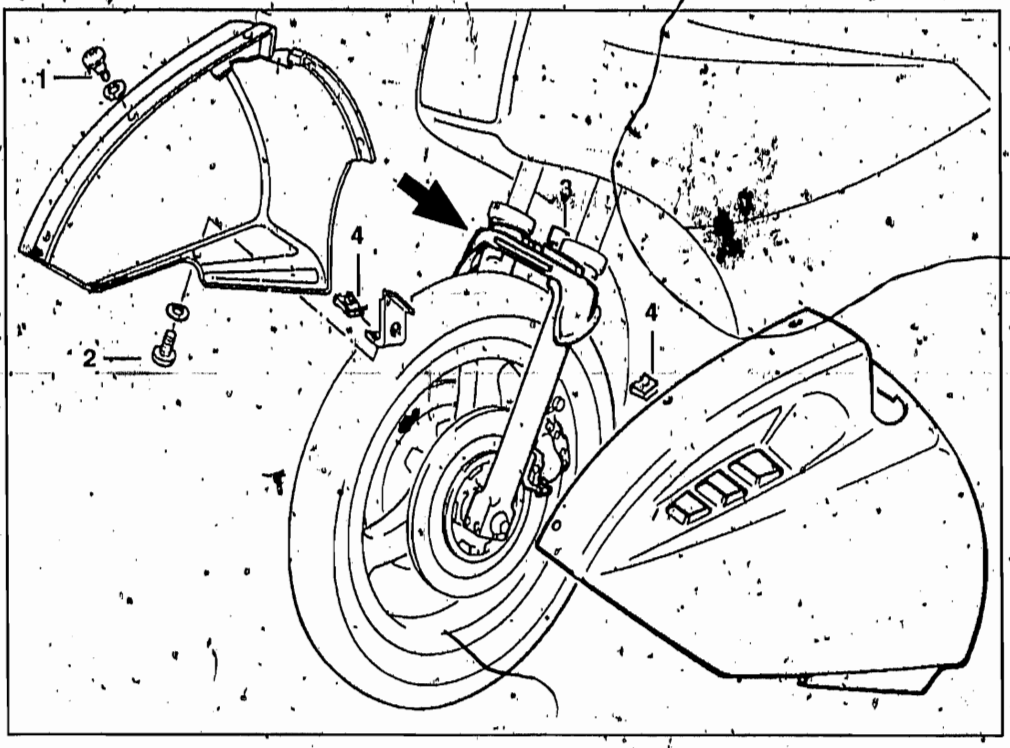
NOTE:

Do not overtighten the retaining nuts. Cut the new seal to the precise length of the circumference and insert so that a butt joint is formed.

DETACHING AND ATTACHING ATTACHMENTS ON CENTRE SECTION OF FAIRING



- Unscrew the retaining nuts (5) for the radiator grille.
- Carefully detach the grille (6) from the threaded pins.
- Unscrew the sheet-metal/spreader nuts (7/8).
- Install in the opposite order of work.



DETACHING AND ATTACHING FRONT MUDGUARD

- Take out the 5 retaining screws (1).
- Remove the retaining screw (2) at left and right.
- Loosen the 2 retaining screws (3) at the retaining plate/fork stabilizer.
- Carefully pull the left/right mudguard halves out of the sleeve (arrow). Note the sheet-metal nuts (4).
- Install in the opposite order of work.

NOTE:

When attaching:
Apply a light coat of tyre fitting paste to the rubber surfaces in the guide rails.
If necessary, bend the sheet-metal nuts lightly to the correct radius.
Install the front mudguard without trapped stresses.

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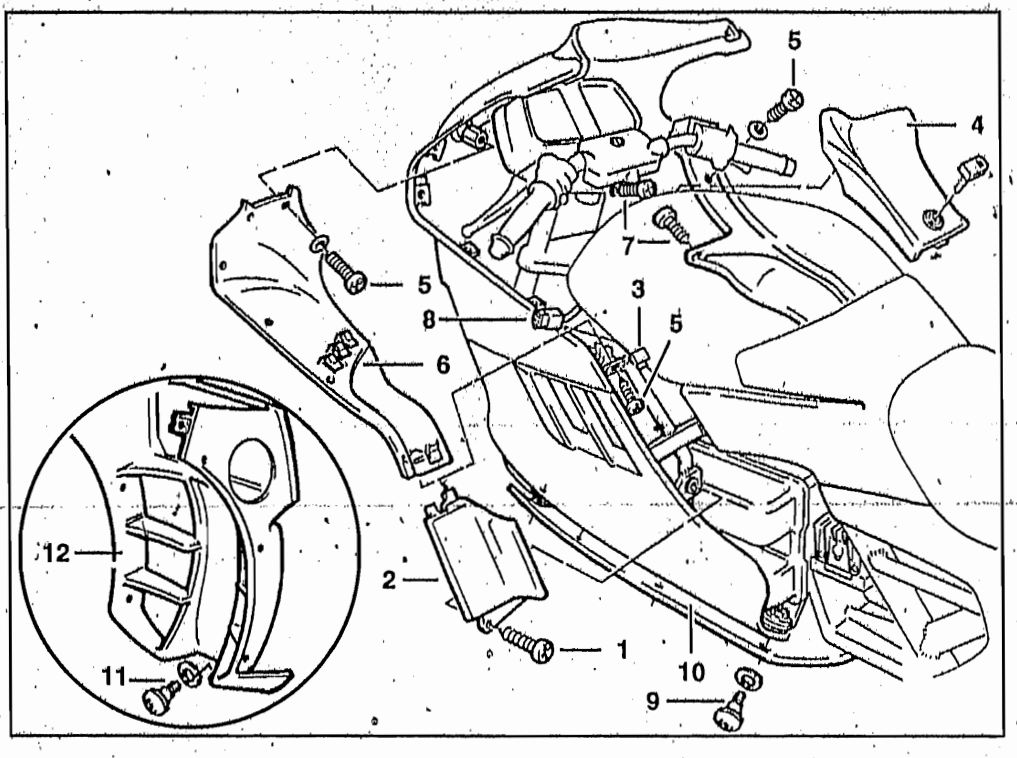
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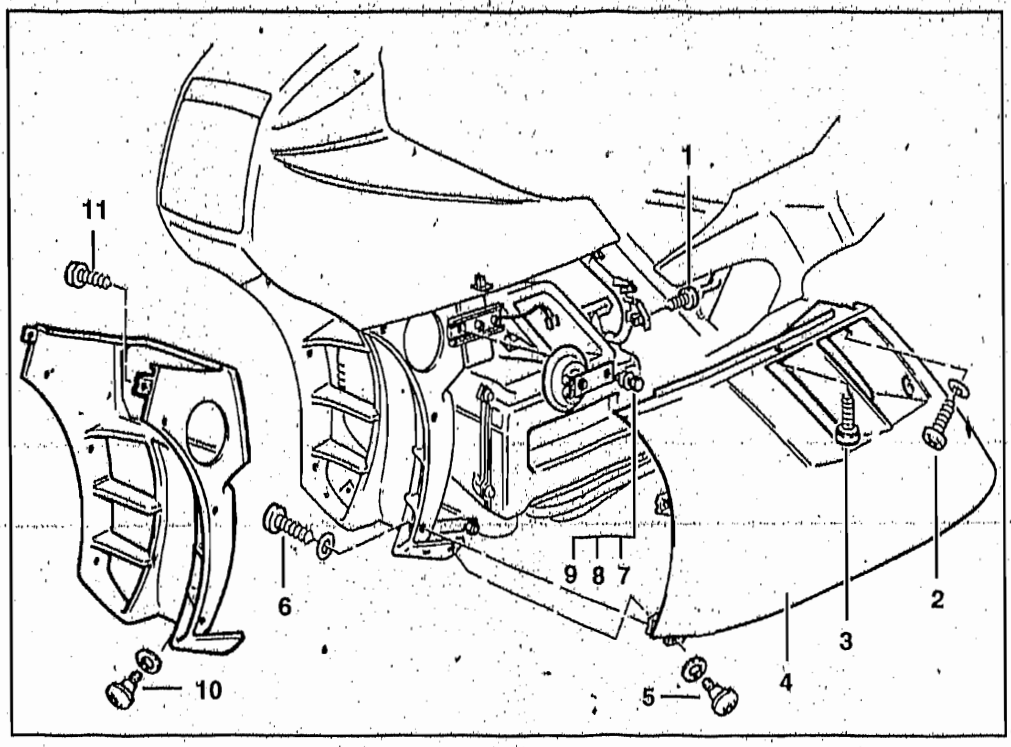
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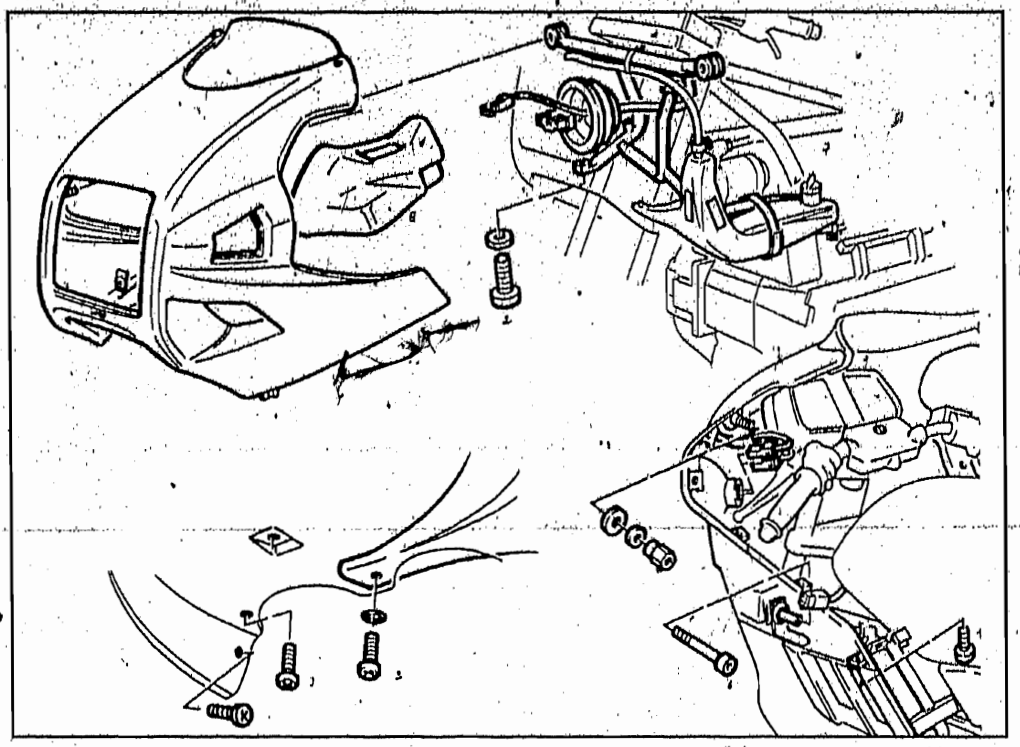
DETACHING AND ATTACHING FRONT SECTION OF FAIRING (WITH ABS)

NOTE:
Do not damage the fairing sections when removing them.

- Remove the retaining screw (1) from the left/right kneepad.
- Pull the left/right kneepad (2) out of holders (3) or take it off.
- Remove the toolkit compartment cover (4).
- Remove the 6 retaining screws (5) from the left/right inner fairing cover (6).
- Remove the 2 retaining screws (7) from the right inner fairing cover.
- Carefully pull the left/right inner fairing cover out of holders (3).
- Separate the plug connections (8) for the auxiliary instruments.
- Take off the left/right inner fairing cover.
- Take the 3 left/right retaining screws (9) out of the engine cover (10).
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- Take off the engine cover.



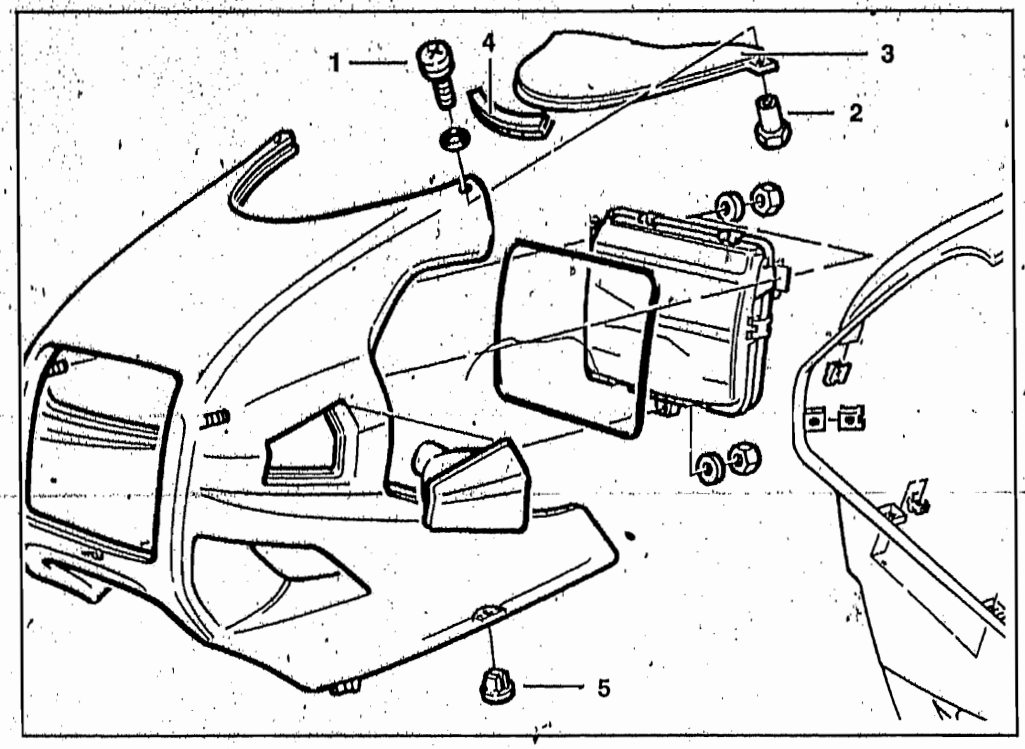
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- Take the 3 retaining screws (6) at left/right out of the radiator surround.
- Take off the left/right centre section of the fairing.
- Remove the retaining screw with lock washer and plain washer (7/8/9) from the horn mount.
- Take the horn off outwards.
- Remove the retaining screw (10) from the radiator surround holder.
- Remove the retaining screw (11) at left/right from the radiator surround/upper section of fairing.
- Carefully pull the radiator surround downwards out of the guide plates and take it off.



- Remove the retaining screw (1) at left/right from the upper section of the fairing.
- Remove the 2 retaining screws (2) from the upper section of the fairing, under the headlight.
- Remove the retaining screw (3) at the holder for the coolant header tank.
- Remove the retaining screw (4) at the coolant header tank.
- Pull off the plug connectors at left/right for the flashing turn indicators.
- Remove the 2 retaining screws (5) from fairing holder (6).
- Remove the retaining screw (7) from the coolant header tank.
- Carefully pull the upper section of the fairing forwards off the studs, holding it horizontal.
- Pull off the multi-pin plug for the high and low headlight beams and the rubber sleeve.
- Pull off the plug connections for the parking light.
- Carefully remove the upper section of the fairing.
- Remove the coolant header tank from the fairing.
- Secure the header tank to the fairing holder with wire (8).
- Take out the toolkit holder (9).
- Remove the 2 retaining screws (10).
- Install in the opposite order of work.

NOTE:

Avoid damage to sections of the fairing when attaching.
Make sure that the sheet-metal nuts are correctly located.
Install the fairing free from trapped stresses.
Check gap widths between fairing sections. Make sure that the wiring is correctly located.
Install wiring without kinks or points of potential abrasion.
Note correct positions of cable straps.
Insert the retaining screws for the fairing sections and screw them up handtight only at first.



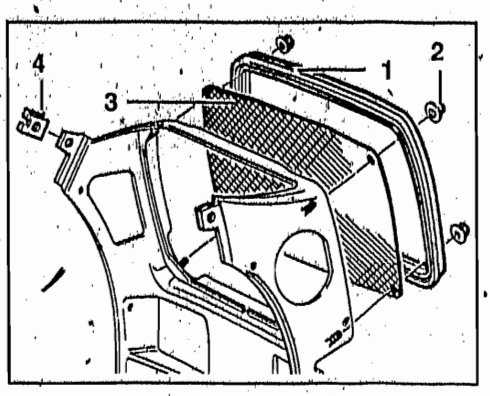
DETACHING AND ATTACHING FAIRING ATTACHMENTS

DETACHING AND ATTACHING FAIRING ATTACHMENTS ON UPPER SECTION OF FAIRING

- Take out the 2 retaining screws with collar nuts (1/2).
- Carefully pull the windscreen (3) out of the guide rail.
- Use a screwdriver to release the sealing strip (4) from the guide rail, and take it out.
- Remove the headlight.
- Remove the left/right flashing turn indicator housing.
- Press the spreader nuts (5) out downwards.
- Install in the opposite order of work.

NOTE:
Do not overtighten the retaining screws.
When installing, locate the sealing strip correctly on the windscreen first.
After this, insert the windscreen with sealing strip into the groove in the fairing.

DETACHING AND ATTACHING ATTACHMENTS ON RADIATOR SURROUND

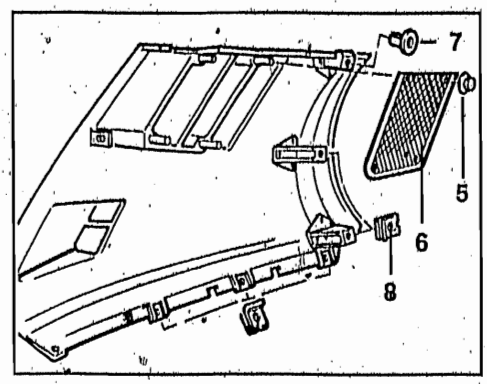


- Pull off the seal (1).
- Unscrew the 4 radiator grille retaining nuts (2).
- Carefully detach the grille (3) from the threaded pins.
- Take off the sheet-metal nuts (4).
- Install in the opposite order of work.

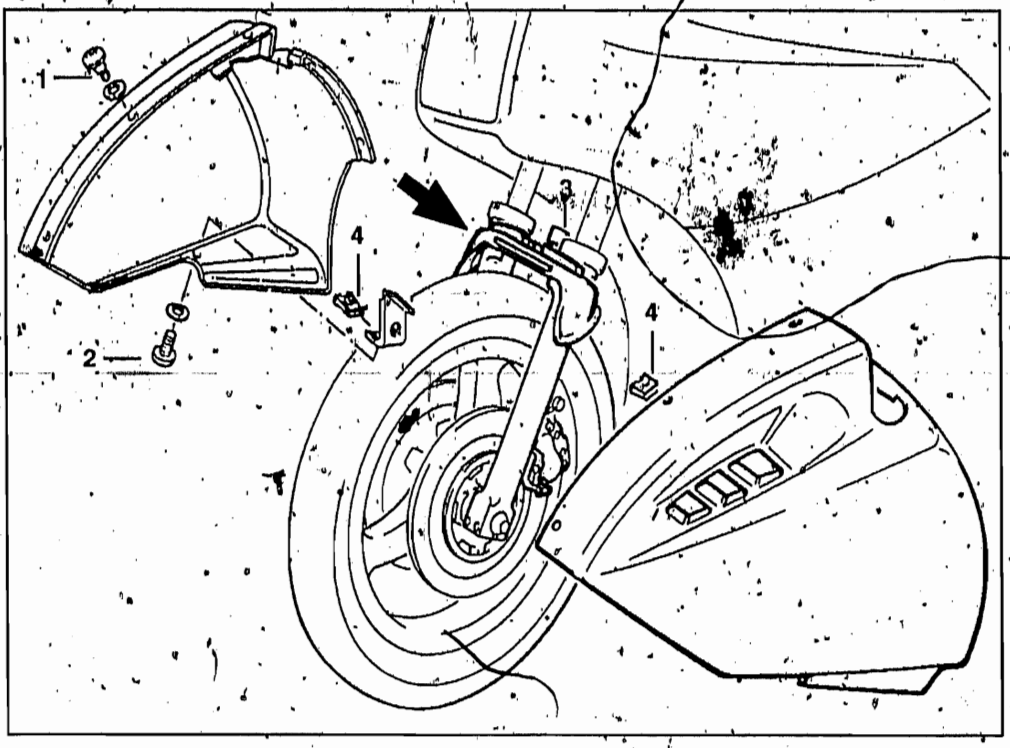
NOTE:

Do not overtighten the retaining nuts. Cut the new seal to the precise length of the circumference and insert so that a butt joint is formed.

DETACHING AND ATTACHING ATTACHMENTS ON CENTRE SECTION OF FAIRING



- Unscrew the retaining nuts (5) for the radiator grille.
- Carefully detach the grille (6) from the threaded pins.
- Unscrew the sheet-metal/spreader nuts (7/8).
- Install in the opposite order of work.

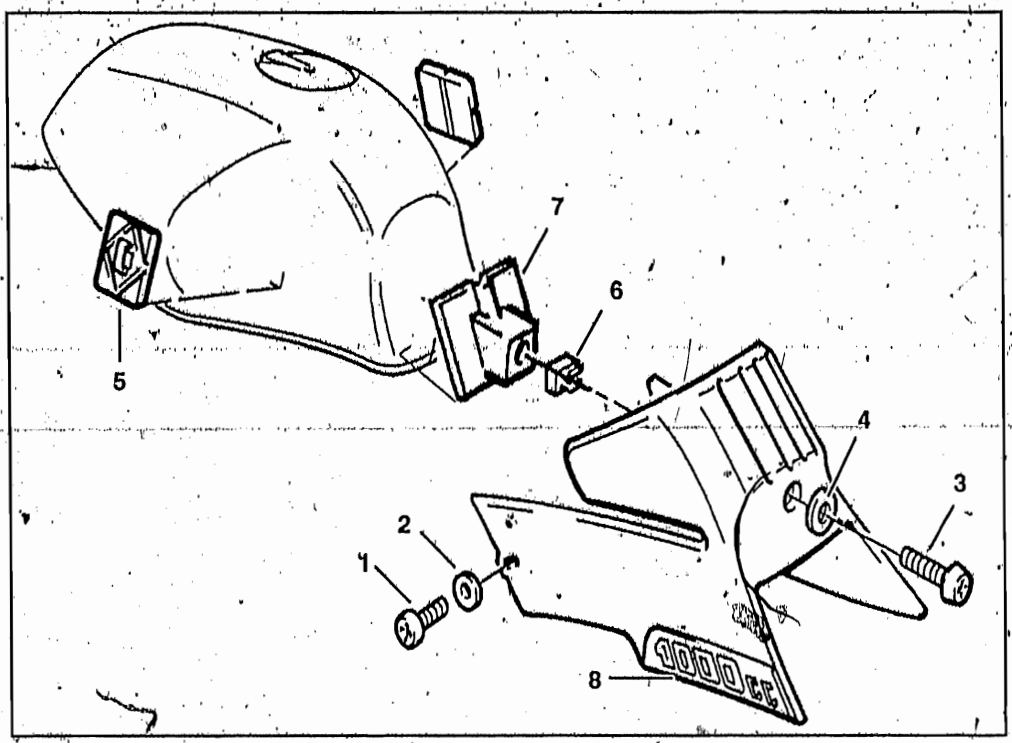


DETACHING AND ATTACHING FRONT MUDGUARD

- Take out the 5 retaining screws (1).
- Remove the retaining screw (2) at left and right.
- Loosen the 2 retaining screws (3) at the retaining plate/fork stabilizer.
- Carefully pull the left/right mudguard halves out of the sleeve (arrow). Note the sheet-metal nuts (4).
- Install in the opposite order of work.

NOTE:

When attaching:
Apply a light coat of tyre fitting paste to the rubber surfaces in the guide rails.
If necessary, bend the sheet-metal nuts lightly to the correct radius.
Install the front mudguard without trapped stresses.

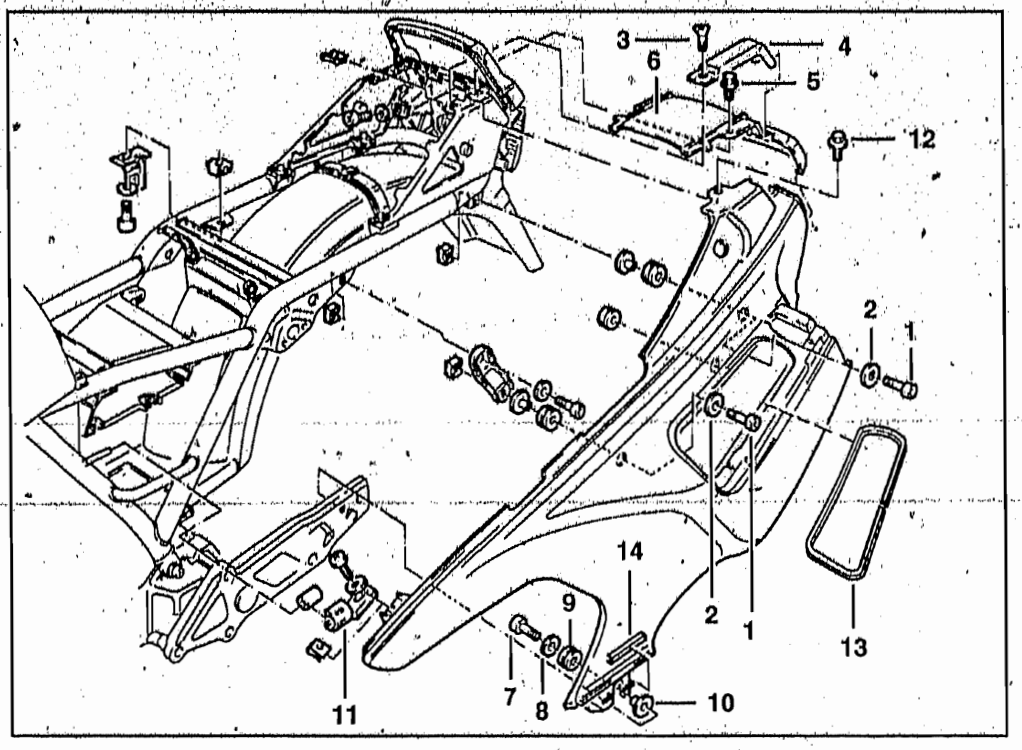


DETACHING AND ATTACHING FUEL TANK PADS AND ATTACHMENTS

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Take out the 2 retaining screws with hollow washers (1/2).
- Take out the retaining screw with washer (3/4).
- Pull the fuel tank pads out of the lugs on the retaining plates (5), and detach them.
- Remove the cage nut (6) from the rubber mounting (7).
- Pull the retaining plates with rubber mountings off the fuel tank.
- Clean the adhesive surfaces.
- Pull off the decal (8) at left/right.
- Install in the opposite order of work.

NOTE:

When installing:
Attach retaining plates and rubber mountings with SCOTCH adhesive sheet.
Use a new cage nut.

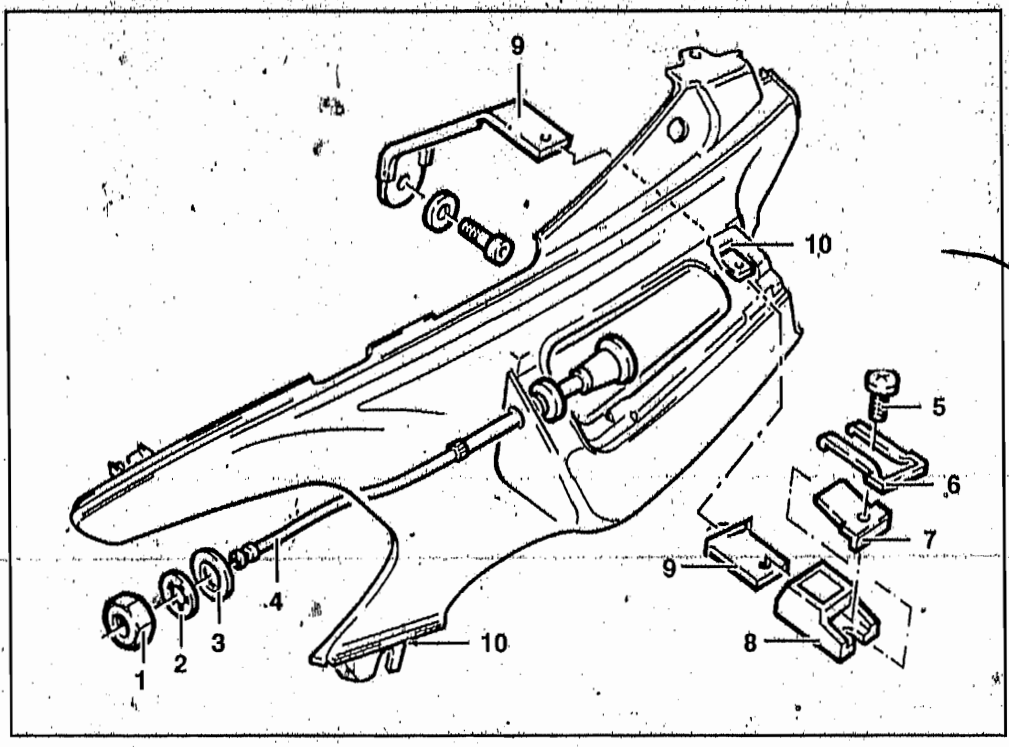


DETACHING AND ATTACHING REAR FAIRING

- Remove the dualseat cover/dualseat.
- Remove left/right covers for storage compartment.
- Remove holder for left/right flashing turn indicator.
- Remove holder for brake/rear light
- Remove lock washer from wire cable for dualseat lock.
- Disconnect the wire cable.
- Remove the 2 retaining screws with washers (1/2) in the left/right storage compartment. Note spacing washer at left/right on angle bracket for helmet holder.
- Remove the retaining screws (3) from the left/right mount (4).
- Remove the retaining screws (5) from the left/right cover (6).
- Remove the retaining screw with washer, grommet and bushing (7/8/9/10) from the left/right footrest plate.
- Pull the rear fairing out of the retaining clips (11) at left/right.
- Remove the retaining screw (12) at left/right.
- Carefully detach the rear fairing upwards and to the rear.
- Pull the seal (13) off the guide flange at left/right.
- Pull off the sealing strip (14) at left/right.
- Install in the opposite order of work.

NOTE:

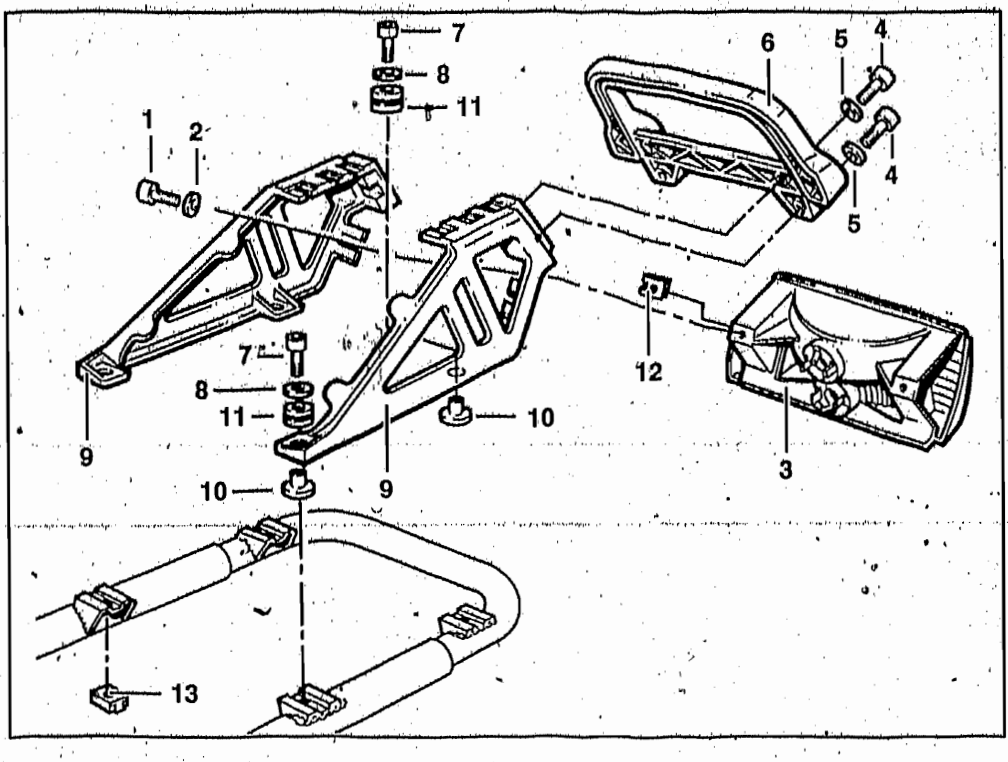
When installing:
Cut the new seal to the precise length of the circumference and insert so that a butt joint is formed.
Clean the adhesive surfaces for the sealing strip.
Attach the sealing strip.
Install the rear fairing without trapped stresses.
Maintain the correct joint gaps between the sections of fairing.



DETACHING AND ATTACHING REAR FAIRING ATTACHMENTS

- Unscrew retaining nut with toothed washer and plain washer (1/2/3).
- Pull the wire cable (4) out through the storage compartment.
- Take out the retaining screw (5).
- Take off the retaining hook with spring plate and housing for the pushbutton (6/7/8).
- Pull the angle bracket (9) out of the rear fairing.
- Install in the opposite order of work.

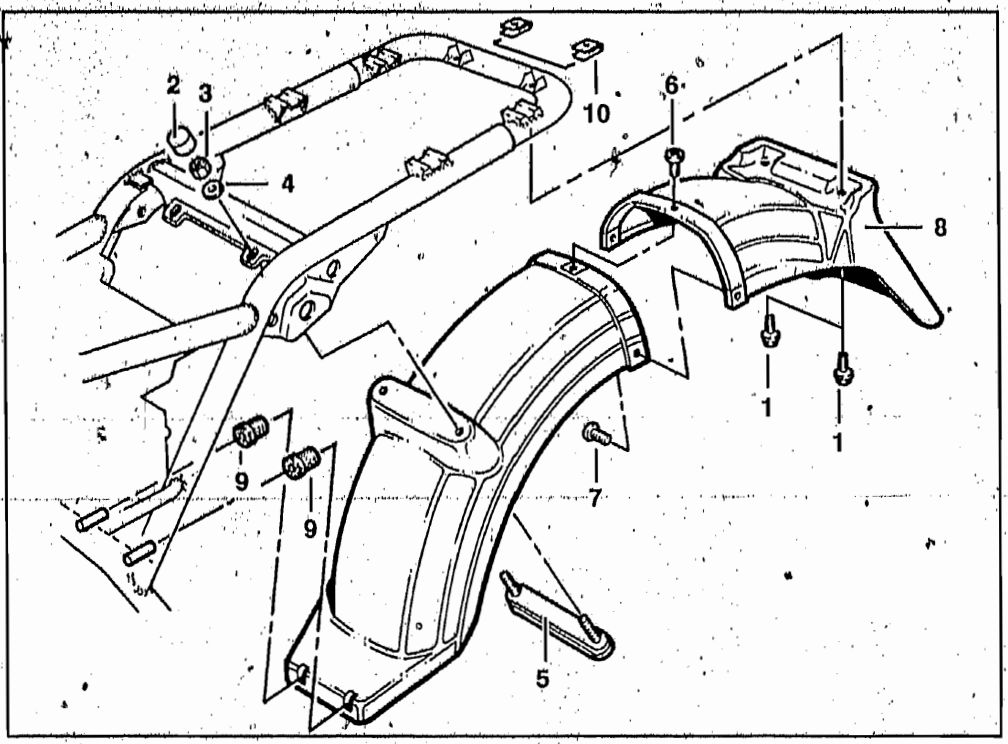
NOTE:
When installing, check correct seating of sealing strip (10).
It must be possible to pull out the retaining hook (6) when the pushbutton is pressed.



REMOVING AND INSTALLING SUPPORT SECTION/HOLDER/REAR LIGHT

- Take out the left/right retaining screw with washer (1/2) at the rear light.
- Take the rear light (3) out of the support section.
- Remove the 2 left/right retaining screws with washers (4/5) from the support section.
- Take off the holder (6).
- Remove the 2 retaining screws with washers (7/8) at left/right from the support section.
- Detach the support section (9) from the frame.
- Lever out the 2 bushings (10) from the left/right support section.
- Press the 2 rubber grommets (11) out of the left/right support section.
- Pull the sheet-metal nuts (12) at left/right off the rear light.
- Using a screwdriver, detach the 4 cage nuts (13) from their locating points on the frame.
- Install in the opposite order of work.

NOTE:
When installing:
If necessary, apply a thin coat of tyre fitting paste to the rubber grommets.
Use new cage nuts.

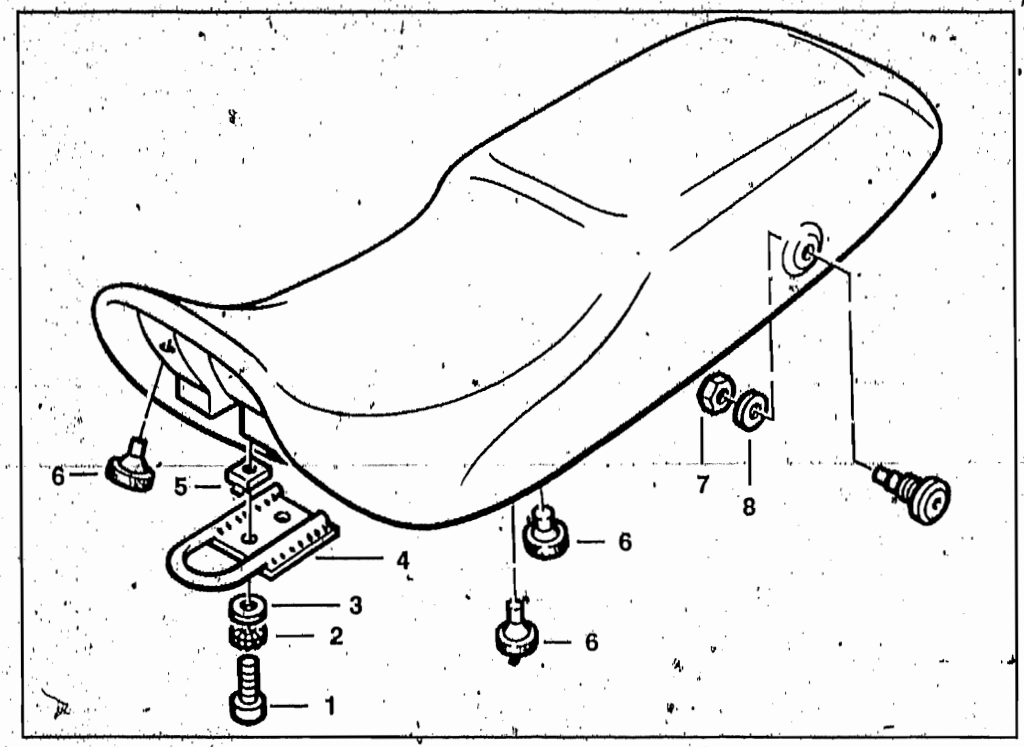


REMOVING AND INSTALLING REAR MUDGUARD

- Remove the dualseat cover/dualseat.
- Remove the 2 retaining screws (1) from the licence plate holder.
- Lever off the 2 protective caps (2).
- Unscrew the left/right retaining nuts with washers (3/4).
- Take out the plate (5).
- Remove the retaining screw (6) from the top of the licence plate holder.
- Take off the licence plate holder (8).
- Remove the rear mudguard to the rear from mountings (9).
- Assemble/install in the opposite order of work.

NOTE:
When installing:
Make sure that the sheet-metal nuts (10) are correctly seated.

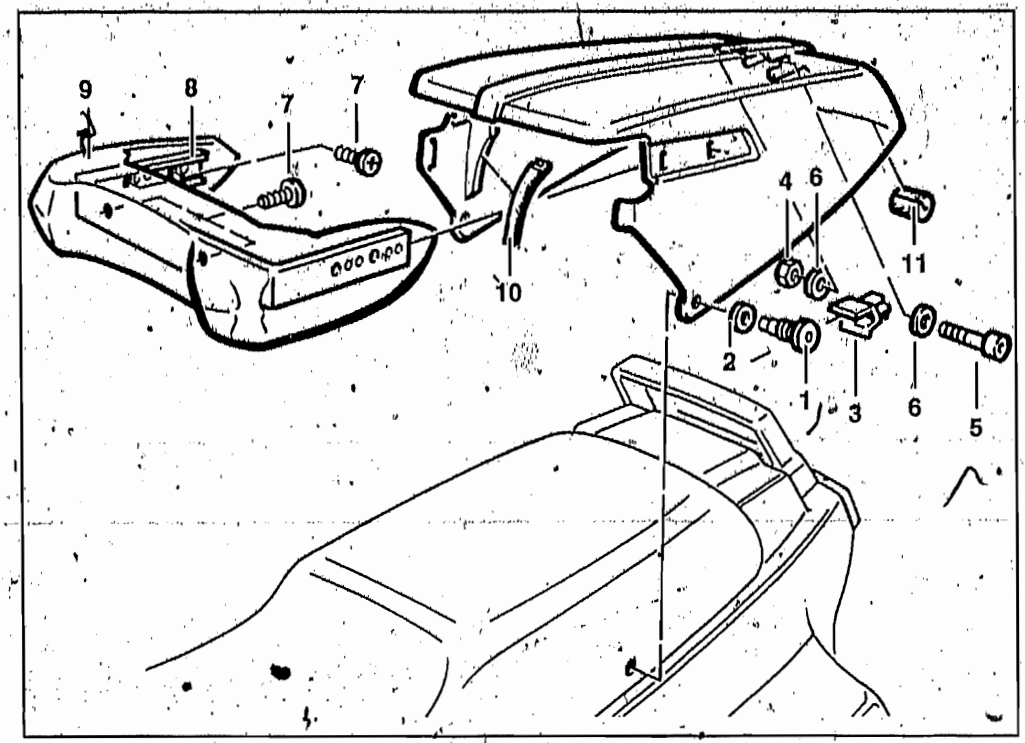
Tightening torque:
Retaining nuts 6.2 Nm



DETACHING AND ATTACHING DUALSEAT ATTACHMENTS

- Remove the dualseat cover/dualseat.
- Remove the 2 retaining screws with toothed and plain washers (1/2/3).
- Pull the catch hoop (4) out of the guide rail.
- Lever out the 2 cage nuts (5).
- Pull out the rubber buffer (6).
- Unscrew the retaining nut with washer (7/8).
- Press the left/right retaining screws (9) out from the inside.
- Install in the opposite order of work.

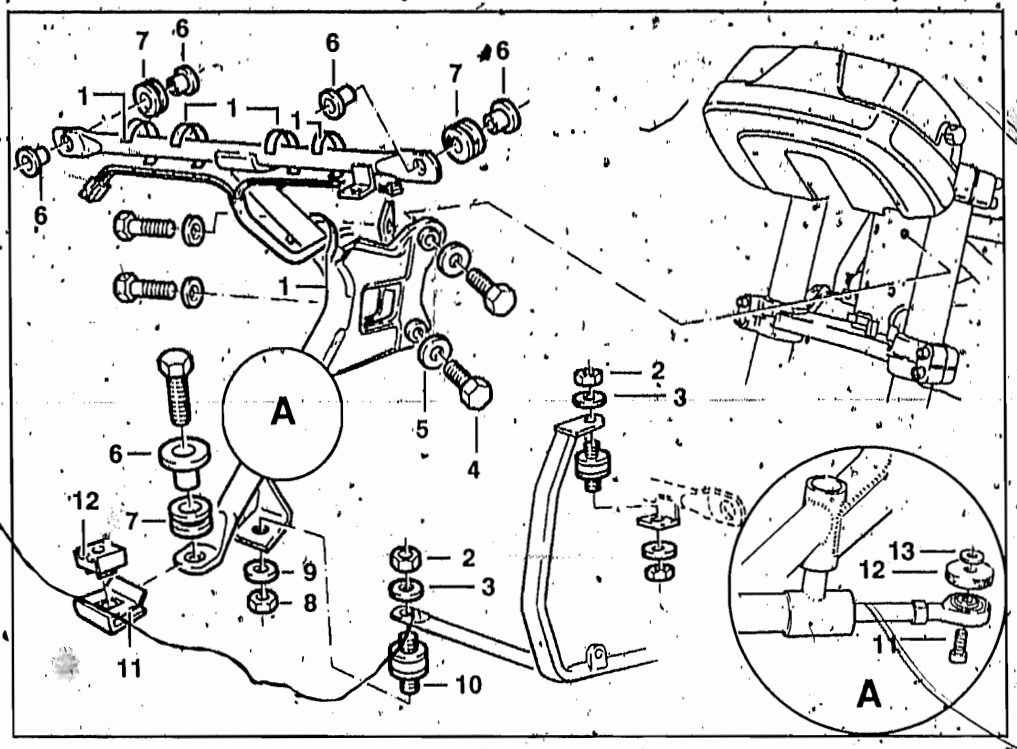
NOTE:
When installing, use new cage nuts.



DETACHING AND ATTACHING DUALSEAT COVER ATTACHMENTS

- Remove the retaining screw with plastic washer (1/2) at left/right from the dualseat cover. Take off the dualseat cover.
- Pull off the holder (3).
- Unscrew the retaining nut (4) and pull out the retaining screw and washers (5/6).
- Remove the 6 retaining screws (7) from the plastic support frame.
- Take the frame and support (8/9) off the dualseat cover, and detach the plastic support.
- Pull off sealing strip and rubber damping inserts (10/11) if defective. Clean the adhesive surfaces.
- Attach new sealing strip/rubber damping inserts with adhesive.
- Install in the opposite order of work.

NOTE:
When installing, make sure that the seals are seated correctly and attached firmly.



DETACHING AND ATTACHING FAIRING HOLDERS

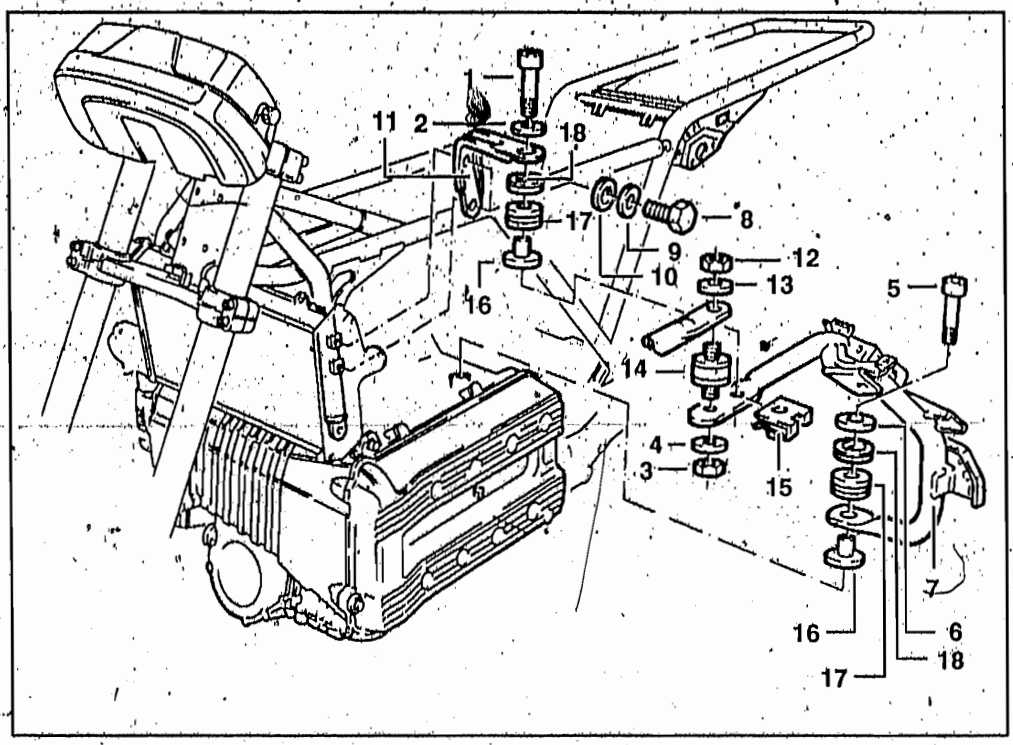
DETACHING AND ATTACHING HOLDER FOR UPPER SECTION OF FAIRING

- Open the 5 cable straps (1).
- Unscrew the 2 retaining nuts with washers (2/3) at the pressure modulator frame.
- Secure the frame to the handlebar with a cable strap.
- Remove the retaining screw at the steering damper.
- Remove the 4 retaining screws with washers (4/5) at the steering head.
- Take off the fairing holder.
- Pull out the bushings/grommets (6/7).
- Unscrew the retaining nut with washer (8/9).
- Take off the rubber mounting (10).
- Pull off the spreader nut and cage nut (11/12).
- Install in the opposite order of work.

NOTE:

When installing:
Avoid any kinks or points of abrasion at the flashing turn indicator cables.
Make sure the cable straps are correctly located.
Secure the retaining screw at the steering damper with LOCTITE 242.
Note the felt ring (12) and washer (13).

Tightening torque:
Retaining screw (4) 9 Nm



DETACHING AND ATTACHING HOLDER FOR KNEEPAD

- Remove the retaining screw with washer (1/2) at the left/right fairing holder.
- Unscrew the retaining nut with washer (3/4).
- Remove the left/right retaining screws with washers (5/6) at the engine block. Take off holder (7).
- Install in the opposite order of work.

Tightening torque:
Retaining screw *9 Nm*

DETACHING AND ATTACHING HOLDER FOR FAIRING

- Remove the 2 left/right retaining screws with spring washers and plain washers (8/9/10) at the frame.
- Take off holder (11).
- Install in the opposite order of work.

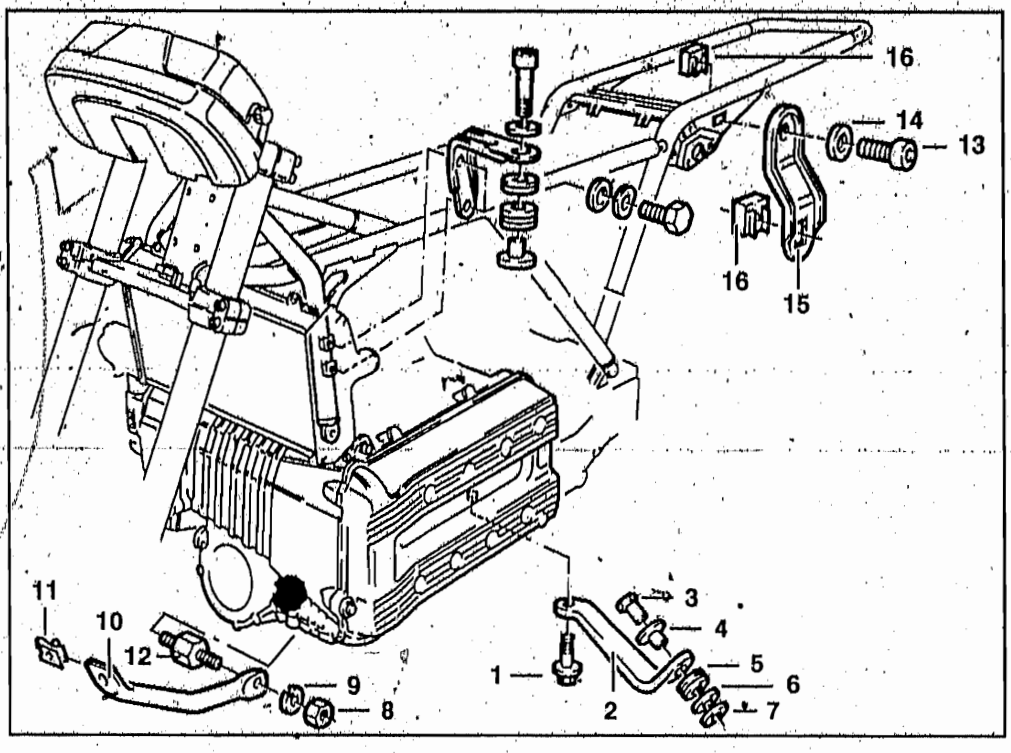
Tightening torque:
Retaining screw *9 Nm*

DETACHING AND ATTACHING ATTACHMENTS FOR LEFT/RIGHT FAIRING HOLDER

- Unscrew the retaining nut with washer (12/13). Take off the rubber mounting (14).
- Pull off the spreader nut (15).
- Pull out the bushings (16).
- Take off the grommets/inserts (17/18).
- Install in the opposite order of work.

HINWEIS:
Bei Anbau genauen Sitz der Spreizmuttern beachten/ggf. Radius leicht nachbiegen.

Tightening torque:
Retaining screw *9 Nm*



DETACHING AND ATTACHING FAIRING HOLDER AT ENGINE

- Remove the retaining screw (1) at left/right and take off the fairing holder (2).
- Unscrew and remove the collar nut with bushing, grommet, insert and sleeve (3/4/5/6/7).
- Install in the opposite order of work.

Tightening torque:
Retaining screw *9 Nm*

DETACHING AND ATTACHING HOLDER FOR REAR FAIRING

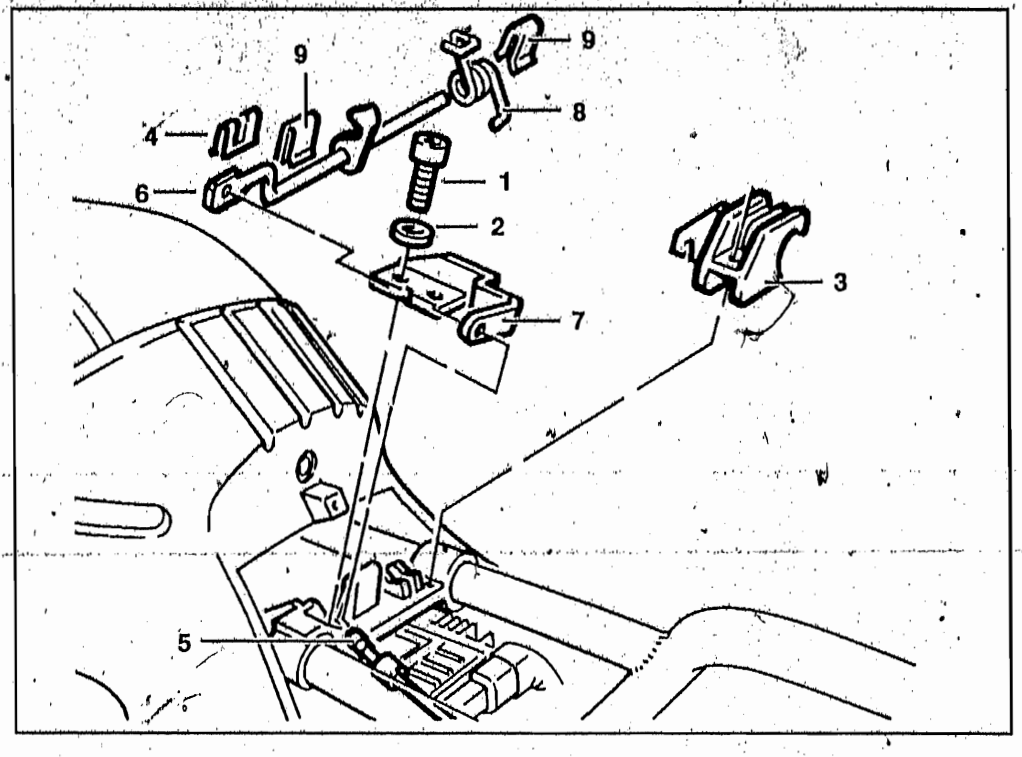
- Take out retaining screw with lock washer (13/14) at left/right.
- Take off fairing holder with cage nut (15/16).
- Press cage nut (16) out of holder.
- Install in the opposite order of work.

Tightening torque:
Retaining screw *9 Nm*

DETACHING AND ATTACHING HOLDER FOR RADIATOR SURROUND

- Unscrew retaining nut with spring washer (8/9) at sump.
- Take off fairing holder (10) with spreader nut (11).
- Take off anti-vibration mount (12).
- Install in the opposite order of work.

Tightening torque:
Retaining screw *9 Nm*



DETACHING AND ATTACHING DUALSEAT CATCH

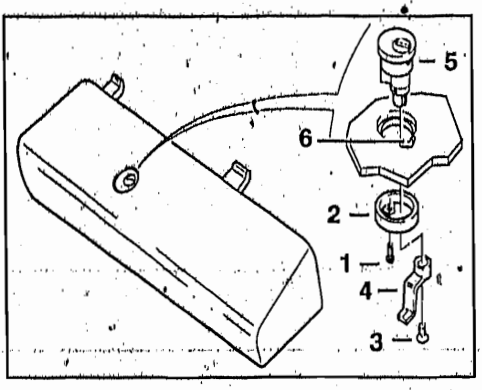
- Remove the dualseat.
- Remove the 2 retaining screws with washers (1/2) from the clamp at left/right (3).
- Remove the keeper (4).
- Pull the wire cable (5) to the left out of the lock striker and clamp (6/7).
- Release the wire spring (8).
- Release the 2 spring clips (9) from the catch.
- Take off the lock striker.
- Attach in the opposite order of work.

NOTE:

When attaching:
Make sure that the keeper (4) is firmly attached.
The wire cable must be run correctly, without kinks.
The lock striker must engage and release correctly.

REMOVING AND INSTALLING LOCKS

REMOVING AND INSTALLING LOCK FOR STORAGE COMPARTMENT COVER



- Take off the cover.
- Remove the retaining screw (1). Take off the locking ring (2).
- Remove the retaining screw (3). Take out the angle catch (4) and lock barrel.
- Install in the opposite order of work.

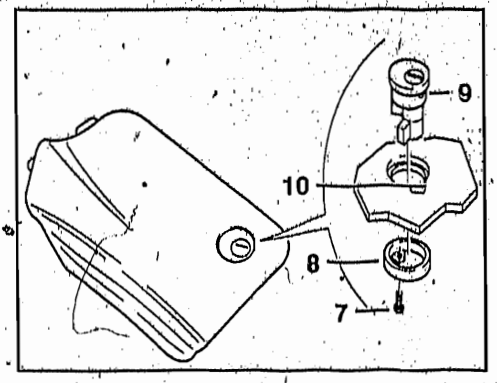
NOTE:
When installing:
The lug (5) on the lock barrel must engage in the slot (6) on the cover.

REMOVING LOCK BARREL WITH BROKEN-OFF KEY

NOTE:
Drill open carefully, without exerting too much pressure.
Avoid damage to the storage compartment cover.

- Drill a 4 - 5 mm dia. pilot hole.
- Drill out slowly until the lock barrel can be removed.

REMOVING AND INSTALLING LOCK FOR TOOL COMPARTMENT COVER.

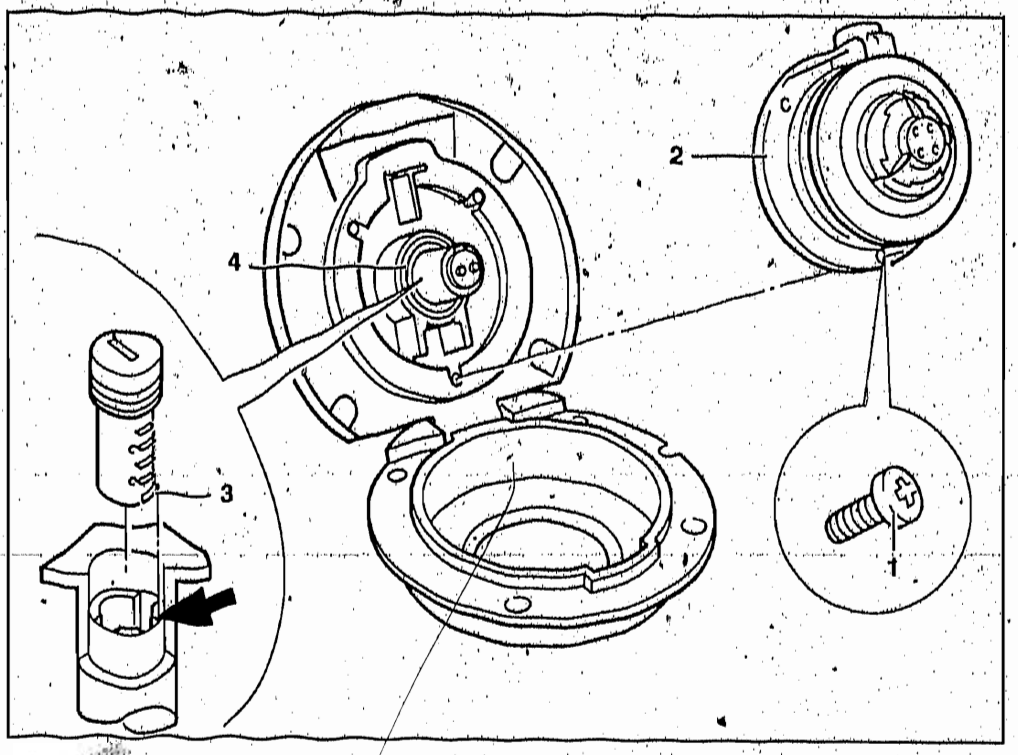


- Take off the cover.
- Take out the retaining screw (7). Take out the lock ring (8) and the lock barrel.
- Install in the opposite order of work.

HINWEIS:
Einbau:
Nase (9) an Schließzylinder in Nut (10) von Abdeckung einrasten.

REMOVING LOCK BARREL WITH BROKEN-OFF KEY

- See Chapter 7 "Removing lock barrel for storage compartment cover".



REMOVING AND INSTALLING FUEL TANK LOCK

- Open the fuel filler cap.
- Cover the opening with a clean cloth.
- Take out the 3 retaining screws (1).
- Take off the fuel tank lock body (2).
- With the key in the lock, press the spring retainer (3) in.
- Pull out the lock barrel with the key.
- Install in the opposite order of work.

NOTE:

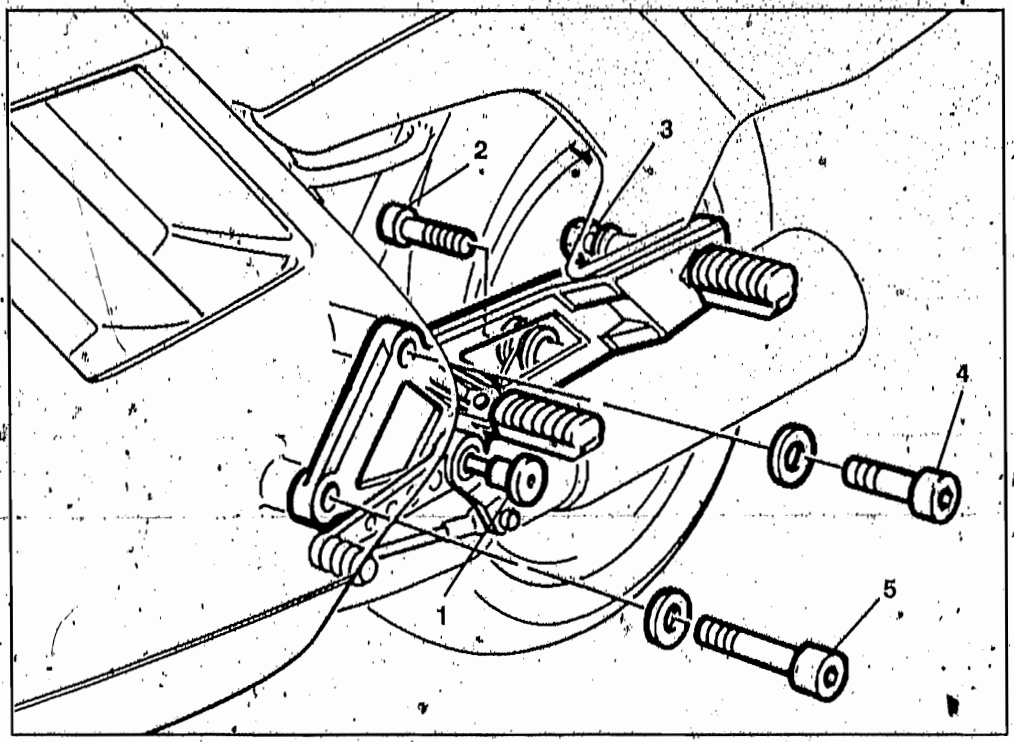
When installing:
Note the O-ring (4).
Grease the lock barrel with RETINAX A.
Insert the lock with the key in the assembly slot (arrow).
Turn to the right until the spring retainer engages.

REMOVING LOCK BARREL WITH BROKEN-OFF LOCK

- Pre-drill with a 4 - 5 mm dia. bit to the maximum drilling depth (length of lock barrel).
- Drill out slowly until the lock barrel can be removed.

WARNING:

All metal swarf must be removed from the fuel tank and mesh screen.



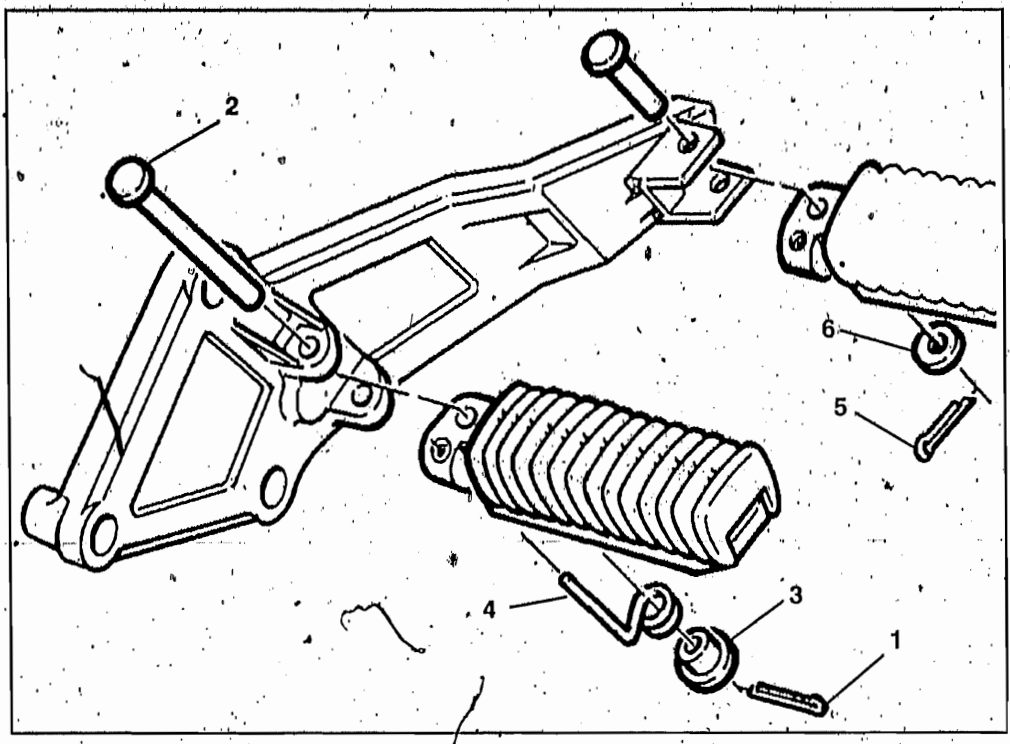
REMOVING AND INSTALLING LEFT FOOTREST PLATE

- Take out the retaining screw (1) and fold the shift linkage forwards.
- Take out the silencer retaining screw (2), noting the presence of the taper washers.
- Loosen the fairing retaining screw (3).
- Take out the footrest plate retaining screws (4/5).
- Install in the opposite order of work.

NOTE:
Secure the gear shift pedal screw with Loctite 242.

Tightening torques:

Footrest plate to gearbox (1, 4, 5)	*15 ± 2 Nm*
Silencer to footrest plate	*9 ± 1 Nm*



DETACHING AND ATTACHING LEFT FRONT/REAR FOOTRESTS

Removing front footrest

- Pull out the split pin (1).
- Drive pin (2) back slightly.
- Take off the spring guide (3) and spring (4).
- Pull out the pin (2) and take off the footrest.
- Install in the opposite order of work.

Removing rear footresters.

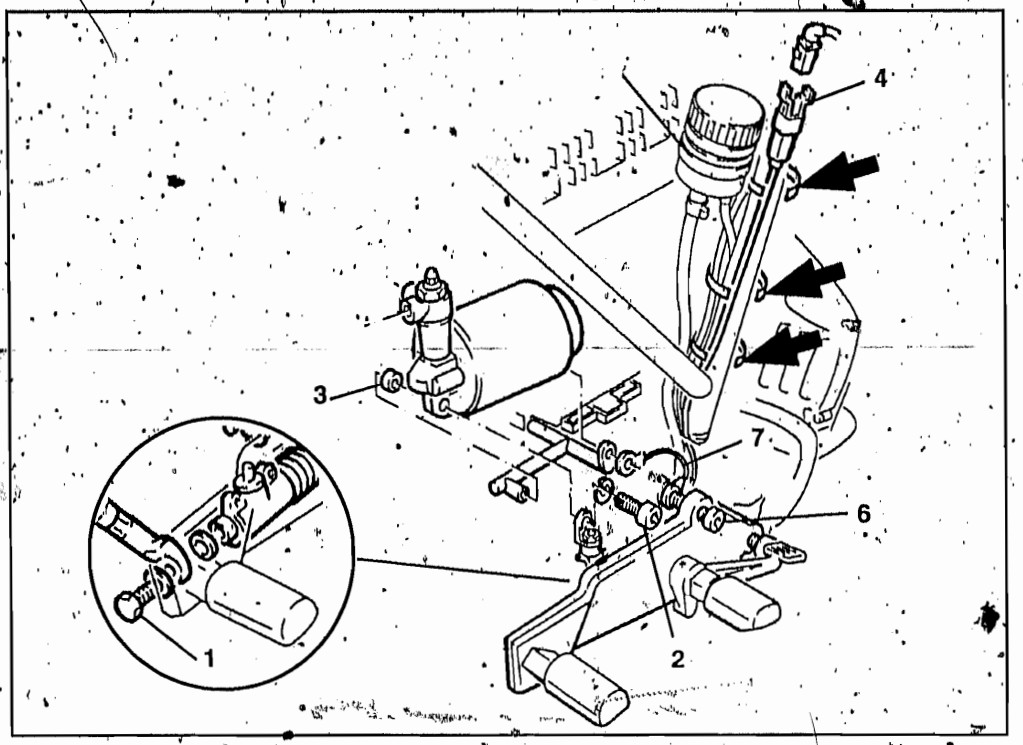
- Pull out the split pin (5).
- Take off the wascher (6).
- Pull out the pin (7).
- Install in the opposite order of work.

- Loosen the footrest rubber with a screwdriver and pull off.
- Apply a thin coat of tyre fitting paste to the inside of the new footrest rubber and push it on.

NOTE:
Renew pin if worn.
Use a new split pin.
Make sure that the split pin is seated firmly.
The driver's footrests must fold in/out under spring loading.

Tightening torque:

Pivot mount to footrest plate	*29 ± 3 Nm*



REMOVING AND INSTALLING RIGHT FOOTREST PLATE

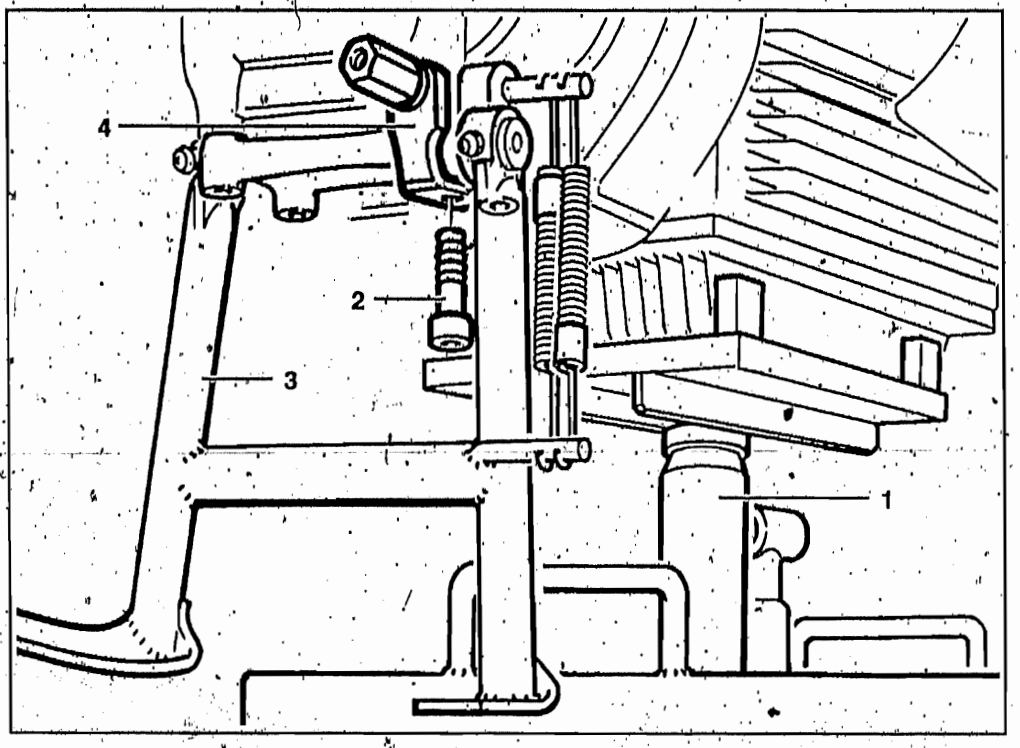
WARNING:
Brake fluid is hazardous to health. Avoid contact with skin or clothing.
Keep brake fluid away from painted surfaces, or these will be damaged.
Trap escaping brake fluid.

NOTE:
Do not operate the brake pedal when the brake pipe is unscrewed.

- Take out the brake pipe retaining screw (1) at the foot brake cylinder.
- Screw a plug into the brake pipe hole.
- Remove the retaining screw (2) at the pressure modulator, noting the spacing bushing (3).
- Open the cable straps (arrows) for the ABS line, the brake light switch and the pulse generator cable.
- Separate the plug connector (4) for the brake light switch.
- Unclip the brake fluid reservoir (5).
- Take out the 3 retaining screws (6) at the footrest plate. Note the ABS earth (ground) cable (7).
- Loosen the rear fairing retaining screw.
- Take off the footrest plate.
- Install in the opposite order of work.

NOTE:
When installing:
Note earth (ground) cable.
Make sure that cables are run correctly. Run the cables without kinks or points of abrasion.
Note the correct position of the brake hose. The brake hose should be in contact with the footrest plate. After attaching the footrest plate, bleed the brake circuit.

Tightening torques:	
Brake hose to master cylinder	*11 ± 1 Nm*
Pressure modulator	*17 Nm*
Footrest plate to gearbox	*15 ± 2 Nm*
Bleed screw	*7.3 Nm*

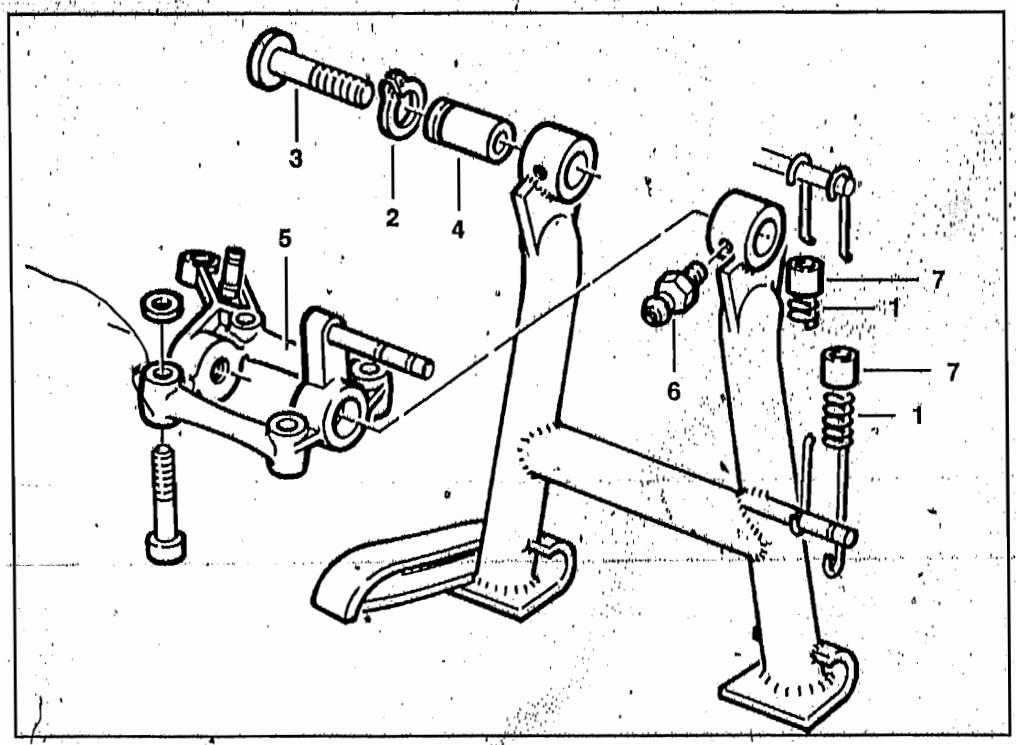


DETACHING AND ATTACHING CENTRE STAND

- Remove the engine fairing.
- Raise the motorcycle under the sump with lifting device BMW No. 00 1 510 (1) until the centre stand can move freely.
- Remove the 4 retaining screws (2) on the pivot mount.
- Take off the centre stand with retaining bracket (3/4).
- Attach in the opposite order of work.

NOTE:
When attaching:
The retaining screws (2) are of the micro-encapsulated type. Clean the threads of the retaining screws and holes with a suitable tap. Blow the holes clean.
Apply LOCTITE 242 to the retaining screws/bores.

Tightening torque:
Centre stand to pivot mount *41 ± 5 Nm*



STRIPPING AND ASSEMBLING CENTRE STAND

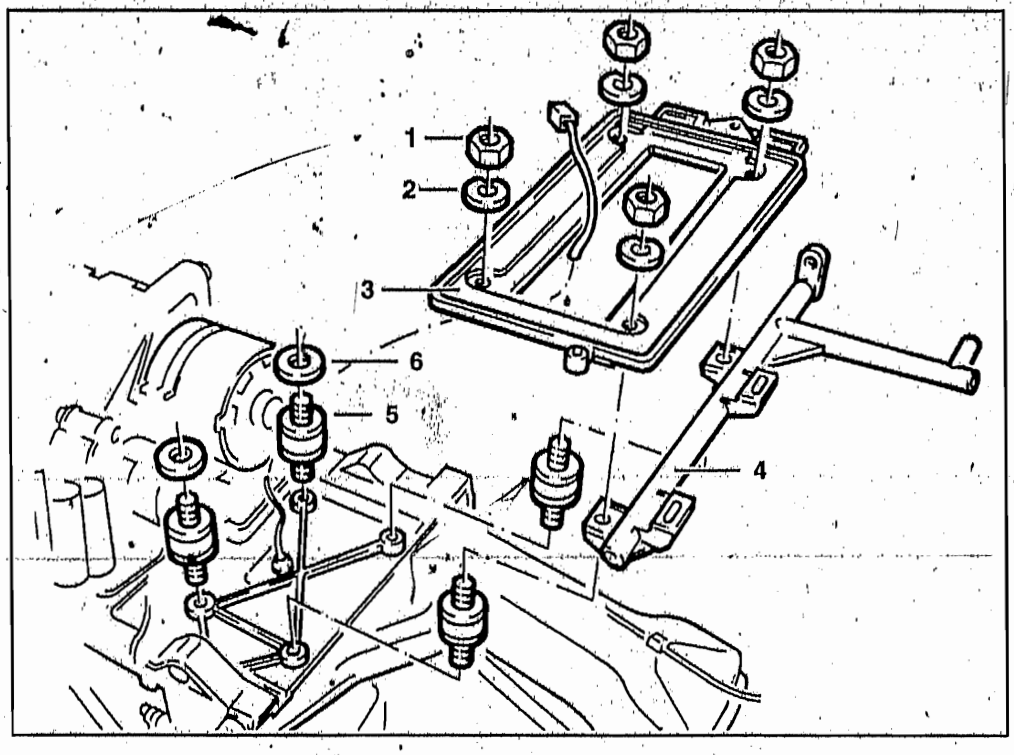
- Disconnect the 2 tension springs (1).
- Remove circlip (2).
- Take out the left/right retaining screws (3).
- Remove the left/right sleeves (4).
- Take off the pivot mount (5).
- Unscrew the left/right grease nipples (6).
- Pull the rubber grommets (7) off the tension springs.
- Install in the opposite order of work.

NOTE:

When assembling:
Renew sleeves/rubber grommets if worn.
Lubricate the sleeves with SHELL RETINAX A.
The retaining screws (5) are of the micro-encapsulated type. Clean the threads of the retaining screws and holes with a suitable tap. Blow the holes clean.
Apply LOCTITE 242 to the retaining screws/bores.

Tightening torque:

Centre stand to pivot mount	*41 ± 5 Nm*



REMOVING AND INSTALLING BATTERY HOLDER (WITH ABS)

Tightening torque:

Retaining nuts	*3.5 Nm*
Rubber mount at gearbox	*3.5 Nm*

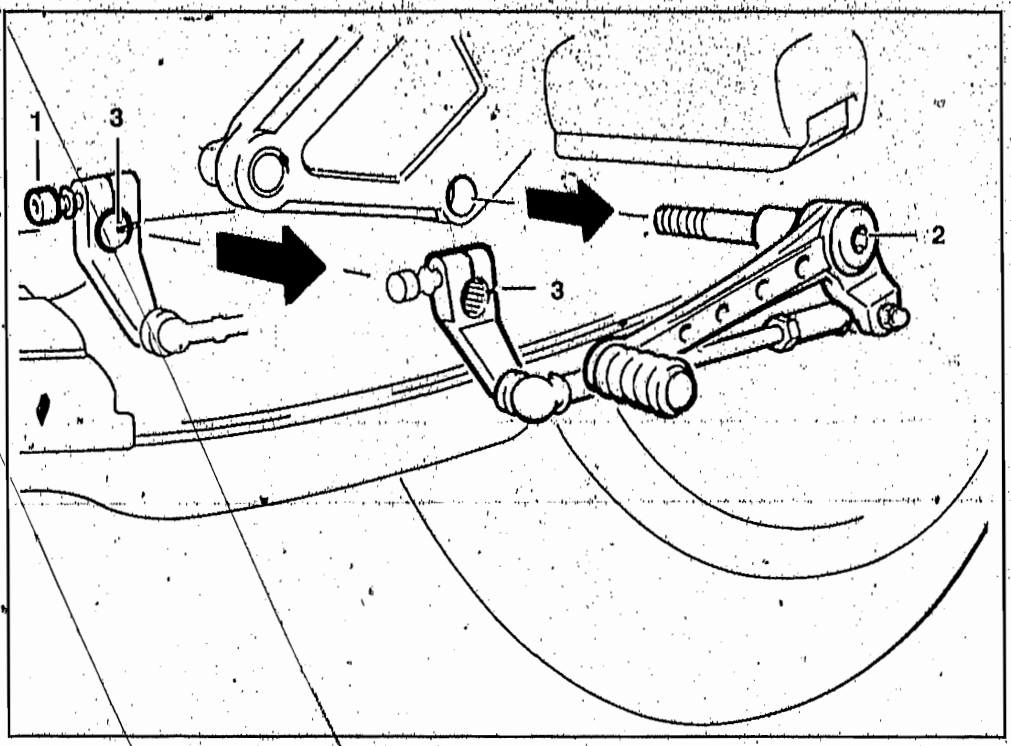
WARNING:

Switch off the ignition.
Disconnect the earth (ground) cable from the gearbox.
Insulate the earth (ground) cable.
Disconnect the negative terminal from the battery first, then the positive terminal.

- Remove the battery.
- Remove the pressure modulator and place it on the rear swinging arm, securing it with adhesive tape if necessary.
- Unscrew the 4 retaining nuts with spring washers (1/2) from the battery holder.
- Take out the battery holder (3).
- Take off the pressure modulator holder (4).
- Detach the 4 rubber mounts with washers (5/6).
- Install in the opposite order of work.

WARNING:

When installing, connect the positive terminal to the battery first, then the negative terminal.
Make sure that the earth (ground) cable is correctly run and firmly connected.



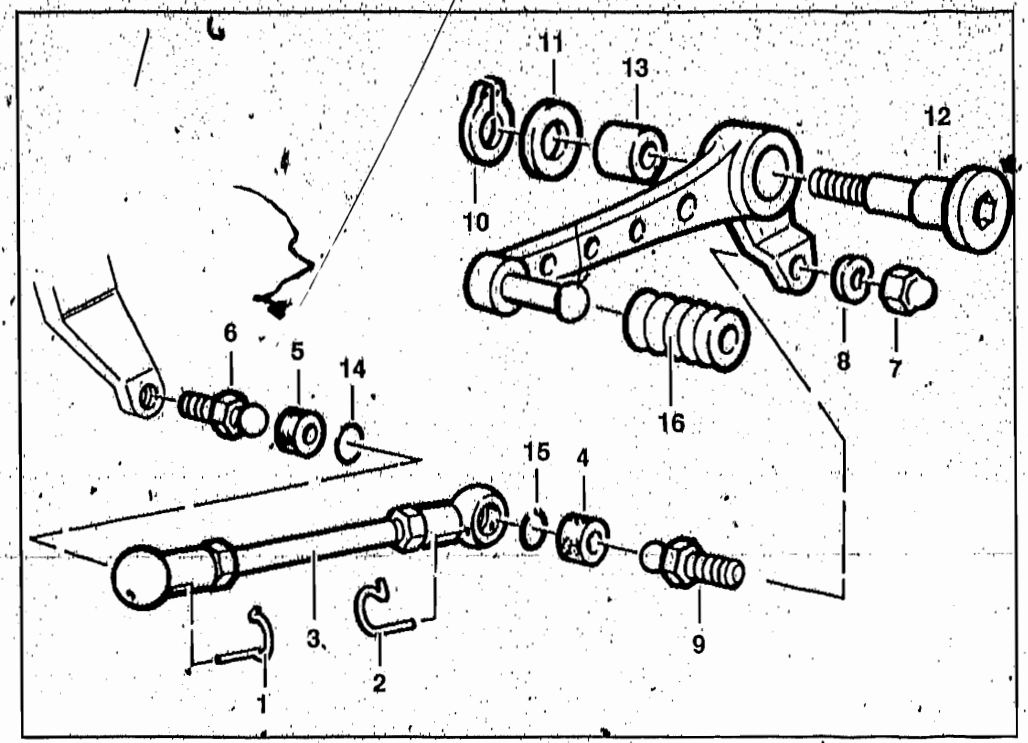
DETACHING AND ATTACHING GEAR SHIFT LINKAGE

- Loosen the retaining screw (1) on the gear shift pedal at the gearbox end.
- Take out the retaining screw (2) at the gear pedal/footrest plate.
- Pull off the gear shift linkage, keeping both ends parallel (arrows).
- Install in the opposite order of work.

NOTE:
When installing:
Note the installation marks (3) on the selector shaft/gear pedal at the gearbox end.
Secure the retaining screw (2) with LOCTITE 242.

Tightening torque:

Footrest plate to gearbox	*15 ± 2 Nm*
Gear pedal to selector shaft	*8.5 ± 1 Nm*



STRIPPING AND ASSEMBLING GEAR SHIFT LINKAGE

- Detach keepers (1/2).
- Detach shift rod (3) from ball joint.
- Pull off plastic bushings (4/5).
- Take off ball journal (6).
- Unscrew retaining nut with spring washer (7/8).
- Take off ball journal (9).
- Release circlip (10).
- Remove washer (11).
- Take out retaining screw (12).
- Press out needle roller race (13) with a suitable arbor.
- Release circlips (14/15) from ball socket.
- Lever out rubber gaiter (16) with a screwdriver.
- Install in the opposite order of work.

NOTE:

When assembling:
Press the needle roller race in until flush.
Grease the pivots/ball sockets with SHELL RETINAX A.
Apply a little tyre fitting paste to the inside of the rubber gaiter.
Renew plastic bushings if damaged.
Make sure the keepers and circlips are correctly seated.

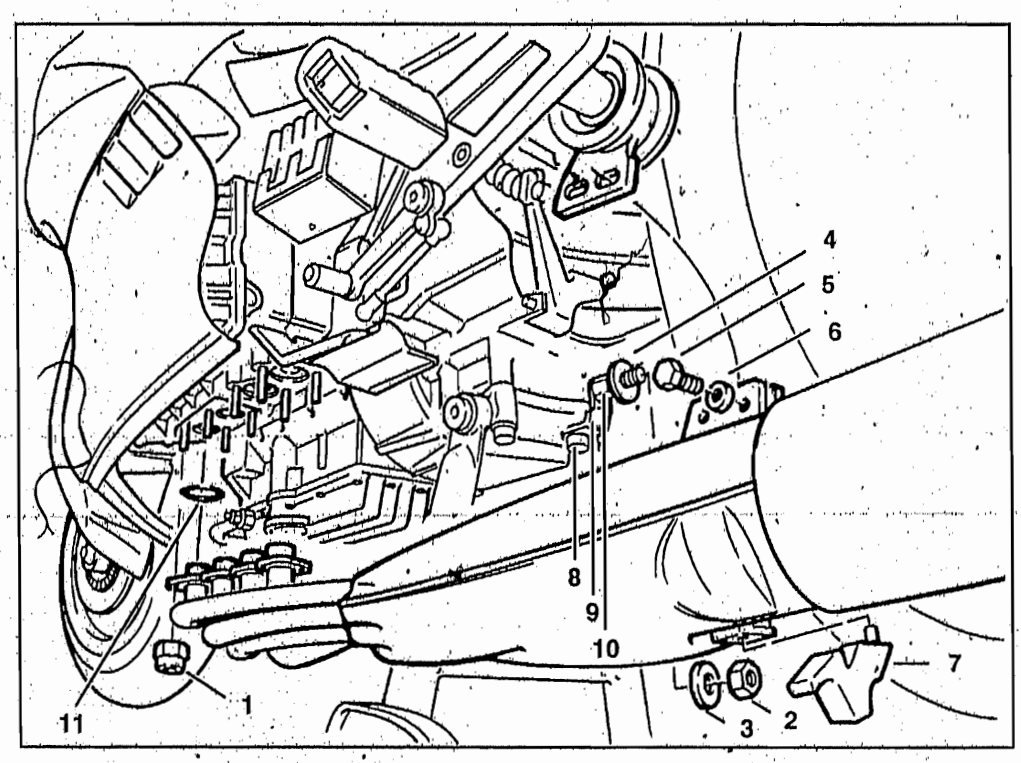
Tightening torque:
Retaining nut 8.6 Nm

8. EXHAUST SYSTEM

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REMOVING AND INSTALLING MUDGUARD 8.4
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REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM

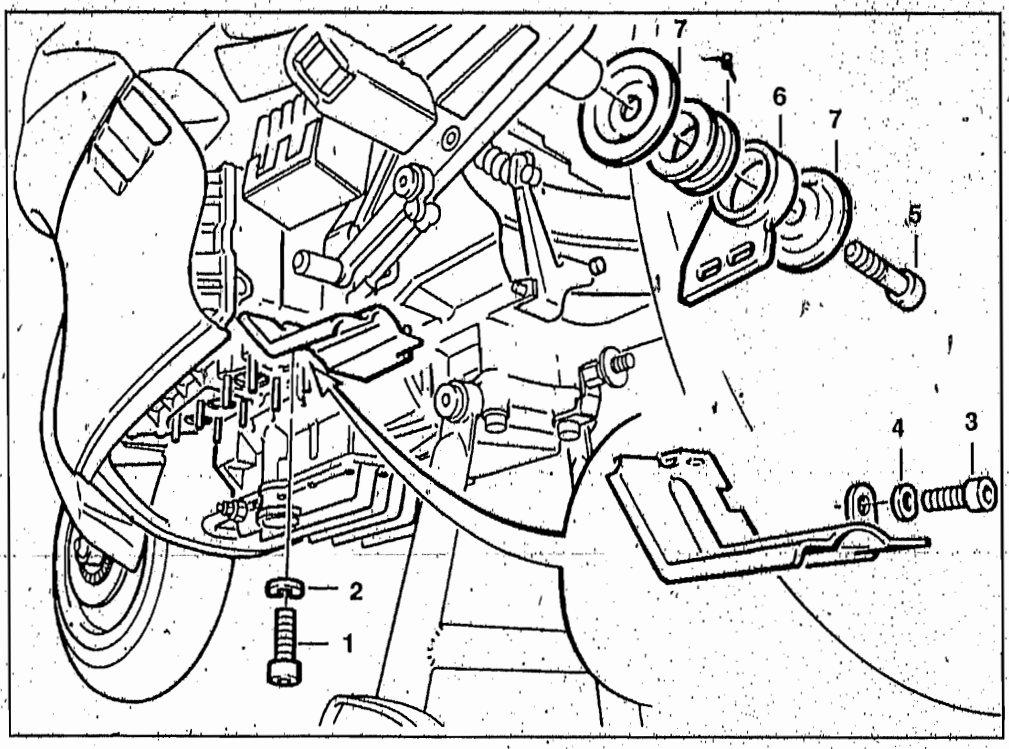
- Remove the engine cover.
- Unscrew the 8 retaining nuts (1) for the exhaust pipes at the cylinder head.
- Unscrew the VERBUS-RIPP nut with washer (2/3) from the mounting bracket. Note the insulating washer (4).
- Remove the 2 retaining screws with washers (5/6) at the footrest plate.
- Take off the complete exhaust system.
- Lever out the rubber damping block (7) with a screwdriver.
- Take out retaining screw (8) on the mount and detach retaining bracket (9).
- Unscrew the VERBUS-RIPP nut on the retaining bracket, noting the washer.
- Take off the anti-vibration mount (10).
- Install in the opposite order of work.

NOTE:

When attaching:
Use new sealing rings (11).
Assemble the components of the exhaust system loosely. Screw up the VERBUS-RIPP (VR) M8 nut at the angle bracket on the gearbox housing side, holding the anti-vibration mount with a 22 mm wrench to prevent it from turning. Tighten the VR nut on the exhaust system side in a similar way, then screw the bracket on to the mount with the retaining screw.

Tightening torque:

Retaining screws at	
- footrest plate	*9 ± 1 Nm*
- cylinder head	*21 ± 2 Nm*
- mount	*41 ± 5 Nm*
VERBUS-RIPP nut	*25 ± 2.5 Nm*



REMOVING AND INSTALLING MUD-GUARD

- Take out the retaining screw with spring washer (1/2) at the cylinder head.
- Take out the retaining screw with washer (3/4) at the gearbox. Take off the shield plate.
- Install in the opposite order of work.

Tightening torque:
Retaining screw to cylinder head 9 Nm

REMOVING AND INSTALLING SILENCER MOUNT

- Take out retaining screw (5) at the footrest plate.
- Take off the mount with taper washers (6/7).
- Lever the grommet (8) out of the mount with a screwdriver.
- Install in the opposite order of work.

NOTE:
When installing:
If necessary, apply a thin coat of tyre fitting lubricant to the mounting surface.

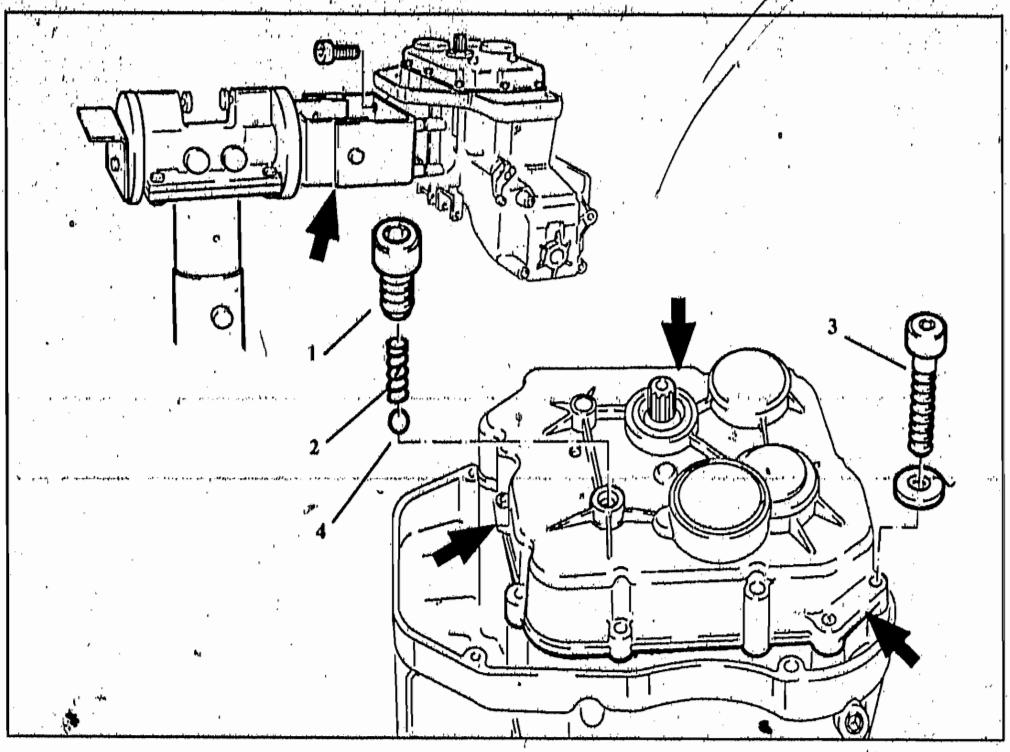
Tightening torque:
Retaining screw to footrest plate 9 ± 1 Nm

9. GEARBOX

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STRIPPING GEARBOX

- Remove the gearbox.
- Remove the gear indicator switch.

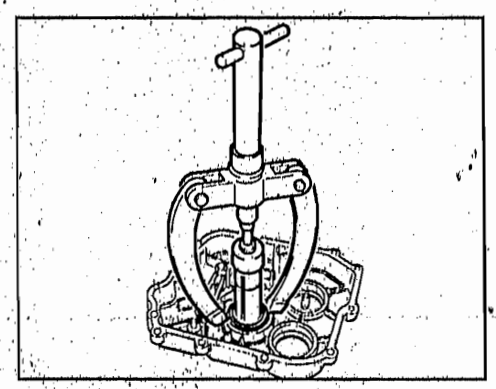
REMOVING GEARBOX COVER

- Secure the gearbox on the assembly stand with fixture BMW No. 23 1 600 (arrow).
- Shift the gearbox into neutral.
- Take out idle lock screw (1) and pull out coil spring (2).
- Take out retaining screws (3).
- Heat the bearing seats in the gearbox cover to app. 100°C.
- Press off the gearbox cover uniformly at three points (arrows).

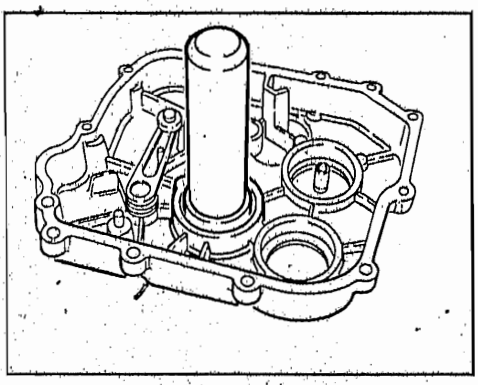
NOTE:
Do not lose the neutral lock ball (4).

STRIPPING AND ASSEMBLING GEARBOX COVER

Removing and installing bearing shell

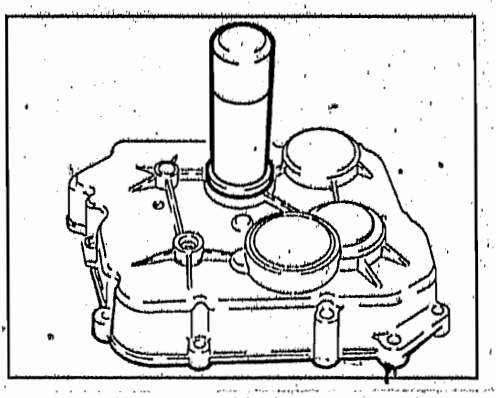


- Heat the bearing cap to app. 100°C.
- Pull off the bearing shell using Kukko reaction piece, BMW No. 00 8 560, and internal puller, BMW No. 00 8 563.



- Heat the gearbox cover to app. 100°C.
- Insert the bearing shell with two fingers.
- Using drift, BMW No. 23 1 770 and handle, BMW No. 00 5 500, drive the bearing shell in to the base of the seat.

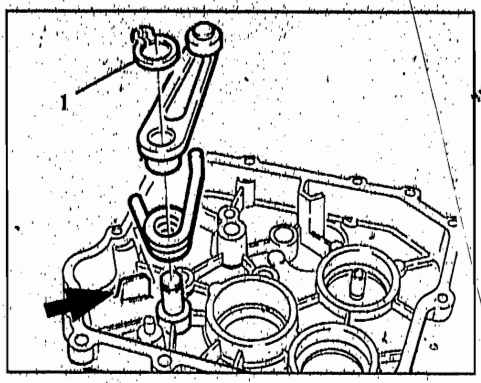
Removing and installing input shaft sealing ring



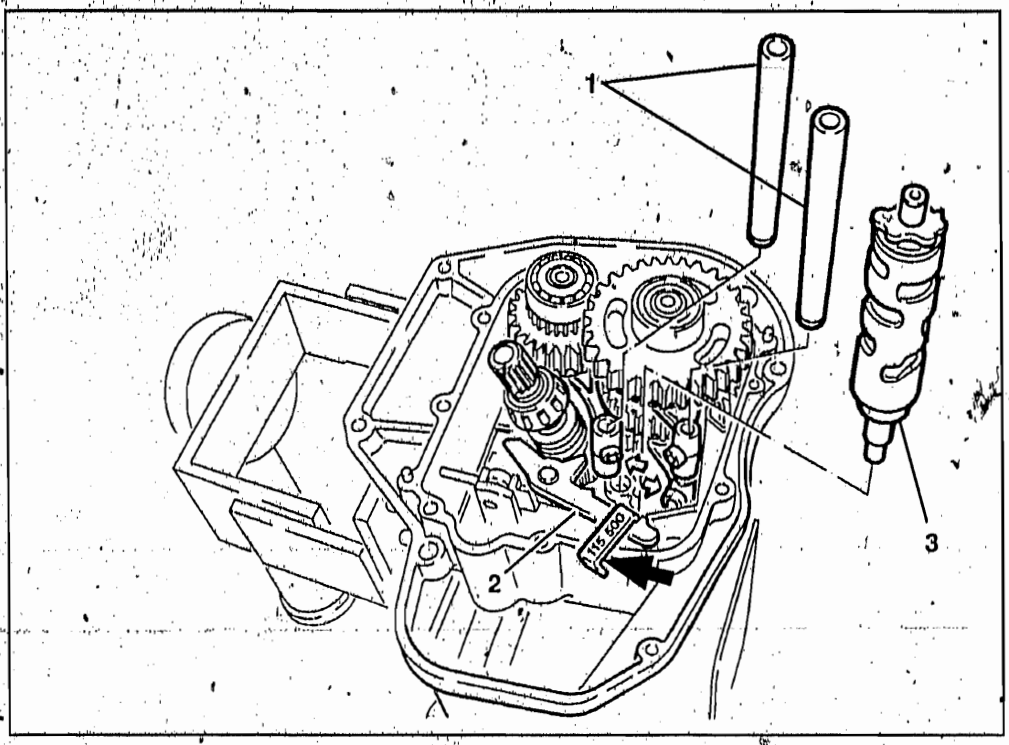
- Using a suitable drift, force the shaft sealing ring out from the inside.
- Drive in the new sealing ring with drift, BMW No. 23 1 770 and handle, BMW No. 00 5 500.

NOTE:
If input shaft friction has to be checked, do not install the sealing ring until after the friction reading has been taken.

Removing and installing the locking lever



- Take out the circlip (1) with Seeger circlip pliers.
- Lift the short arm of the spring over the stop (arrow).
- Pull off the lever and the spring.
- Install in the opposite order of work.



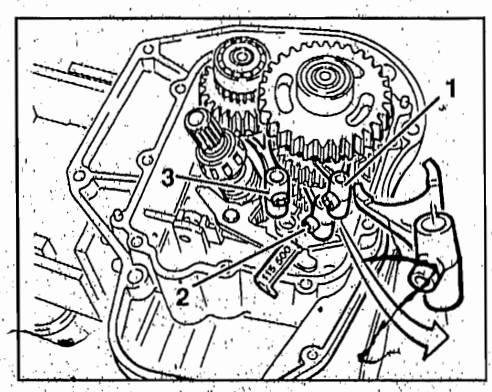
REMOVING SELECTOR DRUM

- Pull the selector fork shafts (1) out of the gearbox housing.
- Press the pawl (2) outwards and secure it with the chain tensioner clamp (arrow), BMW No. 11 5 500.
- Tilt the input shaft to the rear by about 45 degrees.
- Turn the selector forks outwards until the guide journals no longer engage with the selector drum.

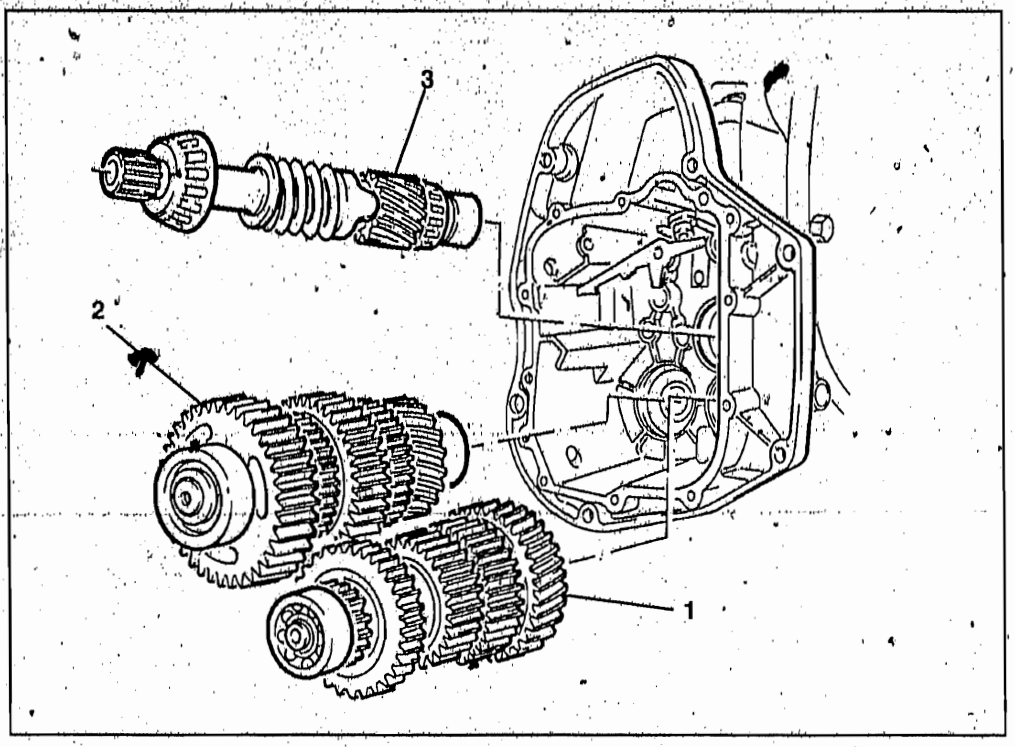
NOTE:
Note the sleeves on the selector fork guide journals.

- Turn the selector drum (3) slightly and pull it out.

REMOVING SELECTOR FORKS



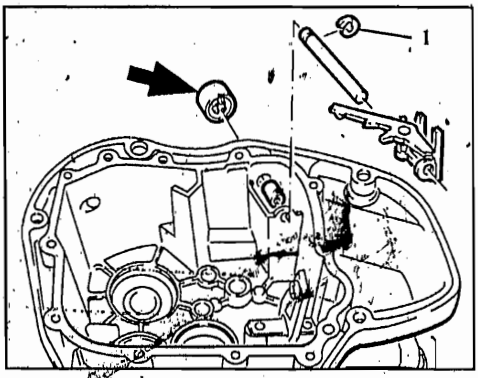
- Pull out the selector forks:
  1) 1st and 2nd gear selector fork
  2) 5th gear selector fork
  3) 3rd and 4th gear selector fork



REMOVING GEARBOX SHAFTS

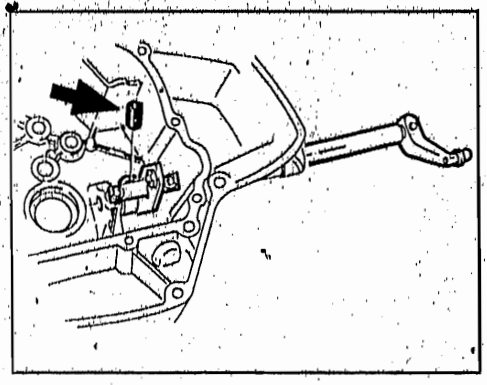
- Heat the bearing points for the output shaft (1) and countershaft (2) to app. 100°C.
- Pull output shaft and countershaft out of the gearbox housing together.
- Take out the input shaft (3).

REMOVING PAWL



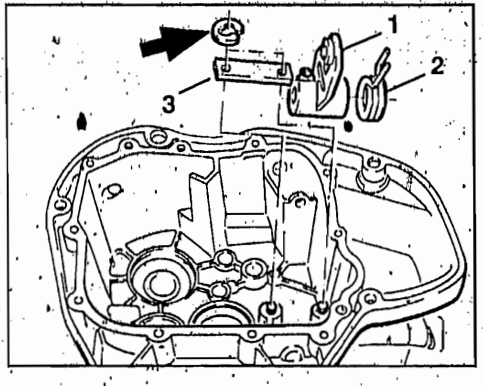
- Carefully drive out the breather (arrow) with a drift, working from the inside.
- Remove the keeper (1) from the guide rod with a screwdriver.
- Pull out the guide rod.
- Remove the pawl holder with pawl.
- Remove the keeper (2) from the pawl shaft.
- Pull the pawl out of its holder.

REMOVING SELECTOR SHAFT



- Takeout the setscrew (it is secured with Loctite).
- Pull the selector shaft with selector lever out of the gearbox housing.

REMOVING SECTOR



- Remove the keepers (arrow).
- Take out the sector (1) with torsion spring (2) and stop (3).
- Installation of the sector, selector shaft and pawl is in the reverse order of work.

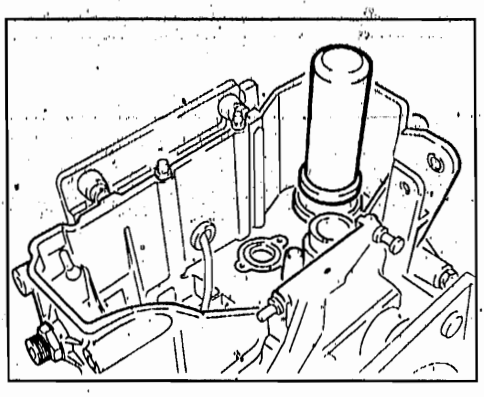
IMPORTANT:
Secure the setscrew with Loctite 242. The screw and hole must be clean and free from grease.

Tightening torque:
Setscrew *17.4 ± 2.6 Nm*

- Drive in the housing breather tube until app. 10 mm projects, and attach the cap.

REMOVING AND INSTALLING OUTPUT SHAFT SEALING RING

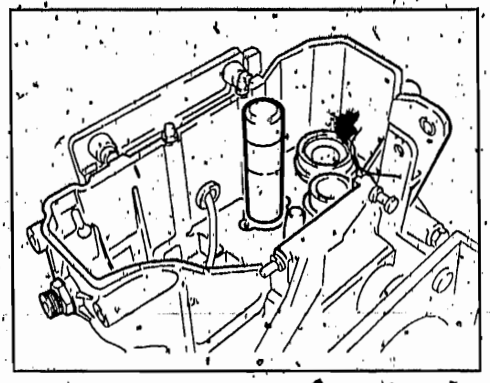
- Drive the shaft sealing ring out of the gearbox housing from the inside, with a suitable drift.



- Drive in the new shaft sealing ring with handle, BMW No. 00 0 500 and drift, BMW No. 23 1 760.

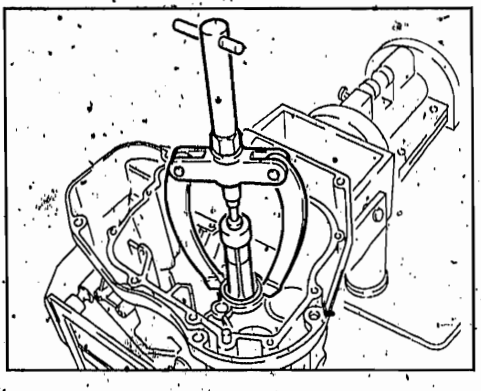
REMOVING AND INSTALLING SELECTOR DRUM SHAFT SEALING RING

- Remove the selector drum.
- Remove the gear indicator switch.



- Lever out the shaft sealing ring with a screwdriver.
- Drive in the new shaft sealing ring with handle, BMW No. 00 0 500 and drift, BMW No. 23 1 790.

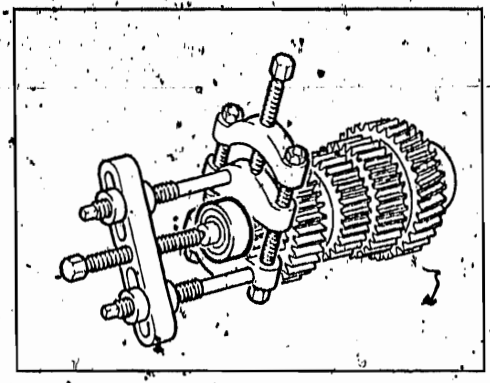
REMOVING AND INSTALLING INPUT SHAFT TAPER ROLLER BEARING SHELL



- Heat the gearbox housing to app. 100°C.
- Pull out the bearing shell with reaction piece, BMW No. 00 8 560 and internal puller, BMW No. 00 8 563.
- To install, heat the gearbox housing to app. 100°C and insert the bearing shell with two fingers.
- Drive it in to the base of the seat with handle, BMW No. 00 0 500 and drift, BMW No. 23 1 770.

REMOVING AND INSTALLING COUNTERSHAFT BALL BEARING

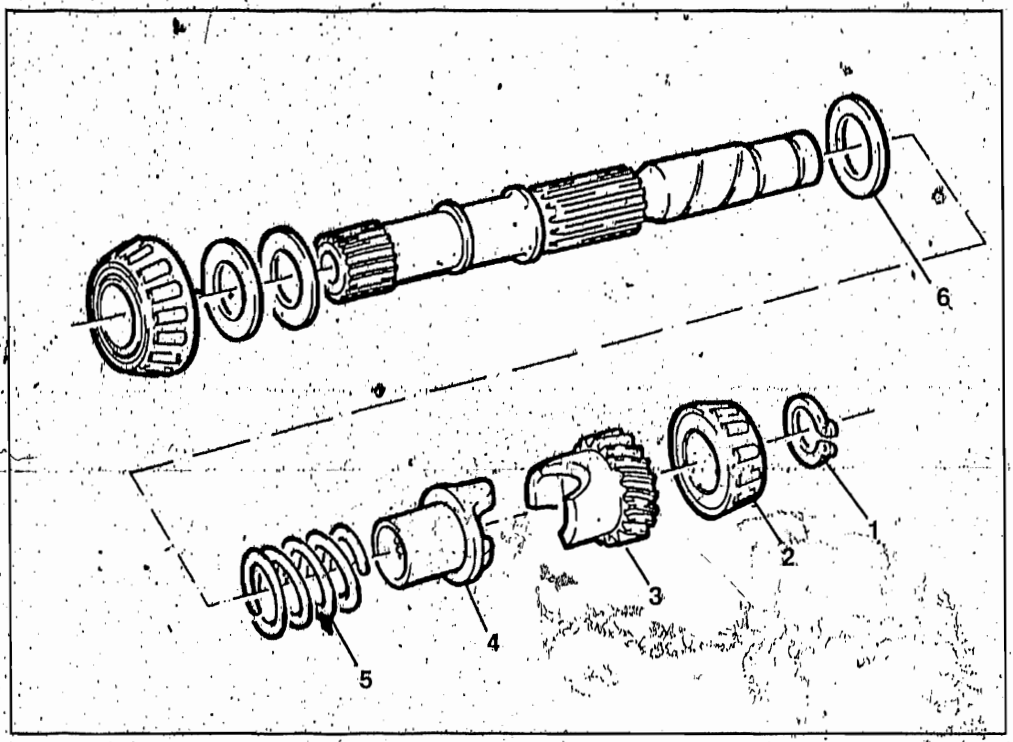
- If the countershaft is not in good working order it must be renewed as a complete unit.



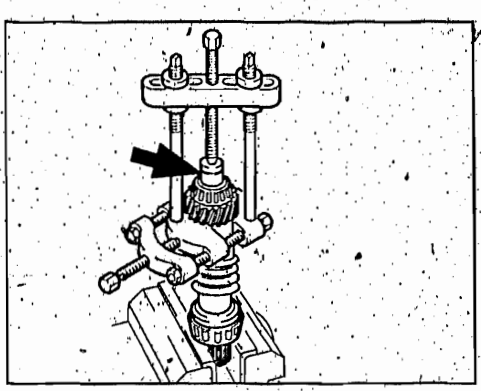
- Pull off the ball bearing with universal extractor BMW No. 00 7 500.
- To install the ball bearing, heat it to app. 80°C.

NOTE:

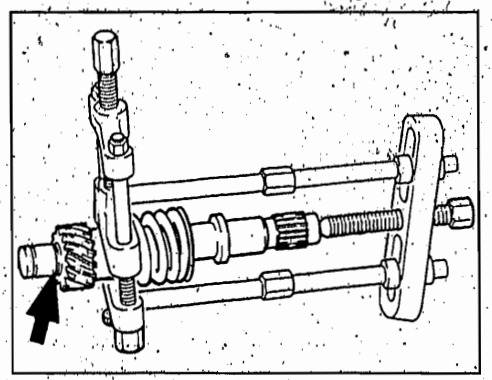
Place the heated ball bearing on the open vise and insert the countershaft from above. If driving in is necessary, strike the inner race of the bearing only.



STRIPPING AND ASSEMBLING INPUT SHAFT



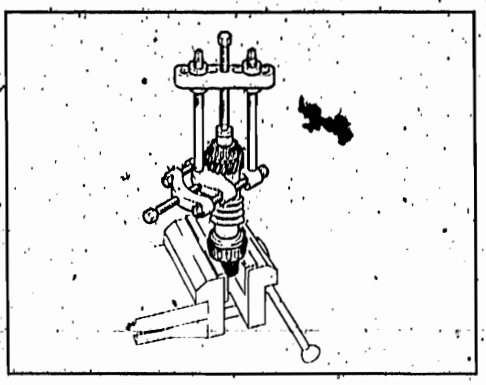
- Clamp the gear side of the input shaft into a vise with soft jaws.
- Remove circlip (1).
- Pull off spur gear (3) and taper roller bearing (2) together with a universal puller, BMW No. 00 7 500 and a pressure head (arrow).
- Pull off the second taper roller bearing in the same way.



- Place washer (6), coil spring (5), thrust piece (4) and spur gear (3) on the shaft.
- Using a universal puller, compress the spur gear against the coil spring until the second groove (arrow) is fully clear of the front of the spur gear.
- Heat the taper roller bearing to app. 100°C and place in position.

NOTE:

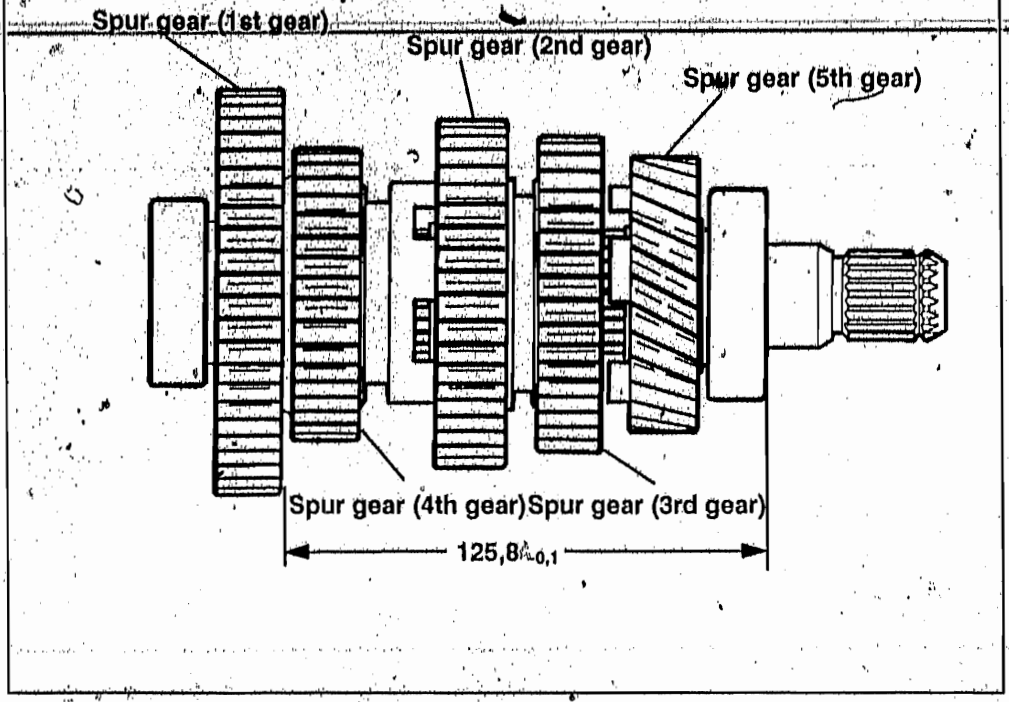
Place the heated taper roller bearing on an open vise and insert the input shaft from above.



- Insert the circlip (1) in front of the taper roller bearing.
- Attach the universal puller under the spur gear and move the taper roller bearing up to the circlip.

NOTE:

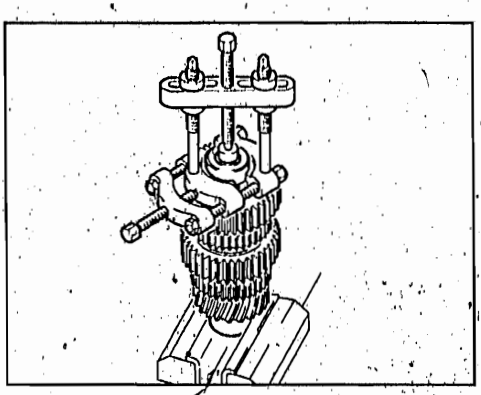
To avoid measuring errors later, when determining the shim thickness, there must be no play between the bearing and the circlip.



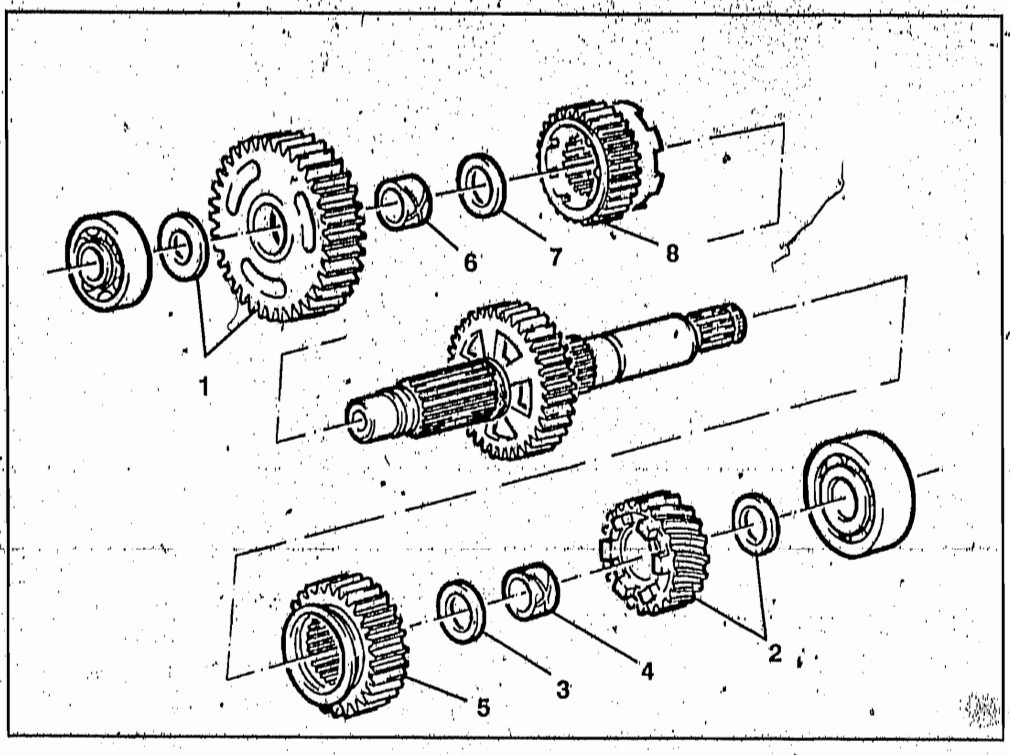
STRIPPING AND ASSEMBLING OUTPUT SHAFT

- Before the output shaft is stripped, measure endplay at the 1st, 2nd and 5th spur gears with a feeler gauge.
  1st gear (1) 0.10 - 0.30 mm
  3rd gear (2) 0.20 - 0.60 mm
  5th gear (3) 0.20 - 0.40 mm
- Correct endplay with shim washers.
- When measuring the total distance, include the shim between the 1st and 4th spur gears.

Removing ball bearing

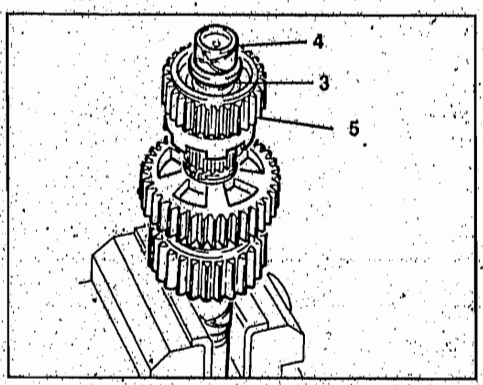


- Clamp the output shaft into the vise, using soft jaws.
- Pull off the ball bearing with universal puller BMW No. 00 7 500 and the thrust head.

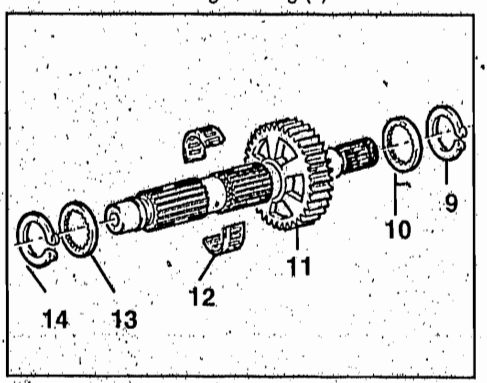


Removing spur gears

- Take off spur gear (1) for 1st gear and (2) for 5th gear, together with the shim washers.
- Heat bearing bushing (4) to app. 80° C.

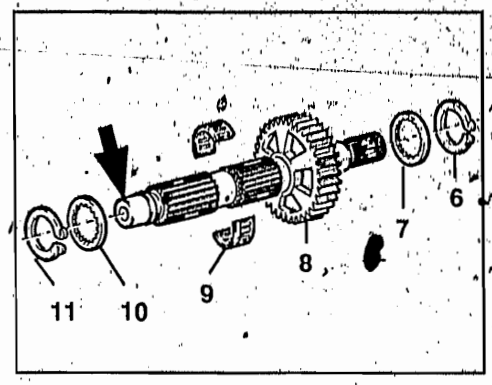


- Carefully pull off the spur gear (5) for 3rd gear, together with the shim washer (3) and bearing bushing (4).
- Heat bearing bushing (6) to app. 80° C.
- Carefully pull off the spur gear (8) for 4th gear, together with the shim washer (7) and bearing bushing (6).

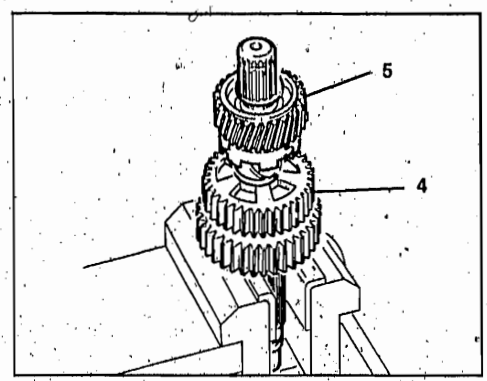


- Remove the circlip (9).
- Take off the toothed washer (10).
- Pull off the spur gear (11) for 2nd gear.
- Take off the two-piece needle roller cage (12).
- Take off the toothed washer (13) and circlip (14).

Installing spur gears



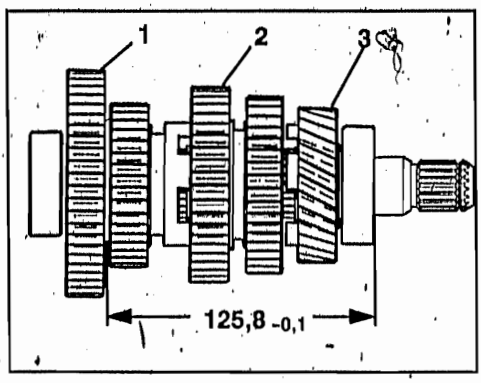
- Slide the toothed washer (10) over the smooth end (arrow) of the output shaft, up to a point ahead of the bearing seat.
- Push on the circlip (11) and locate it in the groove ahead of the toothed washer.
- Oil the two-piece needle roller cage (9) and place it in position on the output shaft.
- Push the spur gear (8) for 2nd gear over the needle roller cage from the splined end of the shaft, with the cutout side leading.
- Install the toothed washer (7) and then the circlip (6).



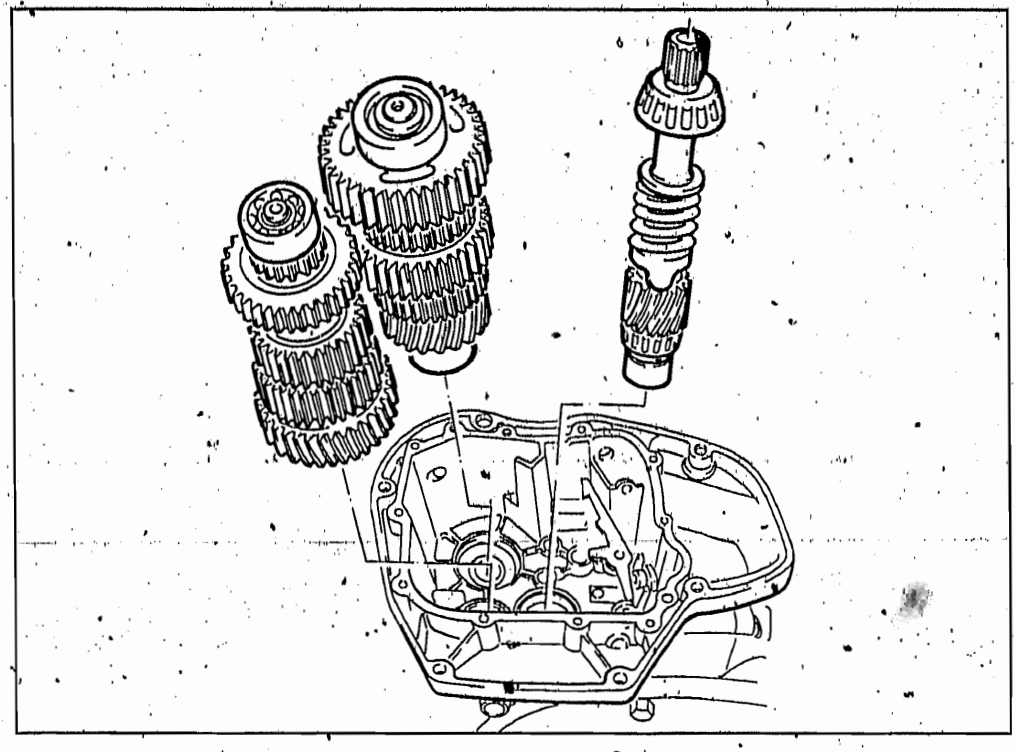
- Clamp the output shaft into the vise (using soft jaws). The splines must be at the top.
- Push the spur gear (4) for 3rd gear on to the output shaft with the cutouts at the top.
- Install the spacing washer.
- Heat the wider of the bushings to app. 80° C and push it on to the output shaft as far as the spacing washer.
- Install the spur gear (5) for 5th gear with the dogs downwards.
- Install the spacing washer.
- Heat the ball bearing to app. 80° C and push on as far as the spacing washer.
- Reposition the output shaft in the vise with the splines downwards.
- Push the spur gear (1) for 4th gear on to the output shaft with the dogs downwards.
- Install the spacing washer (2).
- Heat the narrower of the bushings to app. 80°C and push it on to the output shaft as far as the spacing washer.

NOTE:
The wider bushing is on the splined end of the shaft.

- Push the 1st gear wheel on to the output shaft with the smooth side upwards.
- Install the spacing washer.
- Heat the ball bearing to app. 80°C and install it.



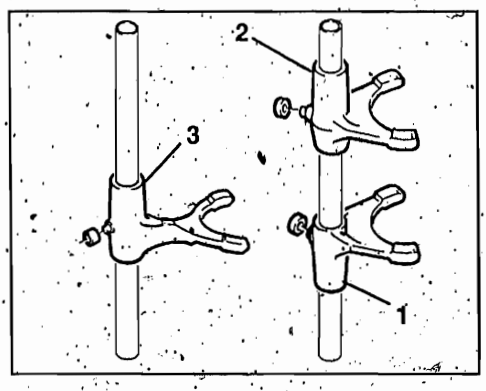
- Check the total distance with sliding calipers: it should be 125.8 mm.
- When measuring, include the shim washer between the 1st and 4th gear wheels.
- Check by measuring spur gear endplay with a feeler gauge.
  1st gear (1) 0.10 - 0.30 mm
  3rd gear (2) 0.20 - 0.60 mm
  5th gear (3) 0.20 - 0.40 mm



INSTALLING GEARBOX SHAFTS

- Heat the gearbox housing to app. 80° C at the countershaft and output shaft bearing points.
- Install the input shaft in the bearing shell.
- Insert the countershaft and output shaft into the housing together.
- With light blows of a plastic-faced hammer, check that the bearing is fully seated.

INSTALLING SELECTOR FORKS

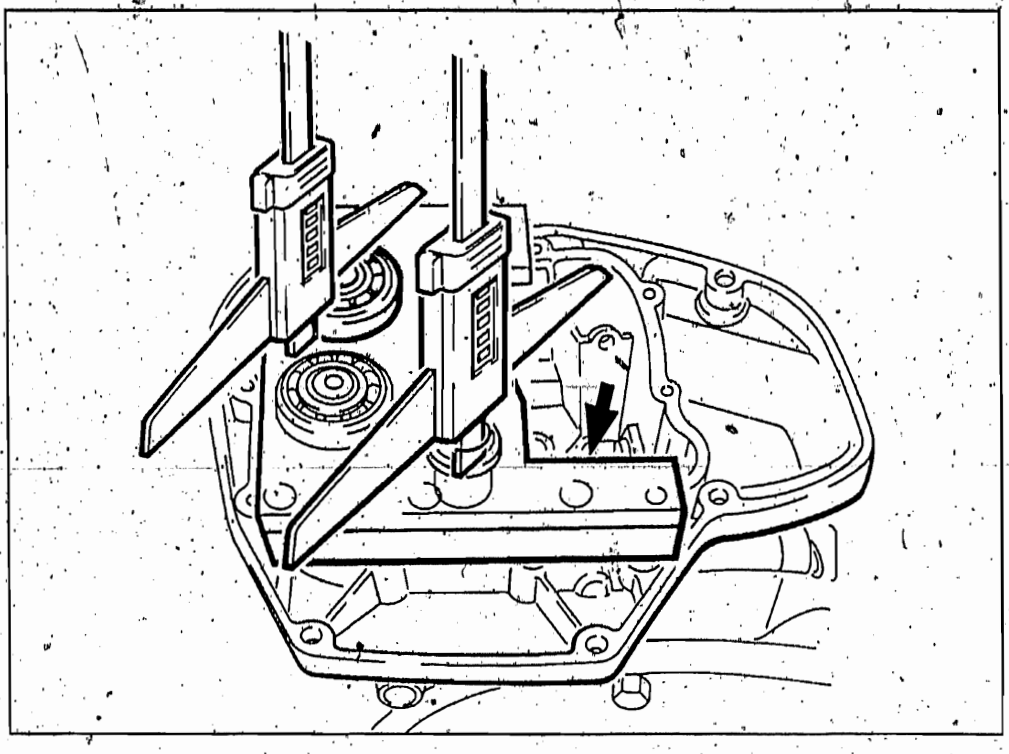


- Insert the 5th gear selector fork (1) into the lower part of the output shaft with the short end of the guide uppermost.
- Insert the 1st and 2nd gear selector fork (2) into the upper part of the output shaft with the short end of the guide at the bottom.
- Insert the 3rd and 4th gear selector fork (3) into the countershaft with the short end of the guide at the bottom.

NOTE:
Apply a small quantity of grease to the guide journal sleeves when placing them on the journals, so that they do not drop off so easily as the selector drum is installed.

INSTALLING SELECTOR DRUM

- Prevent the pawl from moving with clamping device BMW No. 11 1 500.
- Tilt the input shaft about 45 degrees to the rear.
- Swing the selector forks round as far as possible towards the rim of the housing.
- Insert the selector drum so that the recessed area with hole points towards the housing breather.
- Insert the selector fork guide journals in the selector drum.
- Oil the selector fork shafts lightly and insert them into the housing.
- Detach the clamping device from the pawl.
- Swing the input shaft back to the centre.



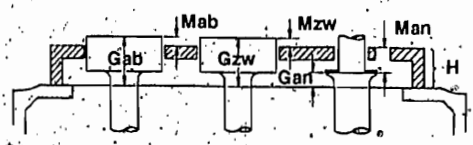
SHIMMING GEARBOX SHAFTS

Measuring shaft bearing spacing

- Place gearbox measuring plate BMW No. 23 1 660 (arrow) on the gearbox housing.
- Measuring procedure for countershaft and output shaft:
  Use depth gauge BMW No. 00 2 550 to determine the distance between the outer ball bearing race and the measuring plate. Before measuring, strike the shaft concerned with a non-recoiling plastic-faced hammer to drive it fully against its seat.

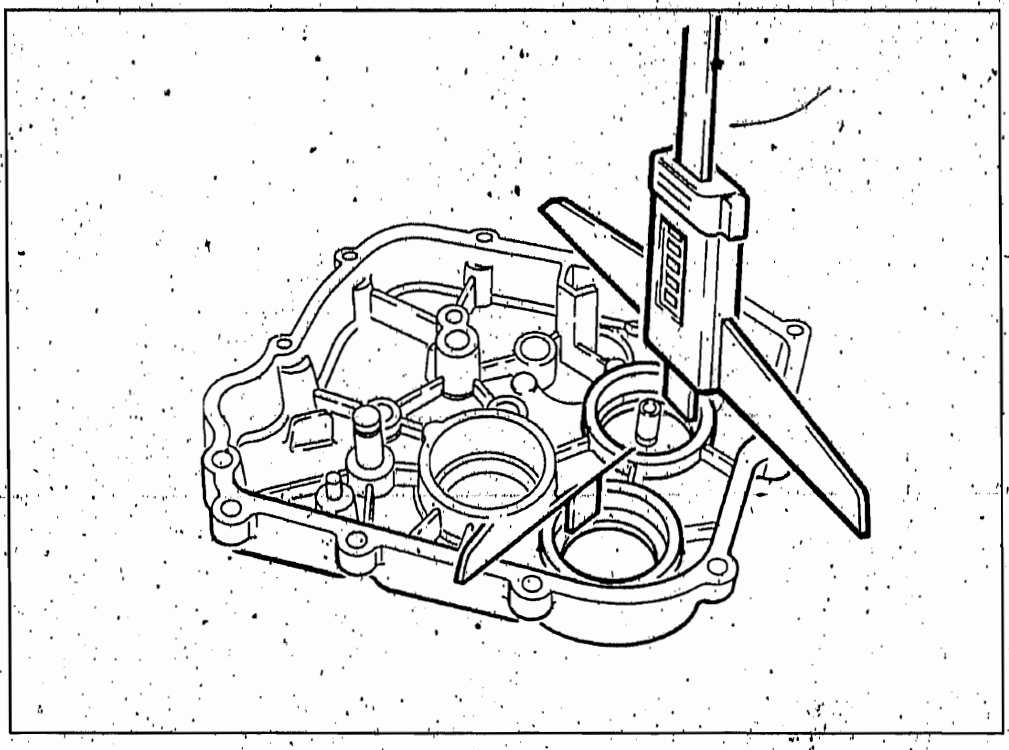
NOTE:
After striking the shaft, measure the gap immediately.

- This measurement is carried out on the countershaft and output shaft only.
- In the case of the input shaft, measure the distance from the bearing shoulder to the measuring plate through the aperture provided in the measuring plate.
- Record all measurements in writing in a table (see example).
- Record the input shaft distance in the table with a minus sign in front of it.



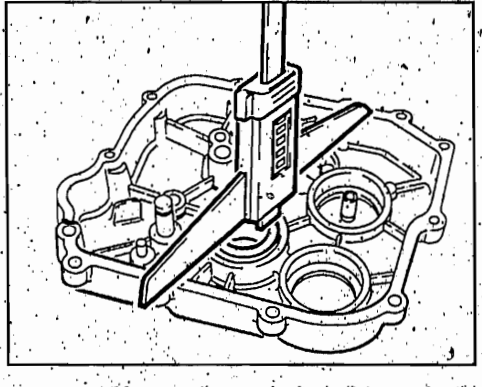
Mab = Output shaft to measuring plate
Mzw = Countershaft to measuring plate
Man = Measuring plate to shoulder on input shaft
H = Height of measuring plate

Overall dimensions:
Gab = Mab + H
Gzw = Mzw + H
Gan = Man + H



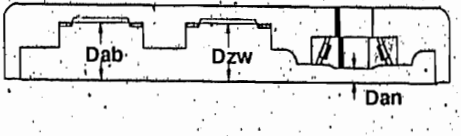
Measuring gearbox cover

- Measure from the gearbox cover joint face to the base of the bearing seat.
- Use this method only for the countershaft and output shaft bearing seats.



- Measure the equivalent distance for the input shaft with the taper roller bearing installed.
- Determine the distance from the inner bearing race to the gearbox cover joint face.

Record the measurements in a table (see example).



Dab = Cover to output shaft
Dzw = Cover to countershaft
Dan = Cover to input shaft

Permissible endplay:
Countershaft/output shaft: *0.05 - 0.15 mm*

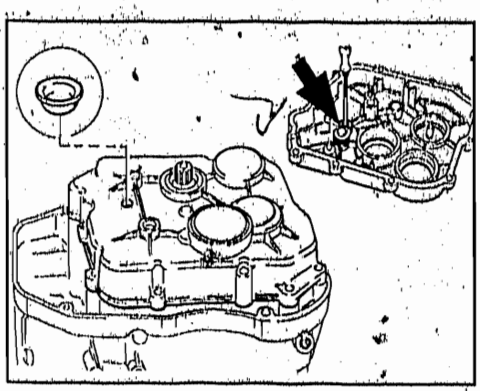
Permissible preload:
Input shaft: *0.03 - 0.08 mm*

Example

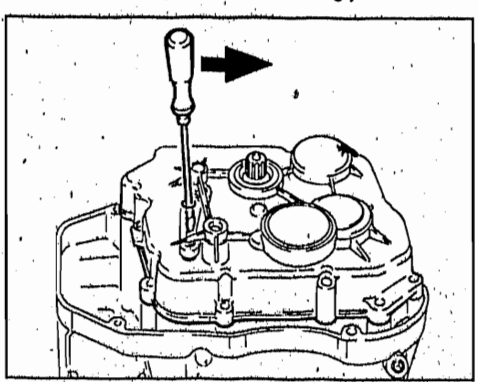
Dimensions in millimetres	Output shaft "ab"	Countershaft "zw"	Input shaft "ab"
H	30,00	30,00	30,00
+ M (measure!)	5,45	6,05	- 20,10
= G	35,45	36,05	9,90
D (measure!)	36,40	36,90	11,30
- G	- 35,45	- 36,05	- 9,90
= play without shims	0,95	0,85	1,40
- prescribed endplay	- 0,05	- 0,05	+ 0,05
= shim thickness	0,90	0,80	1,45

- Detach the measuring plate from the gearbox housing.
- Place shims of the calculated thickness on the input shaft.
- Heat the taper roller bearing to app. 80°C and install it on the input shaft.
- Grease the shims (of the calculated thickness) for the countershaft and output shaft slightly and place them flush on the ball bearing.

INSTALLING GEARBOX COVER

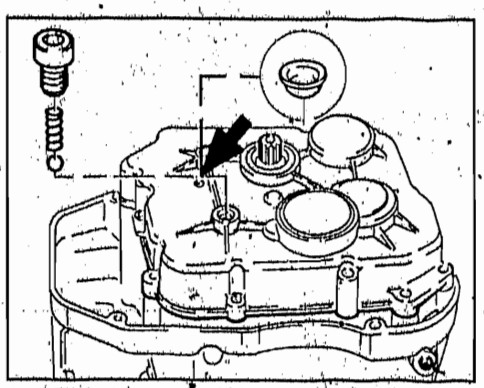


- Using a suitable drift, force the end cap (arrow) out from the inside.
- Heat the gearbox cover to app. 100°C.
- The joint faces on the housing and cover must be free from grease.
- Apply a thin layer of Loctite 573 or Three Bond 1209 to the housing joint face.



- Using a drift or a screwdriver, press back the locking lever.
- Carefully install the cover on the gearbox.
- Tighten the retaining screws to the specified torque.

Tightening torque:
Retaining screws *9 ± 1 Nm*

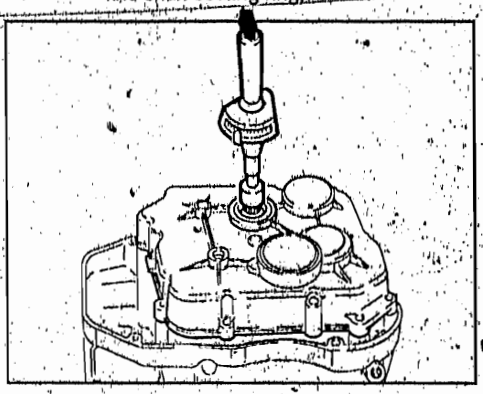


- Apply a thin layer of Three Bond 1209 to the end cap and drive in with an 8 mm dia. drift.
- Insert the neutral lock (ball and spring) into the gearbox after neutral has been selected.
- Apply Loctite 242 to the neutral lock screw and insert and tighten it.

Tightening torque:
Machine screw *13 ± 2 Nm*

CHECKING INPUT SHAFT FRICTION

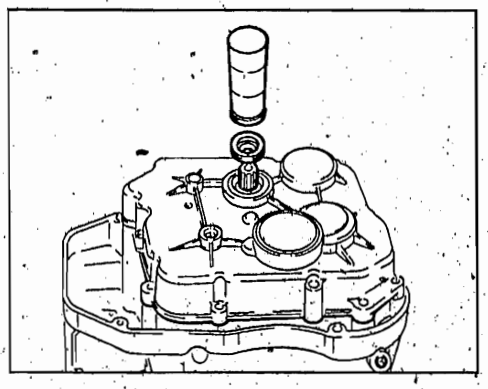
- Correct taper roller bearing preload can be checked by measuring friction (without the shaft sealing ring).



- Select neutral.
- Attach adapter BMW No. 23 3 670 to the input shaft and tighten the knurled screw, but not fully.
- Using friction meter BMW No. 00 2 570, turn the input shaft slowly and evenly, taking the friction reading at the same time.

Friction with preload of:

0.030 mm	*0.19 ± 0.02 Nm*
0.055 mm	*0.34 ± 0.02 mm*
0.080 mm	*0.50 ± 0,02 Nm*



- Oil the input shaft sealing ring lightly and drive it in with drift, BMW No. 23 1 770 and Handle, BMW No. 00 5 500.

10. CLUTCH

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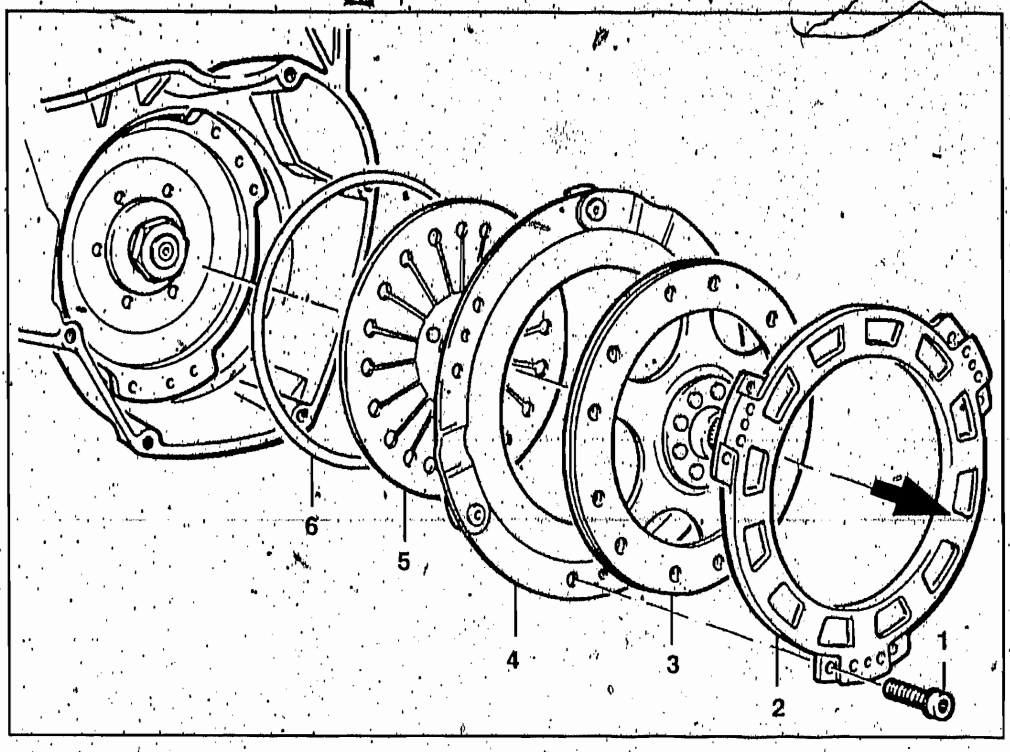
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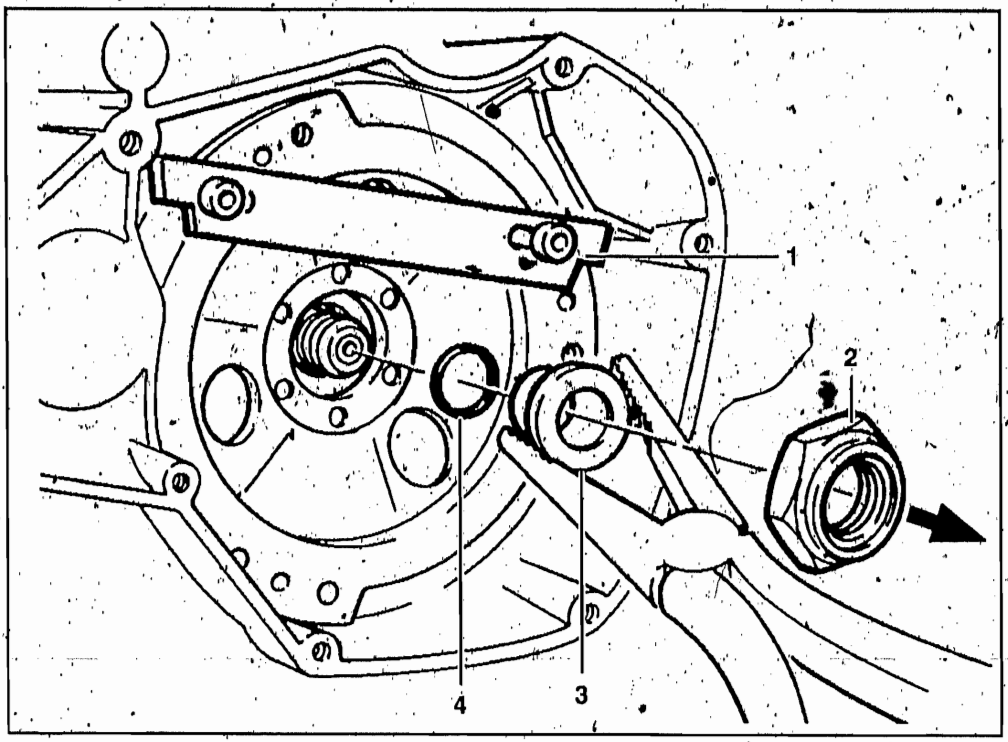
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REMOVING CLUTCH

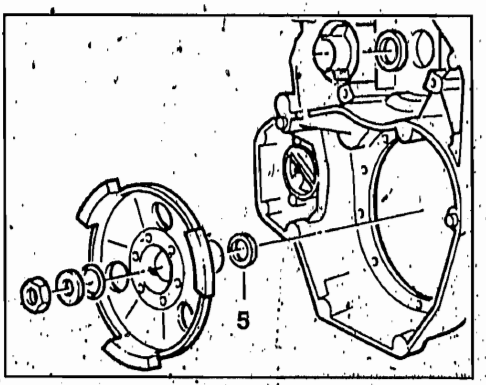
- Remove gearbox in a single unit with rear swinging arm and rear wheel drive.
- Take out the 6 housing cover retaining screws (1).
- Take out the housing cover (2), clutch driven plate (3), driving plate (4) and diaphragm spring (5).
- Take out wire ring (6).



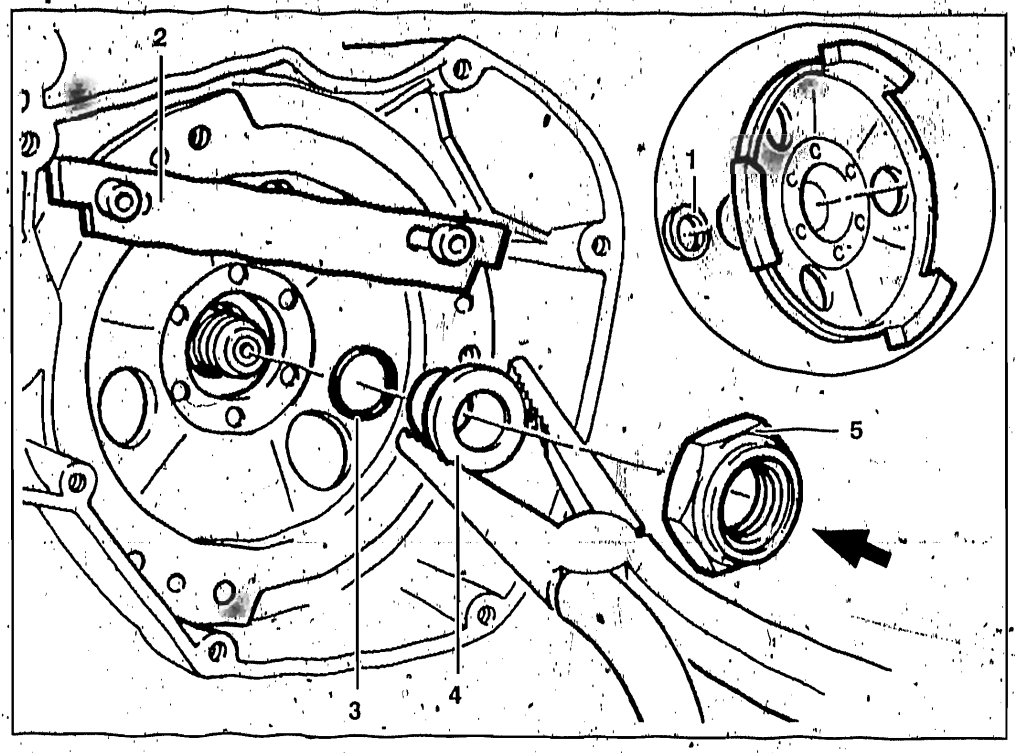
REMOVING CLUTCH HOUSING

NOTE:
If the clutch housing cannot be dislodged, pull off with 3-arm puller BMW 33 1 830 and pressure head.
Avoid damage to the release bearing bushing.

- Attach retainer (1), BMW No. 11 2 800.
- Unscrew hex nut (2).
- Take out thrust ring (3) with pliers.
- Move the clutch housing to and fro until O-ring (4) becomes visible.
- Cut through the O-ring and take it out.



- Pull off the clutch housing.
- Detach the thrust washer (5) from the clutch housing.



INSTALLING CLUTCH HOUSING

- Grease the splines for the output shaft in the clutch housing with STABURAGS NBU 30 PTM.
- Push the thrust washer (1) on to the clutch housing flange.
- Install the clutch housing with retainer (2), BMW No. 11 2 800.
- Insert a new O-ring (3).
- Insert the thrust ring (4).

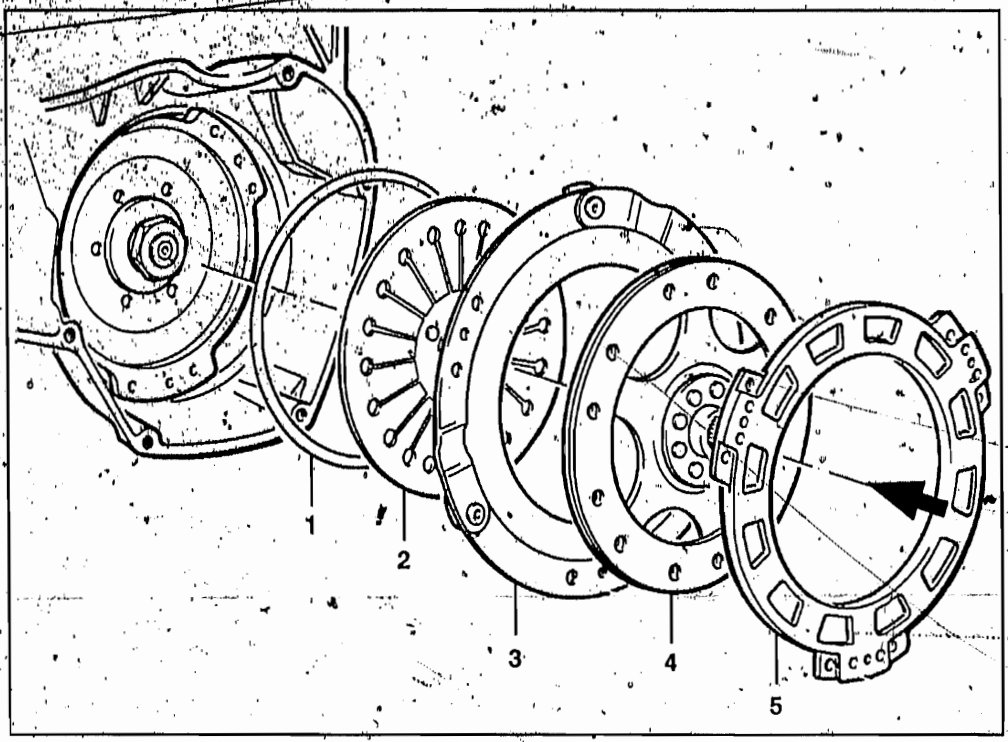
WARNING:
New hex nuts (5) must always be used when installing.

- Tighten the hex nut to the specified torque.

IMPORTANT:
Note the correct tightening order.

Tightening torque:

Clutch flange to input shaft (hex nut):	
Initial tightening	*140 ± 5 Nm*
Slacken off	
Final tightening	*100 $^{+14}/_{-10}$ Nm*



INSTALLING CLUTCH

- Grease lubrication points with STABURAGS NBU 30 PTM.

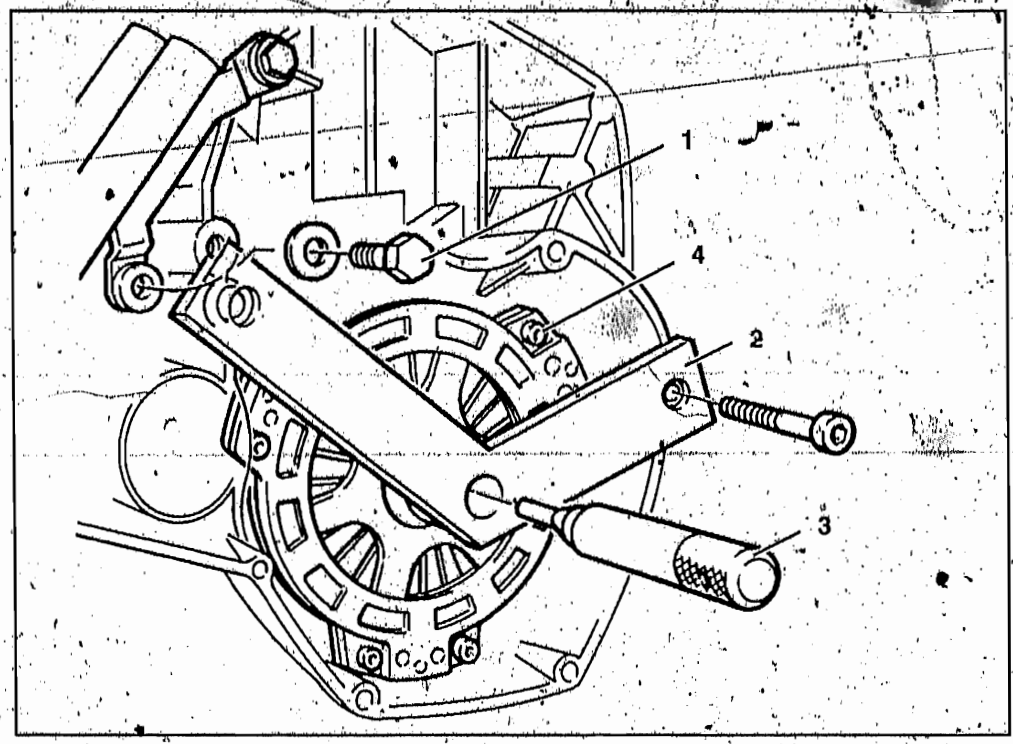
Lubrication points:
Contact points on driving plate/diaphragm spring/ wire ring. Splines on driven plate flange. Taper/pointed end of thrust rod.

NOTE:
Install the diaphragm spring (2) with the convex side towards the driving plate (3).

- Insert the wire ring (1) with diaphragm spring (2) in the clutch housing.

NOTE:
Make sure that the paint marks on the housing and on the driving plate/housing cover are offset by 120 degrees in each case.

- Install driving plate (3), driven plate (4) and housing cover (5) in the clutch housing.



- Remove the lower ignition coil mount retaining screw (1).
- Centre the clutch plate with the BMW No. 21 2 670 centering device.
- Attach the centering bridge (2) to the intermediate flange.
- Centre the clutch using the centering arbor (3).
- Tighten the retaining screws (4) uniformly in a crosswise pattern to the specified torque.
- Remove the centering device.

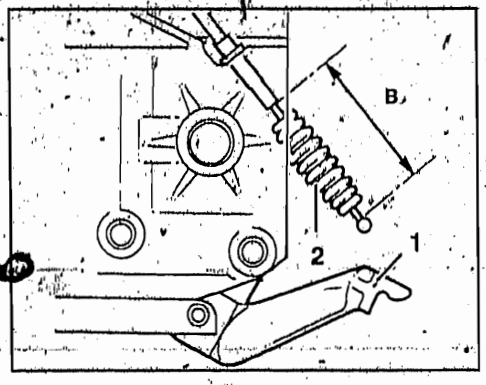
NOTE:
Guide pins:
Short pin: at left looking forwards
Long pin: at right looking forwards.

- Screw the guide pins, BMW No. 23 1 820, into the fitted sleeves in the intermediate flange.
- Insert the short guide pin at the starter-motor side.
- Install the gearbox with rear swinging arm and rear wheel drive.
- Unscrew and remove the guide pins.

NOTE:
Check basic clutch operating clearance and adjust if necessary.

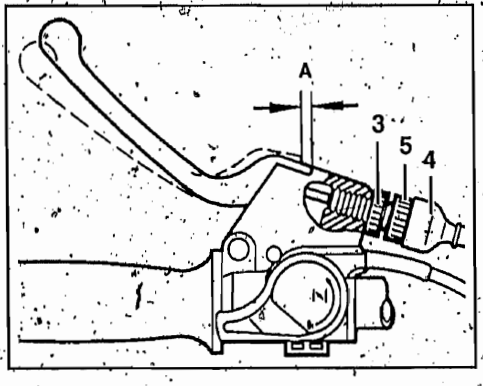
ADJUSTING CLUTCH OPERATING CLEARANCE

BASIC SETTING

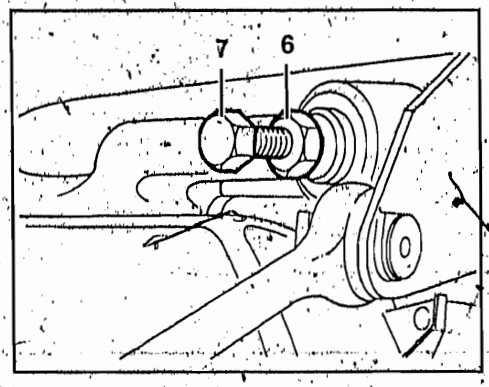


- Disconnect the clutch cable at the release lever (1).
- Push the rubber gaiter (2) back slightly.
- Using BMW No. 21 3 500 adjusting gauge, obtain distance B by turning the adjusting screw on the handlebar lever.

Correct measurement:
Wire cable length
at release lever (B) *75 ± 1 Nm*



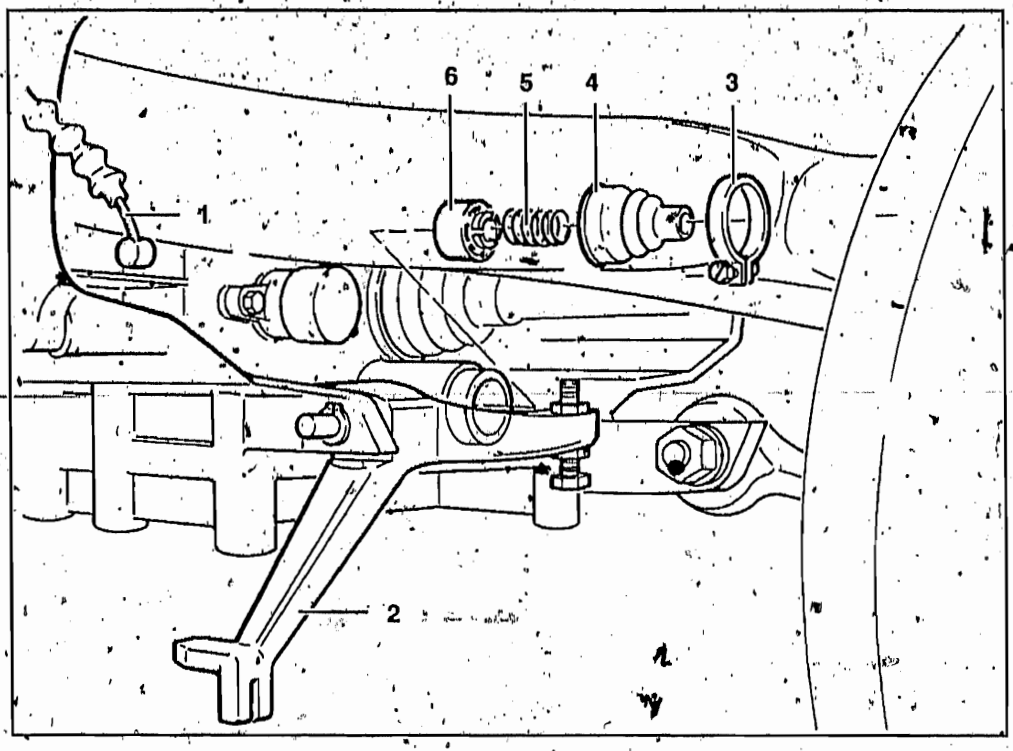
- Slacken off the knurled nut (3) at the adjusting screw on the handlebar lever.
- Pull the rubber sleeve (4) away from the adjusting screw.
- Turn the adjusting screw (5) to obtain distance B.
- Re-attach the clutch cable at the release lever.



- Loosen locknut (6) at the adjusting screw.
- Slacken the adjusting screw (7) by 1 to 2 turns.
- Tighten the adjusting screw carefully until the pressure point is detected.
- Tighten the locknut at this point.
- Adjust play at the handlebar lever to distance A with the adjusting screw.
- Lock with the knurled nut.
- Push the rubber sleeve back over the adjusting screw.

Correct measurement:
Clutch lever play (distance A) *4 ± 0.5 Nm*

IMPORTANT:
Adjust to compensate for wear only at the adjusting screw on the release lever.



REMOVING AND INSTALLING CLUTCH RELEASE BEARING

- Remove the rear wheel.
- Take off the engine cover.
- Take off the exhaust system.
- Disconnect the clutch cable (1) at the release lever (2).
- Unscrew the clip (3) on the sealing sleeve.

NOTE:
Trap escaping oil in a suitable vessel.

- Take off the sleeve and the spring (4/5).
- Take out the release piston and thrust bearing (6).
- Install in the opposite order of work.

NOTE:
Check basic clutch operating clearance and adjust if necessary.

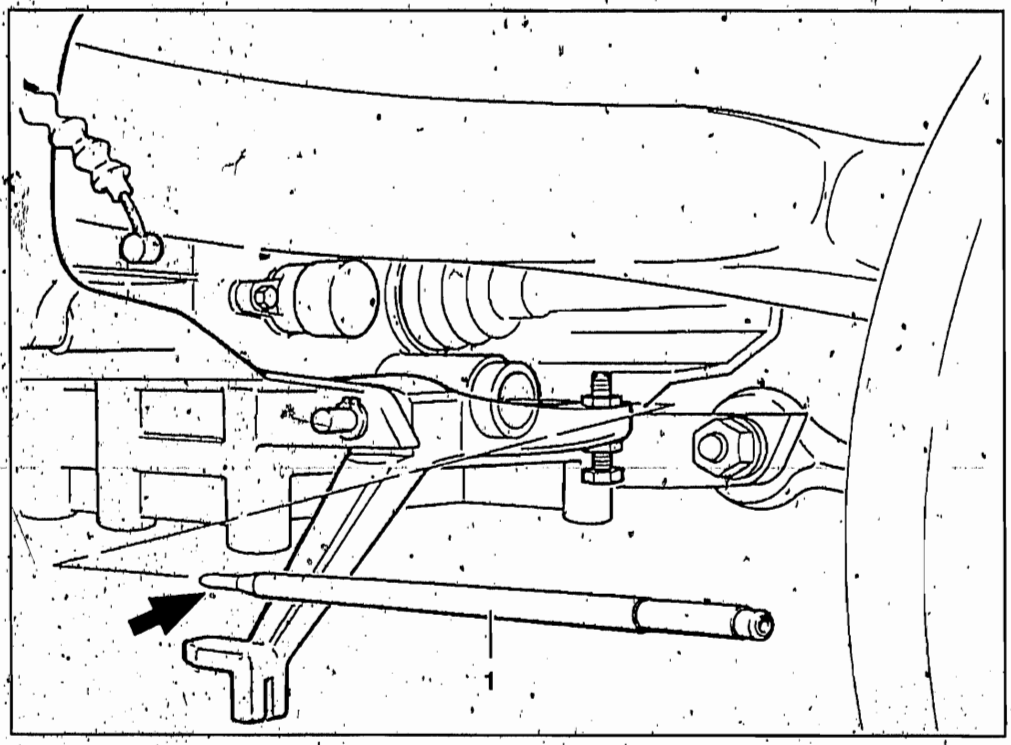
Tightening torque:

Screws at footrest plate	*9 ± 1 Nm*
VERBUS-RIPP nuts	*25 ± 2.5 Nm*
Spring strut to rear wheel drive	*51 ± 6 Nm*
Brake caliper to rear wheel drive	*32 ± 2 Nm*

IMPORTANT:
Rear wheel for motorcycles with ABS: Check the sensor gap each time the brake caliper is removed and installed, and adjust if necessary. The stated distance must be complied with.

Gap between sensor and pulse generating ring:

Maximum	*0.60 - 0.65 mm*
Minimum	*0.20 - 0.25 mm*



REMOVING AND INSTALLING CLUTCH RELEASE ROD

- Remove the rear wheel.
- Take off the engine cover.
- Take off the exhaust system.
- Remove the rear wheel.
- Remove the clutch release bearing.
- Pull the clutch release rod (1) out to the rear.
- Install in the opposite order of work.

NOTE:
When installing:
Grease the lubrication points (arrow) with STABURAGS NBU 30 PTM.

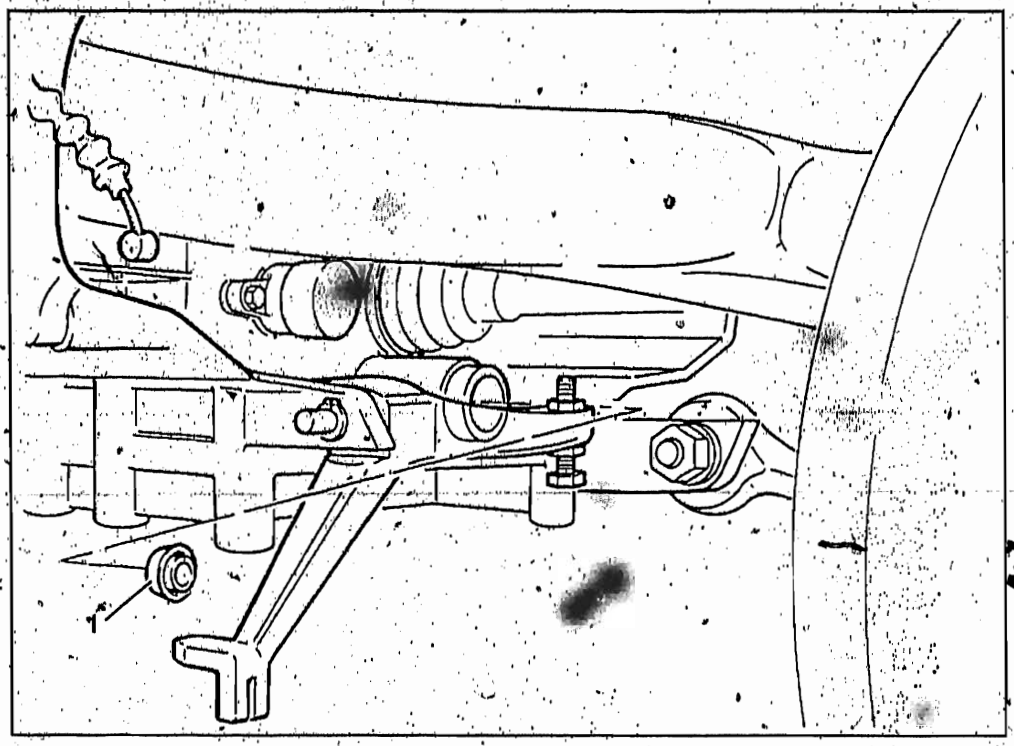
Tightening torque:

Screws at footrest plate	*9 ± 1 Nm*
VERBUS-RIPP nuts	*25 ± 2.5 Nm*
Spring strut to rear wheel drive	*51 ± 6 Nm*
Brake caliper to rear wheel drive	*32 ± 2 Nm*

IMPORTANT:
Rear wheel for motorcycles with ABS:
Check the sensor gap each time the brake caliper is removed and installed, and adjust if necessary. The stated distance must be complied with.

Gap between sensor and pulse generating ring:

Maximum	*0.60 - 0.65 mm*
Minimum	*0.20 - 0.25 mm*



REMOVING AND INSTALLING CLUTCH RELEASE ROD SEALING RING

- Remove the rear wheel.
- Take off the engine cover.
- Take off the exhaust system.
- Remove the clutch release bearing.
- Remove the clutch release rod.
- Lever out the sealing ring (1) carefully with a screwdriver.
- Install/assemble in the opposite order of work.

NOTE:

When installing:
Note correct position of spring washer (on the outside).
Drive the new sealing ring in flush with a suitable tool.

Suitable tool:
e.g. thrust rod from 4-cylinder model gearbox

Tightening torque:

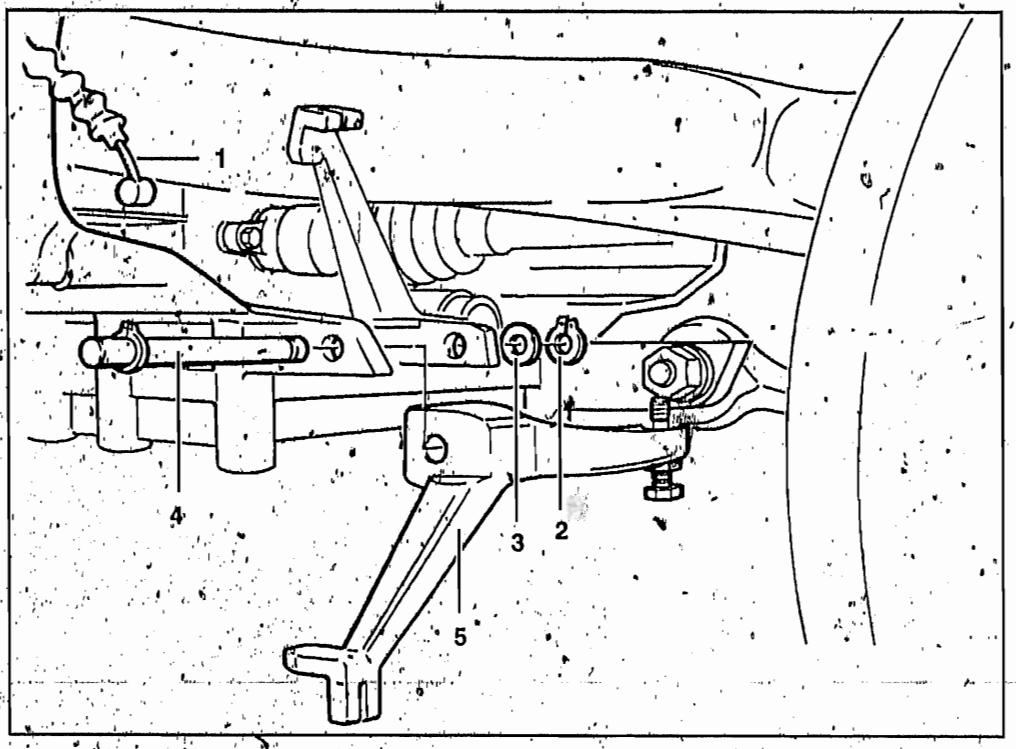
Screws at footrest plate	*9 ± 1 Nm*
VERBUS-RIPP nuts	*25 ± 2.5 Nm*
Spring strut to rear wheel drive	*51 ± 6 Nm*
Brake caliper to rear wheel drive	*32 ± 2 Nm*

IMPORTANT:

Rear wheel for motorcycles with ABS:
Check the sensor gap each time the brake caliper is removed and installed, and adjust if necessary. The stated distance must be complied with.

Gap between sensor and pulse generating ring:

Maximum	*0.60 - 0.65 mm*
Minimum	*0.20 - 0.25 mm*



REMOVING AND INSTALLING RELEASE LEVER

- Take off engine cover.
- Take off exhaust system.
- Disconnect clutch cable (1) at release lever.
- Take off circlip and washer (2/3) on right side (looking forwards).
- Pull out pin (4) to left (looking forwards).
- Take off the release lever (5).
- Install in the opposite order of work.

NOTE:
When installing:
Make sure that the release lever moves freely.
Check basic clutch operating clearance and adjust if necessary.

Tightening torque:

Screws at footrest plate	*9 ± 1 Nm*
VERBUS-RIPP nuts	*25 ± 2.5 Nm*

TROUBLESHOOTING

Clutch slips.

Check clutch operating clearance. Is it incorrect?
- yes → Adjust clutch operating clearance. Renew clutch plate if necessary.
- no ↓

Check clutch plate lining. Is it oiled up?
- yes → Renew sealing ring on gearbox input shaft.
- yes → Renew clutch plate.
- no ↓

Is clutch lining worn?
- yes → Renew clutch plate.

Clutch does not free properly.

Check clutch adjustment. Is it incorrect?
- yes → Carry out the basic adjustment procedure.
- no ↓

Check clutch plate. Is it damaged or worn?
- yes → Renew clutch plate.

Clutch cannot be released.

Check clutch able. Is it broken?
- yes → Renew clutch cable.
- no ↓

Check clutch release rod. Has it jammed or seized?
- yes → Clutch release bearing is damaged. Renew clutch release bearing.

Clutch heavy or stiff to operate. Clutch picks up violently.

Check output shaft lubrication. Is output shaft not lubricated?
- yes → Lubricate splines with STABURAGS NBU 30 PTM.

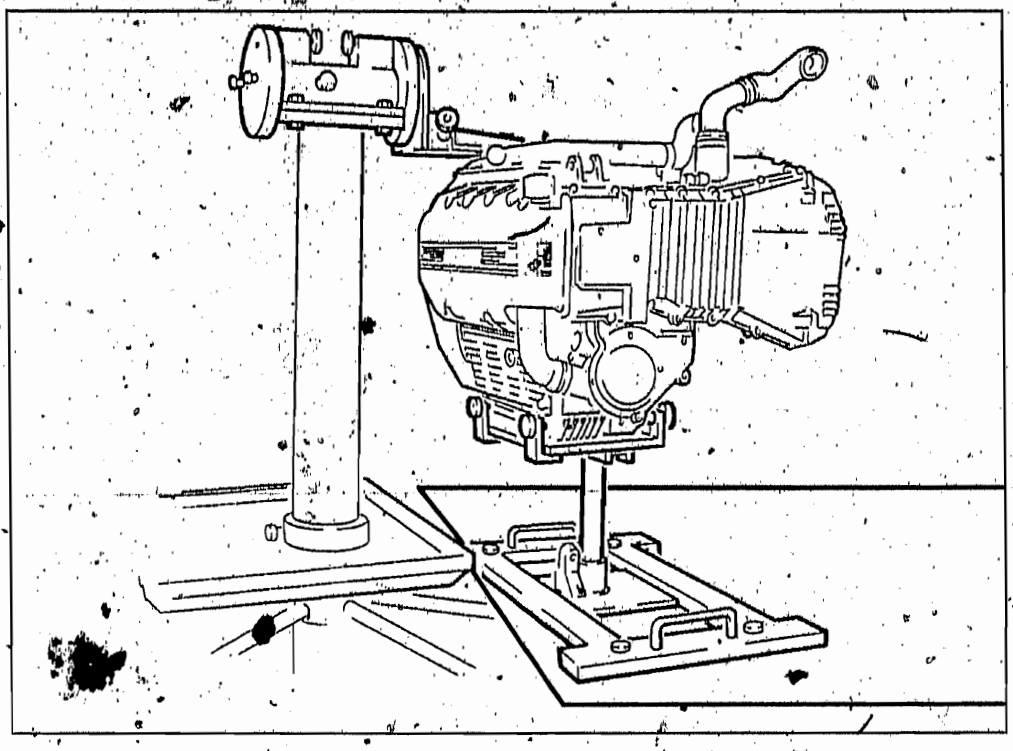
11. ENGINE

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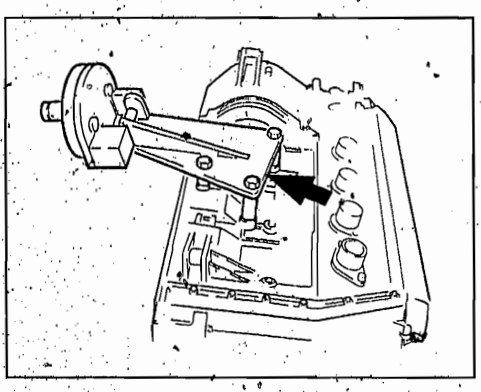
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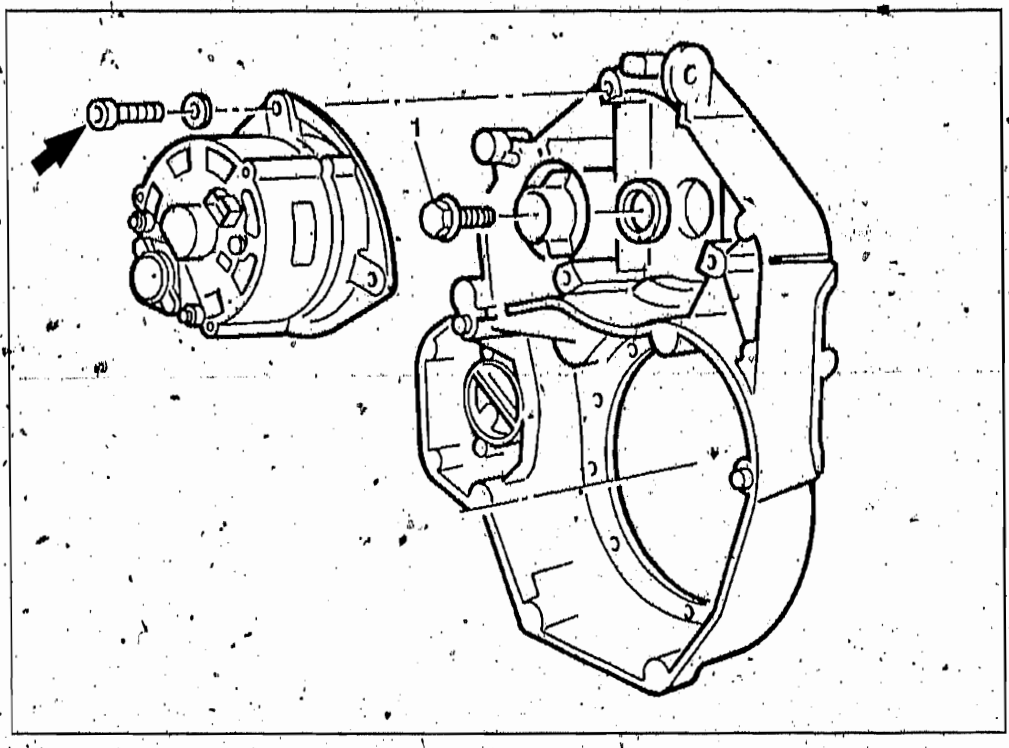


STRIPPING THE ENGINE

- Drain the engine oil.
- Remove the engine.
- Remove the air cleaner box.
- Remove the fuel injection rail.
- Remove the throttle butterfly rail.



- Attach engine support (arrow), BMW No. 11 0 610, to engine block.
- Lower the hoist and allow engine to rest on assembly stand.
- Remove the lifting device.



REMOVING THE INTERMEDIATE FLANGE

Removing the starter motor

- Pull the starter motor out of the intermediate flange.

Removing the ignition coils

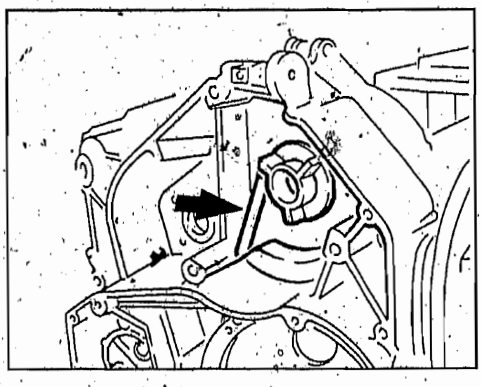
- Remove the coil retaining screws at the intermediate flange and take off the coils with their holder.

Removing the alternator

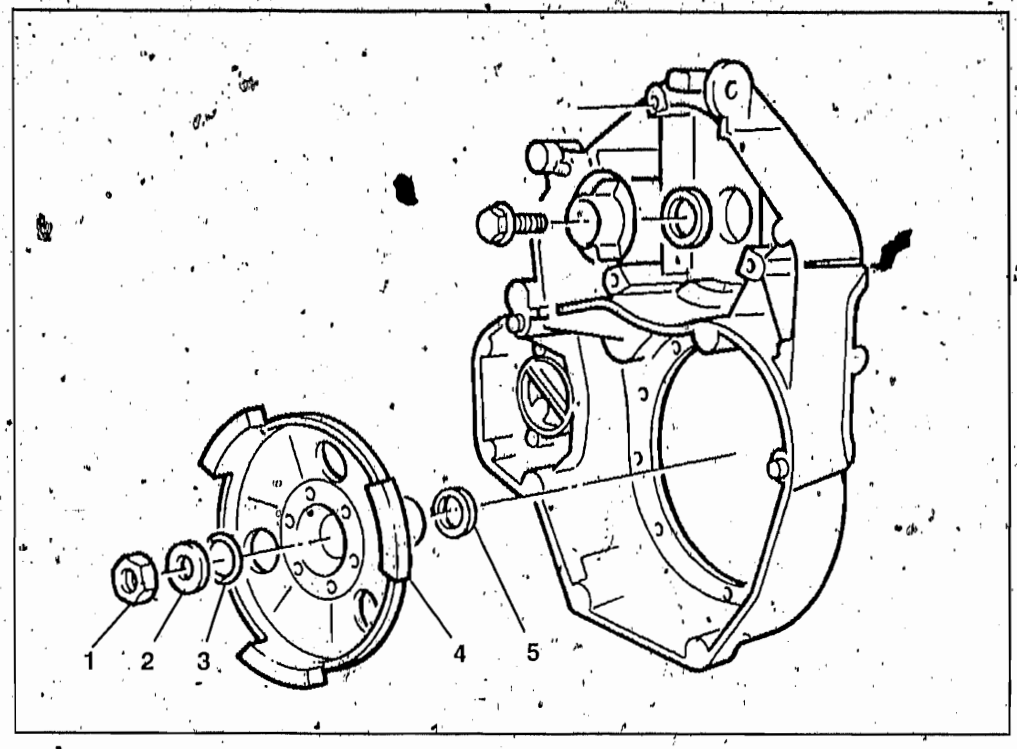
- Remove the retaining screws (arrow) and pull the alternator off the driving element.
- Note the rubber damper.

Removing the driving element

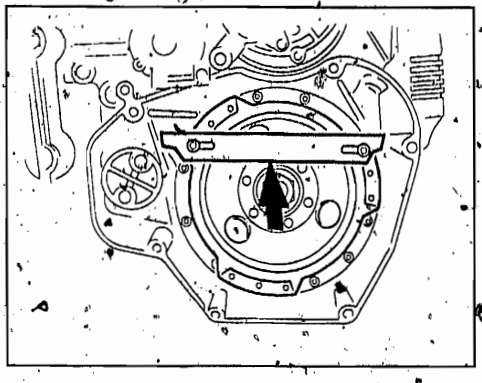
- Remove the retaining screw (1).



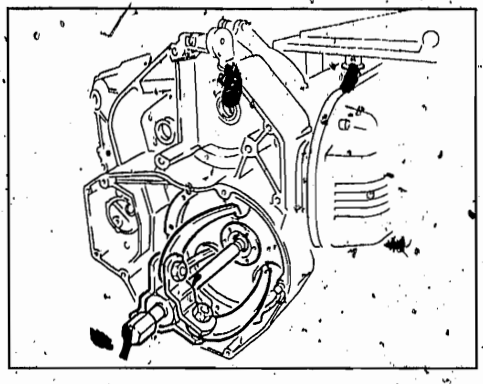
- Support the driving element with a strut (arrow) app. 50 mm long.
- Pull the driving element off by hand, slakkening slightly with an angled screwdriver if necessary.



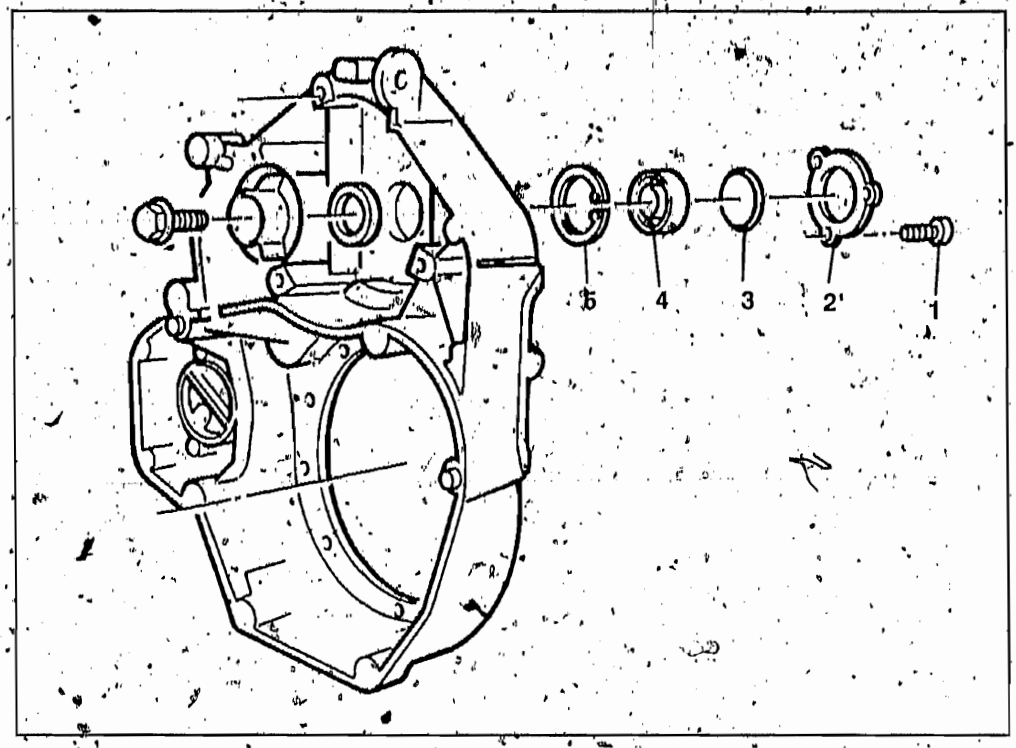
Removing clutch housing



- Install the retaining fixture (arrow), BMW No. 11 2 800, in the position illustrated, and secure it with two screws.
- Unscrew hex nut (1).
- Take off thrust ring (2).
- Move the clutch housing to and fro to push the O-ring (3) forwards.
- Remove the O-ring (pull it out with a hook or a scriber).
- Pull out the clutch housing (4).
- Note the presence of the thrust washer (5).



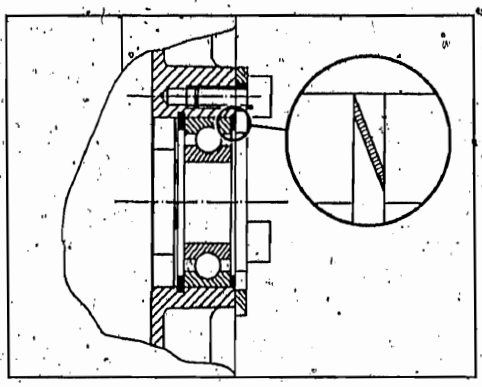
- If the clutch housing cannot be moved, it must be pulled out with a BMW No. 33 1 830 three-arm puller.
- Remove the retaining screws for the intermediate flange, and take it off.



STRIPRING AND ASSEMBLING THE INTERMEDIATE FLANGE

Removing and installing the driving element bearing

- Remove the retaining screws (1) for the bearing plate.
- Take out the bearing plate (2) and the cup spring (3).
- Pull out ball bearing (4) with reaction strut, BMW No. 00 8 570, and internal puller 21/3.
- The Seeger circlip (5) does not have to be renewed.
- Heat the bearing seat on the intermediate flange to app. 120°C.
- Insert the ball bearing as far as the Seeger circlip.
- Kugellager bis zum Seegerring einsetzen.

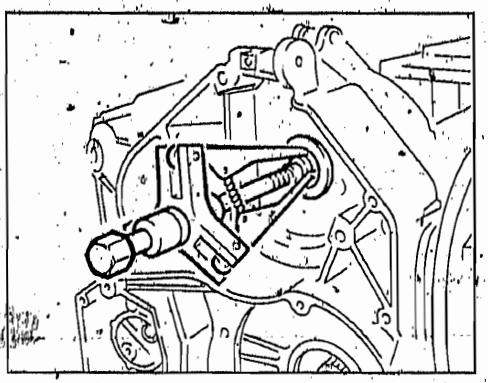


- Insert the cup spring; its larger diameter must press on the outer bearing race.
- Install the bearing plate with the large cutout at the top.
- Clean old Loctite and grease off the retaining screws and tapped holes.
- Apply Loctite 242 to the retaining screws, screw them in and tighten.

Tightening torque:
Retaining screws 9 ± 1 Nm

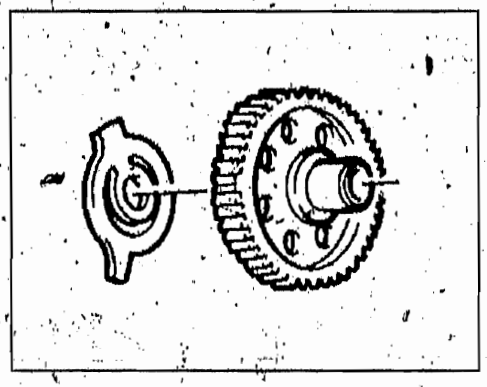
Removing and installing shaft sealing ring for driving element

- If the intermediate flange is installed:

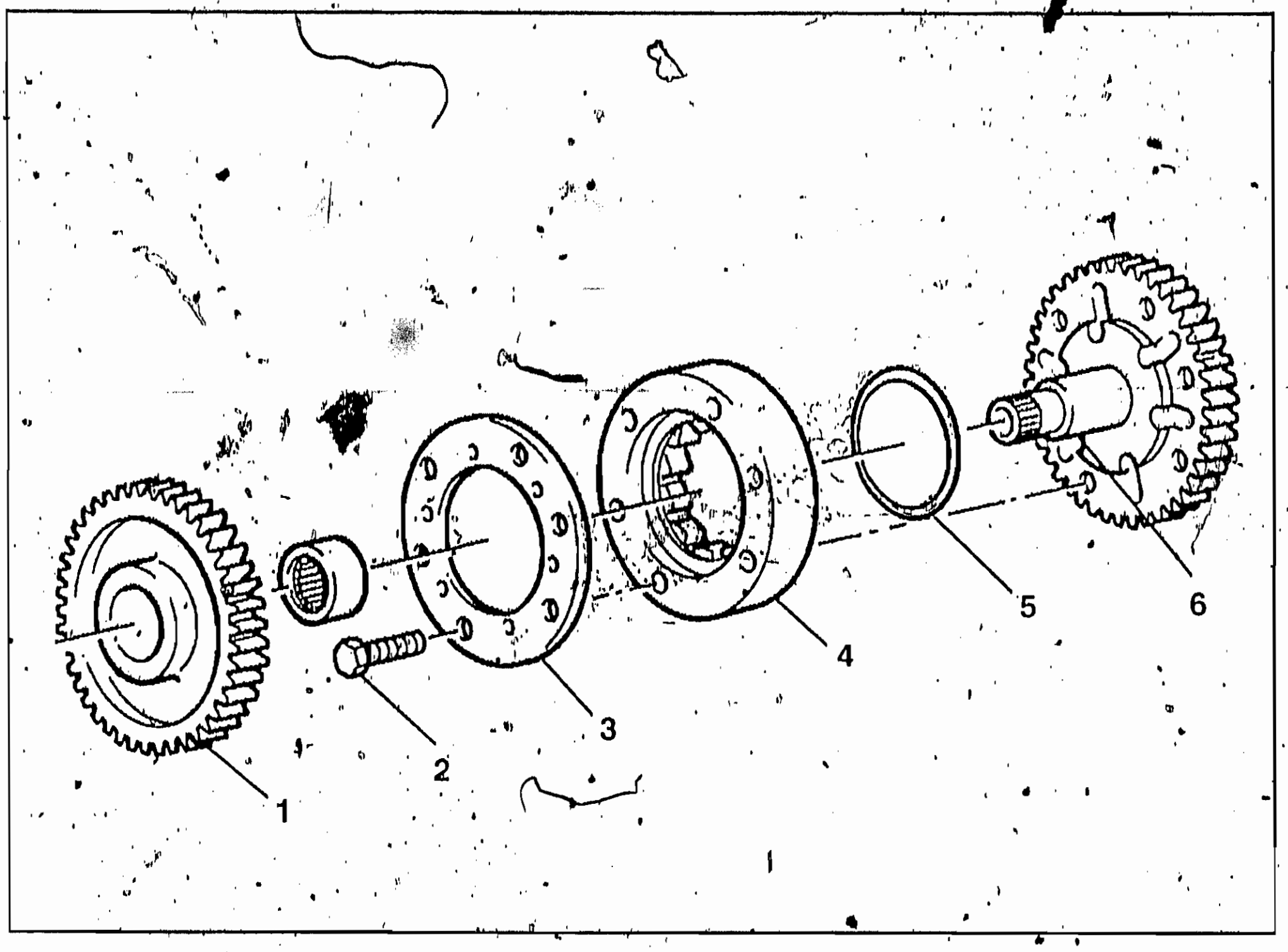


- Pull off the shaft sealing ring with internal puller BMW No. 00 5 010 and the small thrust head from the universal puller, BMW No. 00 7 500.
- If the intermediate flange is removed:
- Lever out the shaft sealing ring with a screwdriver, the blade end of which has been ground into a circular shape.
- Drive in the shaft sealing ring with a drift, BMW No. 11 1 620, and handle, BMW No. 00 5 500.

REMOVING COUNTERSHAFT AND LAYSHAFT WITH FREEWHEEL



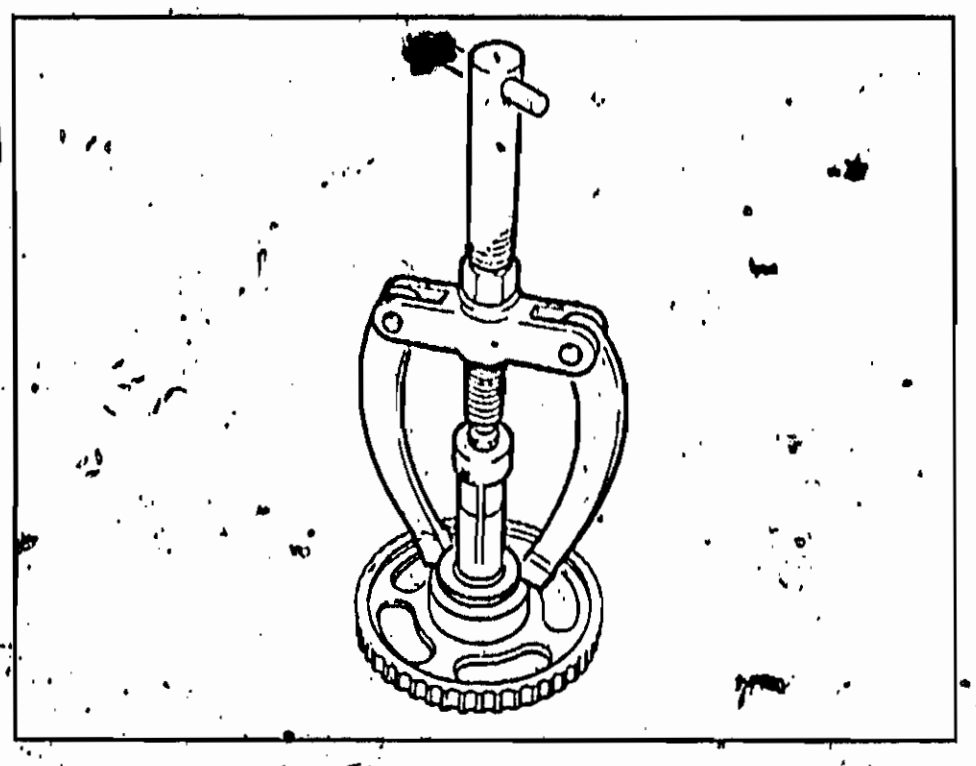
- Pull the countershaft and layshaft out of the engine block together.
- Note the spiral spring on the countershaft.



STRIPPING AND ASSEMBLING THE FREEWHEEL

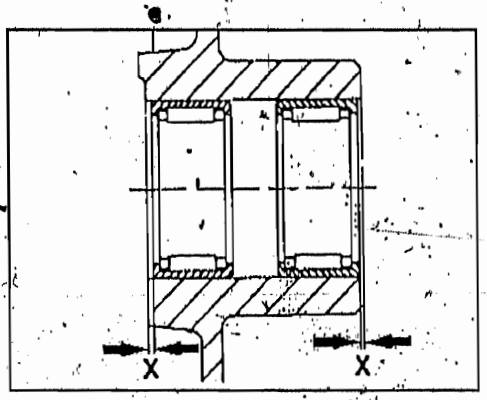
Stripping the freewheel

- Pull the freewheel gear (1) off the layshaft (6).
- Clamp the layshaft with the smooth side downwards into a vise (with soft jaws).
- Remove the retaining screws (2).
- Take off the cover plate (3).
- Take off the freewheel cage (4).
- Take out the cup spring (5).
- Take off the outer race of the freewheel.



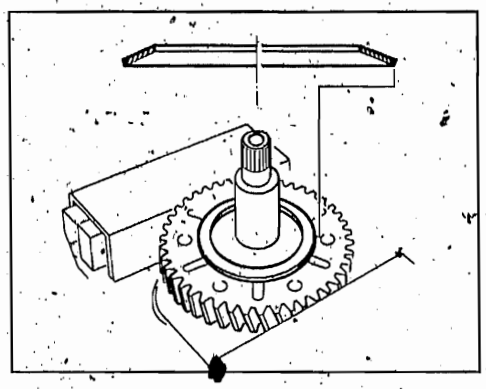
- Pull the needle roller bearing out of the freewheel gear with the reaction strut, BMW No. 00 8 570, and internal puller 21/3.

Assembling the freewheel



- Press the needle roller bearing into the freewheel gear as illustrated, so that the correct dimension is maintained.

"X" = *0,4 ± 0,2 mm*



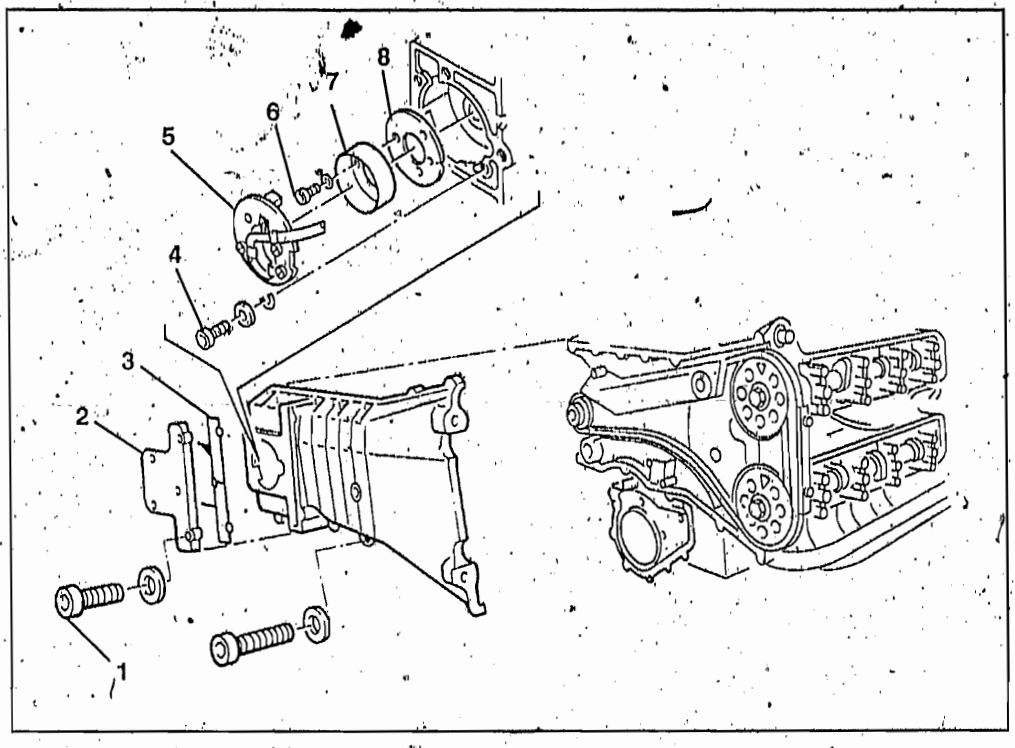
- Place the cup spring on the layshaft gearwheel.
- Oil the freewheel with engine oil and place it in the outer race.
- Place the outer race in position. The cup spring must snap into the outer race. The clamping block springs face towards the cover plate.
- Place the cover plate in position.
- Screw the freewheel together.

Tightening torque:
Retaining screws *9 ± 1 Nm*

- Turn the freewheel gear clockwise and push it on to the layshaft.
- Push the thrust washer and a new O-ring on to the layshaft.

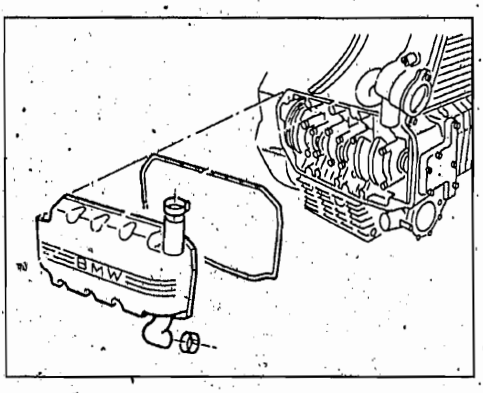
REMOVING AND INSTALLING THE LAYSHAFT NEEDLE ROLLER BEARING

- Heat the bearing point in the crankcase to app. 100°C.
- Pull out the needle roller bearing with reaction strut, BMW No. 00 8 570, and internal puller 21/3.
- Heat the bearing point in the crankcase to app. 100°C .
- Drive in the needle roller bearing with a drift (with 15.5 mm dia. journal).
- Remove the retaining screws for the cylinder head cover.
- Take off the cylinder head cover.
- Take off the seal carefully (it can be reused).



REMOVING THE TIMING CASE COVER

Removing the crankshaft cover



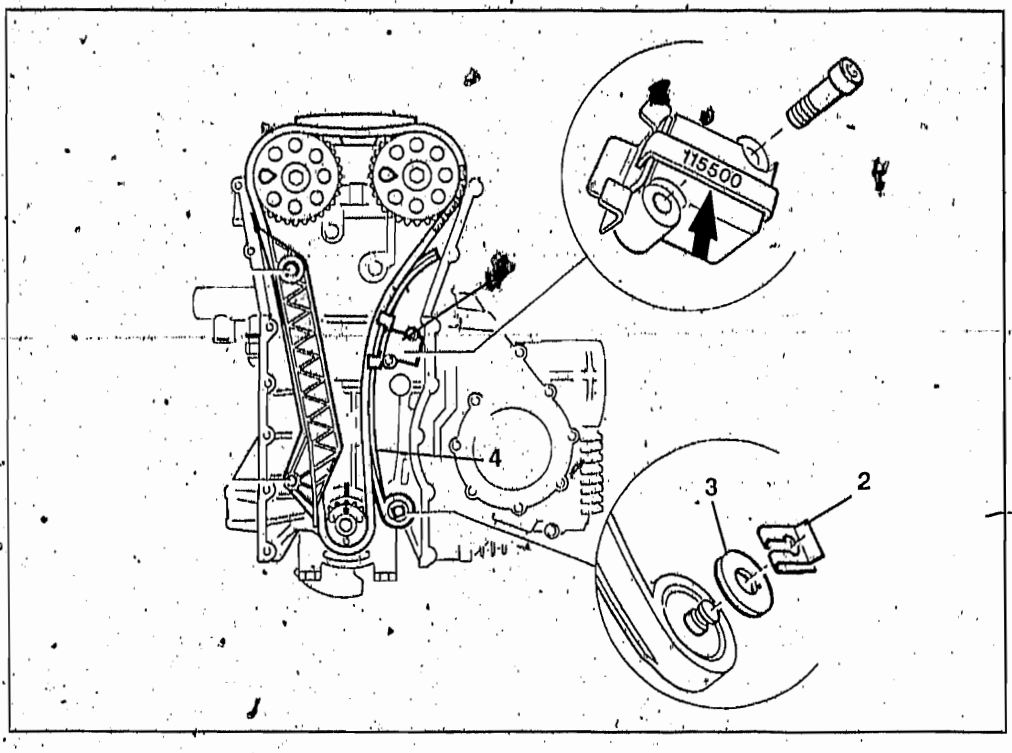
- Detach the coolant hose at the water pump.
- Remove the retaining screws for the cover.
- Take off the cover and the seal (the seal can be re-used).

Removing the Hall-effect transmitter

- Remove the retaining screws (1) from the Hall-effect transmitter cover.
- Take off the cover (2) and the seal (3).
- Remove the retaining screws (4) for the Hall-effect transmitter, noting the half-shims.
- Take off the Hall-effect transmitter with wire.
- Remove the retaining screws (6) for the gate rotor.
- Take off the gate rotor (7) and adjusting disc (8).

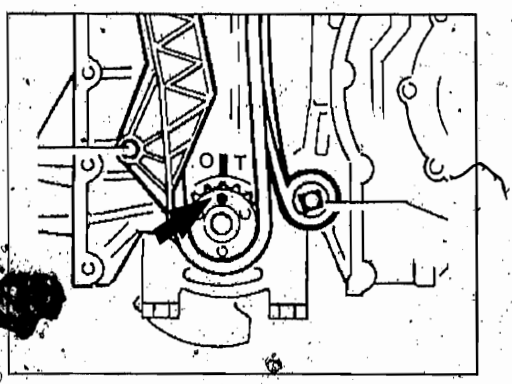
Removing and installing the shaft sealing ring I the timing case cover

- Drive out the shaft sealing ring with a drift.
- Using handle, BMW No. 00 0 500, and drift, BMW No. 11 1 610, drive in the new sealing ring from the inside.



REMOVING THE TIMING CHAIN

- Turn the engine on its assembly stand until the cylinder head is at the top.



- Turn the engine over anti-clockwise at the crankshaft until cylinder 1 (at the timing end of the engine) is at top dead centre (TDC). The pin on the crankshaft chain sprocket (arrow) must be aligned with the TDC mark on the housing.

Removing the chain tensioner

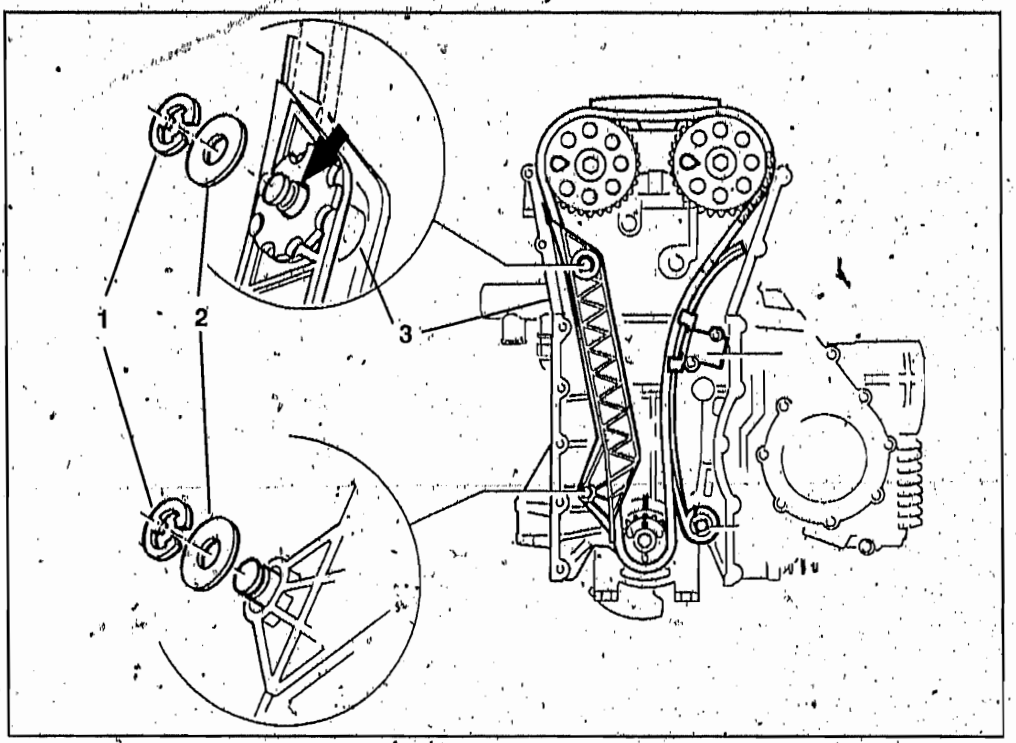
- If possible, prevent the chain tensioner (1) from moving with clamping device, BMW No. 11 5 500.
- Remove the retaining screws and take off the chain tensioner. Do not let it spring apart.

Removing the chain tensioner rail

- Pull off the retaining clip (2), noting the presence of the washer (3).
- Take off the tensioner rail (4).

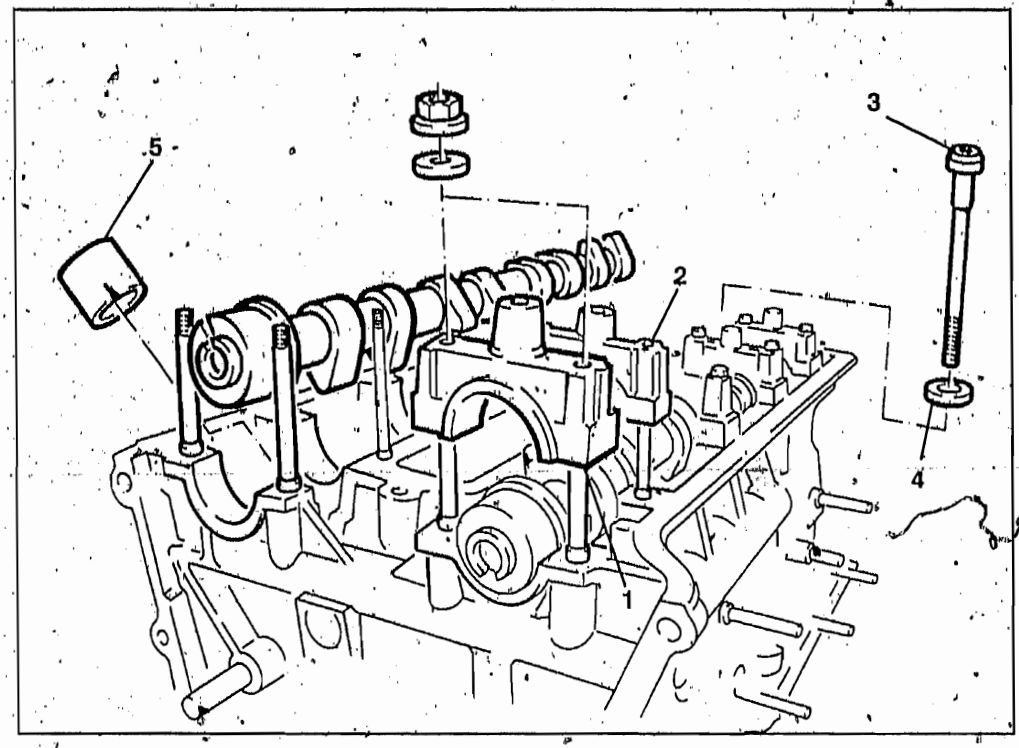
Removing the camshaft chain sprockets

- Remove the retaining screws for the chain sprockets, holding the camshaft with an open-ended wrench at the hexagon provided.
- Take off the chain sprockets.



Removing the chain guide rail

- Remove the keepers (1) from the pivot pin.
- Take off the washers (2).
- Use a screwdriver to force the guide rail (3) a small distance away from the cylinder head.
- Press the guide rail back further; the toothed washer with eccentric (arrow) must project.
- Pull out the eccentric.
- Take off the guide rail with the timing chain.



REMOVING, STRIPPING AND ASSEMBLING THE CYLINDER HEAD

Removing the camshafts

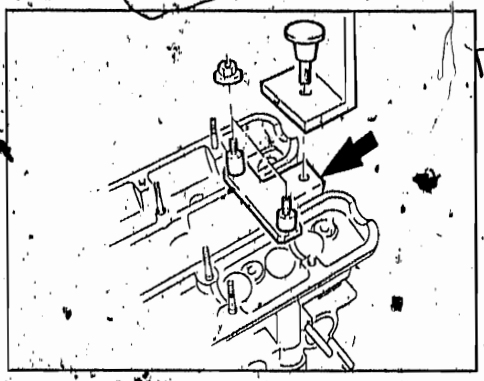
- Remove the chain guide.
- First remove the axial (thrust) bearing cap (1), to prevent the camshafts from tilting.
- Remove the radial bearing caps (2).
- Take out the camshafts.

Removing the cylinder head

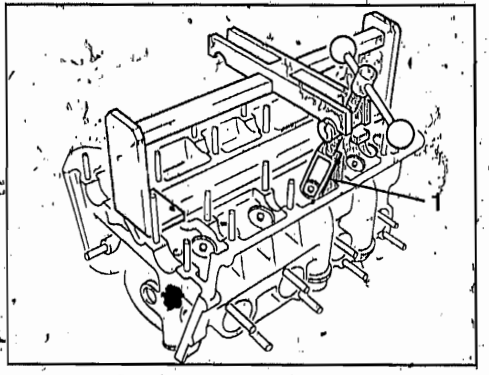
- Unscrew the cylinder head studs (3) using a Torx insert, BMW No. 0002 610. Take them out complete with washer (4).
- Strike the cylinder head sharply but lightly with a plastic-faced hammer to separate it from the crankcase, and take it off.
- Take off the cylinder head gasket.

Remove the valve tappets

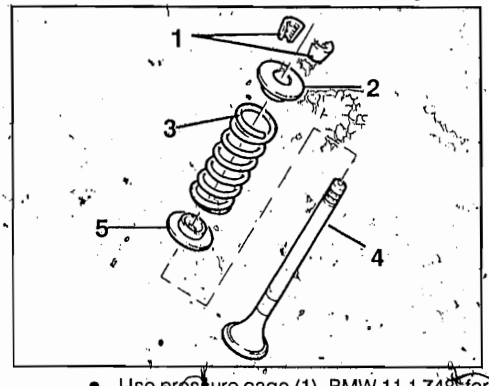
- Using special suction pad, BMW No. 113 251, to pull the tappets (5) out of the cylinder head.
- Mark the tappets to identify the valves to which they belong.



- Screw on support plate (arrow), BMW No. 11 1 748, for the valve spring tensioning device at the rear of the cylinder head.



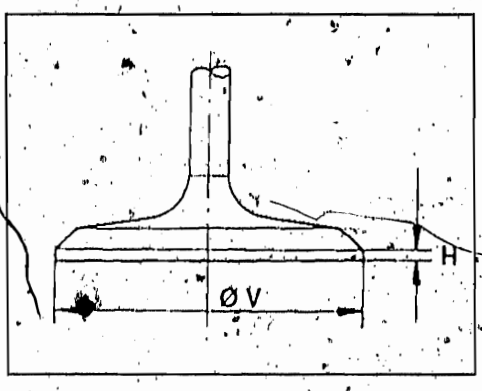
- Attach and secure the valve spring clamping device, BMW No. 11 1 740.
- Use pressure cage (1), BMW 11 1 748, for the small spring plates.
- Place the cylinder head flat on a wooden board and clamp the valve springs.



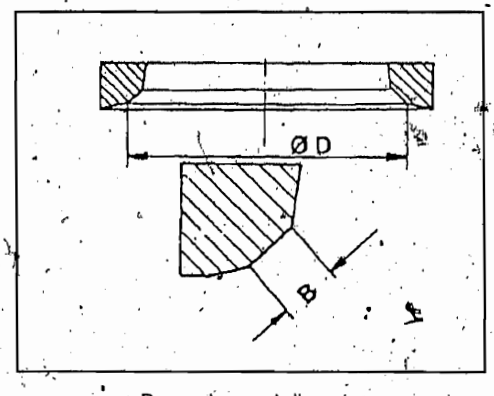
- Use pressure cage (1), BMW 11 1 748, for the small spring plates.
- Place the cylinder head flat on a wooden board and clamp the valve springs.
- Pull out the valve collets (1) with a magnetized screwdriver.
- Release the valve spring and take off spring plate (2).
- Take out the valve spring (3).
- Pull the valve (4) out into the combustion chamber.
- Pull out the valve stem seal with special pliers, BMW No. 11 1 250, moving the pliers to and fro slightly while doing so.
- Lift out the lower spring plate (5) with a magnet and a small screwdriver.

Remachining valves and valve seats

- Valves and valve seats can be remachined if leaks occur.



- ø V = valve diameter
  H = minimum edge thickness
- If H is not maintained, the valve must be renewed.

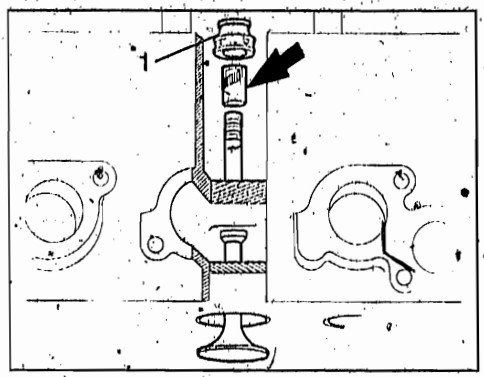


- ø D = valve seat diameter
  B = valve seat width
- If remachining takes place, the width of the valve seat must always be maintained.
- To check a valve for leaks, pour a little fuel into the inlet or exhaust port.
- No fuel must leak through into the combustion chamber.

Installing the valves:

- First install the lower spring plate.
- Oil the valve stem lightly and insert it from the combustion chamber side.
- Place the cylinder head on a flat wooden board.

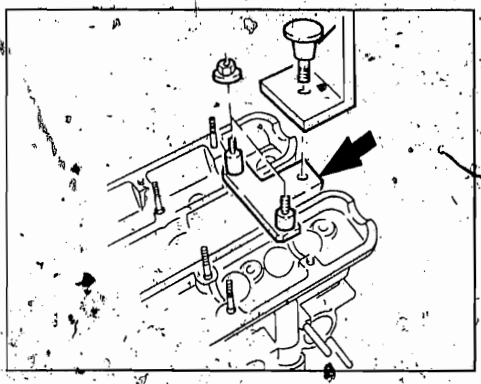
NOTE:
If a valve is removed, a new valve stem seal must be pressed on to the valve guide.



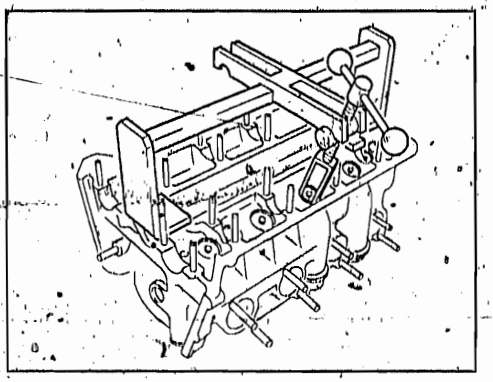
- Place assembly sleeve, BMW No. 11 1 960 (arrow), on the valve stem.
- Drive the valve stem seal (1) in with drift BMW 11 1 950 until the drift reaches the cylinder head.

WARNING:
Remove the protective cap from the valve stem again.

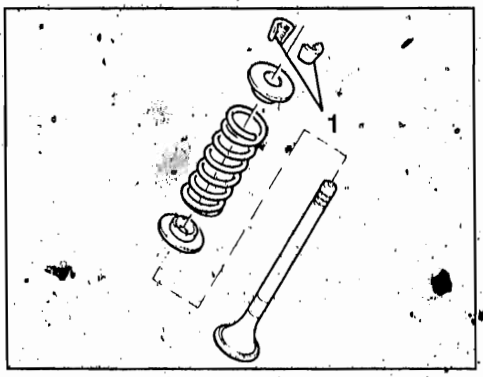
- Insert the valve spring.
- Place the spring plate in position.



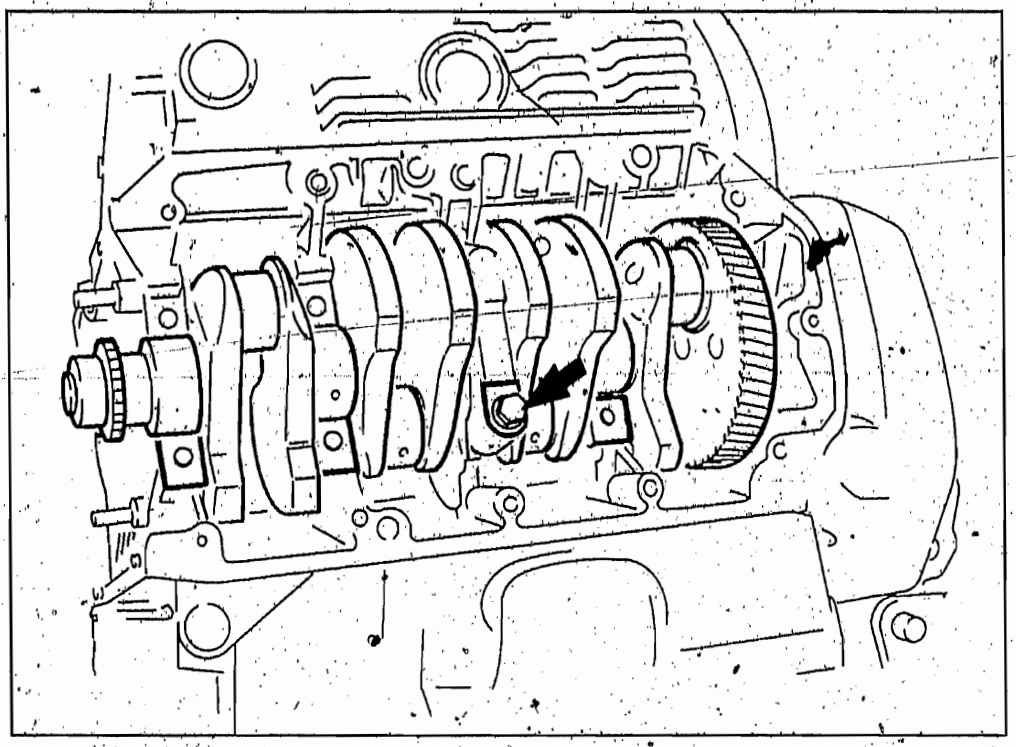
- Attach support plate (arrow), BMW No. 11 1 749, to cylinder head.



- Attach valve spring clamping device, BMW No. 11 1 740, to the cylinder head.
- Clamp the valve spring.



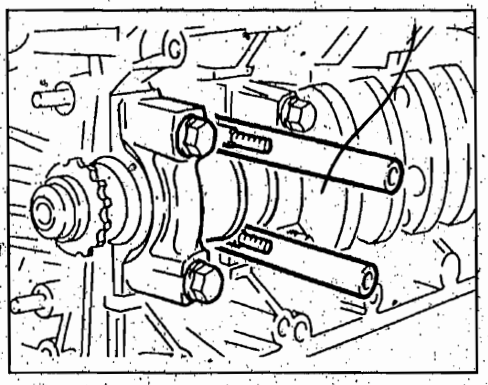
- Grease the valve collets (1) to simplify assembly, and insert them in the grooves on the valve stem.
- Release the valve spring.
- Clean the valve tappet, oil slightly and insert carefully without tilting.



REMOVING THE CRANKSHAFT

Removing the big-end bearing caps

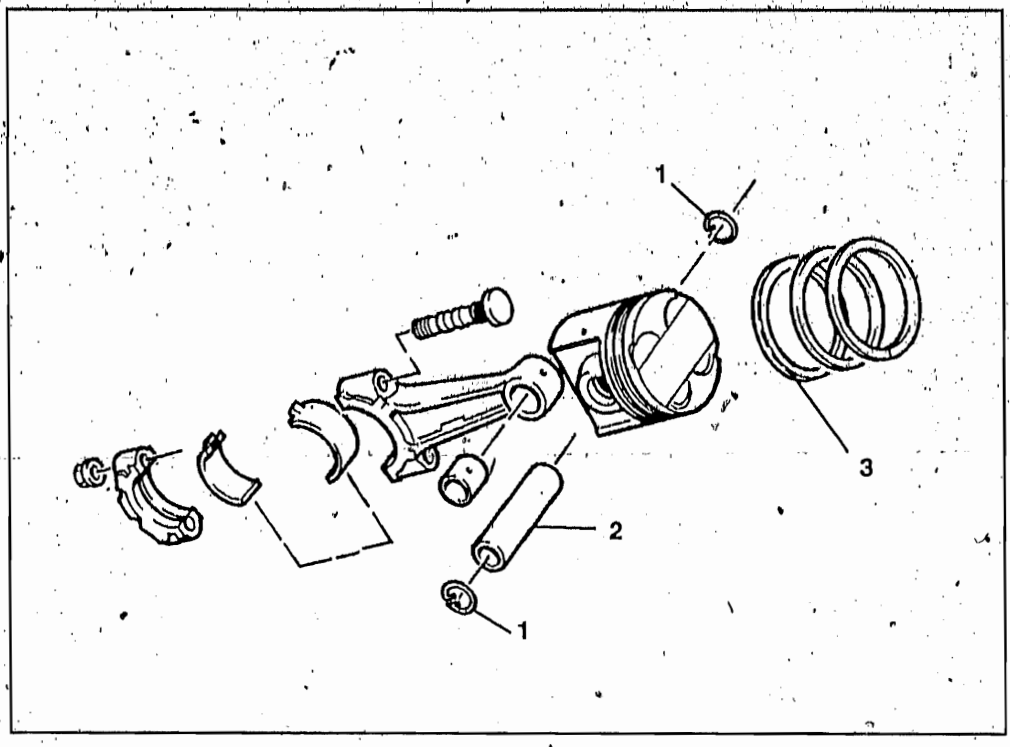
- Turn the engine on its assembly stand until the sump is at the top.
- Move cylinders 1 and 4 to the bottom dead centre (BDC) position.



- Unscrew the big end bearing cap nuts.
- Cover the big end bearing bolts with a tube (arrow) app. 50 mm long.
- Turn the crankshaft further with great care until cylinders 2 and 3 are in the bottom dead centre position.
- Remove the bearing caps and cover the big end bearing bolts.
- Slacken off the main bearing studs.
- Unscrew all studs except one in the centre bearing (arrow).
- Take off the bearing caps.
- Unscrew and remove the last bearing stud. Take off the bearing cap, pressing the crankshaft down into the crankcase while doing so.
- Take out the crankshaft.

NOTE:

Bearing caps 1 - 3 are marked. Bearing 4 (the thrust bearing) and bearing 5 are not marked. Cylinder 1 is at the timing end of the engine.



REMOVING, STRIPPING AND ASSEMBLING PISTON WITH CONNECTING ROD

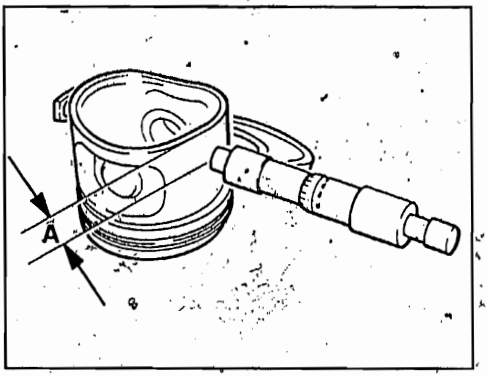
Removing piston with connecting rod

- Working from the crankshaft side, press the piston with connecting rod out of the cylinder.

Stripping the piston

- Using a small screwdriver, lever out the piston (gudgeon) pin circlip (1) on one side.
- Using a drift, BMW No. 11 2 930, press out piston pin (2).
- Carefully remove the piston rings (3) with piston ring pliers.
- Remove carbonized oil from the piston crown.
- Clean the piston.

Measuring the piston

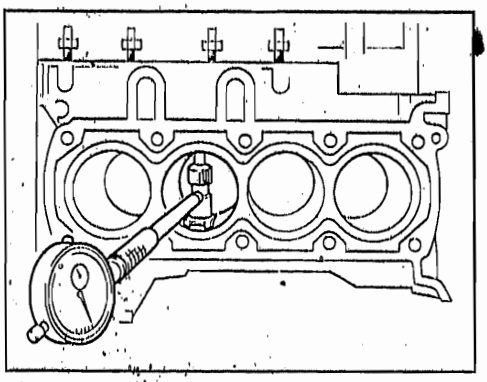


- Measure piston diameter with a micrometer at the piston skirt, at distance A from the bottom of the skirt.

Make:	Distance A
KS	12.0 mm
Mahle	7.6 mm

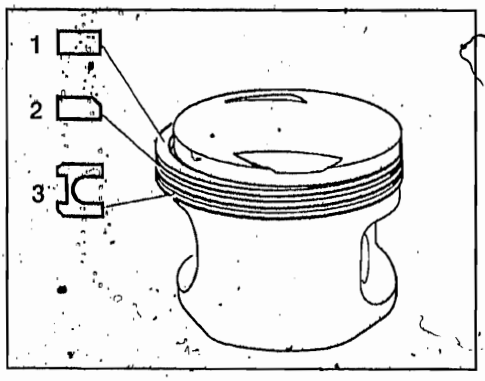
- Measure piston ring flank clearance with a feeler gauge. For correct flank clearance, see Technical Data.

Measuring cylinder



- Set internal micrometer to nominal cylinder bore.
- Measure the cylinder bore at three heights, in a crosswise pattern.
  Measuring heights:
  In the direction of forward travel and at a right angle to it.

Assembling the piston

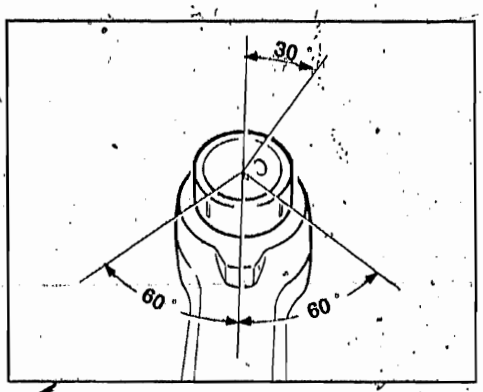


- Carefully install the piston rings, using piston ring pliers:
  1. Groove for rectangular-section ring
  2. Groove for micro-chamfer ring (note pin which locates in ring gap)
  3. Groove for equal-chamfer ring with tubular spring

NOTE:
The tubular spring gap must be offset by 180 degrees to the gap in the equal-chamfer ring.

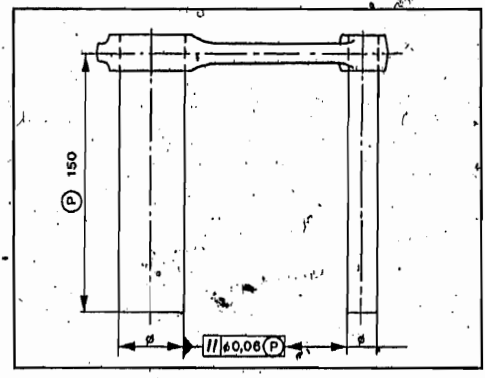
Warning:
Piston and piston ring form a matched pair; do not confuse them accidentally.

Removing and installing the small-end bearing



- Press out the small-end bearing bushing.
- The joint line in the new small-end bearing must be 60 degrees ahead of or behind the connecting rod centreline.
- Ream out the small end bearing bushing.
- Drill the oil hole and deburr it.

WARNING:
It must be possible to push the piston pin through the small end bushing with only light pressure.



- Check that the big and small end bores in the connecting rod are parallel.
- Deviation from parallel over test length P must not exceed 0.06 mm.
  P = 150 mm

Assembling piston and connecting rod

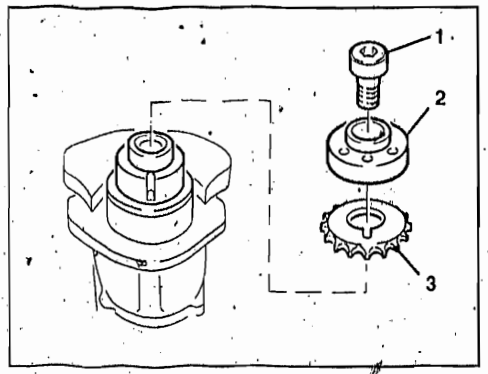
- Note connecting rod weight tolerance.
- Weight tolerance = ± 4 g

> **NOTE:**
> The oil hole in the small end should be on top in the installed position. The arrow mark on the piston crown should point forward.

- Install only pistons of the same make and weight class.

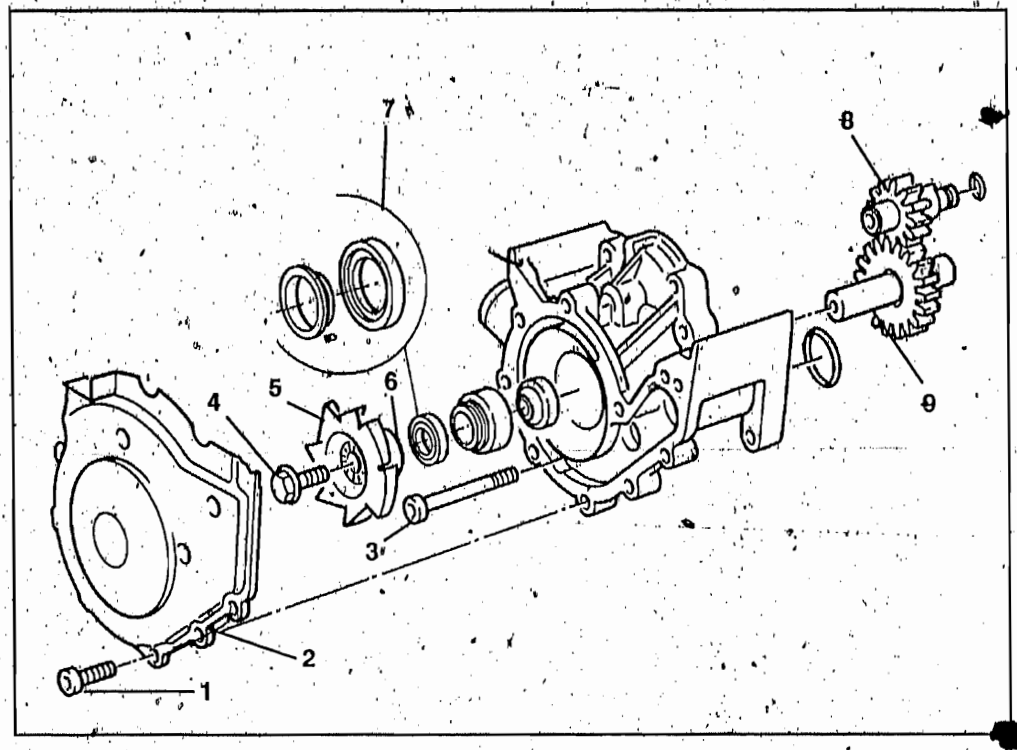
> **Warning:**
> Whenever the piston pin is removed, a new retaining circlip must be installed.

REMOVING AND INSTALLING CRANKSHAFT PINION AND ROTOR FLANGE



- Take out retaining screw (1).
- Pull off the rotor flange (2), striking it lightly to separate it.
- Take off the pinion (3).
- Install in the opposite order of work.

Tightening torque:
Retaining screw *50 ± 6 Nm*



REMOVING THE COMBINED OIL AND WATER PUMP

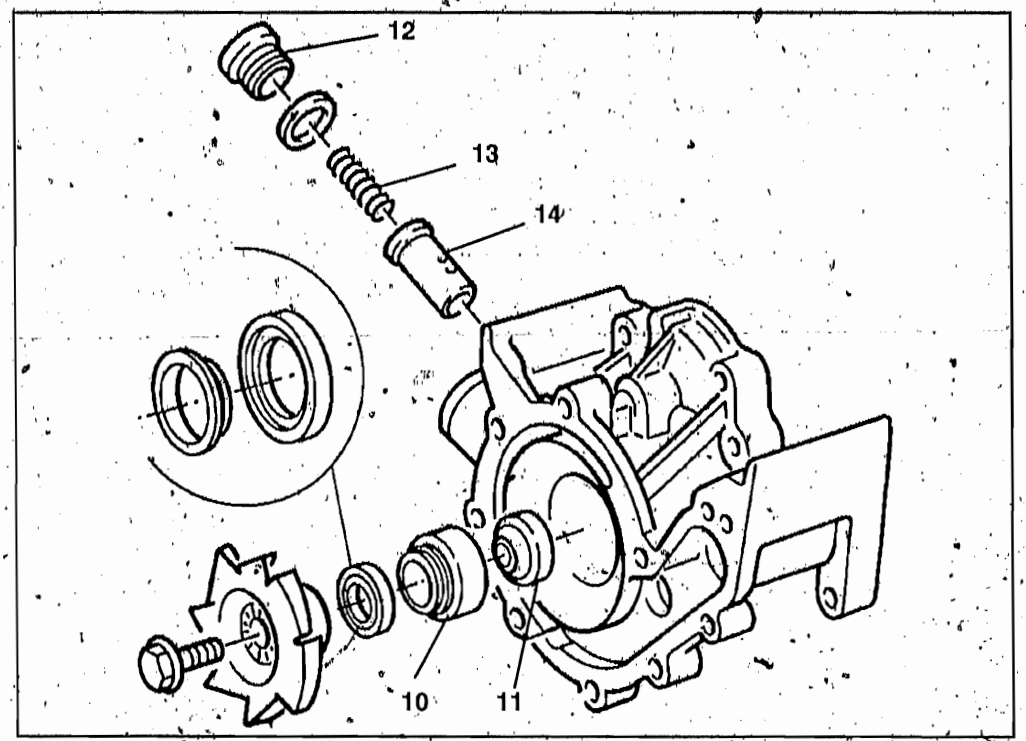
- Detach the oil pressure warning cable at the oil pressure switch and pull the cable out of the housing.
- Remove the retaining screws (1) for the housing cover.
- Separate the cover (2) from the housing with light blows of a plastic-faced hammer.
- Remove the inner and outer housing retaining screws (3). Loosen the housing with a few light blows of a plastic-faced hammer, and pull it off the output shaft.

STRIPPING AND ASSEMBLING THE COMBINED OIL AND WATER PUMP

- Clamp the pump housing by its sealing faces in a vise (using soft jaws).

Removing impeller and pump shaft

- Remove the retaining screw (4) for the impeller (5), preventing the pump shaft from turning with an Allen key.
- Take off the impeller with spacing bushing (6). Note the ceramic disc (7).
- Pull the pinion (8) and the pump shaft (9) out of the pump.
- Examine the pump housing for signs of damage.

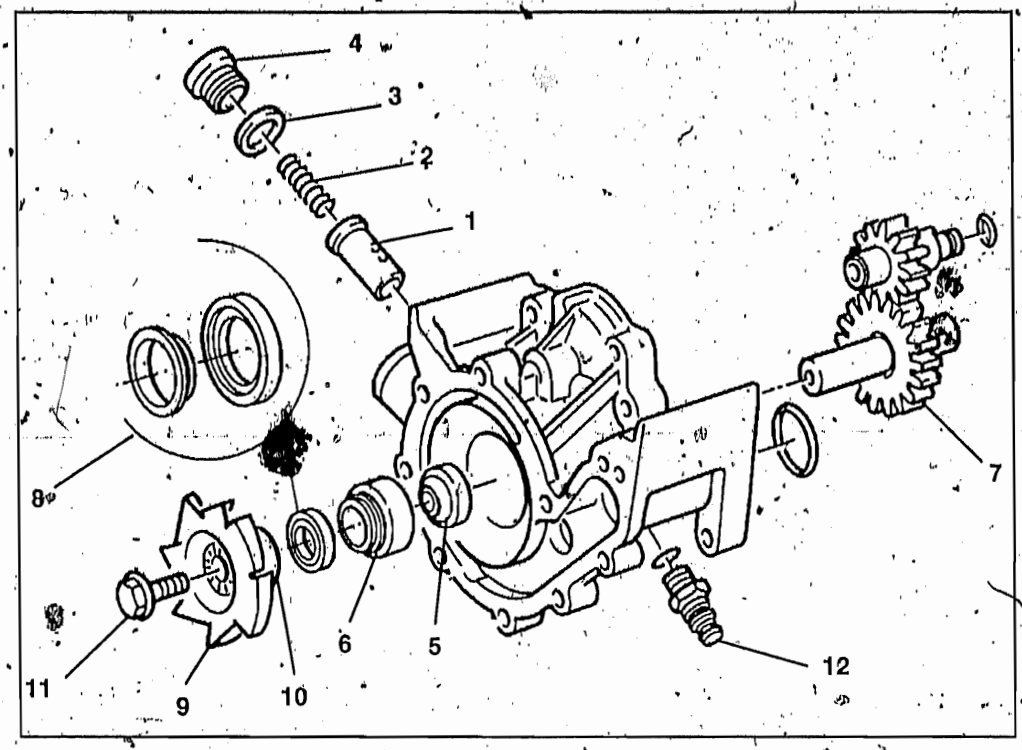


Removing and installing slipring seal/shaft sealing ring

- Press out the slipring seal (10) with a large drift,
- Using a 5 mm wide screwdriver blade, carefully drive out the shaft sealing ring (11) for the oil pump.

Removing the pressure relief valve

- Unscrew the threaded union (12) for the pressure relief valve.
- Take out the valve spring (13) and pull the valve piston (14) out with a magnet.



Installing the pressure relief valve

- There must not be any score marks on the valve piston.
- Oil the valve piston (1) slightly and install it with valve spring (2).
- Screw in end plug (4) with a new sealing ring (3) and tighten to the correct torque.

Tightening torque:
Screw plug *27 ± 3.2 Nm*

Installing shaft sealing ring/slipring seal

- Working from the water side, drive in shaft sealing ring (5) with drift, BMW No. 11 1 640, and handle, BMW No. 00 5 500, with the open side downwards.
- Press in the slipring seal (6) using drift, BMW No. 23 1 780, and handle, BMW No. 00 5 500.

NOTE:
The surface of the slipring must be absolutely free from grease.

Installing the pump shaft and impeller

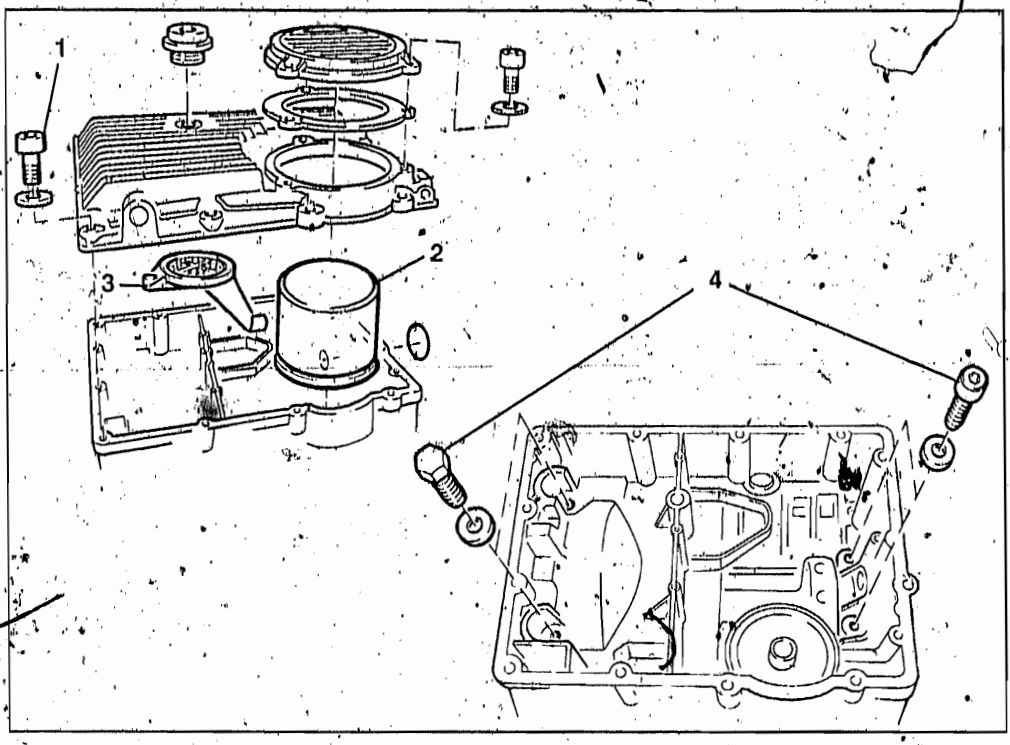
- Lightly oil the pump shaft (7) and push it carefully into the housing from the oil side.
- Push the slipring (8) on to the pump shaft with the smooth side down.
- Install the impeller (9) with spacing bushing (10) and tighten screw (11) to the correct torque while preventing the pump shaft from turning.

Tightening torque:
Impeller retaining screw *33 ± 4 Nm*

Removing and installing oil pressure switch

- Unscrew and remove the oil pressure switch (12).
- Screw in and tighten the oil pressure switch, using a new sealing ring.

Tightening torque:
Oil pressure switch *50 ± 6 Nm*



REMOVING THE OUTPUT SHAFT

Removing the sump

- Remove the retaining screws (1) for the sump.
- Strike the sump lightly with a plastic-faced hammer to separate it from the crankcase, and take it off.

Removing the oil filter

- Detach the oil filter (2) with the special oil filter wrench, BMW No. 11 4 650.

Removing the oil strainer

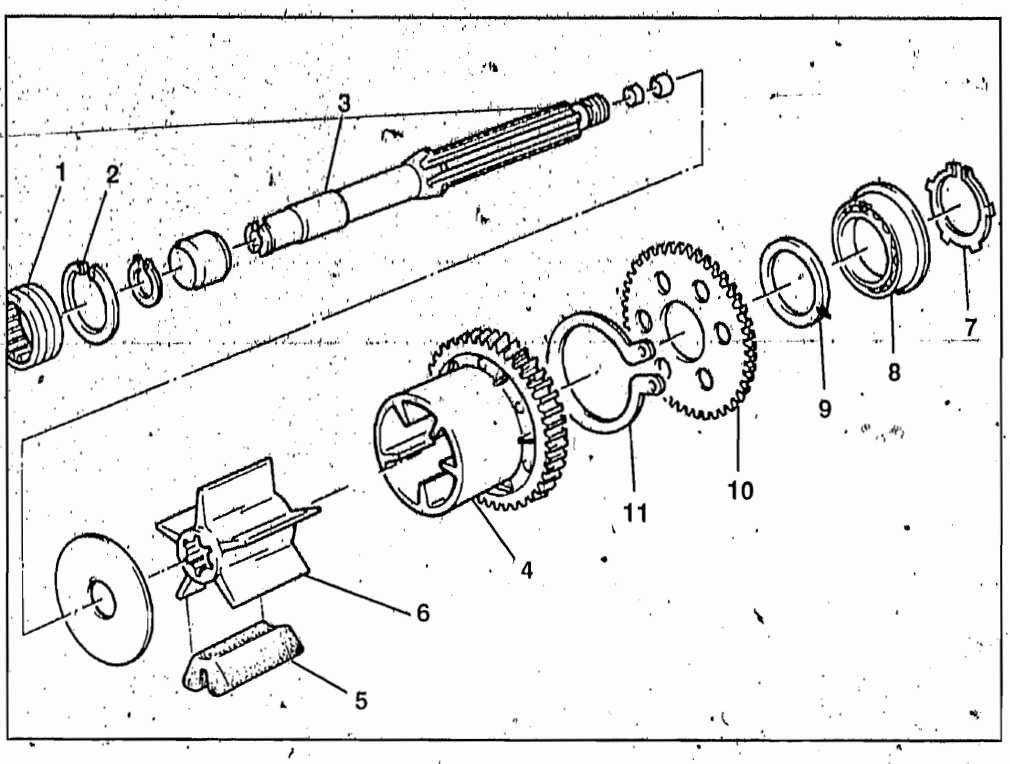
- Remove the retaining screw for the oil strainer (3) and pull it out of the housing.

Removing lower section of crankcase

- Remove the retaining screws for the lower section of the crankcase (outside).
- Remove the output shaft bearing screws (4).
- Strike the lower section of the crankcase lightly with a plastic-faced hammer to separate it from the main crankcase.
- Take off the lower section of the crankcase, noting the presence of the O-rings.
- Carefully lift the output shaft out of the crankcase. Note that the needle roller bearing and circlip are loose on the shaft.

Removing and installing oil level sight glass

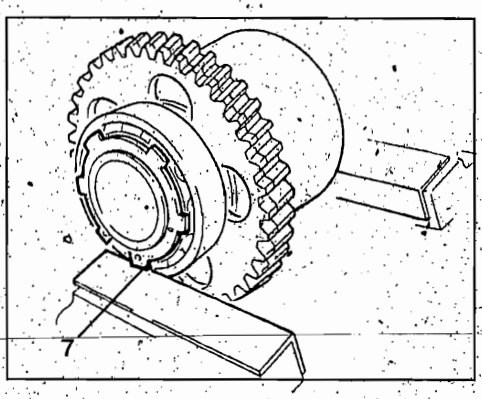
- Using a large screwdriver, pierce the plastic disc and lever out the oil level sight glass.
- Wet the new oil level sight glass lightly with engine oil and drive it in with BMW No. 00 5 550 drift.



STRIPPING AND ASSEMBLING THE OUTPUT SHAFT

- Take off the needle roller race (1) and circlip (2).
- Pull the output shaft (3) out of the damper housing (4) and take out the rubber damping element (5).
- Drive the output shaft out of the inner section of the damper (6) with a plastic-faced hammer.

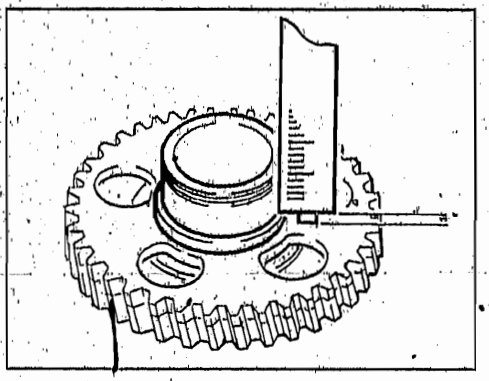
Stripping the tensioning gear



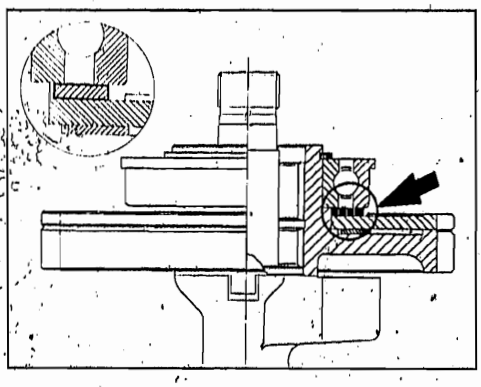
- Clamp the damper into a vise (with soft jaws) as illustrated, so that there is no load on the circlip.
- Remove the circlip (7) with Seeger circlip pliers.
- Place the damper housing on the workbench.
- Using BMW No. 00 8 400 two-arm puller and BMW No. 31 1 307 thrust piece, pull off ball bearing (8).
- Take off spacing ring (9) and tensioning gear (10).
- Take out spring circlip (11) with Seeger pliers.
- Examine all parts for damage or wear and renew if necessary.

Assembling the tensioning gear

- Insert the spring circlip with Seeger pliers.
- Install the tensioning gear.



- Clamp the tensioning gear and the damper housing together in a vise, using soft jaws.
- Measure the distance from the base of the ball bearing seat to the tensioning gear, using a depth gauge.

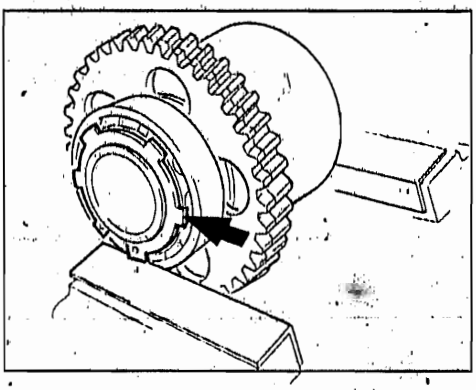


- Place the corresponding shim (arrow) on the tensioning gear.

Distance measured	Shim washer
1.60 ... 1.75 mm	1.60 mm
1.76 ... 1.90 mm	1.75 mm
1.91 ... 2.05 mm	1.90 mm
2.06 ... 2.15 mm	2.05 mm

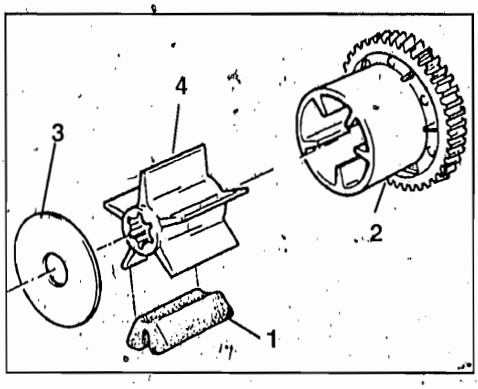
NOTE:
Shim thickness must never be greater than the measured distance.

- Heat the ball bearing to app. 80°C and press it in with the shoulder uppermost.

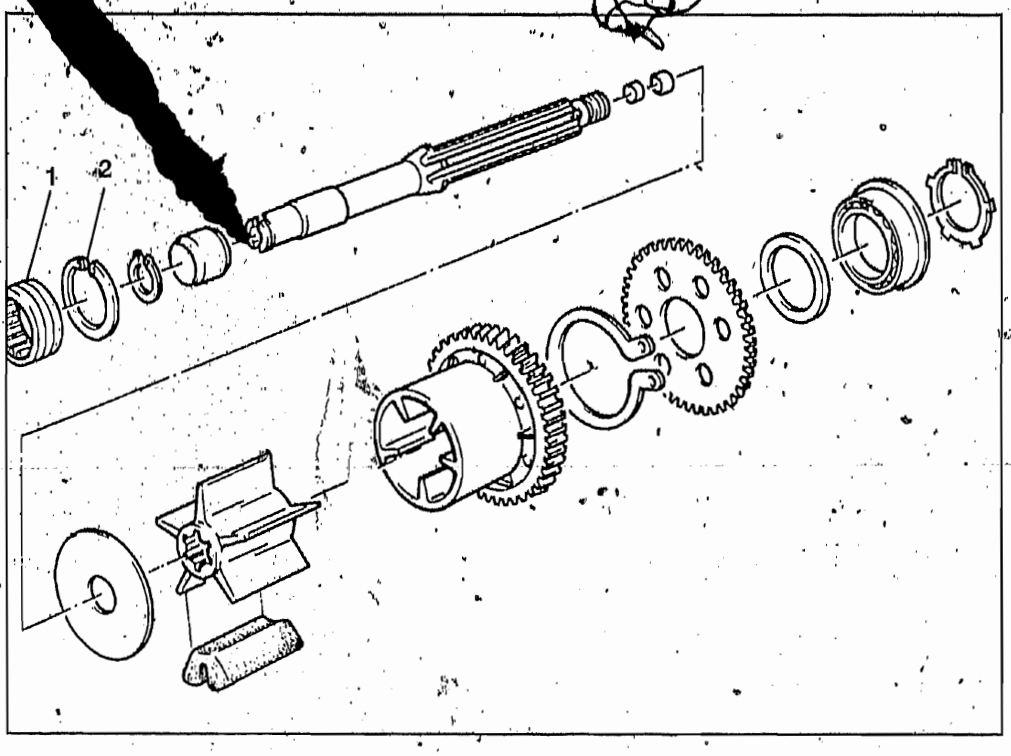


- Clamp the damper housing and the ball bearing together in a vise.
- Insert the circlip in the groove in front of the bearing with Seeger pliers.
- If necessary, drive the circlip in slightly farther with a suitable drift, to ensure that it locates fully in the groove.

Assembling the damper

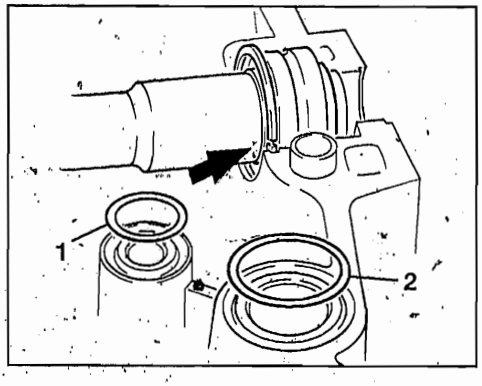


- Insert the rubber element (1) in the damper housing (2).
- Push the retaining plate (3) on to the output shaft. Warm the inner section of the damper (4) slightly and press it on.
- Push the damper housing on to the output shaft.



INSTALLING THE OUTPUT SHAFT

- Push the circlip (1) and needle roller race (2) on to the bearing point on the output shaft.
- Place the output shaft in the crankcase.



- Insert the circlip (arrow) into the groove so that the gap is precisely on the joint line between the housing sections.

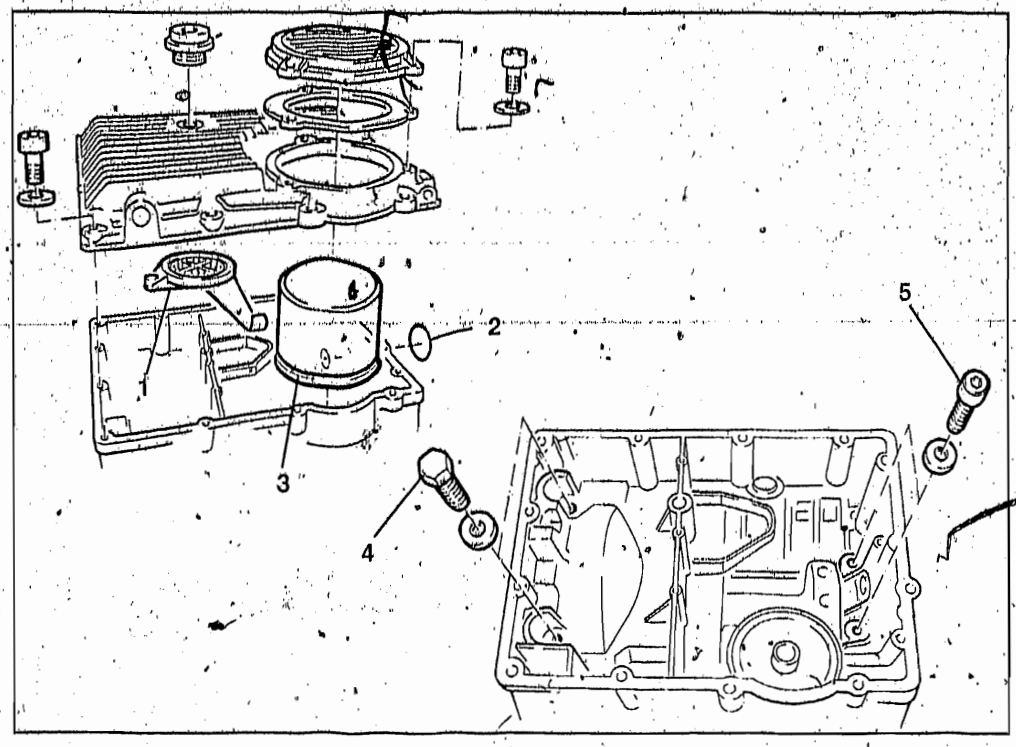
Installing the lower section of the crankcase

- Place the O-rings for the oil and water passages (1, 2) into position.
- The sealing faces must be free from oil and grease. Coat them lightly with 3-Bond 1209.
- Place the lower section of the crankcase on the main crankcase.
- Insert the shouldered bearing and needle roller bearing screws and tighten them in an alternating pattern.

Tightening torque:
Shouldered bearing retaining screws 40 ± 5 Nm
Needle roller bearing retaining screws 18 ± 2 Nm

- Insert and tighten the retaining bolts for the lower section of the crankcase.

Tightening torque:
Retaining bolts: 7 ± 1 Nm



Installing the oil strainer

- Insert the oil strainer (1) into the bore in the crankcase.
- Make sure that O-ring (2) is installed, and is undamaged.
- Screw on the oil strainer at its head.

Installing the oil filter

- Wet the sealing ring for oil filter (3) with engine oil.
- Screw the oil filter fully in, then tighten finally by not more than half a turn.

Installing the lower section of the crankcase

- The sealing faces must be free from oil and grease. Apply a thin coat of 3-Bond 1209 to them and place the lower section of the crankcase into position.
- Make sure that the circlip is correctly located.
- Insert and tighten bearing bolts (4) and (5).
- Insert and tighten the retaining screws.

Tightening torque:

Hex bolt (4)	*40 ± 5 Nm*
Machine screw (5)	*18 ± 2 Nm*
Retaining screw	*7 ± 1 Nm*

Installing the sump

- Apply a thin coat of 3-Bond 1209 to the sealing faces, which must be free from oil and grease.
- Place the sump in position and screw it on firmly.

Tightening torque:

Retaining screws	*7 ± 1 Nm*
Oil drain plug	*32 ± 4 Nm*

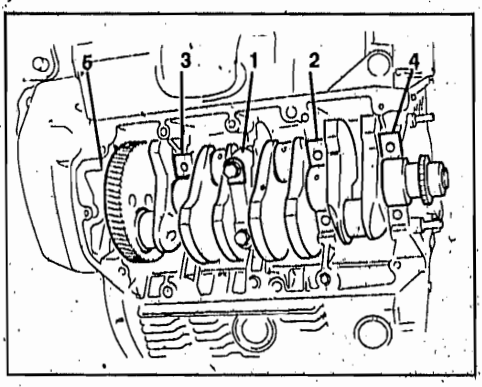
MEASURING MAIN BEARING PLAY

Measuring radial bearing play

- Turn the engine round on the assembly stand until the main bearings are at the top.
- The big end and main bearing journals must be clean and lightly coated with oil.
- Insert the crankshaft and install the correct bearing caps so that the grooves are aligned.

NOTE:
Bearing caps 1 - 3 are marked; bearing 4 (thrust bearing) and bearing 5 are not marked.

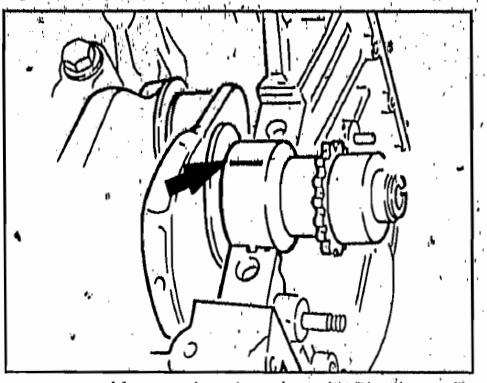
- Screw in the bearing bolts.



- Tighten the bearings to the correct torque and in the specified order, working from the inside outwards.

Tightening torque:
Bearing bolts *50 Nm*

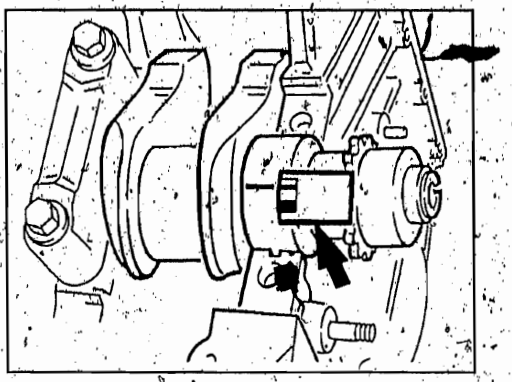
- The crankshaft should be turned so that the connecting rod is at bottom dead centre for the bearing to be measured.
- Turn the crankshaft on by approximately a further 30 degrees.
- Wipe oil off the bearing journal and bearing shell.



- Measure bearing play with Plastigage Type Pg-1, BMW No. 00 2 590.
- Place the Plastigage strip (arrow) over the full width of the bearing, 6 - 8 mm from the centre.
- Install the bearing cap and tighten the bearing bolts to the correct torque.

Tightening torque:
Bearing bolts *50 ± 6 Nm*

NOTE:
Do not turn the crankshaft any further.



- Take off the bearing cap again.
- Determine bearing play by comparing the width of the strip with the scale supplied (arrow).
  Bearing play: 0.220 - 0.056 mm
  Wear limit: 0.110 mm

IMPORTANT:
Measure each bearing separately.

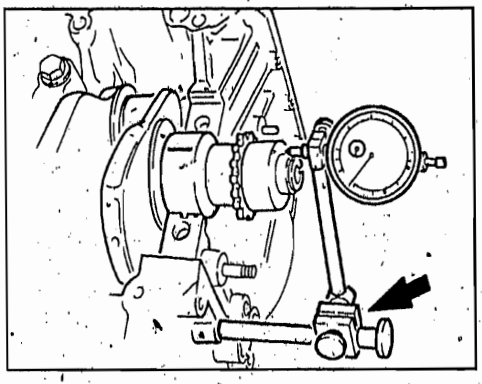
Measuring axial bearing play

- The main bearings must be clean and lightly oiled.
- Insert the crankshaft and align the grooves of the corresponding bearing caps.

> **NOTE:**
> Bearing caps 1 - 3 are marked; bearing 4 (thrust bearing) and bearing 5 are not marked.

- Screw in the bearing bolts and tighten them to the correct torque.

Tightening torque:
Bearing bolts *50 ± 6 Nm*



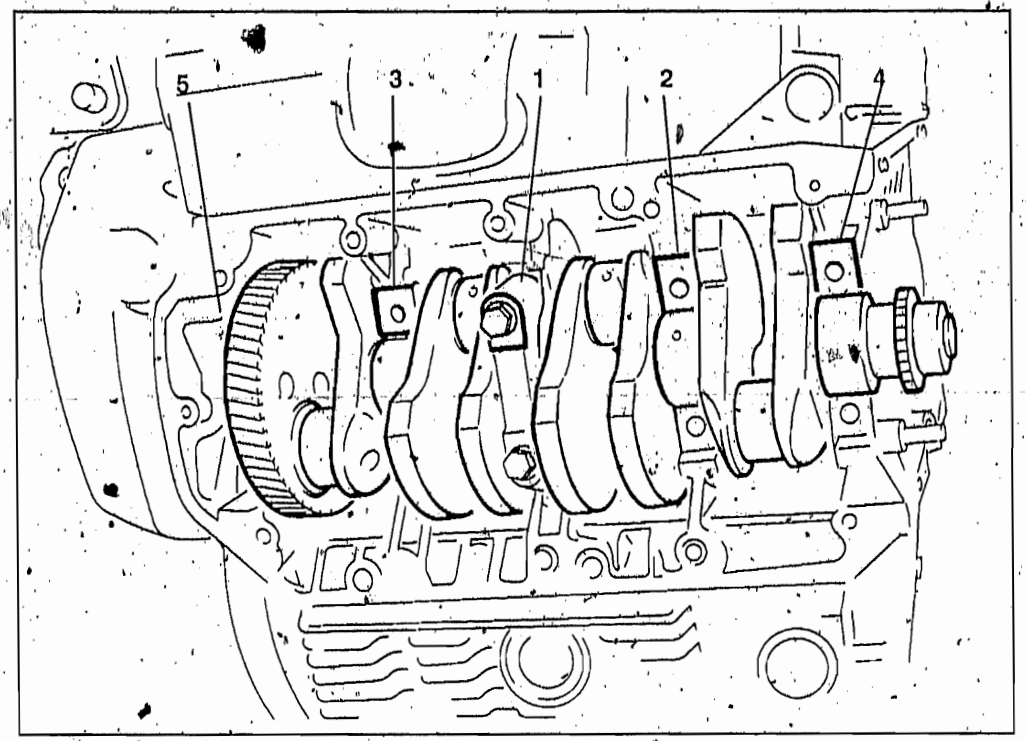
- Screw measuring device BMW No. 00 2 500 (arrow) with dial gauge into the tapped hole for the timing case cover.
- Using a large screwdriver against the crankshaft webs, move the crankshaft to and fro and read off play at the dial gauge.

Axial play:	0.080 - 0.183 mm
Wear limit:	0.130 mm

Measuring the crankshaft

- If measured bearing play is too large, the crankshaft must be re-measured.
- Wear stages (undersizes) 0 and 1 are available. The crankshaft is marked with the appropriate number of paint spots at the bearing point. Wear stage 0 has no paint spot.
- Crankshaft and bearings are matched together; make sure that the same paint marks appear on both items.

> **NOTE:**
> The crankshaft can only be reground in wear stage 0; after this it must be hardened and finished again.



INSTALLING THE CRANKSHAFT

- Oil the bearings lightly and place the crankshaft in them.
- Install the corresponding bearing caps so that the grooves are aligned.

> NOTE:
> Bearing caps 1 - 3 are marked; bearing 4 (thrust bearing) and bearing 5 are not marked.

- Screw in the bearing bolts.
- Tighten the bearing caps down to the correct torque and in the correct sequence, working from the inside outwards.

Tightening torque:
Bearing bolts *50 ± 6 Nm*

INSTALLING THE COMBINED OIL AND WATER PUMP

- Apply a thin coat of 3-Bond 1209 to the sealing faces, which must be free from oil and grease.
- Place a new O-ring on the water passage.
- Insert the drive pinion into the drive shaft with a lightly oiled O-ring, which must be in perfect condition.
- Place the pump housing in position and insert the retaining screws, but do not tighten them yet.

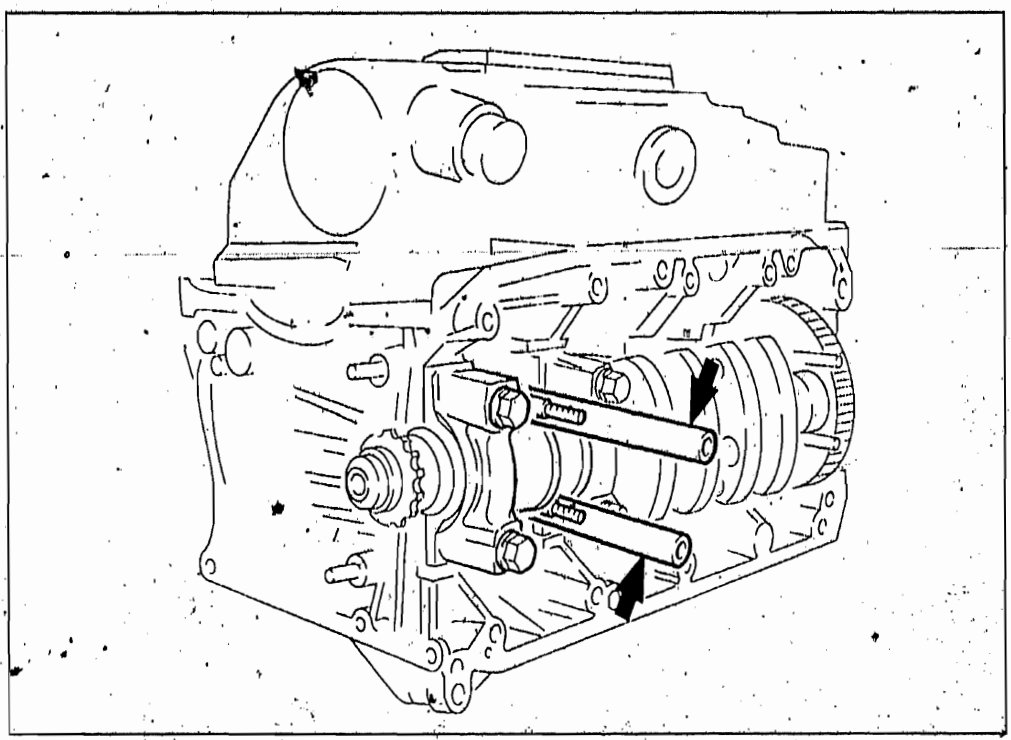
> **NOTE:**
> Turn the crankshaft several times to centre the gearwheels, tighten the housing screws gradually while doing so.

- Tighten the pump housing retaining screws to the correct torque.

Tightening torque:
Pump housing to crankcase *7 ± 1 Nm*

- Lead the cable for the oil pressure switch through the pump housing and connect it to the switch.
- Apply a thin coat of 3-Bond 1209 to the sealing faces, which must be clean and free from grease.
- Install the housing cover and tighten its retaining screws to the correct torque.

Tightening torque:
Cover to pump housing *7 ± 1 Nm*

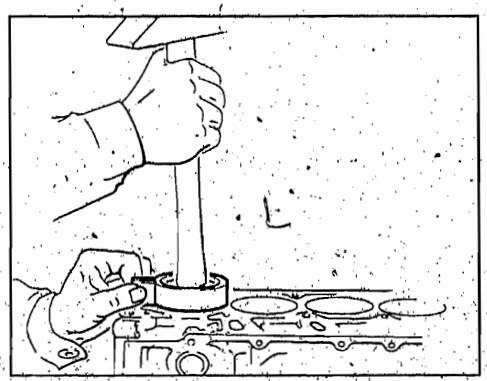


INSTALLING PISTON WITH CONNECTING ROD

- Push 50 mm long protective tubes (arrows) on to the big end bearing bolts, to prevent damage to the crankpins.
- Turn the crankshaft so that the crankpin concerned is at bottom dead centre.
- Offset the piston ring gaps by 120 degrees.

NOTE:
The position of the 2nd-groove ring gap is determined by a pin.

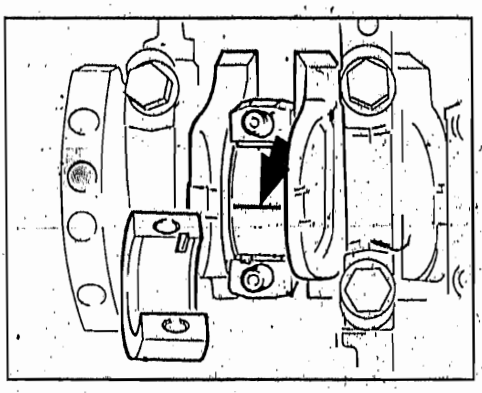
- Oil the piston rings, piston skirt and cylinder wall thoroughly.



- Using BMW No. 11 2 925 clamping strip, compress the piston rings; while doing so, turn the clamping strip to and fro slightly.
- Insert the piston with connecting rod into the cylinder.
- When it is inside the cylinder barrel, strike the piston crown with the handle of a hammer to push the piston further down the cylinder.
- The arrow on the piston crown must point towards the timing end of the engine.
- Make sure that all pistons are in the same weight class.

MEASURING BIG END BEARING PLAY

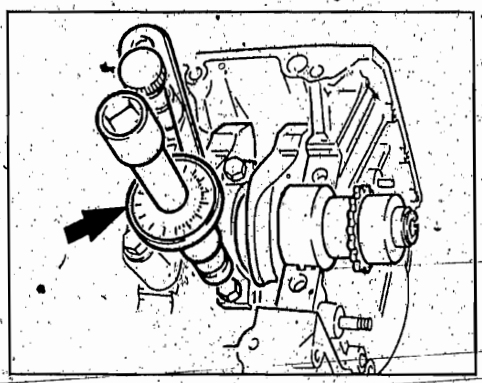
- Turn the crankshaft approximately a further 30 degrees beyond bottom dead centre.
- Wipe oil off the crankpin and bearing shell.



- Measure bearing play with Plastigage Type PG-1, BMW No. 00 2 550 (arrow). Place it over the full width of the bearing, 6 - 8 mm from the centre.
- Install the bearing cap with the correct mark so that the grooves are aligned, and tighten to the correct torque.

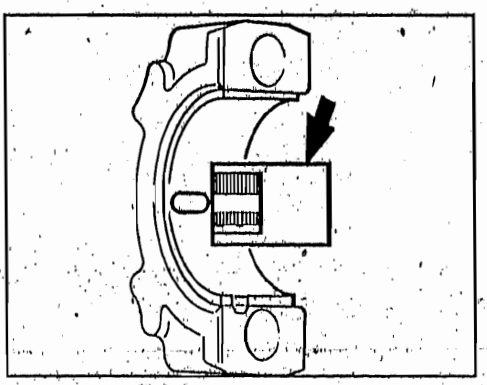
Tightening torque:
Nuts for big end bearing caps *30 ± 3 Nm*

NOTE:
Do not turn the crankshaft any further.



- Using BMW No. 11 2 210 angle gauge (arrow), tighten the big end bearing nuts to the final position.

Tightening angle *80° ± 3°*



- Unscrew and remove the bearing cap again, and compare the strip with the scale (arrow) to determine bearing play.

Bearing play: *0.030 - 0.066 mm*
Wear limit: *0.130 mm*

- If the bearing shells have to be renewed, note the matching colour marks on the crankpins and big end bearings.
- Wear stages (undersizes) 0 and 1 are available. The crankshaft has colour spot markings on the crankpin. No colour spot means wear stage 0.

NOTE:
The crankshaft can only be reground in wear stage 0; after this it must be hardened and finished again.

Installing the big end bearings

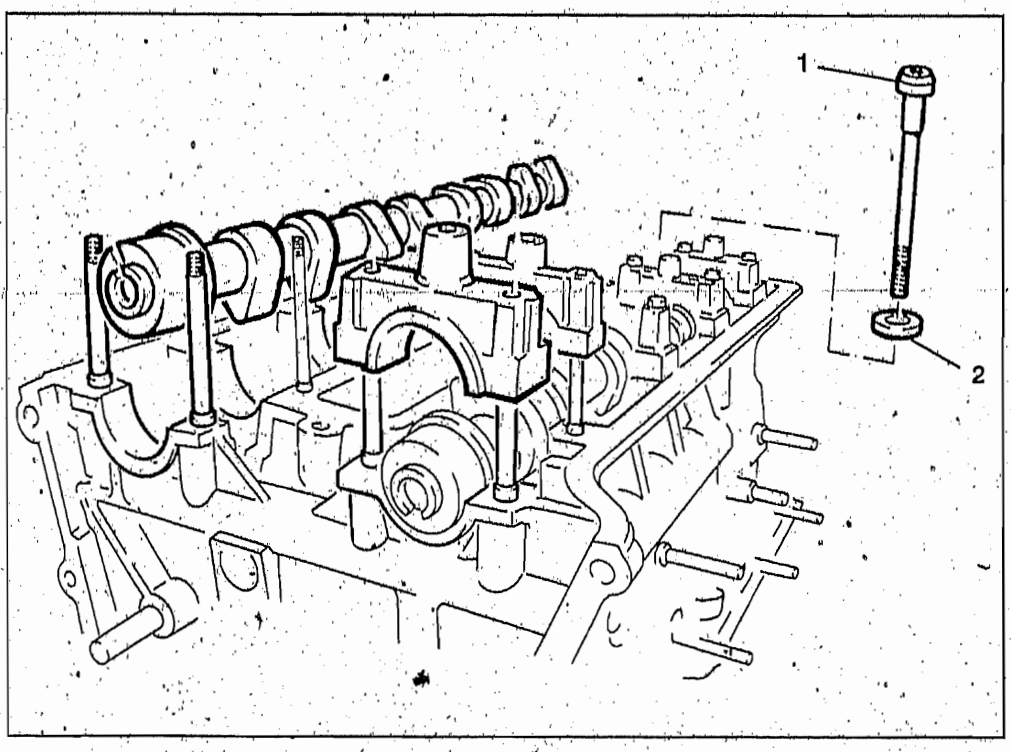
- Turn the crankshaft so that the crankpin for the cylinder concerned is at bottom dead centre.
- Apply engine oil to the crankpin.
- Move the piston with connecting rod to bottom dead centre.
- Pull the protective tube off the bearing bolts.
- Install the bearing cap so that the grooves are aligned, and tighten the nut to the specified torque.

Tightening torque:

Big end bearing cap nuts	*30 ± 3 Nm*

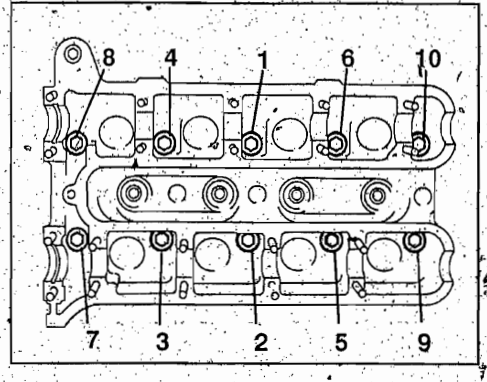
- Using BMW No. 11 2 210 angle gauge, tighten the big end bearing cap nut to the final position.

Tightening angle	*80° ± 8°*



INSTALLING THE CYLINDER HEAD

- Turn the engine on its assembly stand so that the cylinders are at the top.
- Move the piston in cylinder 1 to top dead centre (TDC). Cylinder 1 is at the timing end of the engine.
- Install a new cylinder head gasket, making sure than none of the passages in the cylinder head or engine block are blanked off.
- Place the cylinder head on the crankcase.
- Insert the cylinder head bolts (1) with washers (2).



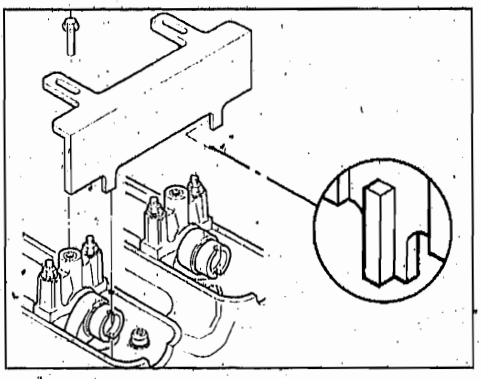
- Tighten the cylinder head bolts in the specified order.

Tightening torque:
Cylinder head bolts 45 ± 5 Nm

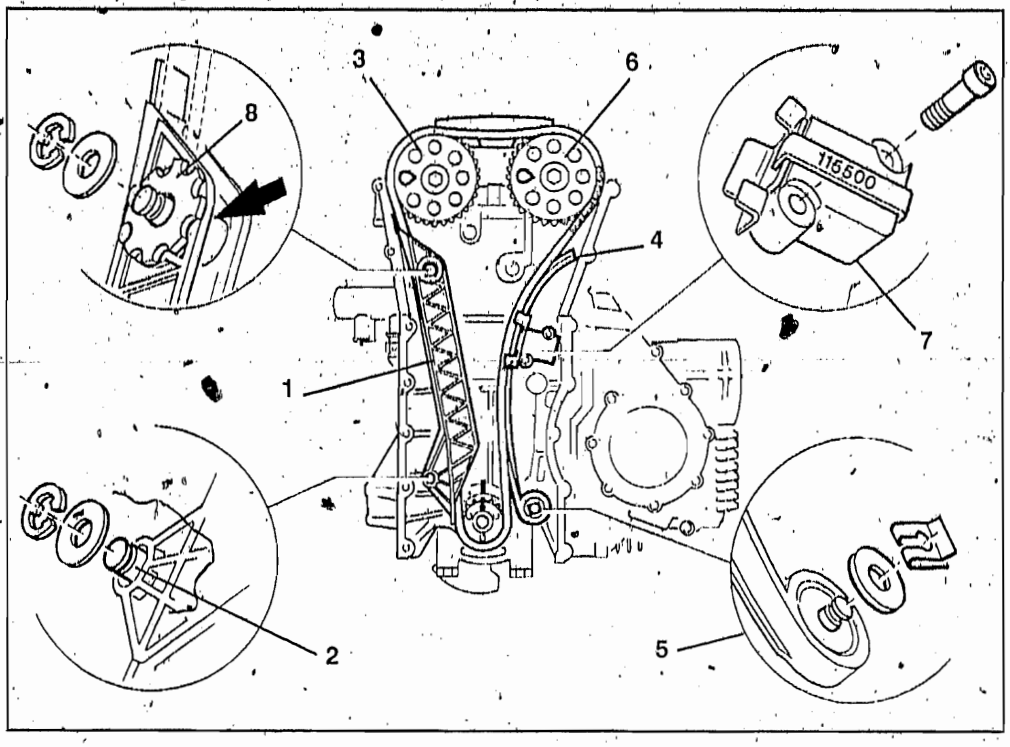
INSTALLING CAMSHAFTS

- The camshafts are marked so that they cannot be accidentally confused:
  Inlet camshaft: groove after the thrust bearing
  Exhaust camshaft: no groove
- The camshaft bearing caps are also identified:
  Inlet side: odd numbers
  Exhaust side: even numbers
- The numbering is from the front (timing end) to the rear.
- Oil the bearing points on the camshafts lightly before installing.
- Tighten the bearing caps uniformly, working from the inside outwards.
- Install the axial bearing (timing end) with chain guide last.

Tightening torque:
Bearing caps *9 ± 1 Nm*



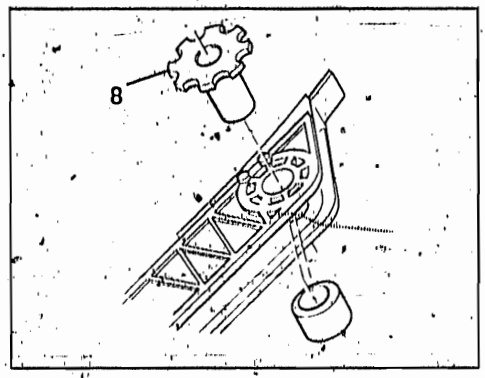
- Turn the camshafts so that the grooves on the endfaces are vertical in relation to the cylinder head.
- The grooves on the front end must point inwards, towards the crankshaft.
- Insert BMW No. 11 3 700 adjusting device and attach it to the camshaft bearings.



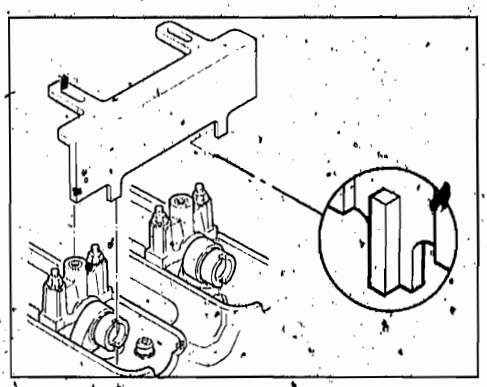
INSTALLING THE TIMING CHAIN

- Place the timing chain in the guide rail (1) and press in the spacing bushing (arrow).
- Place the timing chain round the crankshaft sprocket and press the guide rail on to the bearing pins.
- Secure the guide rail at the lower bearing pin (2) with a washer and clip.
- Install the inlet camshaft chain sprocket so that the timing chain is taut towards the guide rail.
- Insert the retaining screw by hand as far as possible.
- Press the tensioner rail (4) on to the bearing pin and secure with a large washer and clip (5).
- Install the exhaust camshaft chain sprocket so that the timing chain is as taut as possible between the sprockets.
- Insert the retaining screw by hand as far as possible.
- Compress the chain tensioner (7) fully and install and secure it with BMW No. 11 5 500 tensioning device.

Tightening torque:
Chain tensioner retaining screws 9 ± 1 Nm



- Press the notched disc (8) with eccentric shoulder a short distance into the chain guide rail spacing bushing.
- Turn the notched disc until the guide rail is touching the outer edge of the cylinder head.
- Press the notched disc in fully, until it engages with the two pins.
- Secure the notched disc with a small washer and clip.
- Remove the BMW No. 11 3 700 adjusting device.



- Tighten the chain sprocket retaining screws to the specified torque, preventing the camshafts from turning with an open-ended wrench on the hexagon flats.

Tightening torque:
Chain sprocket to camshaft *54 ± 6 Nm*

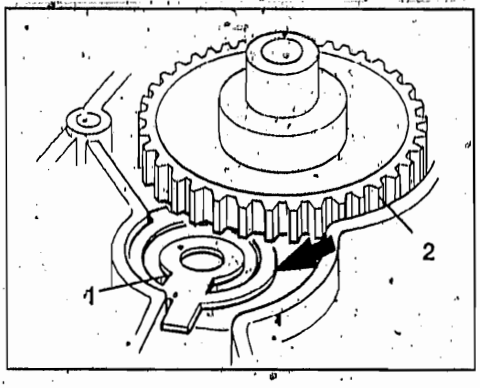
INSTALLING THE INTERMEDIATE FLANGE

- Turn the engine on its assembly stand until the output side is on top.

Installing freewheel

- First insert the complete freewheel with the helical gearwheel into the crankcase.
- Oil the needle roller bearing thoroughly.

Installing the countershaft



- Insert spring (1) with the large outer ring (arrow) projecting upwards and located behind the freewheel gear.
- Insert the countershaft (2) into the crankcase with the small gearwheel downwards.
- Apply a thin coat of 3-Bond 1209 to the mating surfaces, which must be free from oil and grease.
- Install the intermediate flange (with all locating sleeves in position) and tighten the retaining screws with Torx insert BMW No. 00 2 600.

Tightening torque:
Intermediate flange to crankcase *9 ± 1 Nm*

NOTE:
Do not forget the rubber filler in the starter motor area.

INSTALLING THE DRIVING ELEMENT

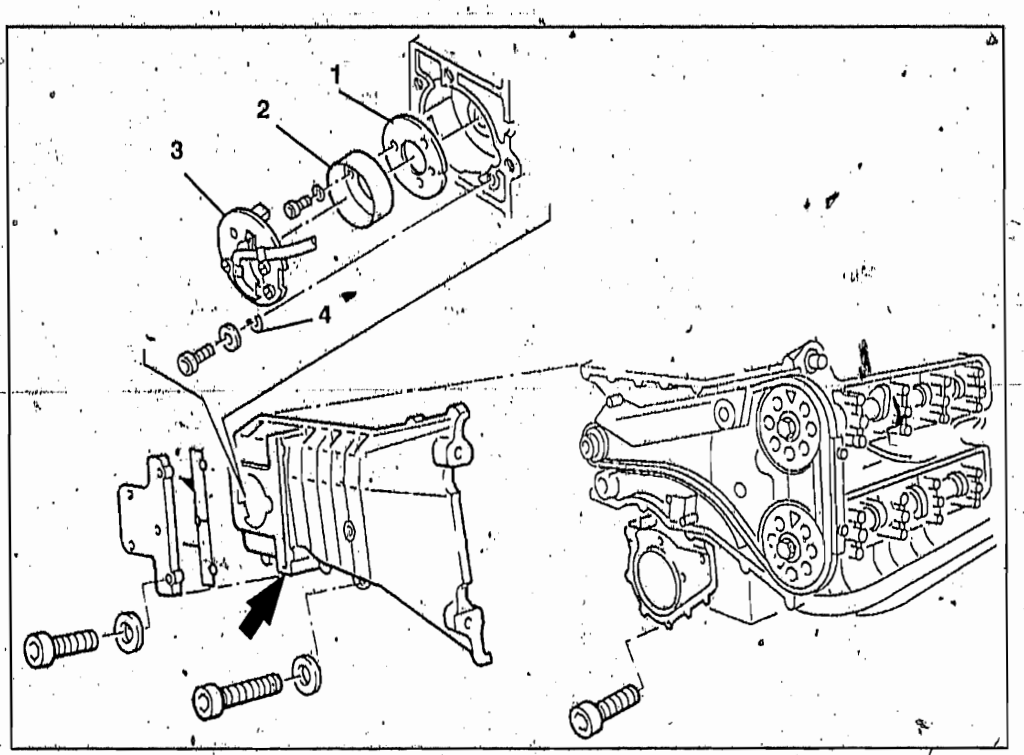
- Clean the thread in the layshaft and on the retaining screw to remove old Loctite.
- Push the driving element on to the layshaft.
- Apply a drop of Loctite 273 FL to the retaining screw, insert and tighten it.

Tightening torque:
Driving element to layshaft *33 ± 4 Nm*

INSTALLING THE ALTERNATOR

- Install the alternator with the rubber damping element and tighten the retaining screws.

Tightening torque:
Alternator to intermediate flange *22 ± 3 Nm*



INSTALLING THE TIMING CASE COVER

- Clean the mating surfaces and make sure that they are free from grease, then apply a thin coat of 3-Bond 1209.
- Insert the oil pressure switch cable through the cable duct (arrow) in the cover, and attach the cover.
- Insert the retaining screws and tighten to the correct torque.

Tightening torque:
Timing case cover to housing *7 ± 1 Nm*

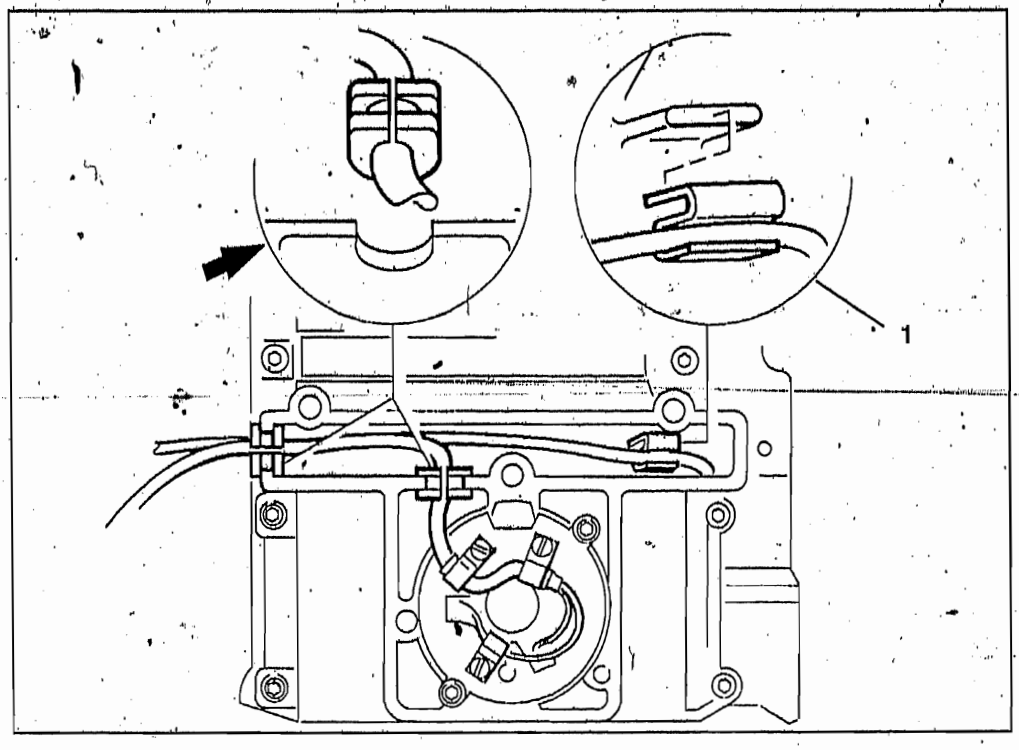
INSTALLING THE HALL-EFFECT TRANSMITTER

- Place adjusting disc (1) on crankshaft.
- Install gate rotor and tighten the retaining screws with washer.

Tightening torque:
Gate rotor to crankshaft *2.5 ± 0.5 Nm*

- Insert the Hall-effect transmitter baseplate into the timing case cover.
- The cutouts in the baseplate and the timing case cover must be aligned.
- Insert and tighten the retaining screws with washer and half-moon disc (4).

Tightening torque:
Baseplate to timing case cover *3.5 ± 0,5 Nm*

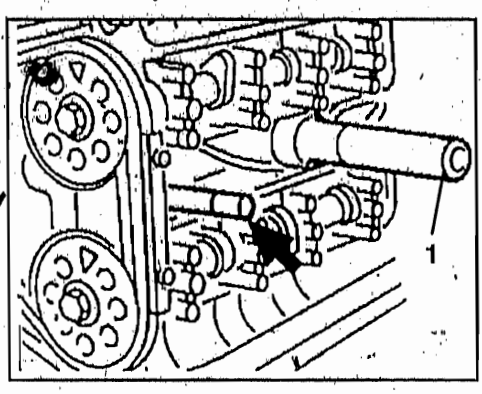


INSTALLING COVER FOR HALL-EFFECT TRANSMITTER

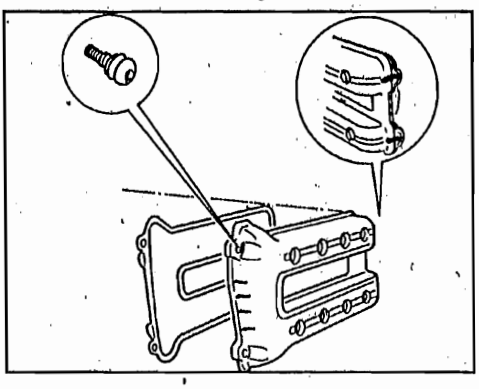
- Place the Hall-effect transmitter with the rubber grommets (arrow) in the timing case cover.
- Secure the oil pressure switch cable with clip (1).
- Run the cables together to the outside.
- Attach the Hall-effect transmitter cover with cork gasket, and tighten the retaining screws.

Tightening torque:
Hall-effect transmitter
cover to timing case cover *6 ± 1 Nm*

Installing the cylinder head cover



- Insert reamed bolt, BMW No. 11 1 980 (arrow) into the front inner hole.
- Press centering pin, BMW No. 11 1 990 (1) with handle, BMW No. 00 5 500 into the mounting under the third camshaft bearing.



- Insert the cylinder head cover gasket with half-moons first; the marks (arrows) on the cover and the gasket must be aligned at front and rear.
- Press the rear half-moons (gearbox end) in first.
- Lightly oil the gasket groove and the half-moon areas in the cover, to simplify assembly.
- Apply a small amount of sealant to the area where the joint faces meet on the timing case cover and cylinder head at top and bottom. These faces must be free from grease.

WARNING:
Handle solvents with care – health hazard.
Comply with the instructions supplied with these products.

- Place the cylinder head cover with gasket over the centering tools and on to the cylinder head.
- Insert all retaining screws until they cannot be screwed in any further without exerting pre-load.
- Tighten the retaining screws from the inside outwards, in a crosswise pattern.
- Remove the reamed bolt and centering pin. Insert and tighten the last retaining screw.

Tightening torque:
Cylinder head cover to cylinder head *8 ± 1 Nm*

NOTE:
Make sure that the cylinder head cover is fitted accurately, or leaks may occur.

COMPLETING THE ENGINE

- Install the throttle butterfly rail.
- Install the fuel injection rail.
- Install the air cleaner housing.

12. FUEL SUPPLY AND MIXTURE CONTROL

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CHECKING/ADJUSTING ZERO POINT ON THROTTLE POSITION SENSOR 12.7

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REMOVING AND INSTALLING COMPONENTS ON AIR CLEANER HOUSING . 12.12

- REMOVING AND INSTALLING NTC SWITCH FOR INTAKE AIR TEMPERATURE 12.12
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- REMOVING AND INSTALLING INJECTORS 12.15
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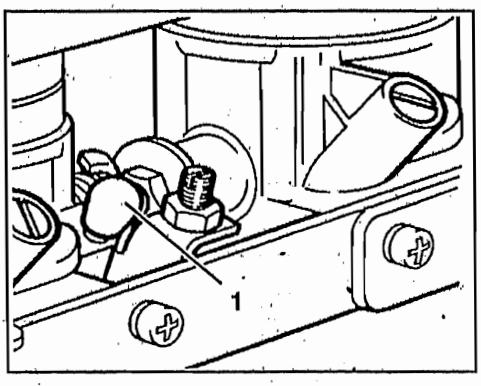
REMOVING AND INSTALLING MOTRONIC CONTROL UNIT 12.17

TROUBLESHOOTING 12.18

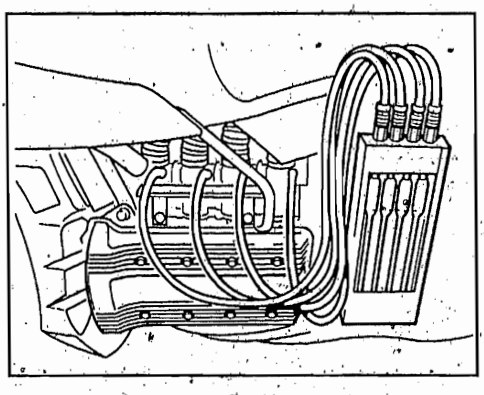
ADJUSTING ENGINE IDLING

NOTE:
Before engine idling is adjusted:
Engine must be at regular operating temperature.
Engine oil temperature app. 85° C.
Check zero point setting on throttle position sensor and adjust if necessary (see Page 12.7).

- Remove the left kneepad.
- Remove the left inner fairing cover.
- Remove the engine cover.
- Remove the left centre section of the fairing.

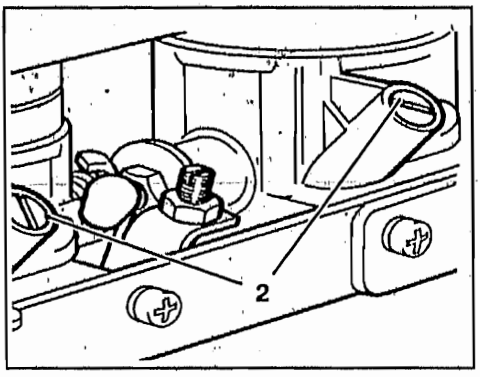


- Pull out the three plugs (1) on the vacuum connections.
- Detach the vacuum hose from cylinder 1.



- Connect the Synchrotester, BMW No. 13 0 700, with adapters BMW No. 13 0 702, to the vacuum holes at cylinders 2 – 4.
- Connect the Synchrotester to cylinder 1 with adapter BMW No. 13 0 703.
- Connect vacuum hose to adapter.
- Start the engine and allow it to idle.

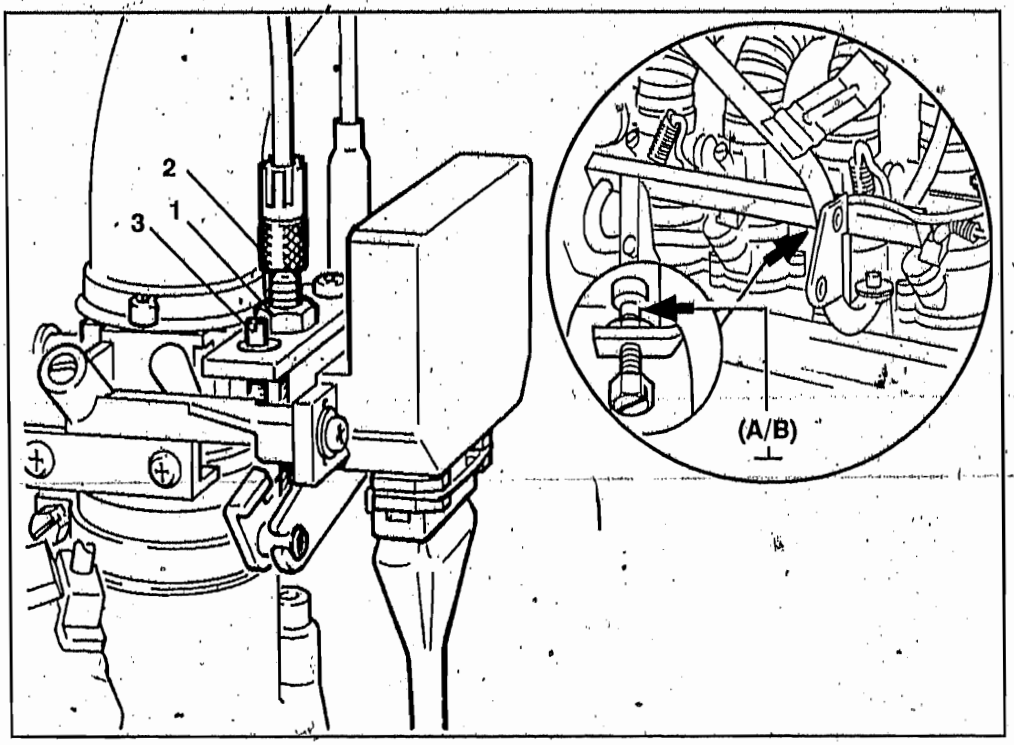
IMPORTANT:
After correcting idle speed, always adjust the CO content of the exhaust at idle speed at the CO potentiometer, to avoid an excessively lean or rich mixture.



- Turn the recirculating air screws (2) to the left or right until all cylinders run uniformly.

NOTE:
The four mercury columns in the Synchrotester must be at the same level.

Idle speed:
Nominal value *950 ± 50/min*



ADJUSTING INCREASED STARTING SPEED

- Remove the left kneepad.
- Remove the left inner section of the fairing.
- Separate the plug connectors for the auxiliary instruments.
- Remove the engine cover.
- Remove the left centre section of the fairing.

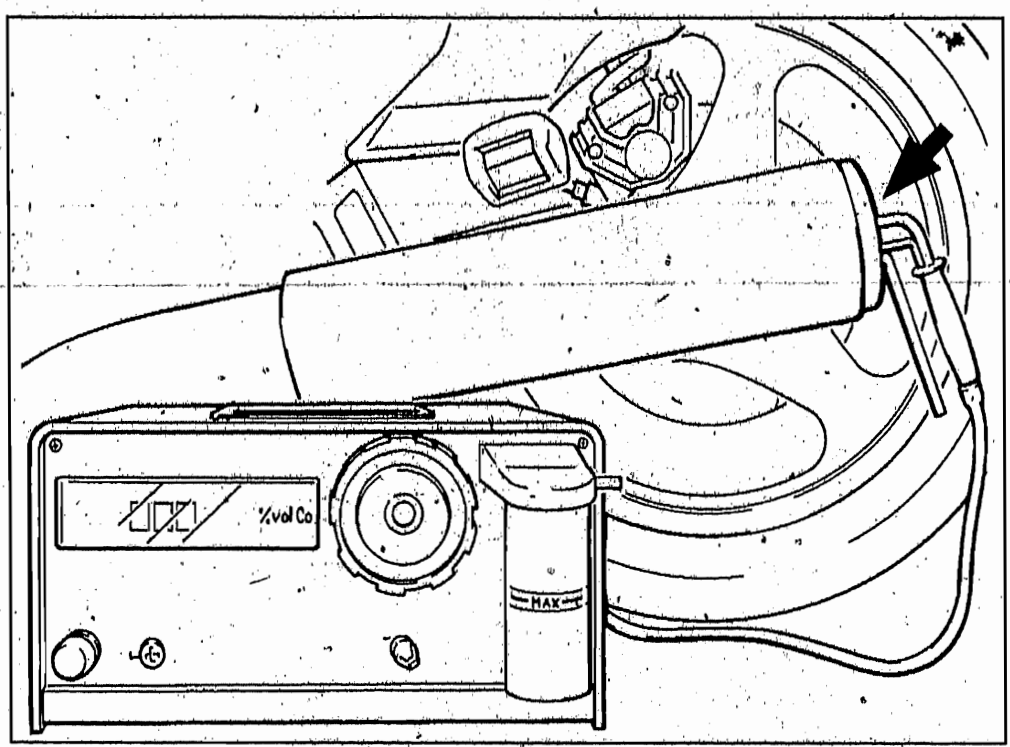
NOTE:
Play at the wire cable adjusting nipple must not exceed 1 mm.

- Move the cold-start control on the handlebar to position 1.
- Slacken off locknut (1).
- Turn adjusting screw (2) to obtain distance A at measuring point A/B.
- Retighten the locknut.
- Move the cold-start control on the handlebar to position 2.
- Turn adjusting screw (3) to obtain distance B at measuring point A/B.

Settings:

Distance A	*1.6 mm*
Distance B	*2.5 mm*

- Attach the fairing sections.

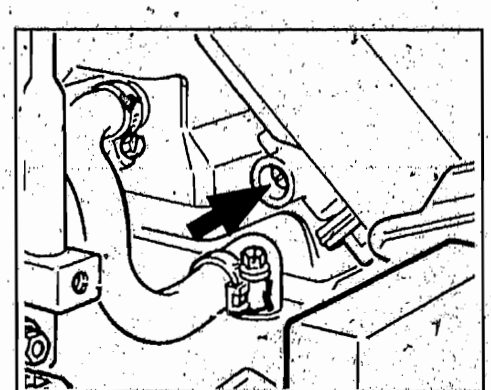


ADJUSTING CO CONTENT OF EXHAUST

- Comply with the instructions of the CO tester manufacturer.

NOTE:
Before adjustment is attempted:
The cold-start lever must be in position 0.
The ignition must be correctly timed.
The throttles must have been synchronized.
Engine idle speed 950 ± 50/min.
Engine at regular operating temperature (engine oil temperature app. 85°C).
No leaks in exhaust system.

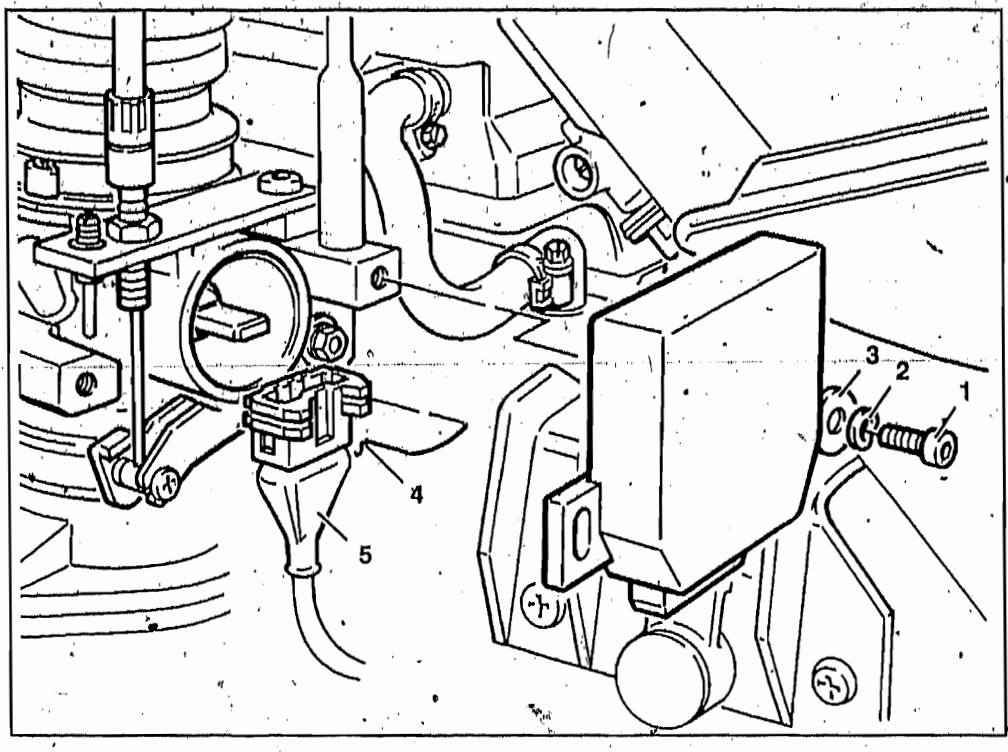
- Insert the measuring probe (arrow) app. 30 cm into the silencer.



- Turn the adjusting screw (arrow) on the CO potentiometer (on the central electric component box) to correct the CO value.

CO value:
Limit *1.5 ± 0.5 % by volume*

- Check engine idling again with the Synchrotester, BMW No. 13 0 700 and correct if necessary.



REMOVING AND INSTALLING THROTTLE POSITION SENSOR

- Take out the 2 retaining screws (1) at the throttle position sensor. Note washers (2/3).
- Pull th[redacted]e position sensor away from the throttle shaft.
- Release the wire keeper (4).
- Pull off the multi-pin plug (5).
- Install in the opposite order of work.

IMPORTANT:

Adjust the zero point on the throttle position sensor whenever it is removed and installed.

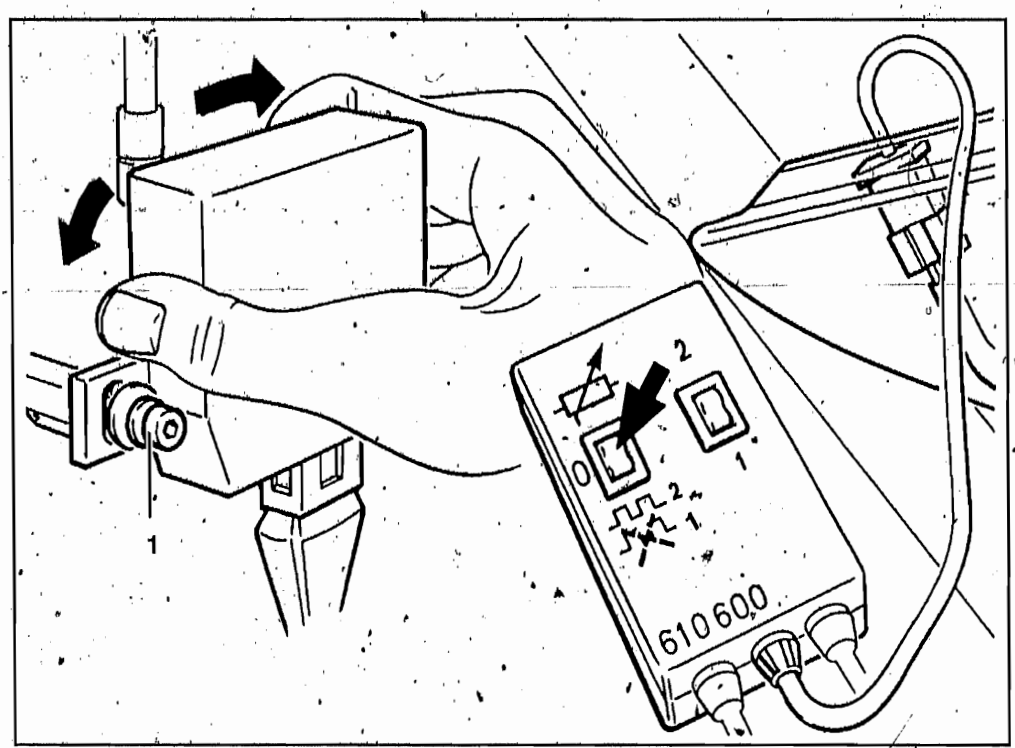
Adjust with the aid of BMW No. 61 0 600 Diagnosis Tester.

The throttle stop screws on the throttle rail are pre-adjusted to the nominal setting and secured with lacquer.

Do not alter the settings of the throttle stop screws.

If these settings are tampered with, the throttle rail will have to be re-calibrated on the flow tester.

After the correct settings have been restored, apply lacquer to prevent accidental or unauthorized tampering.



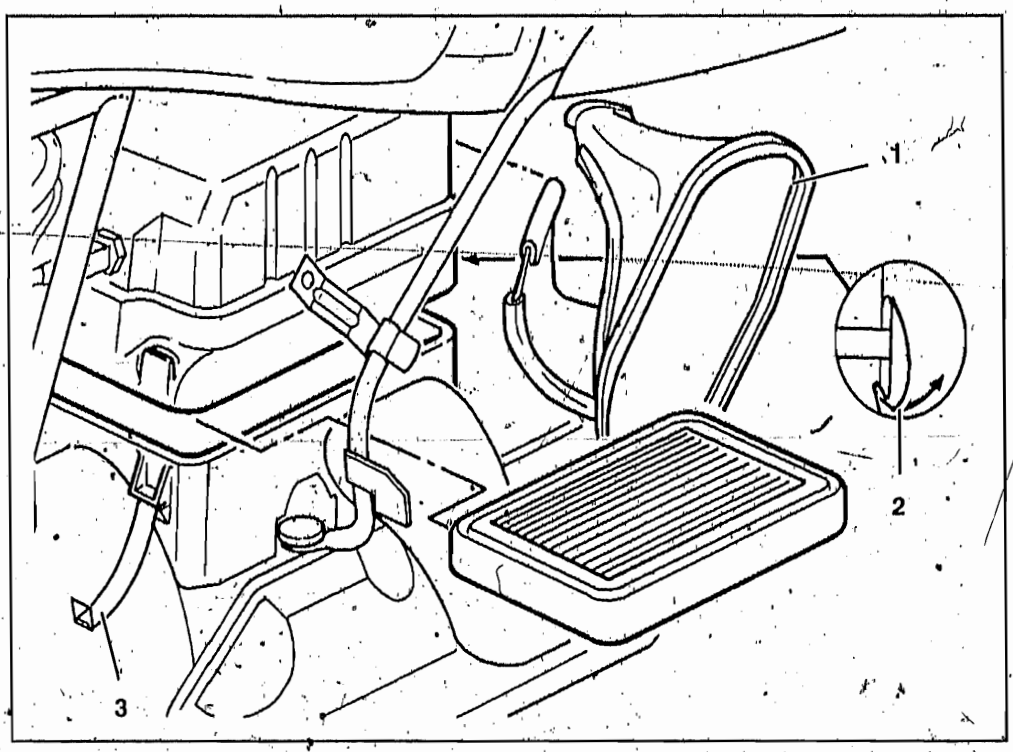
CHECKING/ADJUSTING ZERO POINT ON THROTTLE POSITION SENSOR

WARNING:
The throttle rail must be set to the precise engine idle setting.

- Connect the BMW No. 61 0 600 Diagnosis Tester to the diagnosis plug.
- Press the left switch (arrow) up until it locks into position.
- Switch on the ignition.

NOTE:
If the throttle position sensor is correctly adjusted, the overheat warning light will come on.
Adjust if this light fails to come on.

- Slacken off the 2 retaining screws (1) on the throttle position sensor.
- Turn the throttle position sensor to the left/right (arrows) until the overheat warning light comes on.
- Locate the throttle position sensor at this point.
- Tighten the retaining screws.
- Check that the setting has not altered.



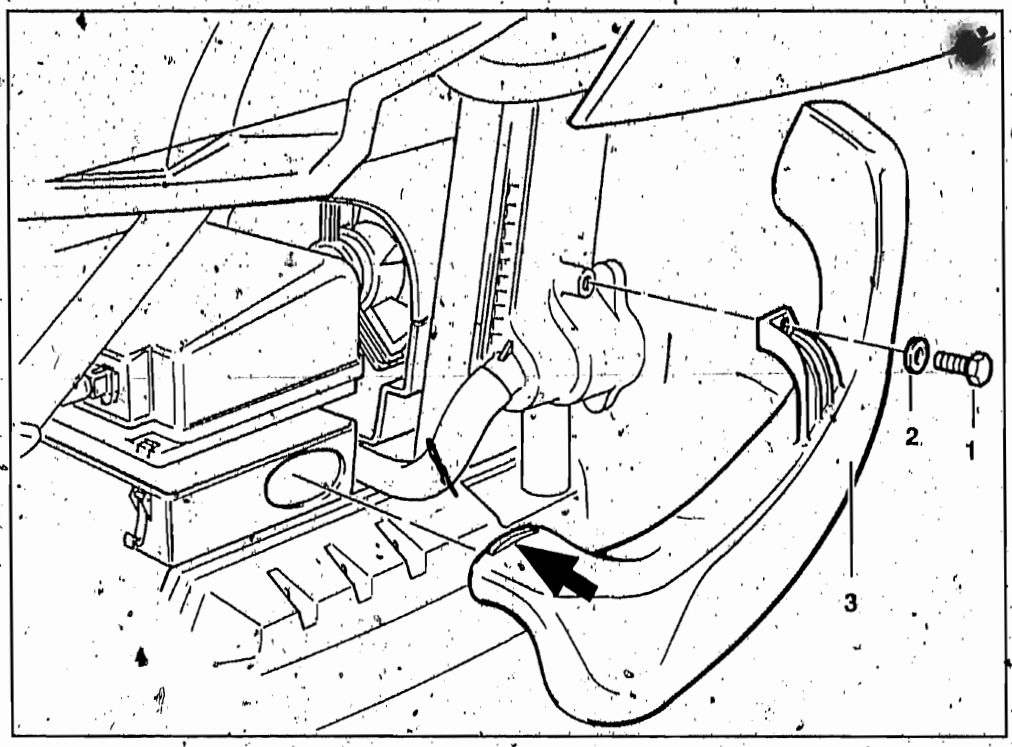
REMOVING AND INSTALLING AIR CLEANER ELEMENT

- Remove the right kneepad.
- Remove the right inner fairing cover.
- Remove the engine cover.
- Remove the right side fairing.
- Pull out the air duct (1), turning it slightly at the same time.
- Release the front clip (2) on the air cleaner housing.
- Release the two rear clips (3) on the air cleaner housing.
- Raise the upper section of the housing slightly.
- Pull out the air cleaner element.
- Install in the opposite order of work.

NOTE:

When installing:
Note correct position of air cleaner element. The inscription is at the back, looking forwards, and the "TOP/OBEN" arrow mark uppermost.

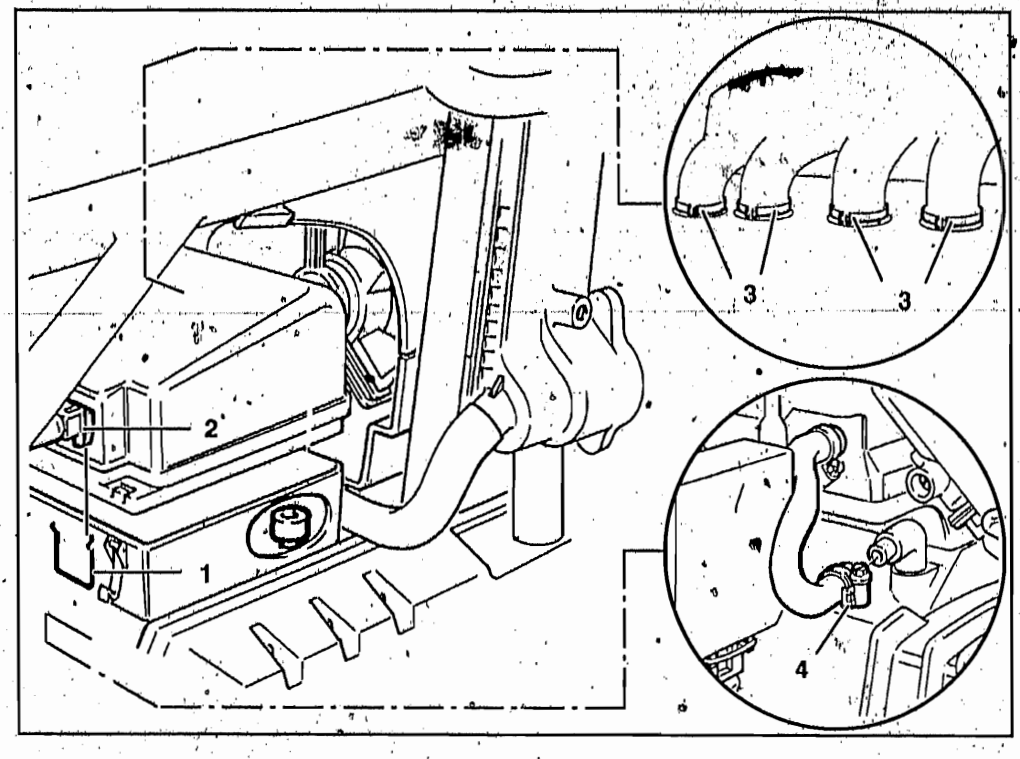
- After installing, check engine idle speed and adjust if necessary.



REMOVING AND INSTALLING INTAKE AIR DUCT

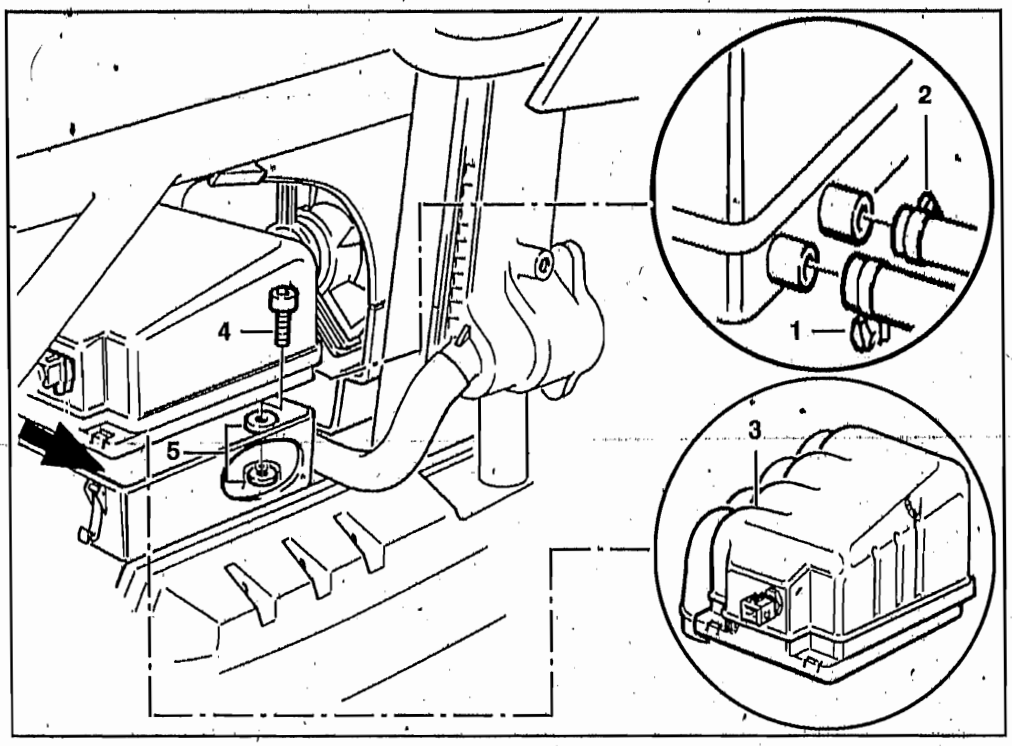
- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing covers.
- Remove the engine cover.
- Remove the left/right centre sections of the fairing.
- Take out the retaining screw with washer (1/2).
- Pull the air duct (3) out of the lower section of the air cleaner housing.
- Install in the opposite order of work.

NOTE:
When installing, make sure that the guide lugs (arrow) are correctly located in the lower section of the air cleaner housing.



REMOVING AND INSTALLING AIR CLEANER HOUSING

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the fuel tank pad.
- Remove the left/right inner fairing covers.
- Remove the engine cover.
- Remove the left/right centre sections of the fairing.
- Take off the fuel tank.
- Remove the right fairing holder.
- Take out the retaining screw with washer at the right intake air duct.
- Take off the air duct.
- Remove the air cleaner element.
- Release the wire keeper (1) at the plug (2) for the NTC connection, and pull off the plug.
- Use a lever-action cutter to open the 4 non-reusable hose clips (3) for the intake manifold at the throttle stub pipe.
- Pull off the intake manifold.
- Loosen hose clip (4) at the crankcase breather (engine end) and pull off the hose.



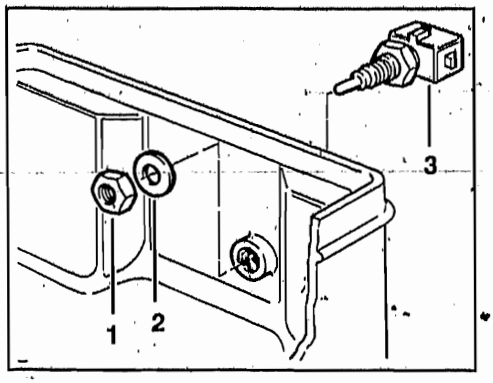
- Loosen the hose clip (1) at the oil return hose and pull off the hose.
- Loosen the hose clip (2) at the air return hose and pull off the hose.
- Turn the air collector (3) to the right (arrow) and take it out.
- Take the two retaining screws with washers (4/5) out of the lower section of the air cleaner housing.
- Remove the lower section of the housing to the right.
- Install in the opposite order of work.

Tightening torque:

Lower section of air cleaner housing to crankcase	*21 ± 1 Nm*
Intake air duct retaining screw	*9 Nm*

REMOVING AND INSTALLING COMPONENTS ON AIR CLEANER HOUSING

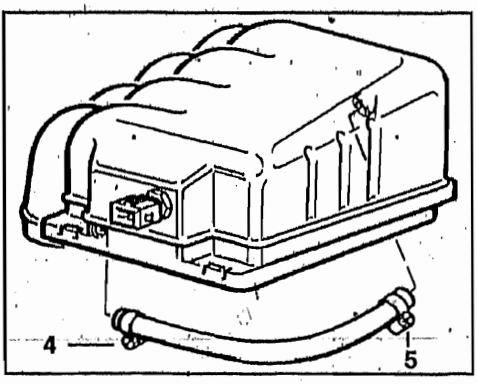
REMOVING AND INSTALLING NTC SWITCH FOR INTAKE AIR TEMPERATURE



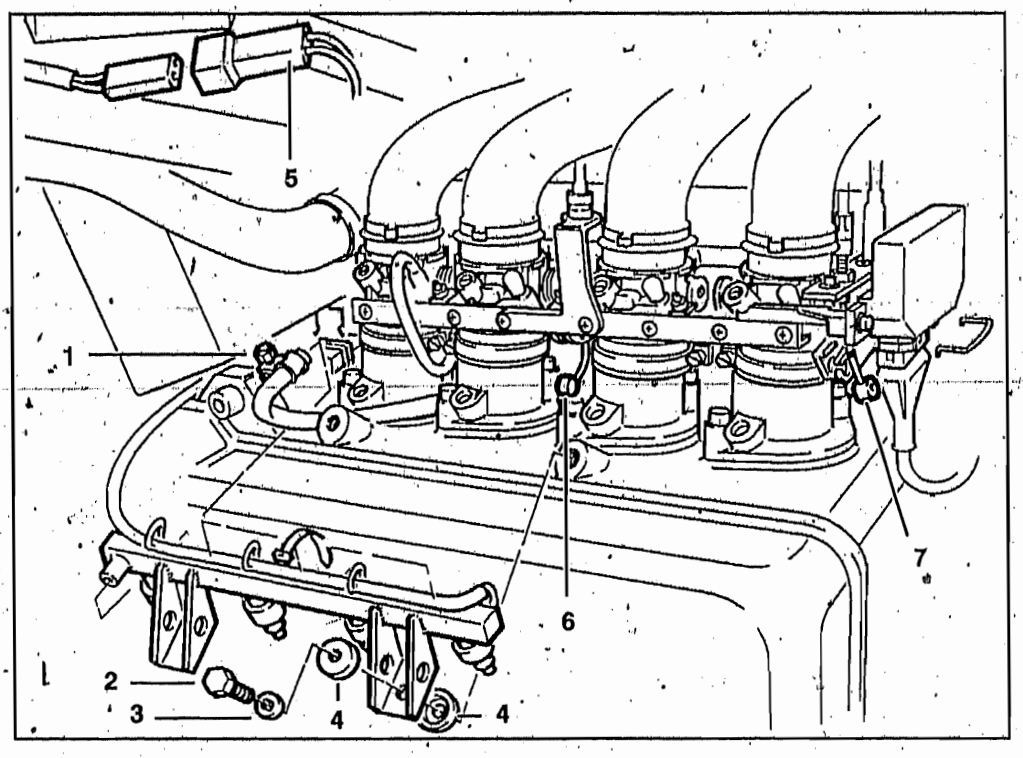
- Unscrew the retaining nut with washer (1/2).
- Take the NTC switch (3) out of the hole.
- Install in the opposite order of work.

NOTE:
When installing, the plug keeper must face upwards.

REMOVING AND INSTALLING OIL RETURN HOSE



- Loosen hose clips (4/5).
- Pull off oil return hose.
- Install in the opposite order of work.

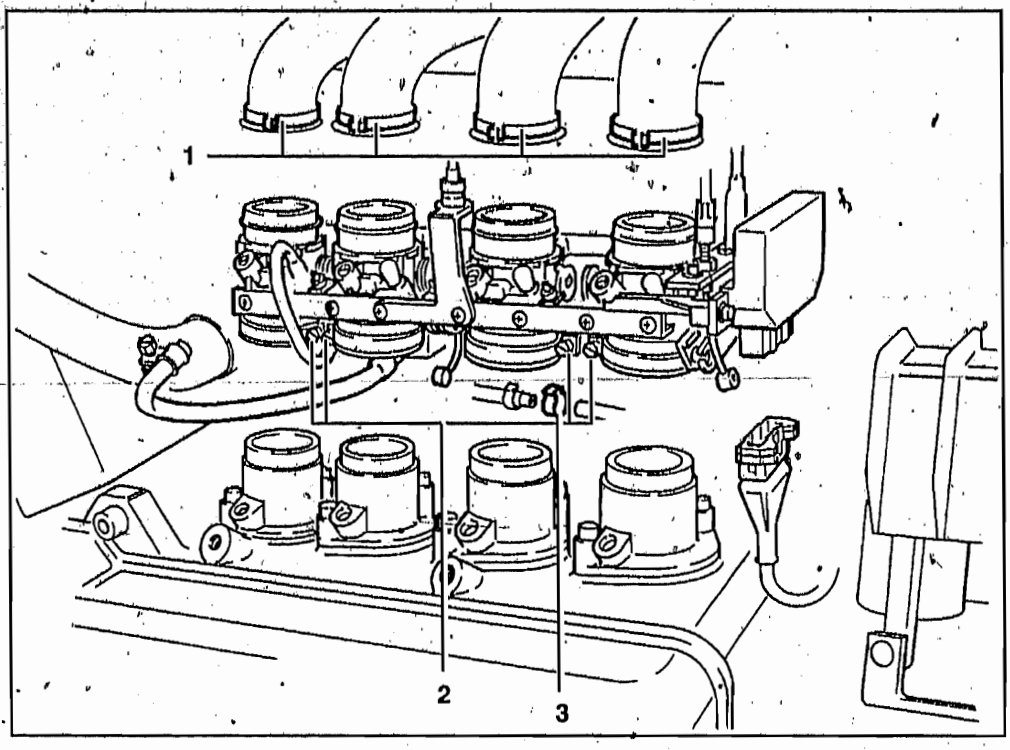


REMOVING AND INSTALLING THROTTLE RAIL

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the fuel tank pad.
- Remove the left/right inner fairing covers.
- Take off the fuel tank.
- Remove the engine cover.
- Remove the left centre section of the fairing.
- Remove the left holder for the centre section of the fairing.
- Loosen the hose clip (1) on the vacuum hose at the fuel injection rail and pull off the vacuum hose.
- Take the two retaining screws with spring washers and plain washers (2/3/4) out of the fuel injection rail.
- Pull out the fuel injection rail with injectors, and mask off the holes with adhesive tape.
- Detach the wire keeper at the temperature sensor plug and pull off the plug.
- Detach the wire keeper at the throttle position switch plug and pull off the plug.
- Separate the plug connection (5) for the illuminated increased engine speed indicator at its installation point below the fuel tank.

WARNING:
Do not kink the wire cables.

- Disconnect the throttle cable (6).
- Disconnect the cold start cable (7).



- Open the 4 non-reusable hose clips (1) at the throttle stub pipes with lever-action cutters.
- Loosen the 4 hose clips (2) at the engine-side stub pipes on the throttle rail.
- Pull the throttle rail out of the stub pipes.
- Open the non-reusable hose clip (3) for the air return hose at the air collector.
- Pull off the air return hose.
- Take off the throttle rail.

NOTE:

Do not remove the switch for the increased engine speed indicator and the pressure regulator unless the throttle stub pipe was renewed.

- Install in the opposite order of work.

NOTE:

When installing:

Make sure that the throttle shaft can move freely.

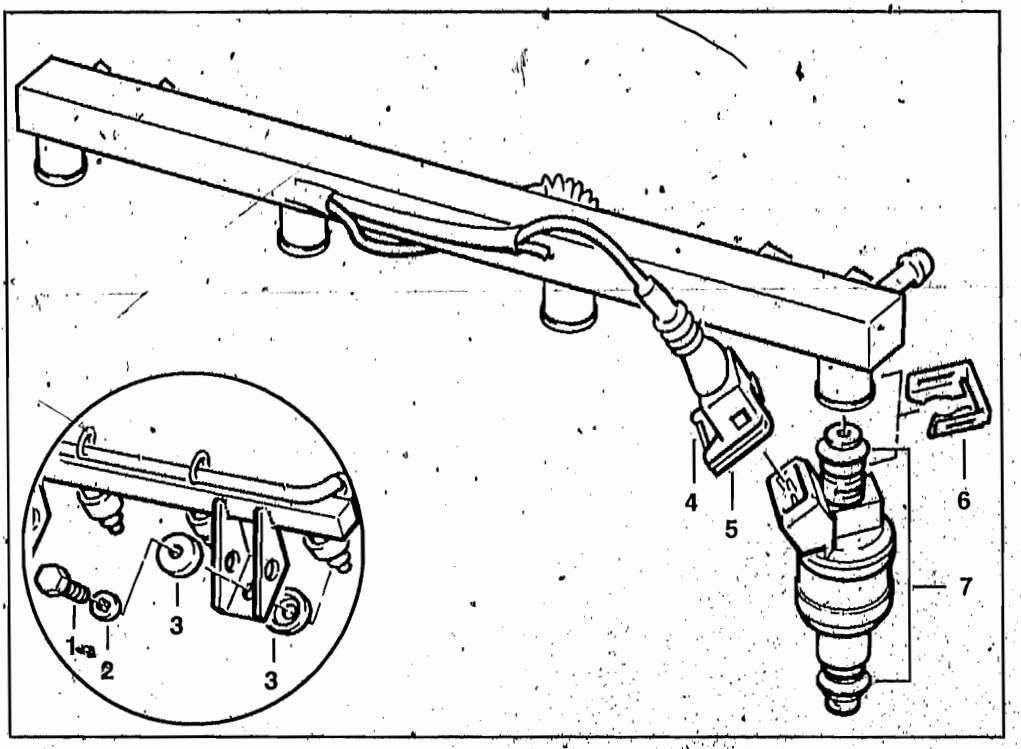
Note correct installed position of fuel hose at injector rail.

Position the clamp screws on the hose clips in pairs facing inwards alternately.

Tighten the non-reusable hose clips with BMW No. 13 1 500 pliers.

Secure the non-reusable hose clips on the throttle rail in parallel, facing outwards towards the cylinder head cover.

Check setting of increased engine speed device and correct if necessary.

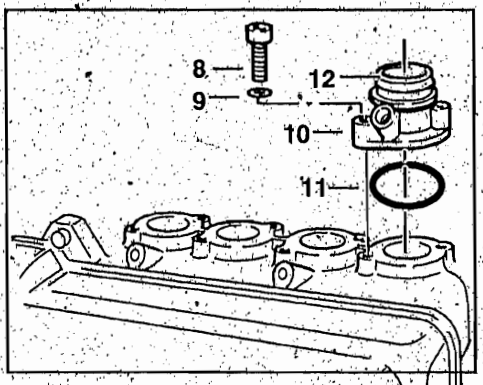


REMOVING AND INSTALLING INJECTORS

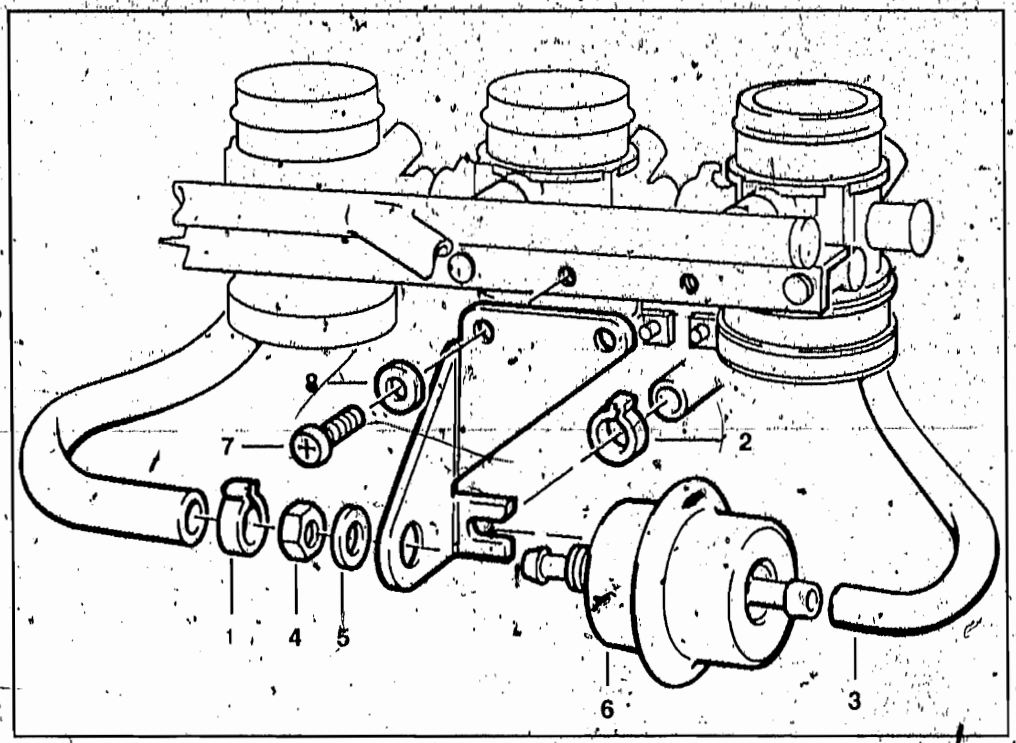
- Take the 2 retaining screws with spring and plain washers (1/2/3) out of the injector rail.
- Pull out the injector rail with injectors.
- Mask off the holes with adhesive tape.
- Release the wire keeper (4) on the injector plug.
- Pull off the plug (5).
- Release the clip at the injector/rail.
- Pull the injector out of the rail.
- Install in the opposite order of work.

NOTE:
When installing, avoid damage to the O-rings (7).

DETACHING AND ATTACHING INTAKE PIPE



- Take the 2 retaining screws with spring washers (8/9) out of the intake pipe.
- Take off the intake pipe (10). Note O-ring (11).
- Loosen the hose clip on the intake pipe socket.
- Pull off the socket (12).
- Install in the opposite order of work.

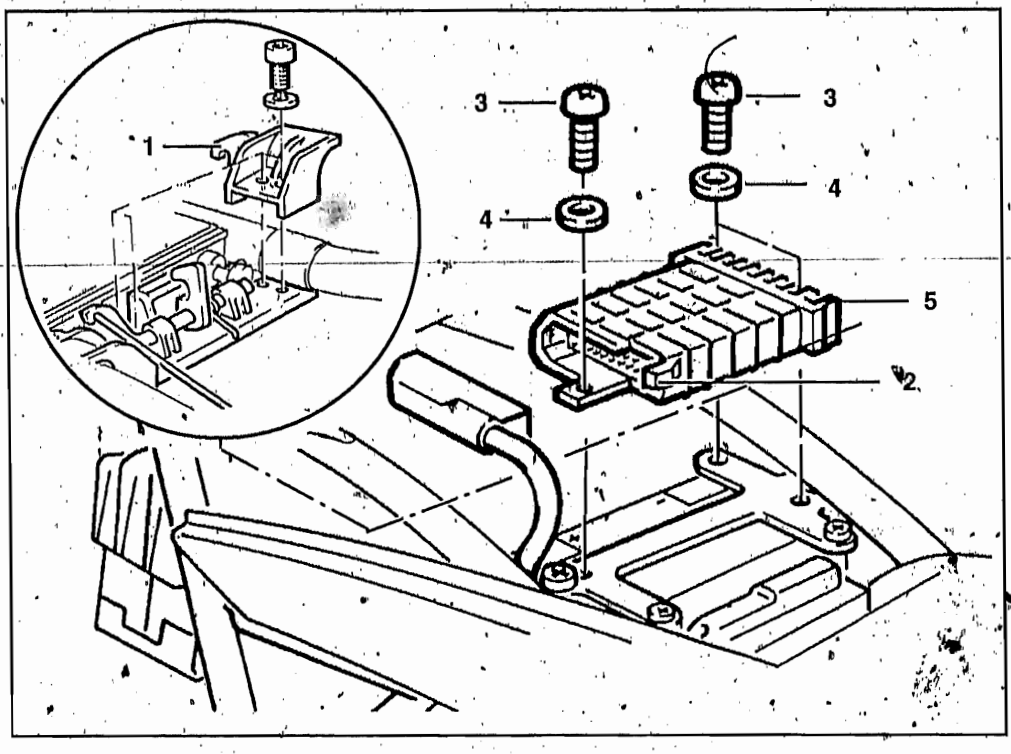


REMOVING AND INSTALLING PRESSURE REGULATOR

- Open up the non-reusable hose clip (1) on the fuel line with lever-action cutters.
- Pull off the fuel line.
- Open up the non-reusable hose clip (2) on the fuel line with lever-action cutters.
- Pull off the fuel line.
- Pull off the vacuum line (3).
- Unscrew the hex nut with washer (4/5).
- Detach the pressure regulator (6) from the mounting plate.
- Tale the 2 retaining screws with lock washers (7/8) out of the mounting plate.
- Take off the mounting plate.
- Install in the opposite order of work.

NOTE:
When installing, fasten the non-reusable hose clips with BMW No. 13 1 500 pliers.

Tightening torque:
Hex nut at pressure regulator mounting plate — *25 ± 3 Nm*



REMOVING AND INSTALLING MOTRONIC CONTROL UNIT

Tightening torque:
Retaining screws *5.25 Nm*

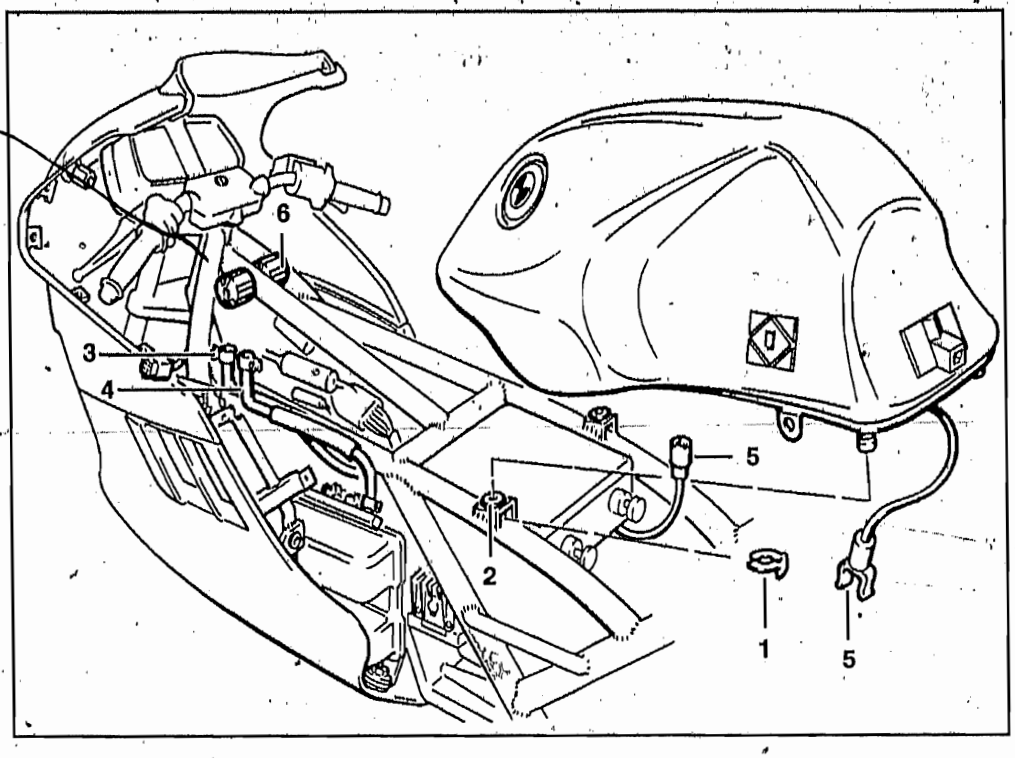
WARNING:
Switch off the ignition.
Disconnect the earth (ground) cable at the gearbox.
Insulate the earth cable.

- Remove the dualseat cover/dualseat.
- Unscrew and remove the dualseat catch mount (1).
- Release the snap-action safety catch (2) on the multi-pin plug and press it to one side.
- Remove the 3 retaining screws with washers (3/4) from the fuel injection control unit.
- Lift the fuel injection control unit (5) out to the rear, at the same time pulling the multi-pin plug out of the fuel injection control unit.
- Install in the opposite order of work.

13. FUEL TANK AND LINES

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REMOVING AND INSTALLING FUEL LEVEL INDICATOR	13.5
REMOVING AND INSTALLING FUEL PUMP	13.6
REMOVING AND INSTALLING FUEL LINES	13.7
CHECKING FUEL PUMP PRESSURE	13.8
TROUBLESHOOTING	13.9



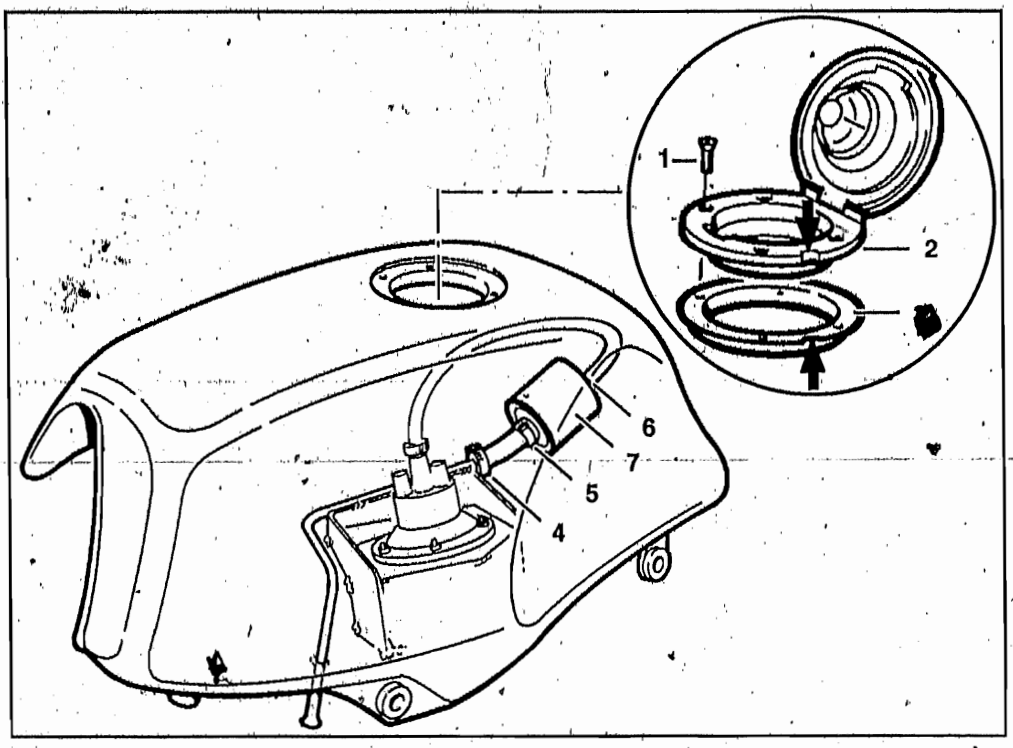
REMOVING AND INSTALLING FUEL TANK

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing covers.
- Separate the plug connectors for the auxiliary instruments.
- Remove the fuel tank pad.
- Using flat pliers, pull off the left/right retaining clips (1).
- Carefully lever the fuel tank out of rubber sleeves (2).
- Pull the fuel tank to the rear until the hose clips for the return and feed lines are accessible.
- Slacken off the return line hose clip (3).
- Slacken off the feed line hose clip (4). Pull off the plug connector (5) for the fuel pump/fuel level indicator.
- Raise the front of the fuel tank.

NOTE:
Use a cloth to mop up fuel which emerges from the feed line.

- Pull ogg the return/feed lines.
- Take off the fuel tank, noting the rubber supports (6).
- Install in the opposite order of work.

NOTE:
When attaching:
Moisten the rubber sleeves or coat them with tyre fitting paste.
Note the cable run to the multi-pin plug.

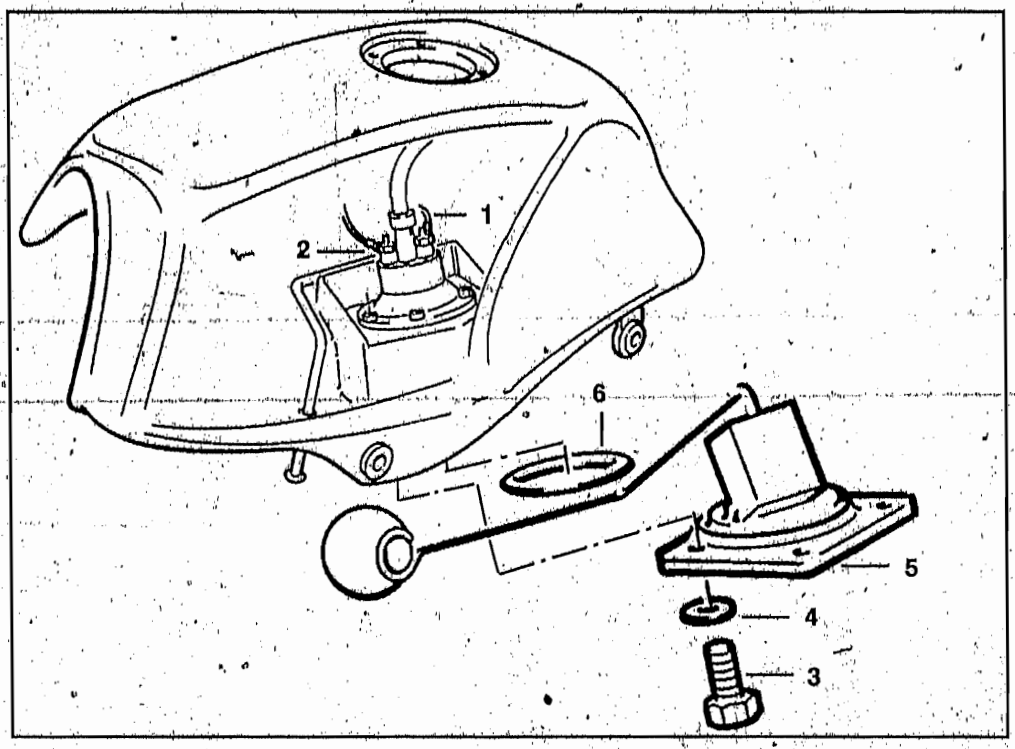


REMOVING AND INSTALLING FUEL FILTER

- Open the fuel filler cap.
- Lower the fuel level in the tank with a hand pump until the filter is exposed.
- Take out the 4 retaining screws (1).
- Take out the fuel filler pipe with seal (2/3).
- Loosen the hose clip (4) at the pipe end and push it on to the pipe.
- Pull the pressure line off the pipe.
- Pull the pressure line with fuel filter out of the tank.
- Loosen hose clips (5/6).
- Pull off hoses at top and bottom.
- Take off fuel filter (7).
- Install in the opposite order of work.

NOTE:

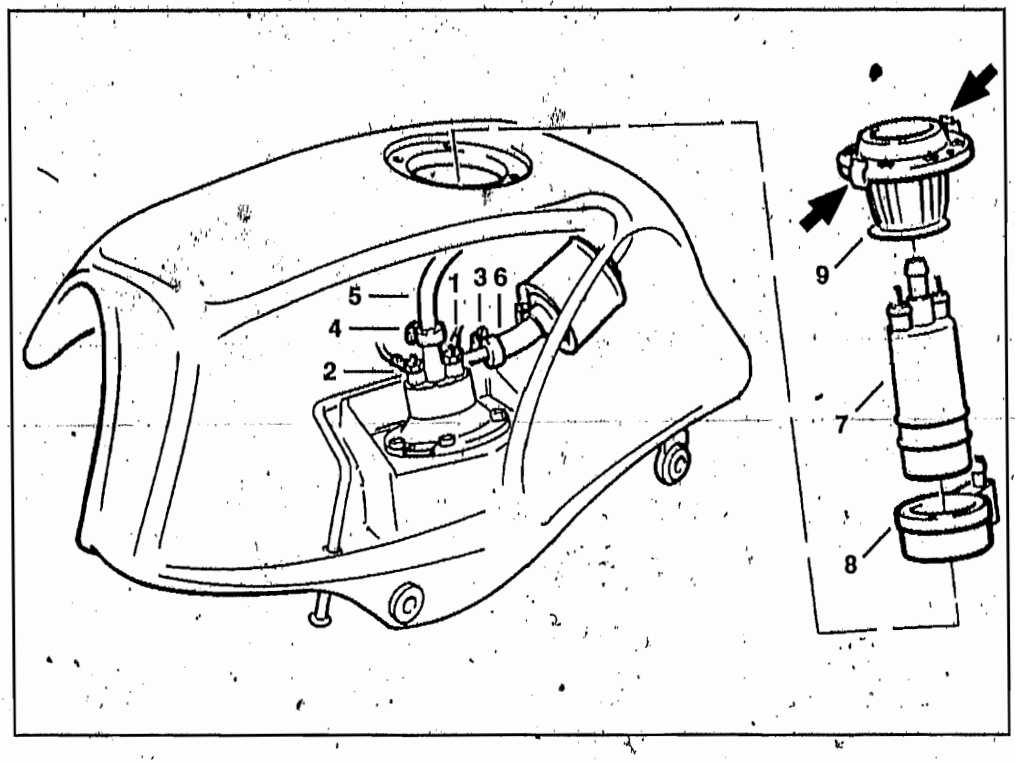
When installing:
Note the marks indicating the correct installed position (direction of fuel flow) on the fuel filter.
Seal (3) must not block the overflow hole.
Note cutouts (arrows) in fuel filler cap/ seal.



REMOVING AND INSTALLING FUEL LEVEL INDICATOR

- Drain the fuel tank and take it off.
- Remove the fuel filler pipe with seal.
- Disconnect the positive and negative cables (1/2) at the fuel pump.
- Take out the 4 retaining screws with washers (3/4) at the fuel level indicator.
- Remove the fuel level indicator with sealing ring (5/6).
- Install/attach in the opposite order of work.

NOTE:
When installing:
Note correct installed position of seal (6).
Check that the float lever is free to move.
Cable connections:
Positive pole = yellow cable, M 4 thread
Negative pole = black cable, M 5 thread.
The fuel filler pipe seal must not block the overflow hole.

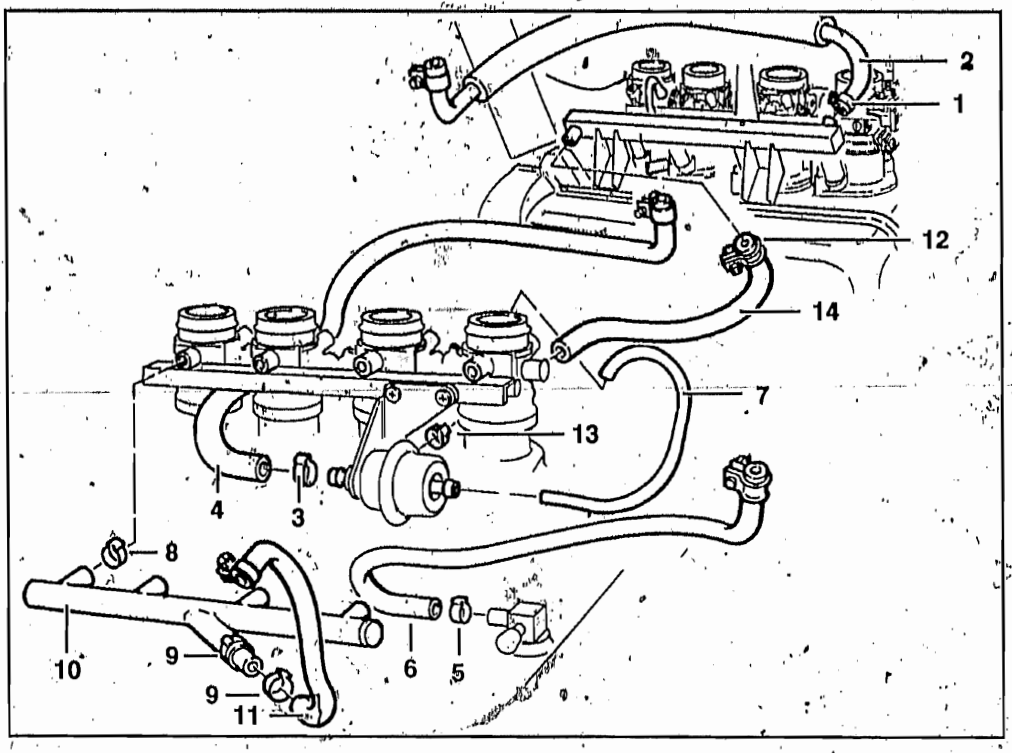


REMOVING AND INSTALLING FUEL PUMP

- Drain the fuel tank and take it off.
- Remove the fuel filler pipe with seal.
- Disconnect the positive and negative cables (1/2) at the fuel pump.
- Loosen the hose clips (3/4) at the fuel pressure lines.
- Pull off the fuel pressure lines (5/6).
- Press together the spring clips (arrows) at the retaining ring.
- Pull out the fuel pump (7).
- Pull the fuel filter (8) off the fuel pump.
- Pull the anti-vibration jacket (9) with retaining ring off the fuel pump.
- Install/attach in the opposite order of work.

NOTE:

When installing:
Push the anti-vibration jacket on to the fuel pump until it is felt to engage.
Make sure that the marking arrows of the fuel filter and vibration damper are aligned.
Cable connections:
Positive pole = yellow cable, M 4 thread
Negative pole = black cable, M 5 thread.
The positive pole of the fuel pump must be opposite the plus mark on the retaining ring.
Install with both marks on the left in the fuel tank, looking forwards.
The fuel filler pipe seal must not block the overflow hole.



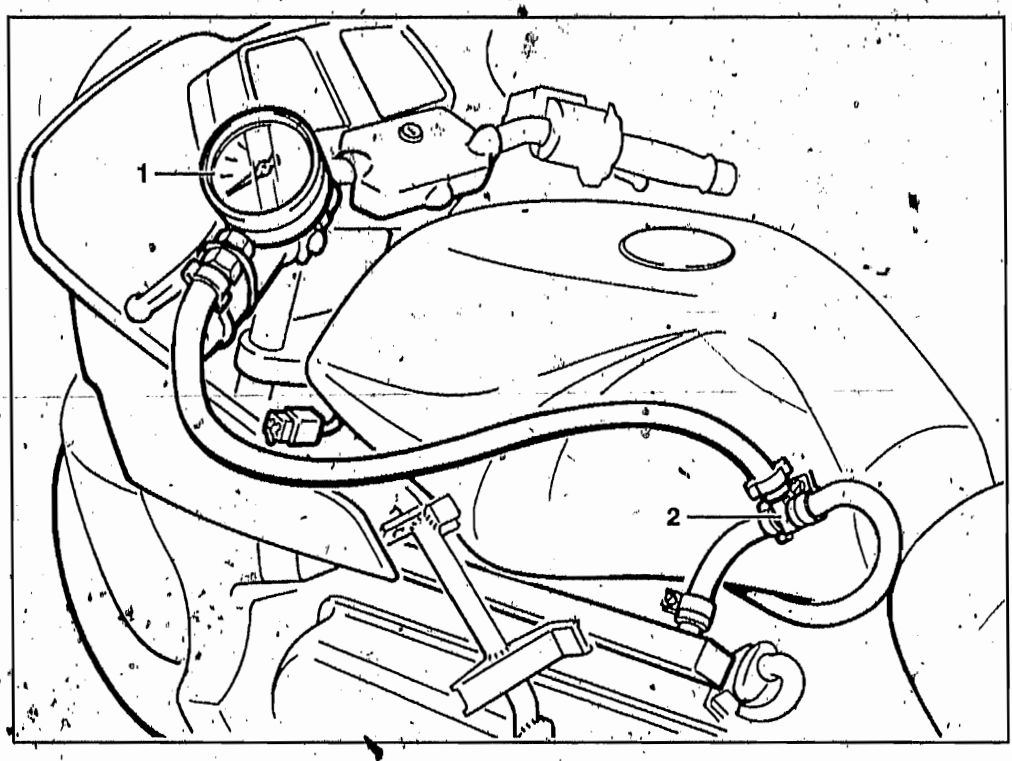
REMOVING AND INSTALLING FUEL LINES

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing covers.
- Separate the plug connectors for the auxiliary instruments.
- Remove the engine cover.
- Remove the left and right centre sections of the fairing.
- Remove the fuel tank pads.
- Take off the fuel tank.
- Remove the air collector.
- Remove the lower section of the air cleaner housing.
- Loosen the hose clip (1) on the pressure line.
- Pull off the fuel line (2) at the injector rail.
- Unfasten the non-reusable hose clip (3) at the pressure regulator.
- Pull off the fuel line (4).
- Open the non-reusable hose clip (5) at the engine end of the oil return line.
- Pull off line (6).
- Pull off the vacuum hose (7) at cylinder 1 and the pressure regulator.
- Open the 4 non-reusable hose clips (8) on the throttle butterfly rail.
- Open the 2 non-reusable hose clips (9) at the fuel distributor.
- Pull off the fuel lines (10/11).
- Loosen hose clip (12).
- Open non-reusable hose clip (13). Pull off the fuel line (14) at the injector rail and pressure regulator.
- Install/attach in the opposite order of work.

NOTE:

When installing:

Fasten the non-reusable hose clips with BMW No. 13 1 500 pliers.



CHECKING FUEL PUMP PRESSURE

- Remove the left kneepad.
- Remove the left inner fairing cover.
- Separate the plug connectors for the auxiliary instruments.
- Remove the engine cover.
- Remove the left centre section of the fairing.
- Connect the test pressure gauge (1), BMW No. 16 1 500, to the left handlebar fitting.
- Pull the fuel feed line off the fuel tank or the injector rail.
- Connect the test gauge in between, using adapter (2).
- Start the engine and allow to idle.
- Read off the delivery pressure at the pressure gauge.

Nominal value:

Pump pressure	*2,5 bar*

NOTE:
If the nominal pump pressure is not reached, renew the fuel pump.

- Remove the pressure gauge and reconnect the fuel lines.
- Attach the various sections of the fairing.

TROUBLESHOOTING

Engine turns over but does not fire.

Check fuel tank.
Is it empty?
yes → Add fuel to tank.
no

Check cold start control setting on handlebar.
Is it incorrect?
yes → Reset cold start lever to correct position.
no

Check fuel tank venting system.
Is it defective?
yes → Repair the fuel tank venting system.
no

Check air cleaner.
Is it blocked with dirt?
yes → Renew air cleaner element.
no

Check intake air ducts.
Are there any leaks?
yes → Eliminate leaks.
no

Check spark plugs and ignition system.
Are spark plugs wet/no spark occurring?
yes → • Dry or renew spark plugs.
• Repair defects in ignition system.
no

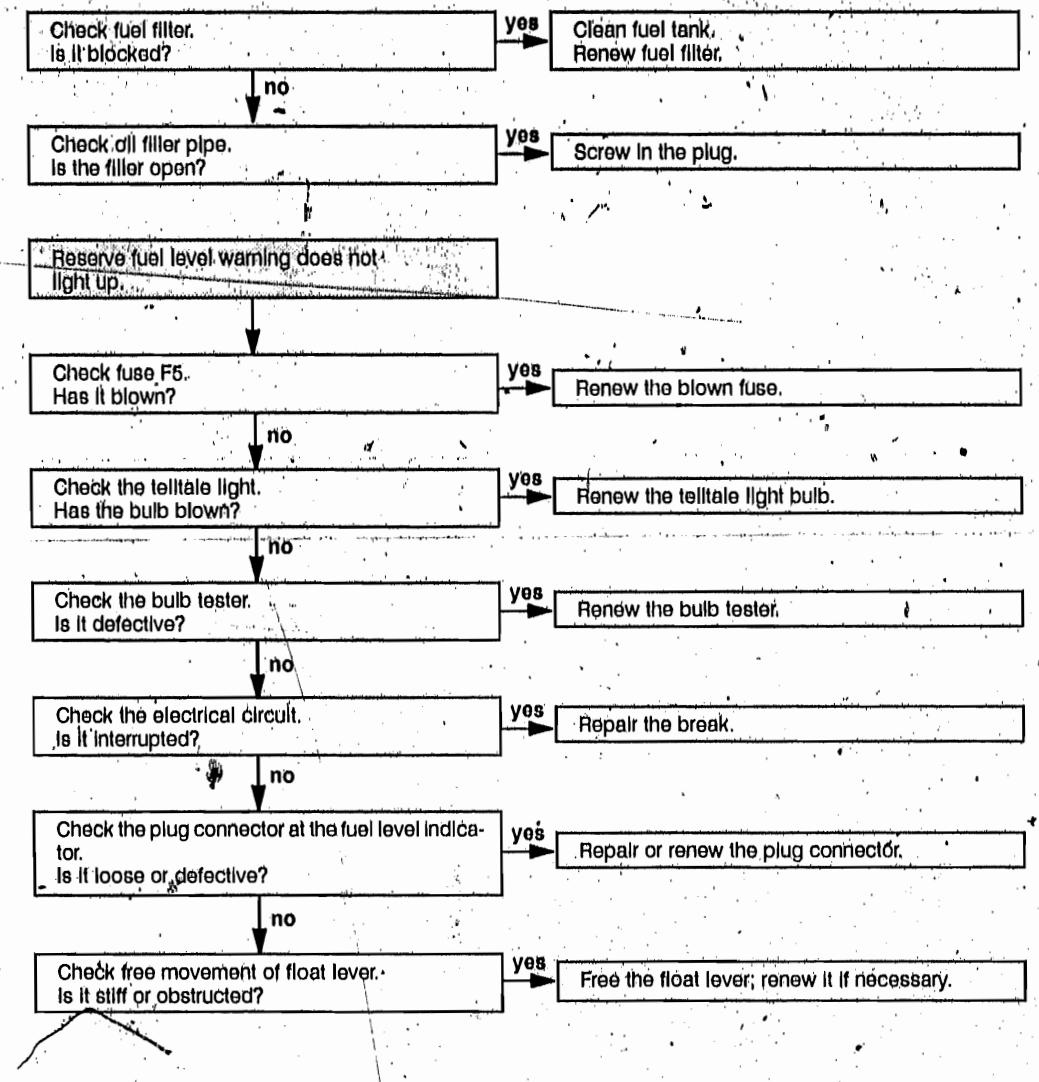
Check fuse F6.
Has it blown?
yes → Renew blown fuse.
no

Check fuel flow rate.
Is it too low or interrupted?
yes → Eliminate break or obstruction.
no

Check fuel pump connections.
Are they loose or wrongly connected?
yes → Tighten connections or make them correctly.
no

Check fuel pump relay.
Is it defective?
yes → Renew fuel pump relay.
no

Check fuel pump.
Is it defective?
yes → Renew fuel pump
no



NOTE:

See also "Troubleshooting":
Chapter 12
- Fuel supply and mixture control

Chapter 11
- Engine

Chapter 4
- Electrics

14. COOLING SYSTEM

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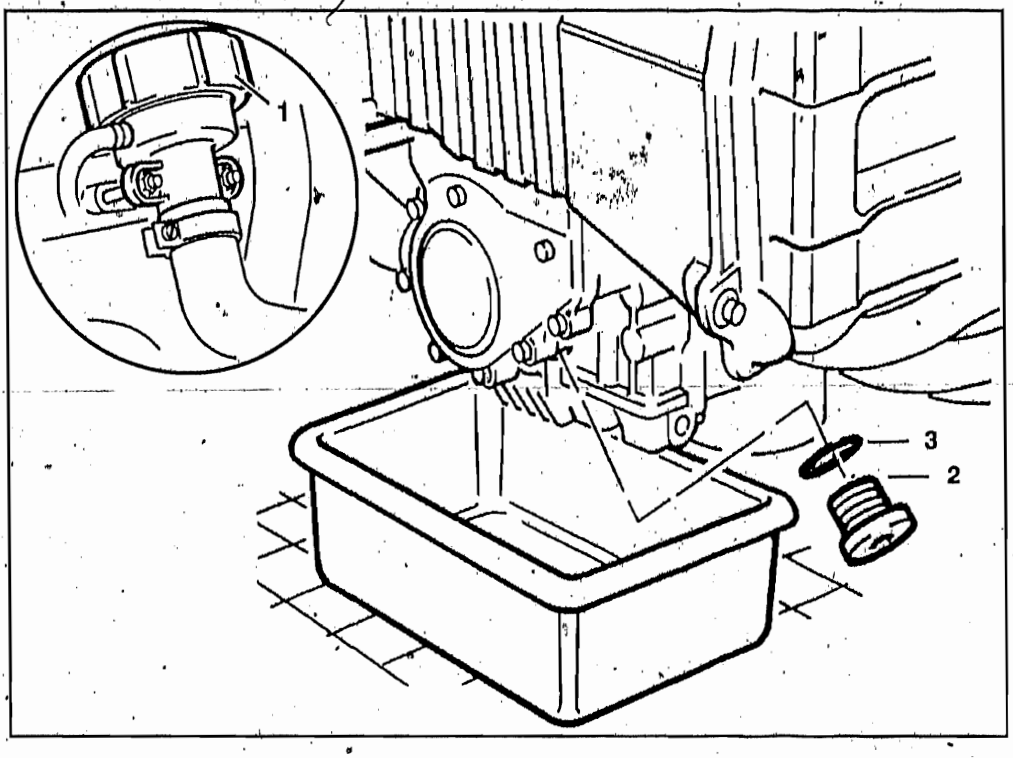
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CHECKING COOLING SYSTEM 14.16

Checking filler cap 14.16

Checking cooling system 14.16

TROUBLESHOOTING 14.17

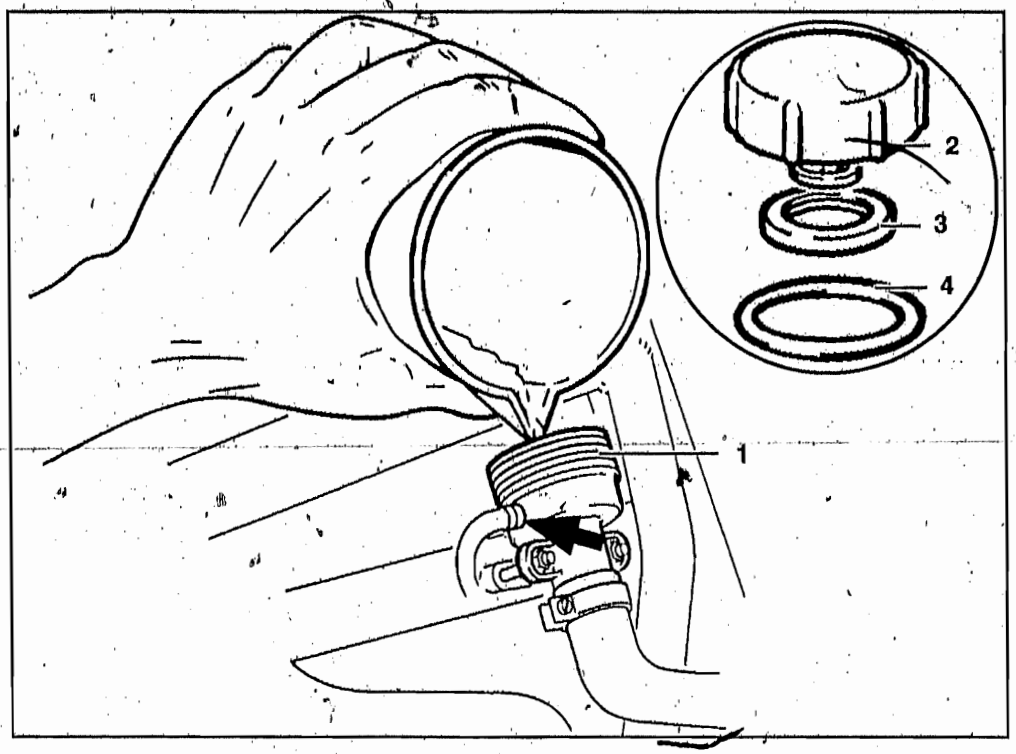


RENEWING COOLANT

Tightening torque:
Drain plug 9 Nm

WARNING:
The engine must be cold.
Renew coolant at least every two years.

- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing covers.
- Separate plug connectors for auxiliary instruments.
- Remove the fuel tank pads.
- Remove the engine cover.
- Remove the left/right centre sections of the fairing.
- Remove the horn mount.
- Remove the radiator surround.
- Remove the fuel tank.
- Remove the cover (1) from the filler pipe.
- Take out the coolant drain plug (2).
- Drain off the coolant.
- Screw in and tighten the drain plug, using a new sealing ring (3).



WARNING:
Use only approved grades (see Technical Data).
Use only corrosion inhibitor and antifreeze free from nitrite.
Never fill beyond the lower edge of the filler pipe.

- Add coolant via the filling pipe (1) up to the lower edge of the overflow (arrow).

Concentration (for protection down to -28°C):

Antifreeze	*40 %*
Water	*60 %*

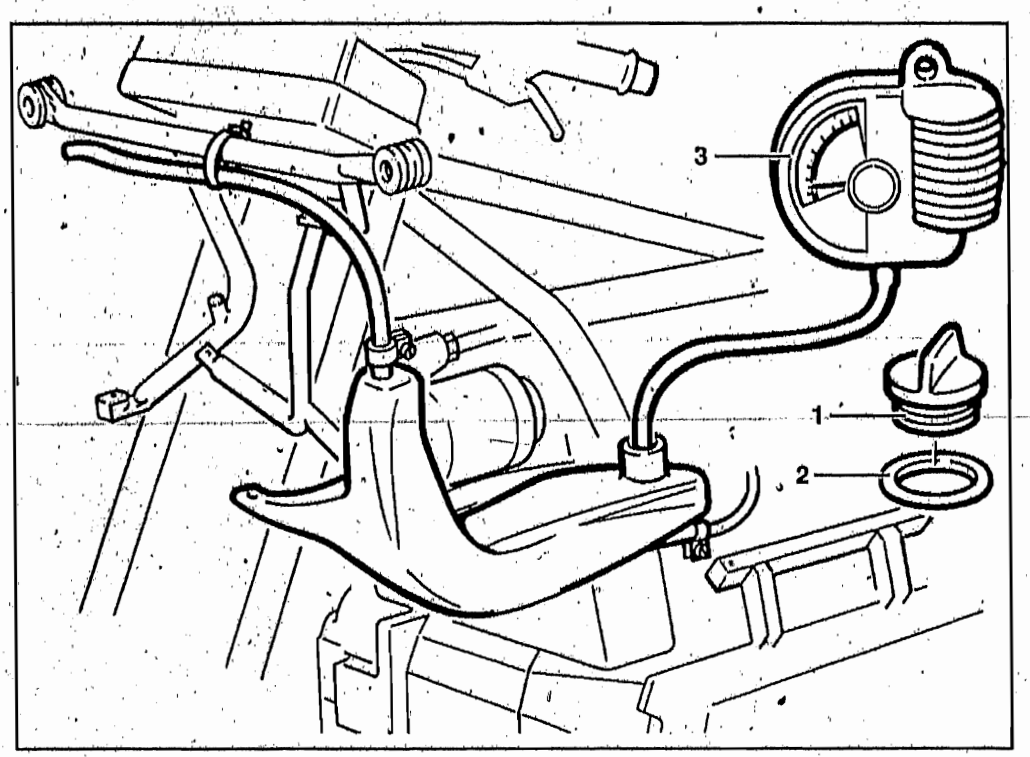
Content:

Coolant header tank	*2.8 + 0.4 l*

- Bleed the cooling system.

NOTE:
Bleeding:
Attach the fuel tank and connect the fuel line.
Turn the engine over with the starter.
At the same time, "knead" the coolant hose from the water pump to the thermostat housing.
Top up coolant level.

- Screw the cap (2) with seals (3/4) on to the filler pipe.
- Check that the coolant header tank is filled up to the lower edge of the filler pipe.
- Install/attach in the opposite order of work.



CHECKING COOLANT CONCENTRATION

- Remove the left kneepad.
- Remove the left inner fairing cover.
- Unscrew the cap (1) from the coolant header tank. Note the seal (2).
- Siphon the coolant out of the header tank with a suitable measuring device (3).
- Read off the frost protection limit on the measuring device.

WARNING:
Add coolant only when the engine is cold, and only to the header tank.
Add coolant only up to the lower edge of the filler pipe.

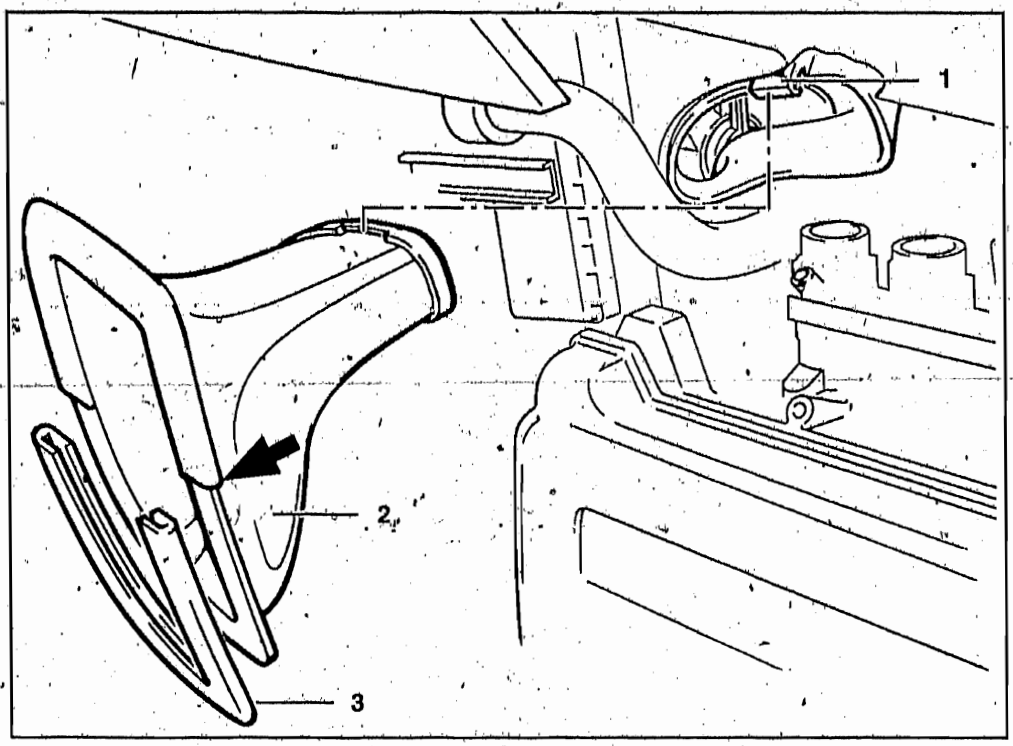
- If necessary, add coolant to the header tank.

Concentration (for protection down to -28°C):

Antifreeze	*40 %*
Water	*60 %*

Concentration (for Scandinavian countries):

Antifreeze	*50 %*
Water	*50 %*

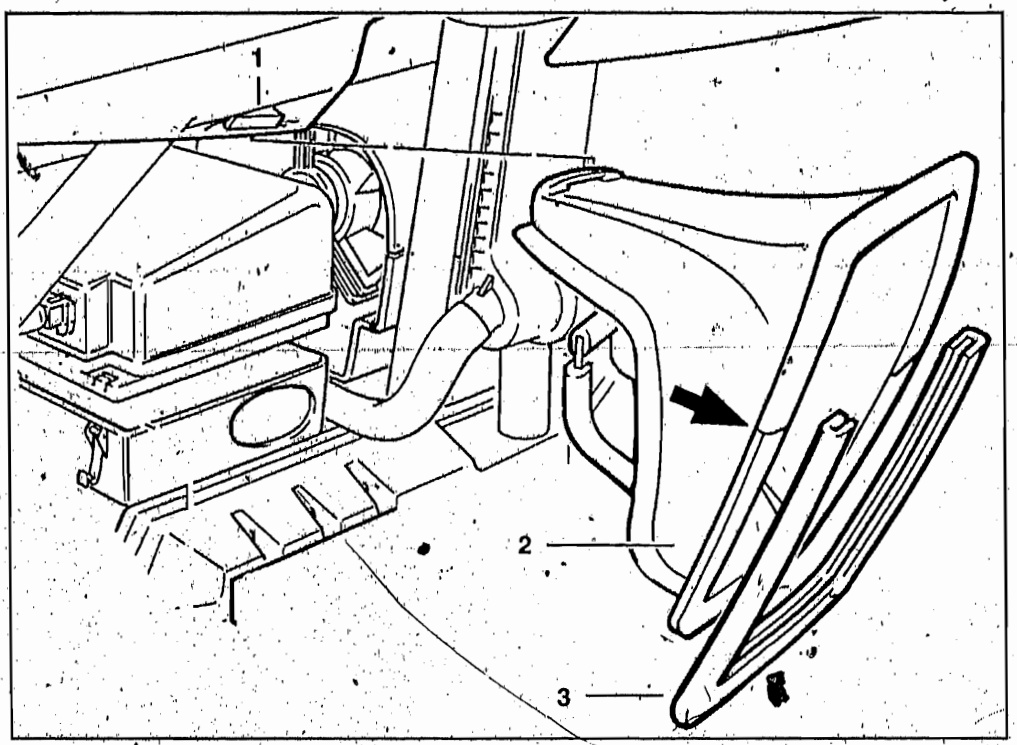


REMOVING AND INSTALLING LEFT FAN AIR DUCT

- Remove the left kneepad.
- Remove the left inner section of the fairing.
- Separate the plug connectors for the auxiliary instruments.
- Remove the left centre section of the fairing.
- Remove the engine cover.
- Carefully press up the plastic clip (1) at the left air duct.
- Take out the air duct (2).
- If necessary, renew the plastic sealing strips (3).
- Install/attach in the opposite order of work.

WARNING:

The plastic sealing strip (3) must surround the air duct completely.
The joint line (arrow) must be centrally positioned on the air duct.



REMOVING AND INSTALLING RIGHT FAN AIR DUCT

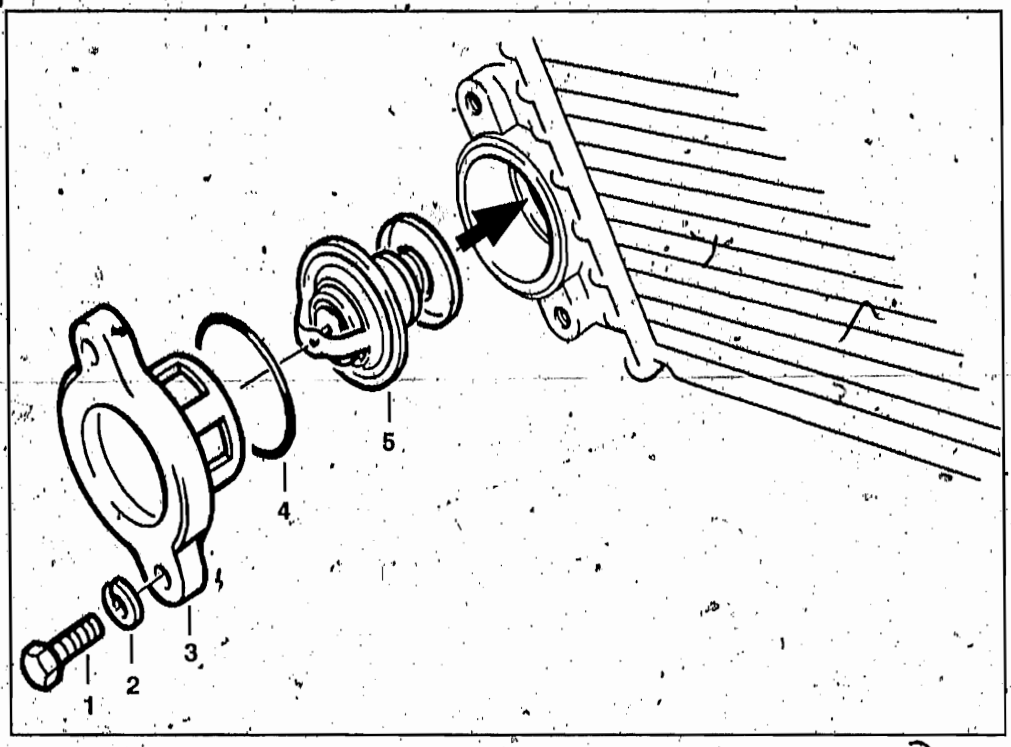
- Remove the right kneepad.
- Remove the right inner section of the fairing.
- Separate the plug connectors for the auxiliary instruments.
- Remove the right centre section of the fairing.
- Remove the engine cover.
- Release the air duct from the retaining clip (1).
- Pull the air duct (2) out to the right, turning it slightly at the same time.
- If necessary, renew the plastic sealing strips (3).
- Install/attach in the opposite order of work.

WARNING:

The plastic sealing strip (3) must surround the air duct completely.
The joint line (arrow) must be centrally positioned on the air duct.

NOTE:

Make sure that the foam rubber seal is correctly seated.



REMOVING, CHECKING AND INSTALLING THERMOSTAT

WARNING:
The engine must be cold.

- Remove the dualseat cover/dualseat.
- Remove the left kneepad.
- Remove the left inner fairing cover.
- Separate the plug connectors for the auxiliary instruments.
- Take off the left centre section of the fairing.
- Remove the engine cover.
- Take off the radiator surround.
- Drain the coolant.
- Take out the 2 retaining screws with lock washers (1/2) at the thermostat housing cover.
- Take off the cover (3). Note the O-ring (4).
- Pull the thermostat (5) out of the housing.

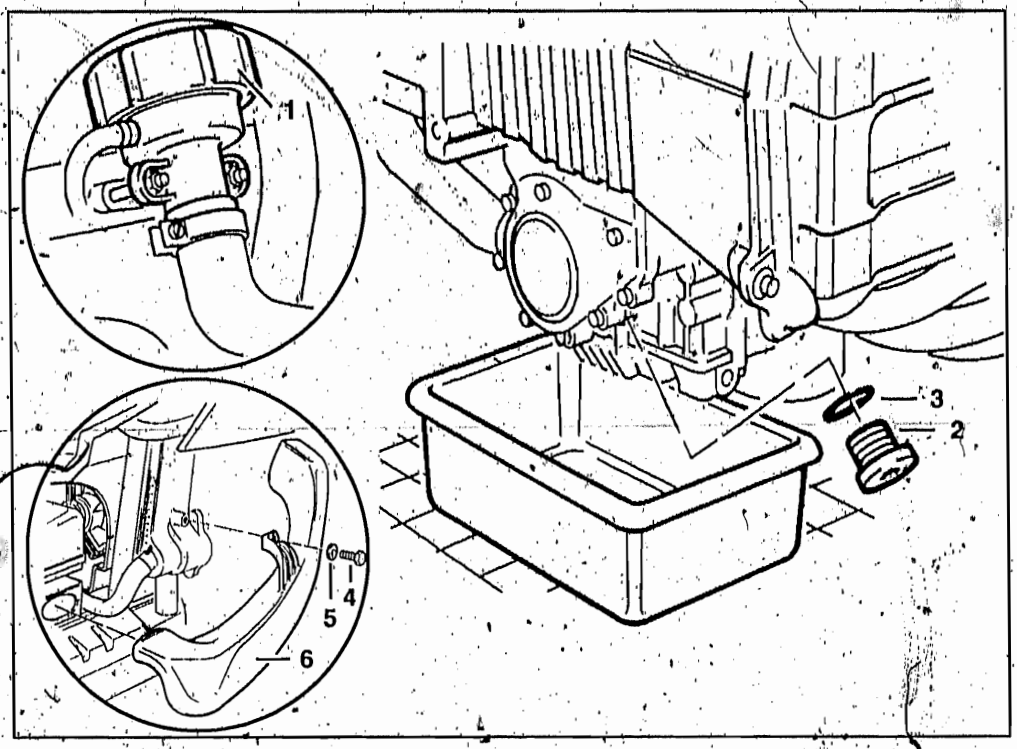
CHECKING THERMOSTAT

- Heat the thermostat in a water bath.
- Note the temperatures at which the opening movement starts/finishes.
- Renew thermostat if defective.
- Opening temperatures:
  Opening starts: 85° C
  Opening completed: 105° C
- Install in the opposite order of work.

NOTE:
When installing:
Note the correct installed position of the thermostat (arrow).
Add coolant. Note the coolant concentration.

Tightening torque:
Thermostat housing to radiator *3 ± 0.45 Nm*

Concentration (for protection down to -28°C):
Antifreeze *40 %*
Water *60 %*



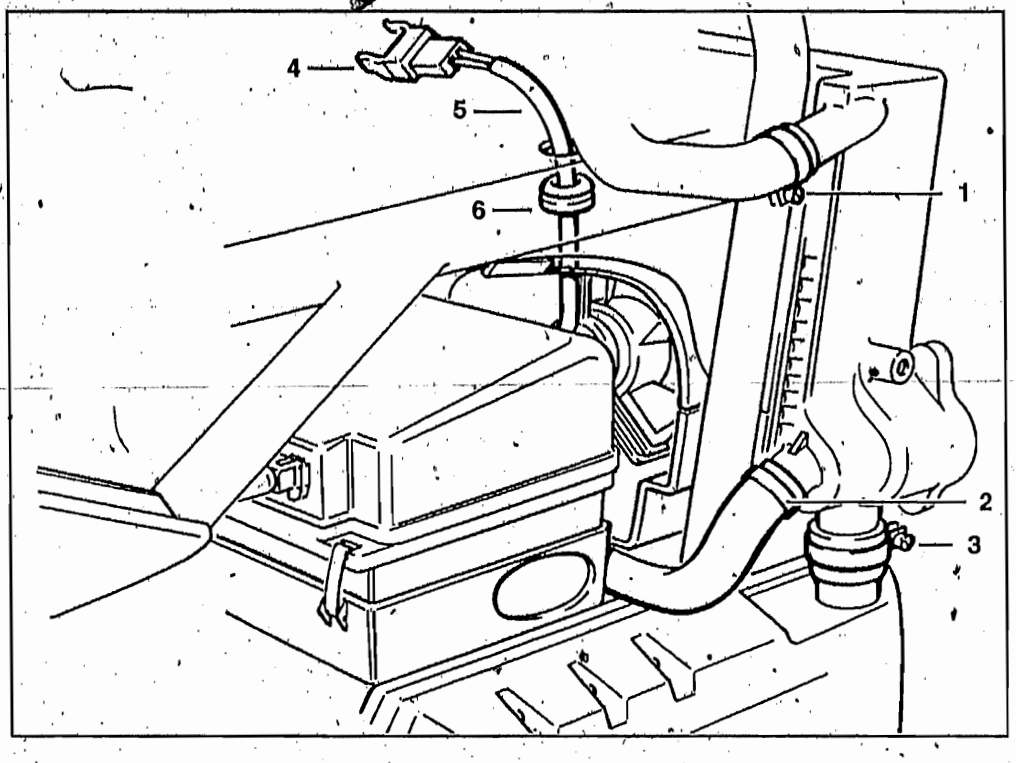
REMOVING AND INSTALLING RADIATOR

WARNING:
The engine must be cold.

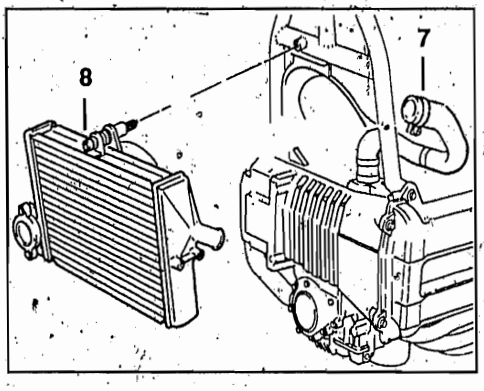
- Remove the dualseat cover/dualseat.
- Remove the left/right kneepad.
- Remove the left/right inner fairing covers.
- Separate the plug connectors for the auxiliary instruments.
- Remove the fuel tank pads.
- Remove the engine cover.
- Remove the left/right centre section of the fairing.
- Remove the horn mount.
- Remove the radiator surround.
- Take off the fuel tank.

NOTE:
Loosen the filler cap (1).
The system will then drain more rapidly.

- Take out the drain plug with seal (2/3).
- Drain the coolant into a clean vessel.
- Remove the retaining screw with washer (4/5).
- Pull the intake air duct (6) out of the lower section of the air cleaner housing, and take it off.



- Loosen the hose clip (1) at the top right of the radiator and pull off the hose.
- Loosen the 2 hose clips (2/3) at the thermostat housing and pull off the hoses.
- Separate the plug connector (4) for the fan motor.
- Pull the cable with rubber grommet (5/6) downwards out of the air duct.



- Loosen the hose clip (7) on the radiator and pull off the hose.
- Take out the retaining screw (8) for the radiator at the frame.
- Tilt the radiator forward at the top and take it off.
- Install in the opposite order of work.

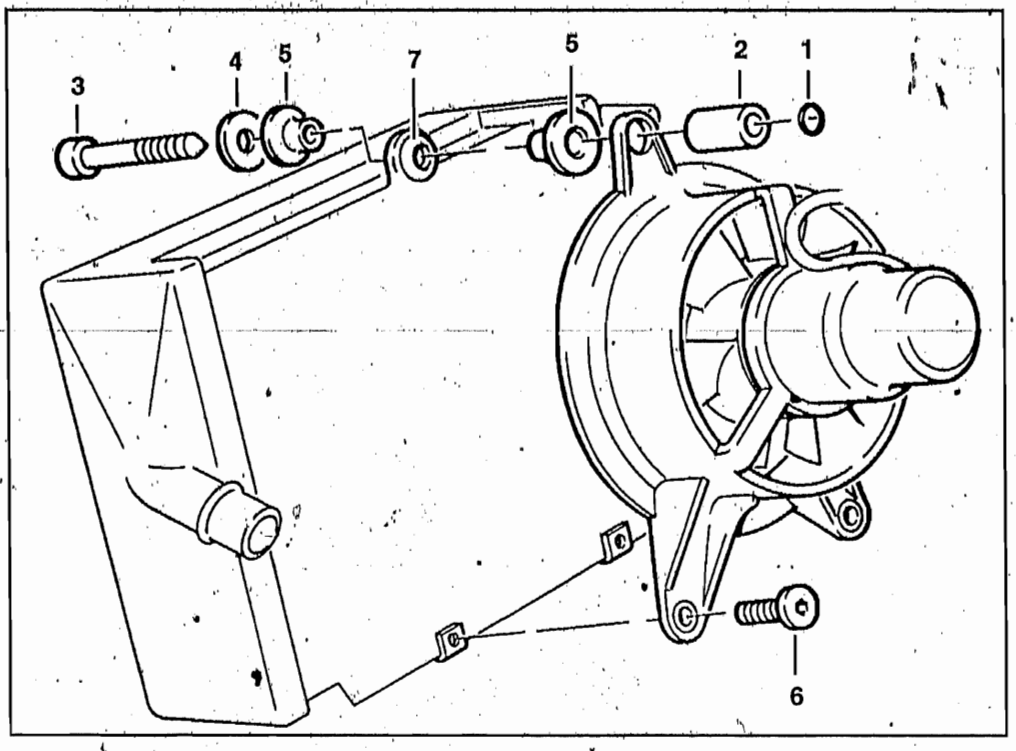
NOTE:
When installing:
Use a new seal on the drain plug.
Refill the system with coolant.

Tightening torque:

Radiator to frame	*8.5 ± 1 Nm*
Drain plug	*9 ± 1 Nm*

Concentration (for protection down to -28°C):

Antifreeze	*40 %*
Water	*60 %*



REMOVING AND INSTALLING FAN

WARNING:
The engine must be cold.

- Remove the radiator.
- Pull the rubber ring (1) off the radiator retaining screw.
- Take off the spacing bushing (2).
- Take out the retaining screw with washer (3/4).
- Pull the left/right bushing (5) out of the rubber grommet.
- Take out the 2 retaining screws (6) at the fan.
- Pull the fan with lug out of the rubber grommet (7).
- Take the fan with fan motor out of the radiator.
- Install in the opposite order of work.

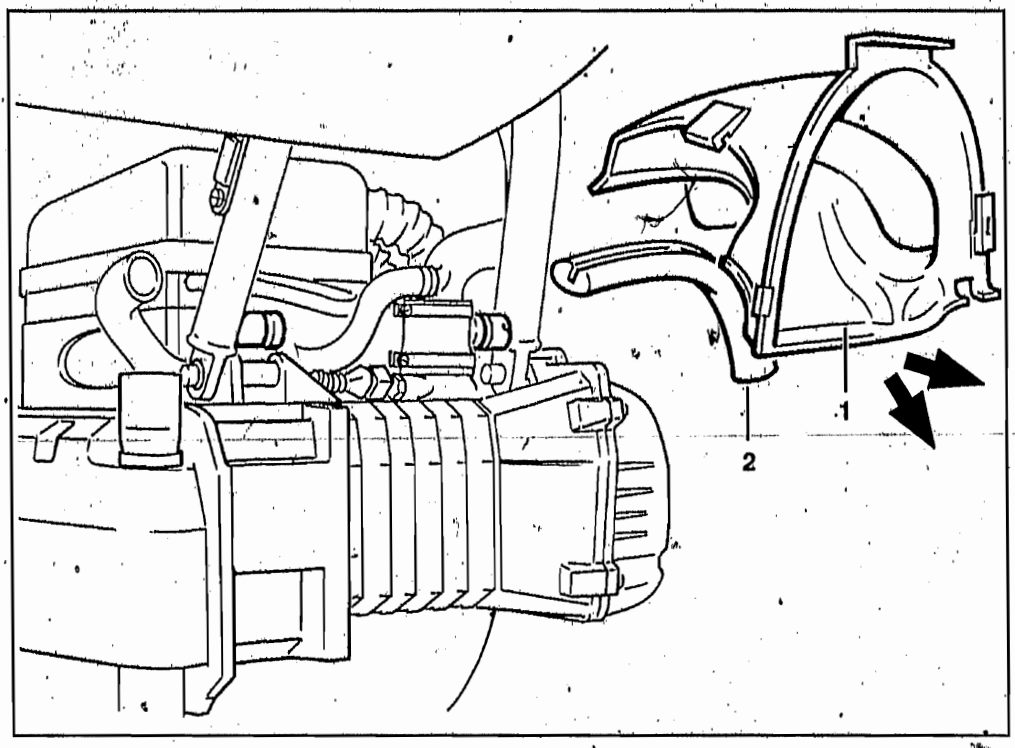
NOTE:
When installing:
If necessary, apply a thin layer of tyre fitting paste to the rubber grommet.
Use a new seal on the drain plug.
Restore the correct coolant concentration.

Tightening torque:

Radiator to frame	*8.5 ± 1 Nm*
Drain plug	*9 ± 1 Nm*

Concentration (for protection down to -28°C):

Antifreeze	*40 %*
Water	*60 %*



REMOVING AND INSTALLING RADIATOR AIR DUCT

WARNING:
The engine must be cold.

- Take off the fuel tank.
- Remove the radiator.
- Take the air duct (1) out forwards and downwards (arrows).
- Install in the opposite order of work.

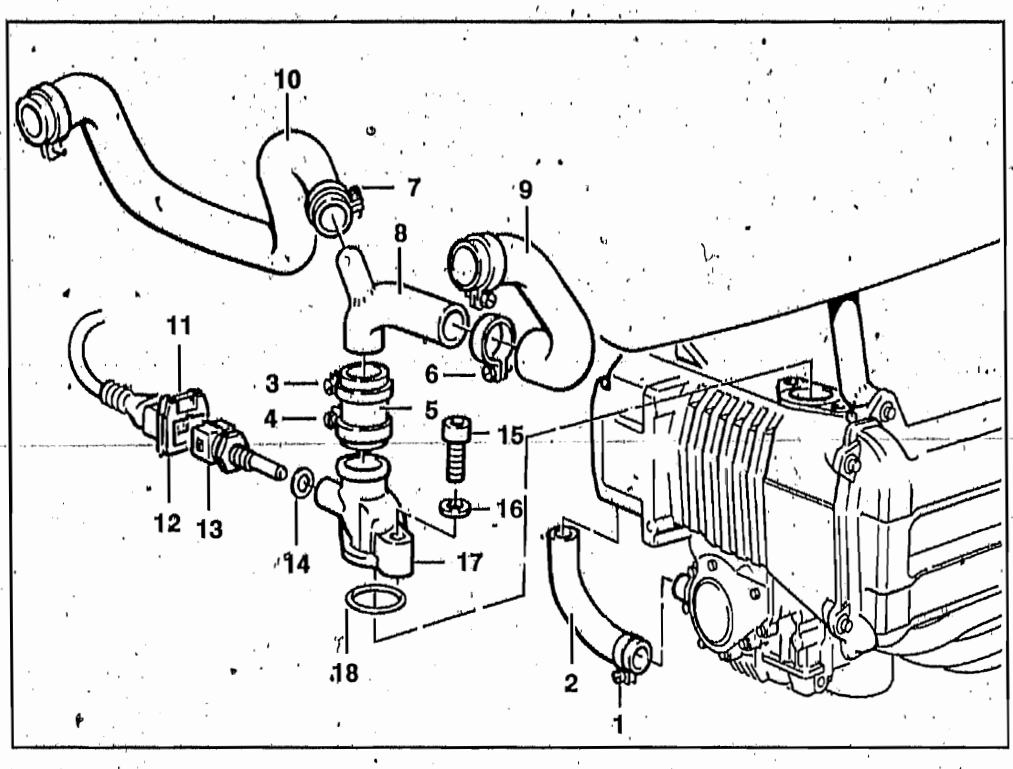
NOTE:
When installing:
Note the foam rubber seal (2) at the air duct.
Note the cable run to the fan motor.
Use a new drain plug seal.
Add coolant.

Tightening torque:

Radiator to frame	*8.5 ± 1 Nm*
Drain plug	*9 ± 1 Nm*

Concentration (for protection down to -28°C):

Antifreeze	*40 %*
Water	*60 %*



REMOVING AND INSTALLING COOLANT HOSES

WARNING:
The engine must be cold.

- Take off the fuel tank.
- Remove the radiator.
- Remove the radiator air duct.
- Loosen the hose clip (1) at the water pump.
- Pull the hose (2) downwards out of the engine cover.
- Loosen the 2 hose clips (3/4) at coolant flange pipe (5).
- Loosen the 2 hose clips (6/7) at the distributor block.
- Pull off the distributor block with hoses (8/9/10).
- Release the keeper (11) on the NTC plug connector.
- Pull off the plug (12).
- Unscrew and remove the NTC plug (13). Note the seal (14).
- Remove the 2 retaining screws with lock washers (15/16) from the flange.
- Take off the flange with O-ring (17/18).
- Install in the opposite order of work.

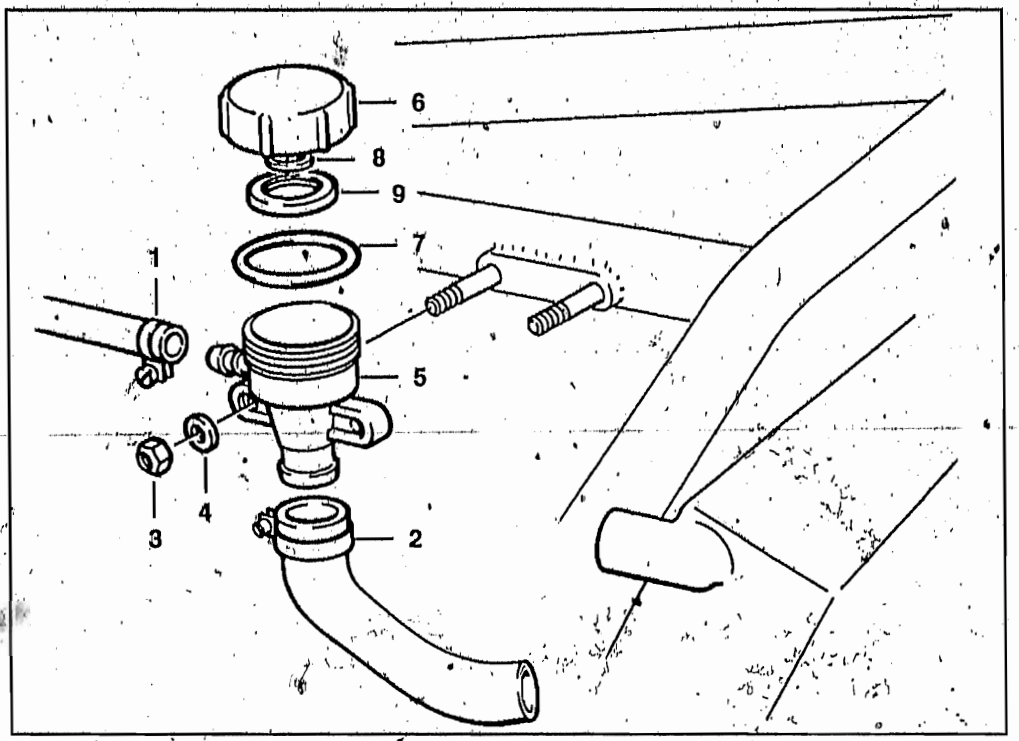
NOTE:
When installing:
Use a new drain plug seal.
Add coolant.

Tightening torque:

Radiator to frame	*8.5 ± 1 Nm*
Drain plug	*9 ± 1 Nm*

Concentration (for protection down to -28°C):

Antifreeze	*40 %*
Water	*60 %*

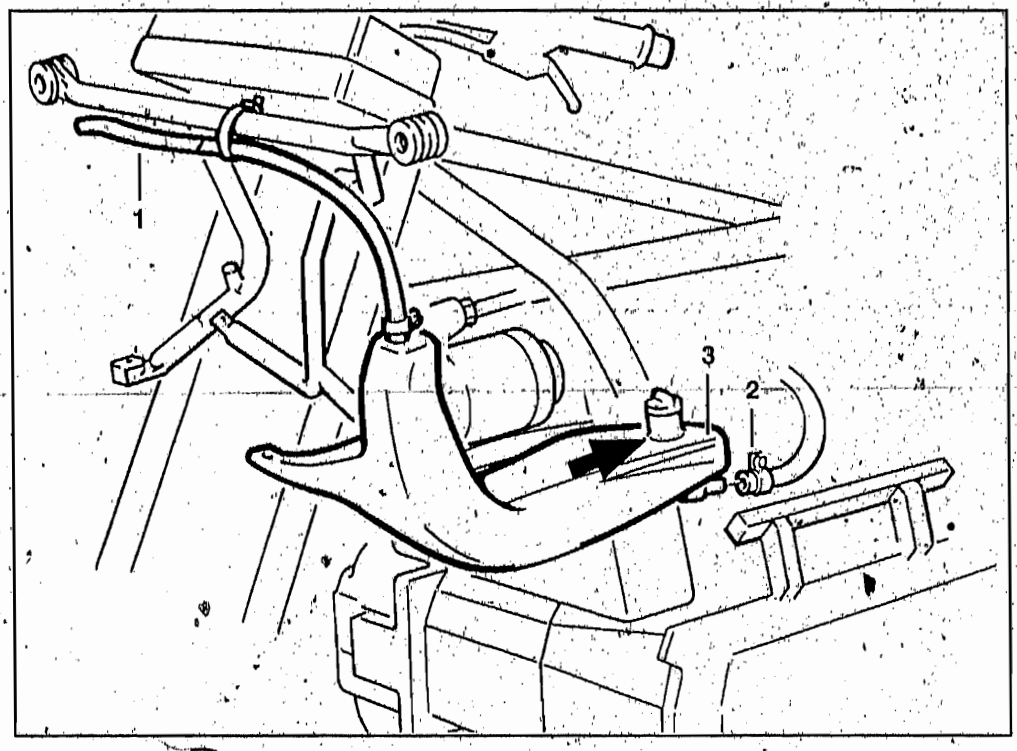


REMOVING AND INSTALLING FILLER PIPE

WARNING:
The engine must be cold.

- Take off the fuel tank.
- Loosen hose clip (1) at the header tank return hose.
- Pull off the hose.
- Loosen the hose clip (2) at the radiator feed hose.
- Pull off the hose.
- Unscrew the two retaining nuts with washers (3/4).
- Take the filler pipe (5) off the studs.
- Unscrew and remove the cap (6). Note seal (7).
- Carefully lever out the mesh strainer (8). Note the seal (9).
- Install in the opposite order of work.

NOTE:
Renew the filler pipe and cap only as a complete unit.



REMOVING AND INSTALLING COOLANT HEADER TANK

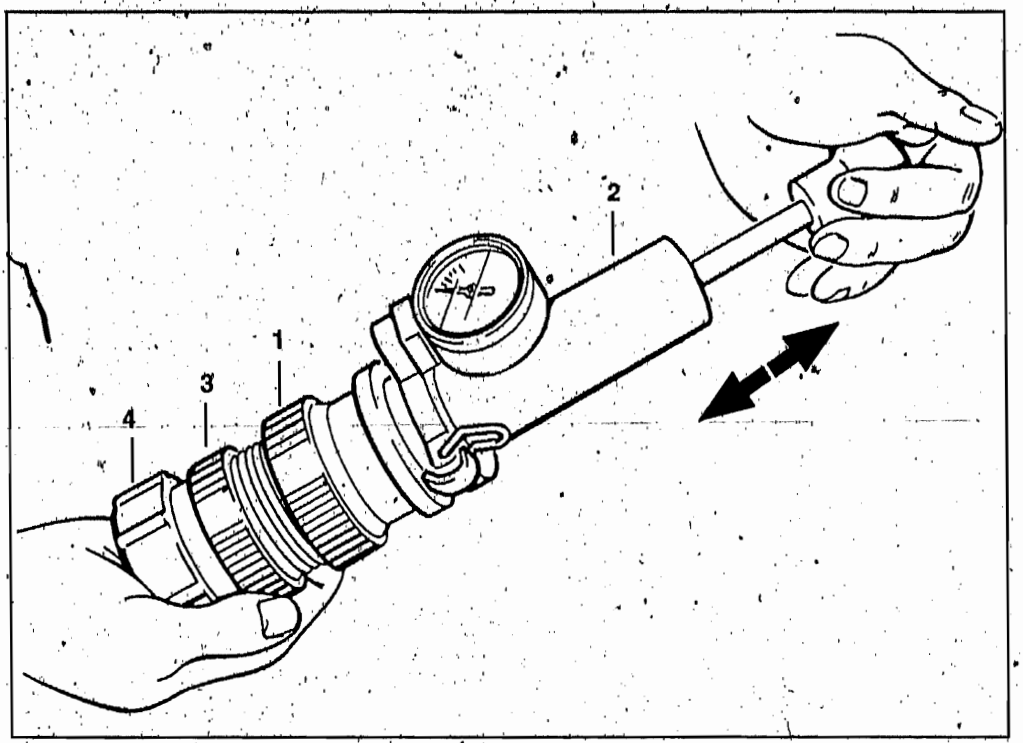
- Take off the upper section of the fairing.
- Pull the vent hose (1) out of the cable strap, fold back and secure with the cable strap.
- Loosen hose clip (2) on the return hose.
- Hold the header tank (3) angled upwards at the back.
- Pull off the return hose. Mop up and escaping coolant with a cloth.
- Take off the header tank.
- Drain the coolant into a suitable vessel.
- Install in the opposite order of work.

NOTE:

When installing:
Note the seal in the header tank cap.
Make sure that the vent hose is correctly located.
After installing, correct the coolant level.
Do not exceed the maximum coolant level (arrow).

Concentration (for protection down to -28°C):

Antifreeze	*40 %*
Water	*60 %*



CHECKING COOLING SYSTEM

CHECKING FILLER CAP

WARNING:
Engine must be cold.

- Take off the fuel tank.
- Secure the intermediate section with clips to the tester (2), BMW No. 17 0 500.
- Screw the threaded stub pipe (3), BMW No. 17 0 003/004, to the intermediate section.
- Screw the filler cap (4) on to the threaded stub pipe.
- Pressurize the system with the hand pump (arrows).

Opening pressure:
Pressure relief valve must open at *1.5 bar*

NOTE:
Ensure that seals are present.

CHECKING COOLING SYSTEM

- Screw the BMW No. 17 0 500 tester to the filler pipe.
- Pressure-test the cooling system at the specified test pressure for at least 10 minutes. The pressure must not fall.

Test pressure:
Cooling system *1 bar*

- Install the fuel tank and the various sections of fairing.

NOTE:
Always renew the filler pipe and cap as a complete unit.

TROUBLESHOOTING

Coolant overheat warning light comes on.

Check coolant in header tank. Is level too low?
- ja → Top up coolant level.
- no ↓

Check thermostat. Is it defective?
- yes → Renew thermostat.
- no ↓

Check water pump. Is it defective?
- yes → Repair or renew water pump.

Fan motor does not cut in.

Check fuse F7. Has it blown?
- yes → Renew the fuse.
- no ↓

Check the fan relay. Is it defective?
- yes → Renew the fan relay.
- no ↓

Check the electrical circuit. Poor contact or open circuit?
- yes → Restore good contact/repair break.
- no ↓

Check fan motor. Is it defective?
- yes → Repair or renew fan motor.
- no ↓

Check thermostat. Has it failed to open?
- yes → Renew thermostat.

Excessive loss of coolant.

Check coolant circuit. Is it interrupted?
- yes → Locate and rectify leak/interruption.

15. TECHNICAL DATA

Model		K 1	K 100 RS
Engine type			Four-stroke inline, arranged longitudinally, with double overhead camshafts, liquid cooling and electronic fuel injection with fuel shutoff when coasting
Location of engine number			On lower section of engine block, at rear right
Cylinder bore		mm	67 ± 0,005
Stroke		mm	70
Number of cylinders			4
Displacement (tax formula)		cm^3	980
Displacement, effective		cm^3	987
Compression ratio			11,0 : 1
Max. power output		kW bhp	74 100
at		rpm	8000
Max. continuous engine speed		rpm	8800
Max. engine speed		rpm	8900
Idle speed		rpm	950 ± 50
Max. permissible engine speeds while running in - up to 1000 km (app. 600 miles) - up to 2000 km (app. 1300 miles		 rpm rpm	 4000 4500)
Direction of rotation			anticlockwise, looking at ignition system
Max. torque		Nm kgm	100 9,81
at		rpm	6750
Compression pressure	good normal poor	bar bar bar	above 10.0 8.5 ... 10.0 under 8.5
Compression test procedure			1. Take out spark plugs 2. Measure with a calibrated compression tester. Battery must be fully charged, engine at normal operating temperature and twistgrip fully open. Run engine at starting speed.
Fuel grades			see Rider's Handbook
Fuel consumption (DIN ISO 7860) - at steady 90 km/h - at steady 120 km/h		 l/100 km l/100 km	 4,2 5,0
Engine lubrication system			Pressurized oil circuit
Oil filter			full-flow
Pressure differential to open bypass valve		bar	1,5
Low oil pressure telltale comes on below		bar	0,2 ... 0,5
Pressure relief valve opens at		bar	5,4

Model		K 1	K 100 RS
Oil content without filter renewal with filter renewal	l l	3,50 3,75	
Permissible oil consumption per 100 km	l	0,15	
Oil pump: Pattern		gear-type	
Valve clearances adjust with engine cold max. 35°C inlet valves exhaust valves	 mm mm	 0,15 ... 0,20 0,25 ... 0,30	
Valve timing inlet opens inlet closes exhaust opens exhaust closes		at 5/100 preload and 3 mm lift 2° bTDC 26° aBDC 30° bBDC 2° bTDC	
Valves: Overall length inlet exhaust	 mm mm	 115,1 113,7	
Valve head diameter inlet exhaust	 mm mm	 26,45 22,95	
Valve stem diameter inlet exhaust	 mm mm	 5,975 - 0,015 5,960 - 0,015	
Wear limit inlet exhaust	 mm mm	 5,950 5,935	
Valve head rim thickness inlet exhaust	 mm mm	 1,04 1,09	
Min. rim thickness inlet exhaust	 mm mm	 - -	
Max. valve head runout inlet exhaust	 mm mm	 0,02 0,02	
Valve seat angle inlet exhaust		 44° 30' - 20' 44° 30' - 20'	
Valve seat width inlet exhaust	 mm mm	 1,1 ± 0,15 1,3 ± 0,15	
Wear limit inlet exhaust	 mm mm	 2,50 3,00	

Model		K 1	K 100 RS
Overall length of valve guides			
Inlet	mm	45	
exhaust	mm	57,5	
External diameter	mm	$11{,}5u^{6}$ $^{+\ 0{,}044}_{+\ 0{,}033}$	
Internal diameter	mm	$6H^{7}$ $^{+\ 0{,}012}_{+\ 0}$	
Wear limit	mm	6,100	
Bore in cylinder head	mm	$11{,}5H^{7}$ $^{+\ 0{,}018}_{+\ 0}$	
Repair oversize	mm	$11{,}7H^{7}$ $^{+\ 0{,}018}_{+\ 0}$	
Valve steam clearance			
- inlet	mm	0,025 ... 0,052	
- exhaust	mm	0,040 ... 0,067	
Wear limit			
- inlet	mm	0,150	
- exhaust	mm	0,160	
Valve gear:			
Valve operation		direct, by bucket-type tappets	
Camshaft drive		Pre-stretched endless single roller chain	
Number of links		126	
Valve springs:			
Wire thickness,	mm	3,2	
External winding dia.	mm	$21{,}6 \pm 0{,}2$	
Spring length, relaxed	mm	41,1	
Wear limit	mm	39,6	
Winding direction		clockwise	
Number of active turns		3,8 6	
Total number of turns		7,8	
Camshafts:			
Inlet camshaft	°	284	
Exhaust camshaft	°	284	
Guide bearing diameter	mm	$^{0}_{-\ 0{,}030}$ 30	
Wear limit	mm	29,95	
Camshaft bearings	mm	$^{0}_{-\ 0{,}030}$ 24	
Wear limit	mm	23,95	
Guide bearing bore	mm	$^{+\ 0{,}041}_{+\ 0{,}02}$ 30F7	
Camshaft bearing bore	mm	$^{+\ 0{,}041}_{+\ 0{,}02}$ 24F7	

Model		K 1	K 100 RS
Play, radial - guide bearing - support bearing	 mm mm	 0,020 ... 0,071 0,020 ... 0,071	
Wear limit - guide bearing - support bearing	 mm mm	 0,150 0,150	
Cam base circle	mm	30	
Cam height - inlet - exhaust	 mm mm	 38,855 ± 0,031 38,855 ± 0,031	
Wear limit - inlet - exhaust	 mm mm	 38,55 38,55	
Tappets			
External dia.	mm	26,86 $^{-0,007}_{-0,020}$	
Wear limit	mm	25,97	
Tappet bore in cylinder head	mm	26 D7 $^{+0,086}_{+0,065}$	
Wear limit	mm	26,17	
Radial play Wear limit	mm mm	0,072 ... 0,106 0,200	
Crankshaft:			
Guide bearing width	mm	23F8 $^{+0,053}_{+0,020}$	
Main bearing dia. Colour coding	mm No paint spot One paint spot	45 $^{0}_{-0,024}$ Wear stage 0 Wear stage 1	
Crankshaft locating bearing dia. Colour coding	mm As main bearings	38 $^{0}_{-0,024}$	
Main bearing	mm	Bore dia. 49H6 $^{+0,16}_{0}$	
Main bearing journals: Radial play Wear limit	 mm mm	 0,020 ... 0,056 0,130	
Main bearing endplay Wear limit	mm mm	0,080 ... 0,183 0,250	
Connecting rods:			
Big end bearing bore	mm	41H6 $^{+0,016}_{0}$	

Model		K 1	K 100 RS
Extra-wide big end bearing bore	mm	$^{-0,065}_{-0,117}$ 22,09	
Crankpin bearing width	mm	$^{-0,19}_{+0,065}$ 22D11	
Big end bearing play, axial	mm	0,130 ... 0,312	
Wear limit	mm	0,400	
Distance between bore centres	mm	125 + 0,1	
Small end bearing bore	mm	$^{+0,021}_{0}$ 20H7	
Permissible weight difference between connecting rods	g	+ 4	
Cylinders:			
Bore	mm	A 67,00 ± 0,005 B 67,01 ± 0,005	
Wear limit	mm	A 67,05 B 67,06	
Pistons:			
Piston weight group, complete		stamped with + or -	
Piston diameter	mm		
Make: KS	A	66,973 ± 0,007	
	B	66,983 ± 0,007	
Wear limit	mm		
	A	66,92	
	B	66,93	
Installed piston clearance	mm	0,015 - 0,039	
Wear limit	mm	0,130	
Piston installed direction		Arrow on crown points forwards	
Piston rings:			
Groove 1 (rectangular)			
Height	mm	$^{-0,010}_{-0,025}$ 1,2	
wear limit	mm	1,10	
Ring end gap	mm	0,20 ... 0,40	
Wear limit	mm	1,50	
Vertical clearance in groove	mm	0,040 ... 0,075	
Wear limit	mm	0,30	
Groove 2 (micro-taper ring)			
Height	mm	$^{-0,010}_{-0,022}$ 1,2	
Wear limit	mm	1,10	
Ring end gap	mm	0,10 ... 0,30	
Wear limit	mm	1,50	
Vertical clearance in groove	mm	0,030 ... 0,044	
Wear limit	mm	0,30	

Model		K 1	K 100 RS
Groove 3 (equal-chamfer ring)			
Height	mm	$2{,}5^{-0{,}010}_{-0{,}025}$	
Wear limit	mm	2,40	
Ring end gap	mm	0,20 ... 0,45	
Wear limit	mm	1,50	
Vertical clearance in groove	mm	0,20 ... 0,055	
Wear limit	mm	0,30	
Installed direction of piston rings		with "Top" marking uppermost (grooves 2 and 3)	
Piston (gudgeon) pin			
Pin diameter	mm	$18^{-0{,}004}$	
Wear limit	mm	17,96	
Piston pin bore dia.			
in piston	mm	$18^{+0{,}006}_{+0{,}002}$	
Piston pin clearance in piston	mm	0,002 ... 0,010	
Piston pin clearance in small end bushing	mm	0,006 ... 0,021	
Wear limit	mm	0,060	

Model	K 1	K 100 RS	
Threaded connection		**Nm**	
Freewheel:			
Cover plate/freewheel cage at countershaft gear		9 ± 1	
Combined water/oil pump:			
Oil pressure switch at housing		50 ± 6	
Drain plug at housing		9	
Screw plug for pressure relief valve at housing		10 ± 1	
Pump impeller to shaft a) nut		27 ± 3	
b) screw		33 ± 4	
Pump housing to crankcase		7 ± 1	
Cover to pump housing		7 ± 1	
Intermediate flange			
Thrust plate at intermediate flange		9 ± 1	
Intermediate flange to crankcase		9 ± 1	
Crankshaft:			
Big end caps to connecting rod		30 ± 3	
- tightening angle		80° + 3°	
Lower section of crankcase to cylinder block:			
Output shaft to front of crankcase		18 ± 2	
Output shaft to rear of crankcase		40 ± 5	
Lower section of crankcase to cylinder block, outside		7 ± 1	
Sump to lower section of crankcase		7 ± 1	
Cover to sump		7 ± 1	
Oil drain plug		20 ± 4	
Cylinder head:			
Cylinder head to cylinder block		40 ± 5	
Cylinder head cover to cylinder head		8 ± 1	
Camshaft bearing caps to cylinder head		9 ± 1	
Camshaft gears to camshafts		54 ± 6	
Chain tensioner to cylinder block		9 ± 1	
Slide rail top camshaft bearing cap		9 ± 1	
Chaincase cover to cylinder block/cylinder head		9 ± 1	
Cover for Hall-effect trigger to chaincase cover		7 ± 1	
Screw plug at chaincase cover		6 ± 1	
Clutch:			
Clutch housing to output shaft		140 ± 5	
		140 ± 5 then release	
Tighten finally to		100 ± 10	
Housing cover to clutch flange		19 ± 2	
Driver on countershaft		33 ± 4	Do not reuse this bolt; insert new bolt with Loctite 273 sealant

Model	K 1	K 100 RS
Threaded connection		Nm
Alternator to intermediate flange		22 ± 3
Crankshaft cover to cylinder block		8 ± 1
Exhaust pipes to cylinder head		21 ± 2
Coolant stub pipes/intake stub pipes to cylinder head		7 ± 1
Fuel injection rail to cylinder head		7 ± 1
Gearbox to intermediate flange		16 ± 2
Spring strut to rear wheel drive		51 ± 6
Bearing mount to gearbox		41 ± 5
Lower section of air cleaner housing to cylinder block		21 ± 1
Frame to engine, intermediate flange and gearbox		45 - 6
Starter motor to gearbox		7 ± 1
Radiator to frame		8,5 ± 1
Silencer to exhaust pipe		20,5 ± 2
Silencer to footrest plate		33 ± 2
Anti-vibration mounting on silencer to angle assembly, gearbox housing		12 ± 1

STEERING		TECHNICAL DATA	
Model		**K 1**	**K 100 RS**
Steering lock angle to either side	°	27	34
Handlebar width (with weights)	mm	740	700
Handlebar tube diameter	mm	22	

STEERING	TECHNICAL DATA	
Model,	**K 1**	**K 100 RS**
Threaded connection		**Nm**
Handlebar mount clamp halves		22 ± 2
Handlebar mount to upper fork bridge		16 ± 2
Mirror to housing		15 ± 3

Model		K 1	K 100 RS
Rear wheel drive gear tooth pattern		Klingelnberg (Palloid) spiral bevel	
Number of teeth		12 : 33	11 : 31
Ratio		1 : 2,75	1 : 2,81
Tooth backlash	mm	0,07 ... 0,16	
Shims thicknesses available (in 5/100 mm steps)			
Crownwheel	mm	1,95 ...2,80	
Pinion	mm	1,50 ... 2,50	
Taper roller bearing preload	mm	0,05 ... 0,1 = 600 ... 1600 N preload force	
Available shims	mm	0,1/0,15/0,2/0,3/0,4/0,5 ... 1,6/1,7	
Oil grade	above 5°C below 5°C all the year round	Brand-name SAE 90 hypoid gear oil Brand-name SAE 80 hypoid gear oil, API Class GL5 Brand-name SAE 80 W 90 hypoid gear oil	
Content	l	0,26	
Drive shaft: Layout		2-piece enclosed double universal-joint shaft in swinging arm tube, with integral torsional vibration damper and universal joint running in needle roller bearing at gearbox end, secured with snap rings at rear wheel drive end	
Rear suspension		adjustable to 4 settings, with progressive overall spring rate and travel-dependent damping	
Suspension travel	mm	137,5	
Spring length, off-load	mm	281,5-4	
Wire diameter	mm	9,5	

Model	K 1	K 100 RS
Threaded connection		**Nm**
Threaded ring in rear wheel drive		118 ± 12
Nut on input bevel pinion		200 ± 20
Retaining screws in housing		35 ± 4
Brake disc to rear wheel drive		21 ± 2
Fixed swinging arm bearing to gearbox		9 ± 1
Free swinging arm bearing journal		7,5 ± 0,5
Locknut at free swinging arm bearing		41 ± 3
Spring strut to frame/rear wheel drive		51 ± 6
Brake caliper to rear wheel drive		32 ± 2
Rear wheel studs		105 ± 4
Oil drain plug in rear wheel drive housing		23 ± 3
Oil filler plug in rear wheel drive housing		23 ± 3
Inductive sensor to rear wheel drive		2,5 ± 0,5
Rear wheel drive:	Fixed bearing	105 ± 7
(bearings in swinging arm)	Free bearing	7,5 ± 0,5
	Locknut for free bearing	105 ± 7

Model		K 1	K 100 RS
Brake fluid		DOT 4, e.g.	ATE "SL" DOT 4 Castrol Disc Brake DOWET 504 Shell Donax DOT 4 Hydraulan DOT 4
Brake pads		Use only pads from the same manufacturer together	
Minimum pad thickness	mm	1,5	
Front wheel		Twin disc brake	
Brake disc diameter	mm	305	
Brake disc thickness	mm	5 ± 0,1	
Minimum thickness	mm	4,5	
Effective pad area	cm^2	100	
Piston dia. in brake caliper	mm	32/34	
Piston diameter in master cylinder	mm	20	
Rear wheel		Single disc brake	
Brake disc diameter	mm		285
Brake disc thickness	mm		5 ± 0,2
Minimum thickness	mm		4,57 = 0,18"
Permissible brake pad lateral runout	mm	0,1	
Effective pad area	cm^2	41,5	
Piston dia. in brake caliper	mm	38	
Piston diameter in master cylinder	mm	12	

Model	K 1	K 100 RS
Threaded connection		**Nm**
Brake caliper to slider tube/rear wheel drive		32 ± 2
Brake pipe to caliper		7 ± 1
Brake hose to pipe		7 ± 1
Hollow screw for brake hose at distributor pipe		7 ± 1
Distributor pipe to fork bridge		10 ± 1
Brake hose to distributor pipe		7 ± 1
Brake hose to master cylinder		11 ± 1
Brake disc to front wheel		22 ± 3
Quick-release axle retaining screw		33 ± 4
Quick-release axle clamp screw		14 ± 2
Brake disc to rear wheel drive		21 ± 2
Rear wheel studs		105 ± 4
Brake pedal to footrest plate		25 ± 3
Master cylinder to footrest plate		6 ± 1
Adjusting screw at master cylinder		8 ± 2
Bleed screw		7 ± 1
Distributor to stabilizer		17 ± 2

Model		K 1 K 100 RS
Type of wheel		Cast light alloy,
Wheel size	front	3,50 x 17 MT H 2
Wheel size	rear	4,50 x 18 MT H 2
Radial runout, max.	mm	0.5 measured at rim shoulder without tyre
Axial runout, max.	mm	0.5 measured at rim shoulder without tyre
Tyre size	front	120/70 VB 17 tubeless
Tyre size	rear	160/60 VB 18 tubeless
Tyre pressures with cold tyres		
One-up, front	bar	2,2
rear	bar	2,5
Two-up, front	bar	2,5
rear	bar	2,9
Wheel bearing lubrication		Brand-name anti-friction bearing grease Operating temperature range -30 ... + 140°C Drip point 150 ... 230°C High corrosion inhibiting action, good resistance to moisture and oxidation e.g. Shell Retinax A

TIGHTENING TORQUES

Model	K 1	K 100 RS
Threaded connection		**Nm**
Brake disc to front wheel		22 ± 3
Brake caliper to slider tube		32 ± 2
Quick-release axle clamp screw		14 ± 2
Quick-release axle retaining screw		33 ± 4
Rear wheel studs		105 ± 4
Note correct tightening order:		
Pre-assembly:		all studs hand-tight
Next, tighten the 4 outer studs in a crosswise pattern to		50
Tighten the central stud to		105 ± 7
Final tightening value for outer studs		105 ± 7

FRAME		TECHNICAL DATA	
Model		**K 1**	**K 100 RS**
Location of manufacturer's plate Location of frame number		On rear right frame tube	
Overall width (incl. mirrors)	mm	875	
Seat height, off-load	mm	780	800
Overall length	mm	2230	
Wheelbase, off-load	mm	1565	
Wheel misalignment	mm	max. 3	
Unladen weight	kg	258	259
Gross weight limit	kg	480	

FRAME, FAIRING ELEMENTS — TIGHTENING TORQUES

Model	K 1	K 100 RS
Threaded connection		**Nm**
Frame to engine or intermediate flange		45 ± 6
Bearing mount to gearbox		41 ± 5
Centre stand to bearing mount		41 ± 5
Side stand to bearing mount		41 ± 5
Footrest plate to gearbox		15 ± 2
Bearing mount to footrest plate		29 ± 3
Fairing holder to engine		9 ± 1

Model		K 1 K 100 RS
Battery		BMW-Mareg, with transparent polypropylene case
Standard version	V/Ah	12/25
Alternator		Three-phase AC generator with all-electronic voltage regulator; direct drive, ratio 1 : 1.5
Output	W	460
Starter motor		Permanent-magnet type with four-stage reduction gears, ratio 27 : 1, and freewheel
Rating	kW	0,7
Electrical circuit protection		"Minifuses" (flat plug-in pattern); 7 circuits
Load ratings	A A	7,5 (3 circuits) 15 (4 circuits)
LIGHTS		
Headlight diameter	mm	180 Ø
Bulbs: High/low beam		H4 halogen, 60/55 W, asymmetric
Parking light	DIN 72601	12 V/4 W, standard designation T 8/4
Rear light assembly: Rear light Brake light	 DIN 72601 DIN 72601	 12 V/10 W, standard designation R 19/10 12 V/21 W, standard designation P 25-1
Flashing turn indicators	DIN 72601	12 V/21 W (4x), standard designation P 25-1
Instrument cluster: Flashing turn indicator repeater	 DIN 72601	 12 V/4 W (2x), standard designation T 8/4
Other telltales and instrument lighting	DIN 72601	12 V/3 W (13x), standard designation W 10/3