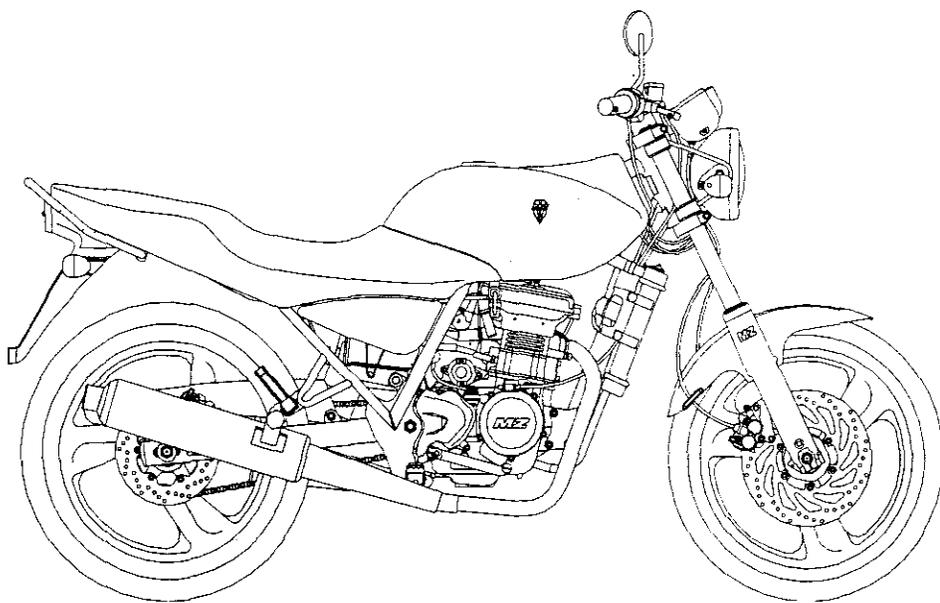


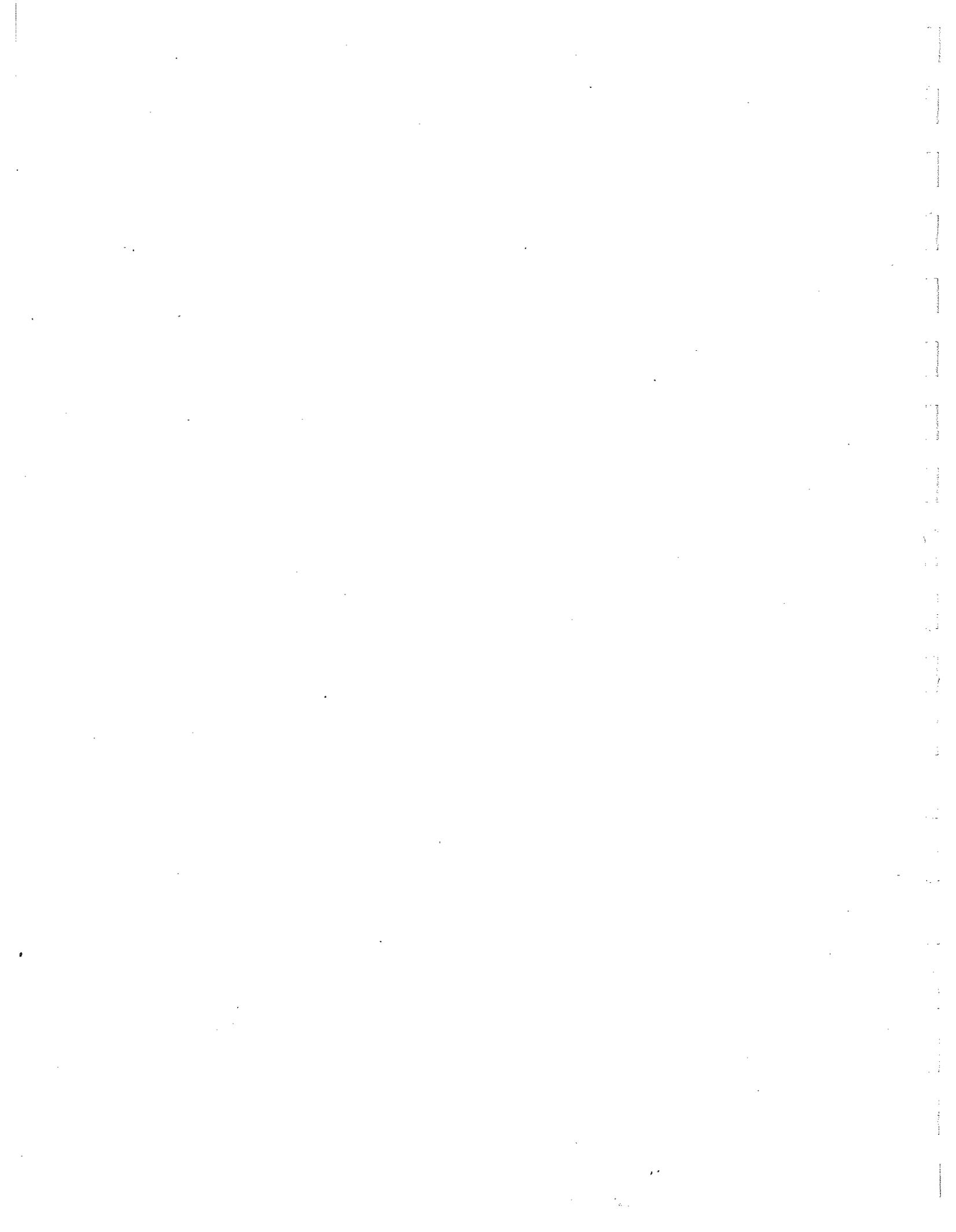


Repair Manual

RT 125



MOTORRAD- UND ZWEIRADWERK GMBH



Foreword

This repair manual explains the most important work procedures for the main components of the MZ RT 125. It is primarily oriented toward MZ service stations with qualified, trained personnel and individuals with a fundamental technical understanding of the mechanical concepts and processes. Repairs and maintenance work should only be performed with sufficient knowledge and experience and not based on this manual alone.

We are not liable for damages due to:

- unauthorized technical modifications
- installation of parts which are not original replacement parts or accessories
- installation of accessories not intended for the specific model
- improper repair work on MZ vehicles!

This repair manual contains various hazard warnings, important information and tips. Please pay careful attention to this information to eliminate the risk of injury during maintenance and repair work. Incorrect maintenance or repairs can endanger life and health or damage the vehicle. Please also note that the hazard warnings, important information and tips are not exhaustive. It would be impossible to warn against all possible hazards and consequences which could result from failure to follow these instructions.

We are constantly working on the further development of our vehicles. For this reason, we reserve the right to make changes in the interests of technical progress (equipment, shape, technology, etc.).

This repair manual is based on the most recent information available at the time of publishing. Therefore, no claims may be derived from the information, figures and descriptions in this repair manual. The illustrations also do not necessarily perfectly depict the vehicle to be repaired.

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1 Safety Regulations and Information

1.1 Important Information

Important information in this manual is designated as follows:

**Danger!**

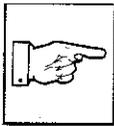
Immediate danger!

Failure to heed the warning may result in serious injury or death.

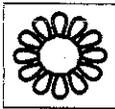
**Attention!**

Dangerous situation!

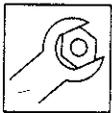
Failure to heed the warning may result in injuries or property damage.

**Note:**

Useful supplemental information or user tips.

**Environment!**

Possible dangers for the environment and information on how to prevent them.

**Tightening torque:**

Special tightening torques to be observed.

Every safety item explains:

- which danger exists,
- what can happen,
- what you can do to prevent injuries.

1.2 Safety Regulations**Attention!**

Installation errors can endanger the health or even the life of the vehicle operator and other persons in traffic.

For this reason, please observe all safety regulations and information when performing work.

- Work safely and with your full attention!
- Follow the procedures described in the manual!
- Only operate the engine in a well ventilated work area and for no longer than necessary (health and

2 Data Sheets

2.1 Technical Data

Dimensions	
Overall length	1950 mm
Overall width with/without mirror	860/700 mm
Width of handlebars	690 mm
Height with/without mirror	1240/1080 mm
Seat height	770 mm
Wheel base	1355±15 mm
Caster	102 mm
Steering angle	62.5°
Steering angle left/right	40° each
Turning circle	3.9 m
Ground clearance with maximum permissible load	125 mm
Weight (ready to ride)	133 kg
Unladen front axle load	62 kg
Unladen rear axle load	71 kg
Total permissible weight	320 kg

Engine	
Engine type	MZ 125
Method of operation / control	4-stroke ignition engine, DOHC, 4 valves
Number of cylinders	1, vertical, inclined 10° forward
Cylinder capacity	124 cm ³
Piston stroke	44.0 mm
Output at rpm	11 kW/9000 rpm
Cooling type	water cooling
Nominal set value of the engine temperature regulator	thermostat opening beginning 71 ° ~ 81 °C
Maximum torque at rpm	11.7 Nm / 8500 rpm
Compression ratio	11.2 ± 1:1
Camshafts: <ul style="list-style-type: none"> • Drive • External diameter of the camshaft at the bearing • Clearance between the bearing neck and bearing cap 	control chain 92 RH 2010 / 122 chain links 19.967 - 19.980 mm 0.020 - 0.040 mm
Tappet clearance <ul style="list-style-type: none"> • Intake • Exhaust 	0.09 - 0.11 mm 0.12 - 0.14 mm

Engine	
Bucket tappet	
• Bucket tappet outside diameter	24.967 -24.980 mm
• Bucket diameter in cylinder head	25.000 -25.021 mm
• Clearance	0.020 -0.054 mm
Lubrication	wet sump lubrication
Clutch	wet multi-plate clutch
Air filter	dry paper filter

Carburettor	
Manufacturer, identification, type	MIKUNI VM 24
Main jet	100
Needle jet	N-9
Idling jet	15
Needle adjustment	5L10/3rd notch from top
Idle air adjusting screw	1/4-1/2 turn out
Idling speed	1400 ⁺¹⁰⁰ (1800 ⁺¹⁰⁰) rpm
Fuel level	32 mm below centre of carburettor
Float height	20+1mm from sealing surface of the carburettor casing
Exhaust gas setting	max. 4.5Vol% CO

Transmission	
Number of gears	6
Idling speed indicator	pilot lamp "N"
Lubrication	wet sump drip lubrication
Type of transmission	spur pinion-change (wheel) gear with dog-type lock shift
Operating system	left foot controls
Primary step-down gear system	spur gears
Secondary step-down gear system	chain 1/2"x5/16", 126 links
Primary ratio	24/91 (1:3.792)
Secondary ratio	16/49 (1:3.063)
1st gear	12/35 (1:33.868)
2nd gear	16/30 (1:21.772)
3rd gear	17/24 (1:16.393)
4th gear	21/24 (1:13.271)
5th gear	23/22 (1:11.107)
6th gear	22/18 (1:9.501)

Chassis	
Type of frame	tubular frame
Front suspension - Design - Spring travel - Oil volume/type	telescopic fork 130 mm 250 cm ³ per fork spar / fork oil AE 5W, BP Autram GM-MP, BP Autram ATF10W
Rear suspension - Design - Spring travel / adjustment	long swinging fork 130 mm/adjustable spring base
Steering bearing	deep groove ball bearing
Clutch lever and Twist grip - Play in the clutch lever - Play in gas cable	3 - 5 mm at the end of the clutch 2 - 3 mm at the twist grip flange
Wheels	
Front tyre tyre pressure, load depending Rim size Rim wobble limit, vertical side	110/70-17 54H TL 180 kPa 3.00x17 2 mm 2 mm
Rear tyre tyre pressure, load depending Rim size Rim wobble limit, vertical side	130/70-17 54H TL 230 kPa (260 kPa max. permissible axle load) 4.00x17 2 mm 2 mm
Front wheel brake - Design - Outside diameter x plate thickness - Thickness of the brake pad (wear limit) - Main brake cylinder inside diameter - Brake caliper cylinder inside diameter - Brake fluid	disc brake, floating brake caliper bearing 280 x 4 mm 5.0 mm (< 2.0 mm) 11 mm 25.4 mm DOT 4
Rear wheel brake - Design - Outside diameter x plate thickness - Thickness of the brake pad (wear limit) - Main brake cylinder inside diameter - Brake caliper cylinder inside diameter - Brake fluid	disc brake, floating brake caliper bearing 220 mm x 4 mm 5.0 mm (< 2.0 mm) 13 mm 25.4 mm DOT 4
Brake level and brake pedal: - Play in brake lever - Position of brake pedal	2 - 5 mm at the end of the brake lever 25 mm under the footrest rubber surface

Electrical Installation	
Nominal voltage	12 V
Ignition	contract-free capacitor ignition
Ignition unit: - Resistance of the ignition coil - Ignition unit / manufacturer	324 ± 32 Ohm at 23°C 16.754.126/Iskra, AET 16.754.127/Iskra, AET (80 km/h variant)

Electrical Installation	
Ignition coil: - Model / manufacturer - Minimum sparking distance - Resistance of the primary coil - Resistance of the secondary coil	16.725.102/Iskra, AET 6 mm 0.72 Ohm \pm 15% at 20°C 7.6 kOhm \pm 20% at 20°C
Ignition time point	depends on rpm
80 km/h variant: - Riding speed < 2 km/h - Riding speed > 2 km/h < 80 km/h - Riding speed > 80 km/h	ignition event at 6,700 rpm rpm limitation above 10,500 rpm ignition events to reduce performance
Spark plug	NGK CR8E
Spark plug air gap (mm)	0.7
Alternator	alternating current generator 180 W at 5000 rpm
Battery	12V/9 Ah
Charging system	transverter
Headlight	H4 12V-60/55W
Parking light	12V-5W
Direction indicators	12V-10W
Tail light	12V-21/5W
Speedometer illumination	12V-2W
Rev counter illumination	12V-2W
Indication lights	12V-1W
Main fuse (light blue)	15A
Direction indicator fuse (purple)	3.0A
Fan fuse (brown)	7.5A

Filling Amounts	
Fuel	13.5 l Super unleaded, min. RON 95
Fuel reserve	3.6 l
Engine oil	1.2 l SAE 15W-50 API SG/SH 1.2 l SAE 15W-40 API SG/SH
Total coolant volume	950 cm ³
Telescopic fork volume per spar	250 cm ³

Driving Performance	
Maximum speed	108 km/h or 80 km/h (reduced performance version)
Fuel consumption	3.2 l/100km

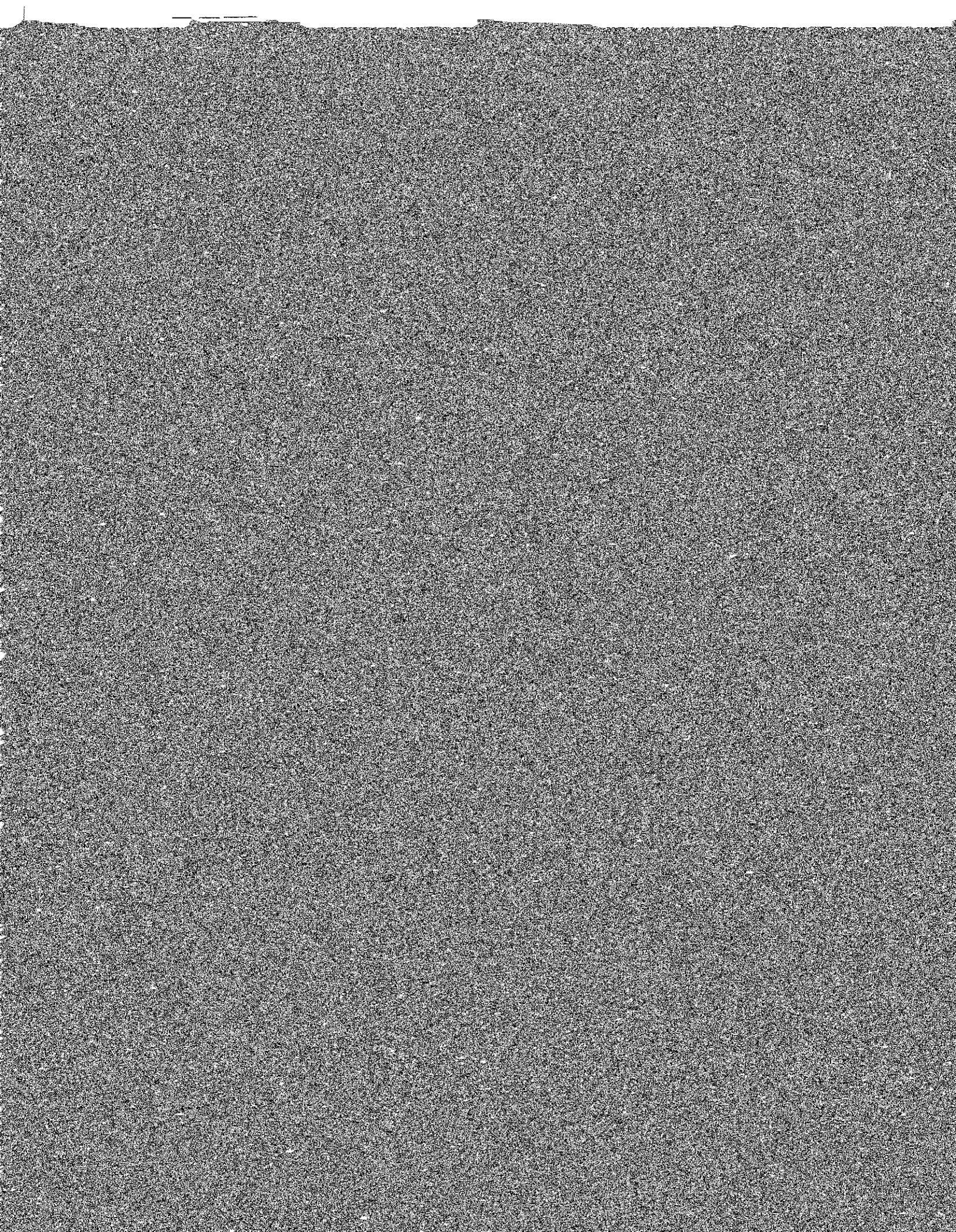
2.2 Inspection

Engine and gearbox	see page	after 1,000 km	every 6,000 km or 1x year	every 12,000 km	every 2 years
Check/adjust clutch clearance		•	•	•	
Check/adjust valve clearance		•	•	•	
Coolant level/density/anti-freeze compound		•	•	•	change
Check oil level / add oil		after every 1,000 km			
Oil change, clean the coarse filter		•	•	•	
Tighten the exhaust pipe attachment to the cylinder		•	•	•	
Check the engine mountings		•	•	•	
Clean the carburettor		•	•	•	
Check the carburettor settings		•	•	•	
Measure the exhaust fume values		annually			

Chassis	see page	after 1,000 km	every 6,000 km or 1x year	every 12,000 km	every 2 years
Check the braking efficiency			•	•	
Check the brake fluid level		before every ride			
Change the brake fluid					•
Check the thickness of the brake linings		every 2,000 km			
Grease the ball joint between the spring strut and the swingarm			•	•	
Check and service the telescopic fork			•	•	
Change the fork oil					•
Check the air pressure and condition of the tyres		before every ride			
Check the wheel rim eccentricity			•	•	
Check the clearance on the wheel bearings			•	•	
Check the damping of the rear wheel drive			•	•	
Clean the fuel filter in the fuel cock		•	•	•	
Clean the air filter		every 6,000 km (or more often, depending on riding conditions)			
Replace the air filter		every 12,000 km (or more often, depending on riding conditions)			
Empty the condensate collector under the intake			•	•	
Check that all bolts, screws and hose clips are tight		•	•	•	

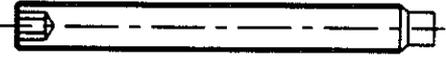
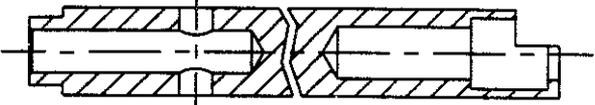
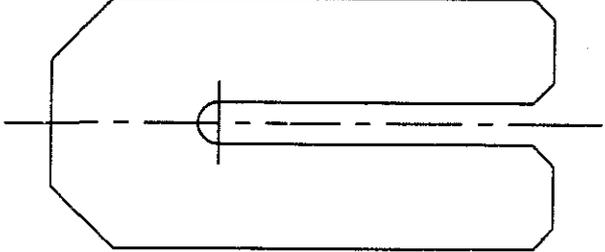
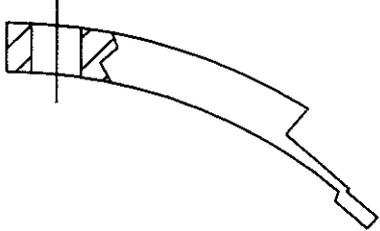
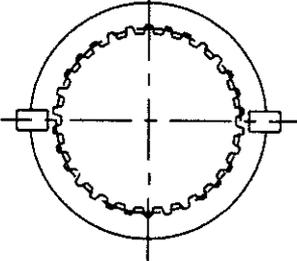
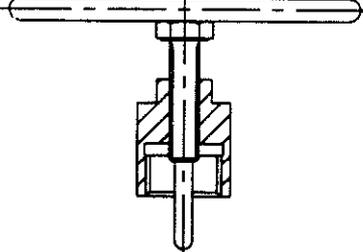
Chassis	see page	after 1,000 km	every 6,000 km or 1x year	every 12,000 km	every 2 years
Check the chain slack and wheel tracking		every 500 km (or more often, depending on riding conditions)			
Clean and lubricate the chain		every 500 km (or more often, depending on riding conditions)			
Lubricate the hand lever and Twist grip		1 x year (or more often, depending on riding conditions)			
Check and lubricate the bowden cables		1 x year (or more often, depending on riding conditions)			
Lubricate the speedometer drive		1 x year (or more often, depending on riding conditions)			
Clean and lubricate all sliding surfaces and bearings			•	•	
Check the side stand switch		•	•	•	

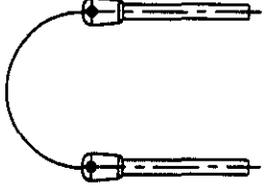
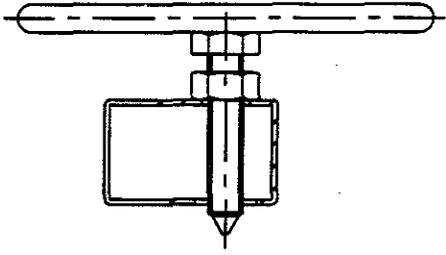
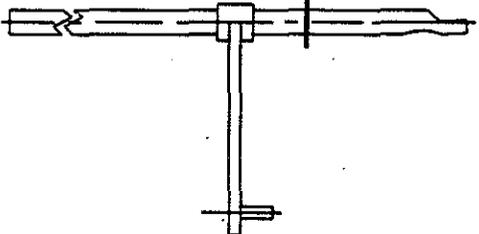
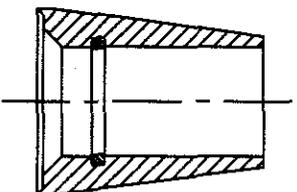
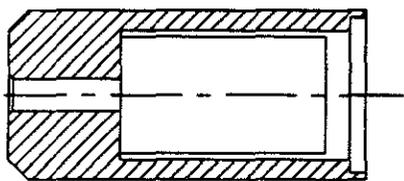
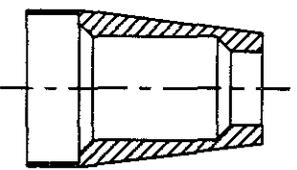
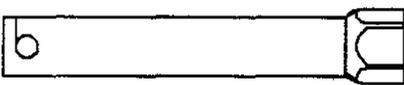
Electrical Installation	see page	after 1,000 km	every 6,000 km or 1x year	every 12,000 km	every 2 years
Check the lighting and signalling systems		before every ride			
Check the headlight adjustment (also after every adjustment of the spring preload of the spring strut)		•	•	•	
Check all accessible contacts, treat with contact spray			•	•	
Spark plugs: check, clean/replace		•	•	•	
Check the air gap of the pick-up sensor				•	
Check the electrolyte level in the battery and the cable terminals		every 6 weeks			



2.4 Special Tools

The term "special tool" is abbreviated in the text as "ST".

Number	Part Number	Designation	
1	8999200000	Locking bolt, crankshaft	
2	8999201000	Sleeve for valve shaft seal	
3	8999202000	Piston installation plate	
4	8999203000	Pick-up adjusting tool	
5	8999204000	Clutch locking tool	
6	8999205000	Alternator rotor removal tool	

Number	Part Number	Designation	
7	8999206000	Camshaft locking tool	
8	8999207000	Casing halves separator tool	
9	8999208000	Brace for index lever	
10	8999209000	Installation sleeve for left crankshaft	
11	8999210000	Adapter for valve spring lifter	
12	8999212000	Installation sleeve for right crankshaft	
13	3937001000	Spark plug spanner	

2.5 Tightening Torques

Tighten all screws and nuts after 1000 km (2 months), then every 6000 km.

The nuts, screws and bolts listed in the following table are important safety parts. They should be tightened with the specified torque as necessary, using a torque spanner.

2.5.1 Chassis

Designation	Thread	Tightening Torque (Nm)	Securing
Steering tube bolt	M24x1	80 ⁺¹⁰	
Fork bridge, top locking screw	M8	25 ⁺⁵	
Fork bridge, bottom locking screw	M8	25 ⁺⁵	
Front brake caliper	M8	25 ⁺⁵	
Rear axle	M16	100 ⁺¹⁰	
Rear brake caliper screw	M8	25 ⁺⁵	Loctite 290
Rear brake caliper, screw plug locking bolt	M10x1	2 ⁺¹	Loctite 290
Brake pad locking bolt	M10x1	15 ⁺⁵	
Brake caliper sliding pin		15 ⁺⁵	
Link bracket bolt	M16	100 ⁺¹⁰	
Side stand / bearing bracket	M6	5 ⁺² Nm, re-torn by 90°	
Top handlebar locking screw	M8	25 ⁺⁵	
Front axle	M16	60 ⁺⁵	
Front axle locking ring	M8	25 ⁺⁵	
Brake hose, hollow bolt	M10x1	20 ^{+2.5}	
Ignition steering lock	M6	Break-off screws	
Rear brake disc	M6- mk	10 ⁺²	micro encapsulated
Front brake disc	M6- mk	10 ⁺²	micro encapsulated
Brake pedal	M6	18 ⁺³	

Designation	Thread	Tightening Torque (Nm)	Securing
Spring strut mountings			
top	M10	40 ⁺⁵	
bottom	M10	40 ⁺⁵	
Exhaust pipe support/frame	M10	30 ⁺⁵	
Exhaust clamp	M6	10 ⁺²	
Exhaust flange/cylinder head	M6	3 ⁺¹	
Exhaust pipe support/exhaust	M10	30 ⁺⁵	
Instrument mount	M6	6 ⁺¹	
Headlight	M10	10 ⁺¹	
Regulator mounting	M6	4 ⁺¹	
Securing instruments to mount	M6	4 ^{+1.5}	
Switch lever	M6	10 ⁺²	
Front wheel mud guard	M6	5 ⁺¹	
Tank (rear)	M8	20 ⁺⁵	
Fuel cock on tank	M5	3 ⁺¹	
Side panelling (top)	M6	3 ⁺¹	
Splash shield on intake muffler	M5	0,5 ^{+0.5}	
Splash shield on frame	M6	6 ⁺²	
Front tail piece	M5	1 ⁺¹	
Front mounting shackle	M8	20 ⁺⁵	
Rear mounting shackle	M8	20 ⁺⁵	
Intake muffler (on frame)	M6	5 ⁺¹	
Pinion cover	M6	6 ⁺²	
Seat lock on frame	M6	6 ⁺²	
Collar screw for rubber battery piece in the intake muffler	M6	3 ⁺¹	Loctite 290
Brake fluid container on intake muffler	M6	1 ⁺¹	
Rubber-metal element for fastening tail light to tail piece	M4	0,5 ^{+0.5}	
Tail light	M4	0,5 ^{+0.5}	
Chain guard	M6	2 ⁺¹	
Left handlebar controls	M5	1 ⁺¹	

Designation	Thread	Tightening Torque (Nm)	Securing
Clutch and brake handlebar mountings	M6	6 ⁺¹	
Twist grip	M5	5 ⁺¹	
Indication lights housing	M5	1 ^{+0.5}	
Direction indicators front/back	M6	1 ⁺¹	
Flasher mounting (rubber collar nut)	M4	20 ⁺¹⁰ Ncm	
Ignition box mounting	M5	70 ⁺¹⁰ Ncm	
Ignition coil mounting	M5	3 ⁺¹	
Horn	M6	12+3	
Relay (rubber collar nut)	M4	10 ⁺¹⁰ Ncm	

2.5.2 Engine

Designation	Connection	Tightening torque	Securing
Transmission bearing mounting plate, right	DIN 912-M6x12-8.8-mk	10 ⁺² Nm	micro encapsulated
Housing screws	DIN 912-M6x30-8.8-ps si	10 ⁺² Nm	
Housing screws	DIN 912-M6x70-8.8-ps si	10 ⁺² Nm	
Tension rod in housing	Stud bolt M8	13 ⁺³ Nm	
Cylinder head nut	DIN 6331-M8-10	22 Nm, then tighten by 80 ⁺¹⁰ °	
Timing chain shaft	DIN 912-M6x90-8.8	10 ⁺² Nm	
Bearing cap piece nut	DIN 6923-M6-8	10 ⁺² Nm	
Camshaft bolt	DIN 931-M8x25-10.9	30 ⁺² Nm	Loctite 243
Screw, sliding rail	M6 screw	10 ⁺² Nm	Loctite 243
Bolt, index lever	M6 bolt	8 ⁺² Nm	Loctite 243
Oil pump screw	DIN 912-M6x25-8.8-mk	10 ⁺² Nm	micro encapsulated
Water pump screw	DIN 912-M6x20-8.8-mk	10 ⁺² Nm	micro encapsulated
Primary gear nut	DIN 936-M16x1.5-22H left	78 ⁺⁴ Nm	
Clutch dog nut	DIN 934-M12x1-10	58 ⁺⁴ Nm	
Free-wheel countersunk screw	DIN 7991-M6x35-10.9	8 ⁺² Nm	Loctite 243
Cover screw, right	DIN 912-M6x30-8.8-ps si	10 ⁺² Nm	
Cover screw, right	DIN 912-M6x50-8.8-ps si	10 ⁺² Nm	

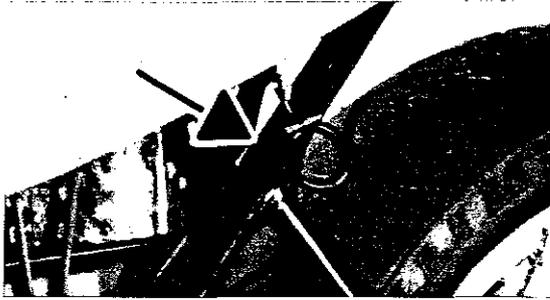
Designation	Connection	Tightening torque	Securing
Oil filter cover screw	DIN 912-M6x20-8.8-ps si	8 ⁺² Nm	
Oil drain plug	ISO 7379-10 M8x30-12.9-f9 ps si	8 ⁺² Nm	
Cover screw, left	DIN 912-M6x30-8.8-ps si	10 ⁺² Nm	
Cover screw, left	DIN 912-M6x40-8.8-ps si	10 ⁺² Nm	
Clutch springs screw	264M31 A15921	5 ⁺¹ Nm	
Air intake fitting screw	DIN 912-M6x20-8.8-ps si	8 ⁺² Nm	
Idling switch		10 ⁺² Nm	
Oil pressure switch	M10x1	10 ⁺² Nm	
Thermal switch		13 ⁺² Nm	
Decoupler	EEZ HD 190, 13965.00.3	8 ⁺² Nm	
Rotor screw	DIN 933-M8x20-10.9-A4K- mk	26 ⁺⁴ Nm	micro encapsulated
Stator screw	DIN 912-M5x25-8.8-A4K- mk	5 ⁺² Nm	micro encapsulated
Pick-up screw	DIN 912-M5x12-8.8-A4K- mk	5 ⁺² Nm	micro encapsulated
E-starter screw	DIN 912-M6x30-8.8-ps si	8 ⁺² Nm	
Drain plug		20 ⁺⁵ Nm	
Oil screen screw cap	DIN 910-M18x1.5-A4K	30 ⁺⁵ Nm	
Chain adjuster locking screw	DIN 908 M18x1.5	15 ⁺⁵ Nm	
Crankshaft locking screw	DIN 912-M8x20-8.8-A4K	10 ⁺² Nm	
Spark plug	NGK CR 8 E	10 ⁺² Nm	
Clutch cable counter bearing screw	ISO-7380-M6x10-10.9-ps si	10 ⁺² Nm	
Clutch activation shaft locking screw	DIN 6912-M5x20-8.8-ps si	5 ⁺² Nm	Loctite 243 and colour markings
Clutch activation lever screw	ISO7380-M6x10-10.9-ps si	8 ⁺² Nm	
Support plate mounting screw for alternator cable	ISO 7380-M5x6-A4K	5 ⁺² Nm	
Carburettor mounting nut	DIN 985-M6-8-A4K, nut	8 ⁺² Nm	
Bearing cap piece stud bolt	DIN 835-M6x30-8.8	6 ⁺⁴ Nm	
Exhaust stud bolt	DIN 835-M6x30-8.8-A4K	5 ⁺² Nm	
Chain wheel nut	M16x1	70 ⁺⁵ Nm	Locking plate 37- 46.032
Cable holder screw	flat mushroom head screw M5x10-10.9-A4K	5 ⁺² Nm	

3 Chassis

3.1 Seat

Removal

1. Pull the pull ring.
The pull ring is located behind the left frame spar.
2. Pull the seat backward out of the lock and lift it up and off.



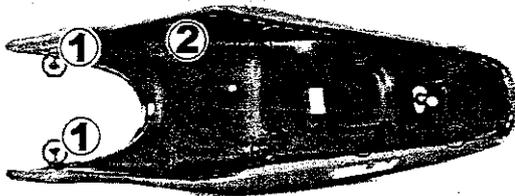
Inspection

Inspect the rubber parts for wear and porosity.
Replace defective parts.

Roll off the two O-rings (1).

The 8 rubber elements (2) are normally not intended to be replaced. Should it be necessary:

1. Pull off the rubber elements.
2. Insert new rubber elements with 5 mm thorn.
Insert the thorn into the hole of the rubber element and press it into the opening in the seat.



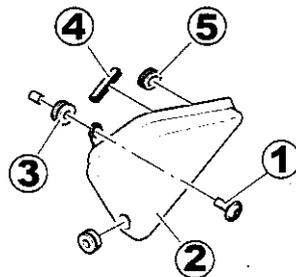
Installation

1. Slide the seat under the fuel tank.
2. Pressing lightly on the seat, snap the pins in the lock (requires easy motion of the bowden cable).

3.2 Covering

Removal

1. Unscrew the screw (1). Remove the side panel (2).
2. Inspect the spacer bushing (3), profile piece (4) and hook bushing (5), replace if necessary.
3. To install, insert the pins into the hook bushing and screw on.

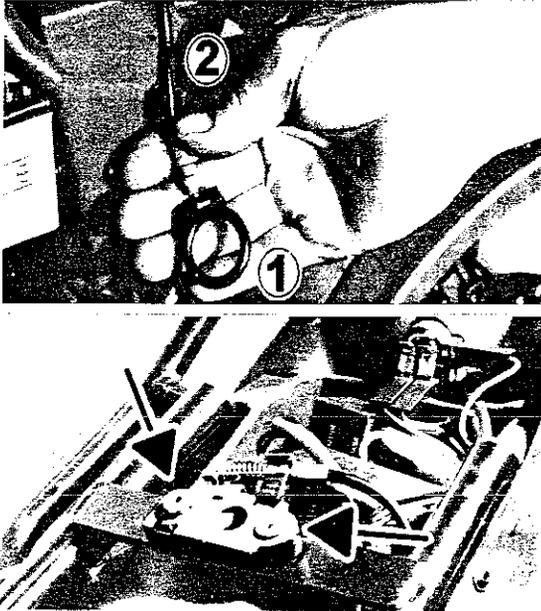
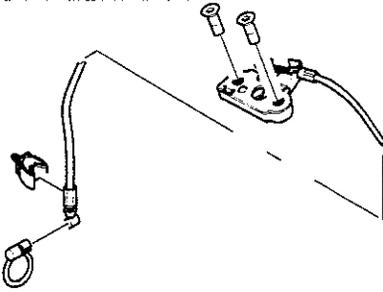


Installation

Install in reverse order.

3.3 Lock with bowden cable

The lock and bowden cable are available as a single replacement part and are replaced together.



Removal

1. Remove seat.
2. Remove tool package, if available.
3. Remove the left side panel (see 3. 2" Covering").
4. Remove the pull ring (1) from the bowden cable.
5. Remove the bowden cable from the line clip (2).

6. Remove the two countersunk screws,
7. Remove the lock and cable.

Installation

Install in reverse order.

The bowden cable must be installed in the same location.

Bowden cable maintenance

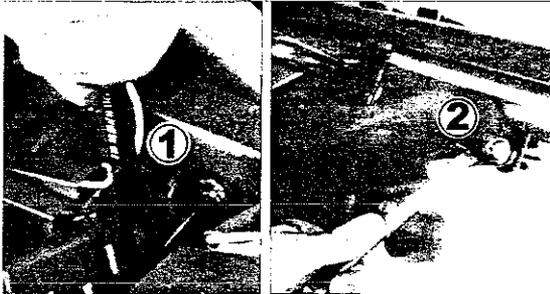
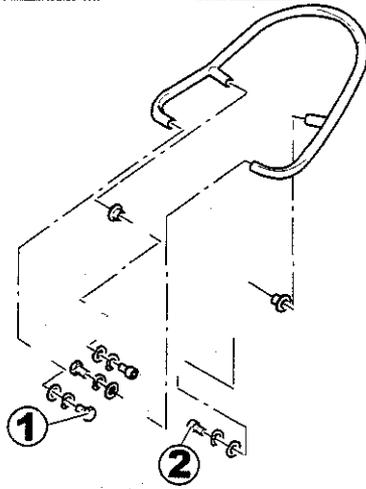
Clean the free ends of the bowden cable.

Treat the bowden cable with thin silicon oil or with bowden cable oils from the accessories shop.

3.4 Bracket

Removal

1. Remove seat.
2. Unscrew flasher relay.



3. Unscrew the 2 cylinder screws (1) in the rear part of the splash shield.
A hexagon socket spanner with ball head is a suitable tool.
4. Unscrew the 2 M8 screws (2).

Installation

Install in reverse order.

3.5 Fuel Tank



Danger!

Risk of fire and explosion!

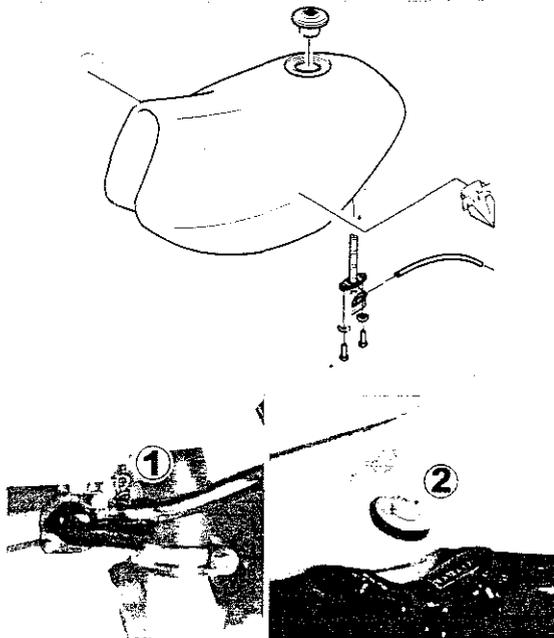
Fuel is a flammable liquid of hazard class A1 and therefore an extreme fire risk. Fuel fumes are highly explosive.

Exercise maximum care when working with fuel and other easily flammable substances!

Only work with the engine switched off and in well ventilated areas. No smoking! Keep flames and sparks away from the entire work area.

Completely empty the fuel tank, using only containers intended for this purpose. Explosive gas fumes remain in the fuel tank even after it has been completely drained!

Leaked or drained flammable liquids must be collected immediately, removed from the working area and stored in an appropriate location until final disposal.



The fuel tank is made of plastic (polyamide PA 6).

Defective fuel tanks cannot be repaired, they must be replaced.

The tank volume is approx. 13.5 l.

Removal

1. Close the filter valve.
2. Remove seat. Loosen the clamp (1) and pull out the fuel hose.
Collect any fuel that runs out.
3. Remove the nut, corrugated washer and washer (2).
4. Hold the fuel tank by the grip in the lower rear, pull it away from the bolt and pull it off diagonally up and back.

Inspection

Inspect the following parts and replace, if necessary:

- Fuel tank fastening element
- Filter valve with O-ring, fuel hose
- Front fuel tank mount
- Tank cap and seal
- Bushing and damping ring on left and right of the frame

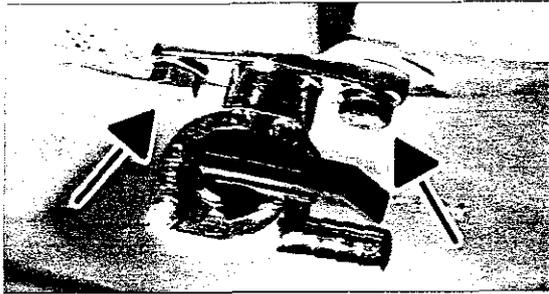
Installation

Install in reverse order.

3.5.1 Filter Valve

Removal

1. Empty the fuel tank.
To do so, connect the hose to the filter valve and let the fuel drain into a suitable container.
2. Unscrew the 2 M5 hexagon head screws.
3. Pull out the filter valve.



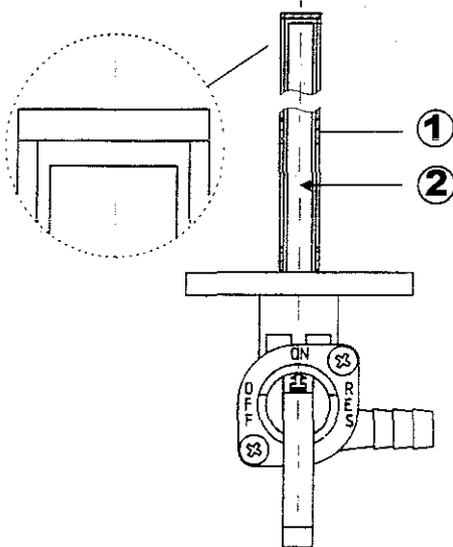
Screen



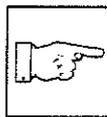
Attention!

Possible eye injury!

Always wear protective goggles when working with compressed air!



1. Separate the screen (1) from the filter valve by turning it to the left.
2. Rinse out with engine cleaner and dry with compressed air.
3. Insert the screen into the filter valve, turn to the right to tighten.



Note:

There must be space between the inside pipe (2) and the screen. Otherwise, no fuel can flow through the filter pipe. Operation is then only possible in the reserve setting of the filter valve (RES).

Installation

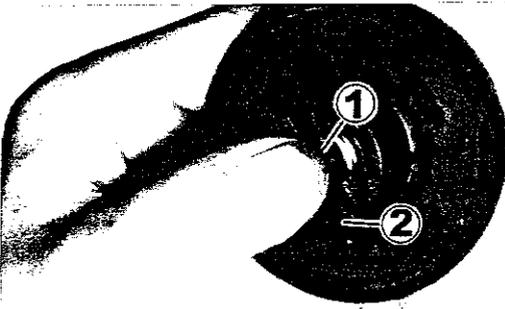
Always use the specified seal ring (oil- and fuel-resistant O-ring)! The seal surface of the filter valve/fuel tank and the threading must be undamaged. Otherwise the fuel tank must be replaced! The filter valve must sit flat on the seal surface.



3.5.2 Tank Cap

Removal

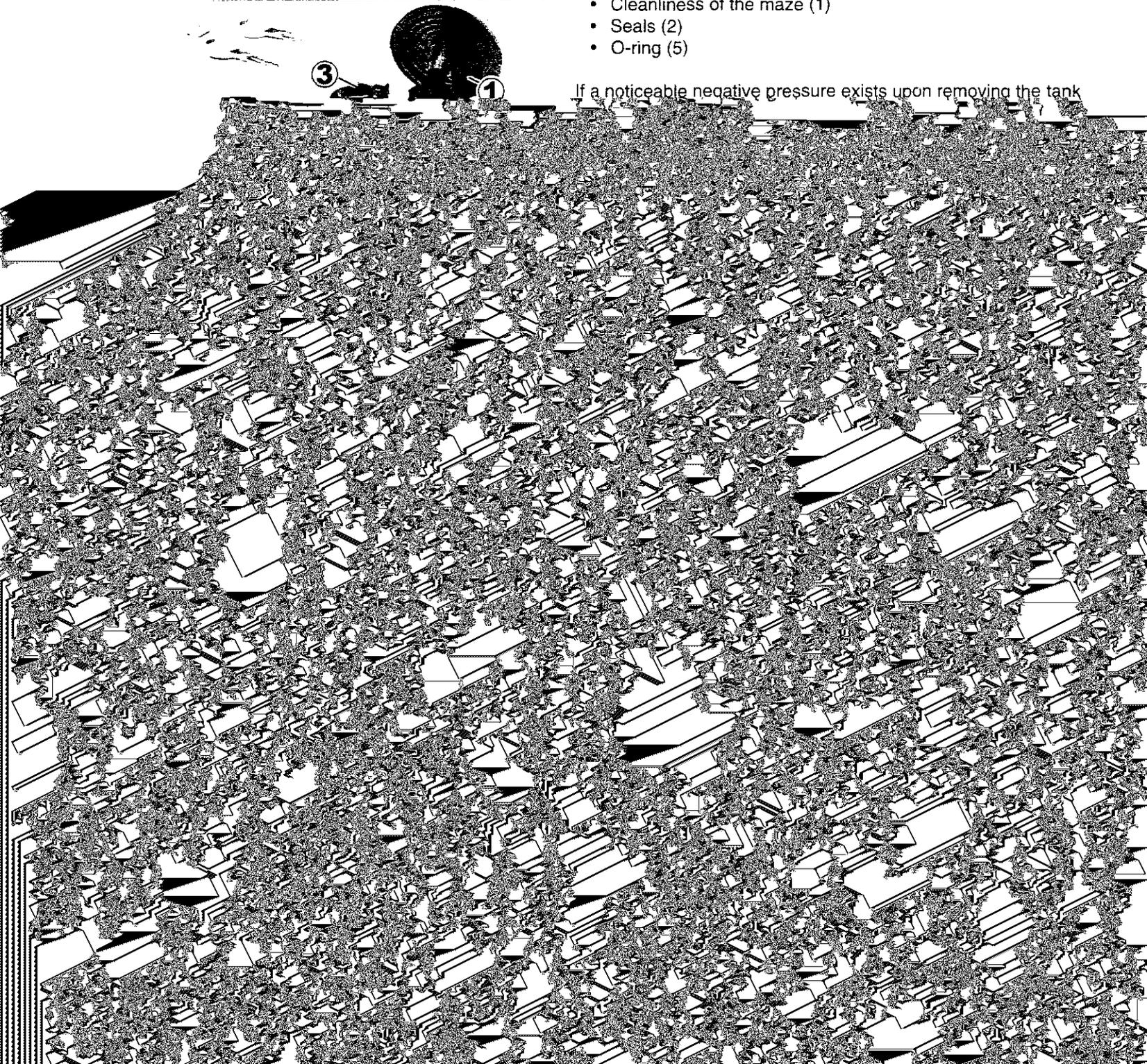
1. Press down the centre part (1) of the underside.
2. Remove the pin (2).
3. Remove the parts.



Inspection

- Cleanliness of the maze (1)
- Seals (2)
- O-ring (5)

If a noticeable negative pressure exists upon removing the tank



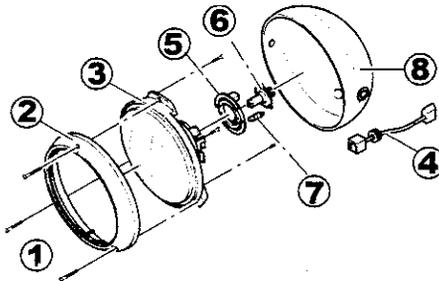
3.6 Lighting/Signal System

The lighting/signal system includes:

Headlight, parking light, tail light, indicator lights, control lights and horn.

Defective bulbs may only be replaced with the specified bulbs.

3.6.1 Headlight



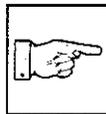
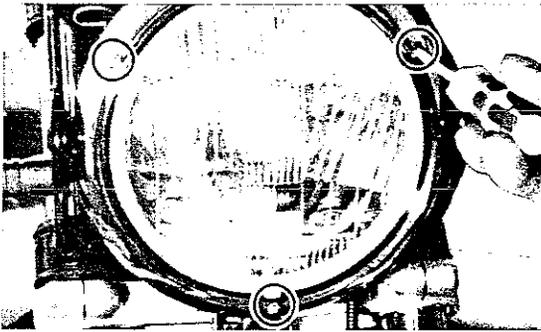
- (1) Phillips head thread-cutting screws
- (2) Front ring
- (3) Headlight reflector, right-hand symmetry
- (4) Connection cable
- (5) Locking ring
- (6) Bulb
- (7) Wedge base bulb
- (8) Headlight housing

Bulb

Type: H4-12V-60/55W

Removal

1. Unscrew the 3 Phillips head thread-cutting screws.
2. Remove the reflector.
3. Disconnect the connection plug from the bulb.



Note:

The terminals may tear off when removing the bulb from the cable. Always hold the bulb by the socket. Individual wires of the flexible cable must not be split! In this case, the fault must be corrected and the plug remounted.

4. Turn the locking ring approx. 25° counter-clockwise and remove it from the reflector.
5. Remove the bulb.
6. Check the terminals and clean if necessary.
The ends of the cable must be clean and tightly clamped in.

Installation

1. Insert new bulbs with the nose into the guide on the locking ring.
The screen on the lamp must point upward.
2. Insert the locking ring into the reflector and turn 25° clockwise.



Attention!

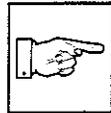
Inspect the terminals of the connection cable and clean, if necessary. Loose, corroded or contaminated terminals result in loss of power. The illumination is reduced.

Do not touch the glass parts of the bulb with bare fingers. Carefully clean the bulb glass with a clean, fibre-free rag and solvent.

3. Connect the connection cable and mount the reflector.
4. Perform a function test.

Replacing the wedge base bulb (parking light)

Type: Wedge base bulb W 2.1x9.5 d 12V 5W



Note:

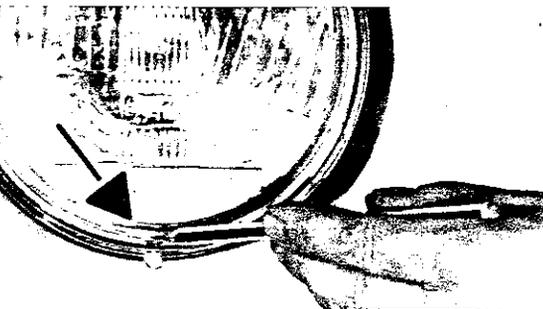
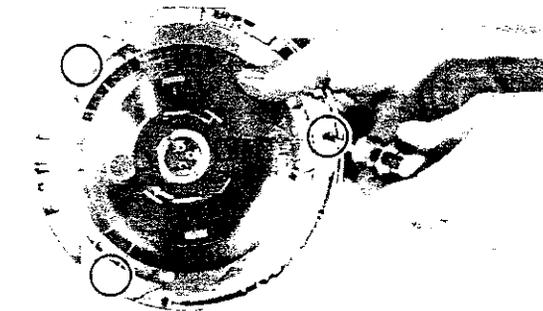
The terminals may tear off when removing the bulb from the cable. Always hold the bulb by the socket. Individual wires of the flexible cable must not be split! In this case, the fault must be corrected and the plug remounted.



1. Remove the reflector.
2. Hold the wedge base bulb by the socket and pull it out.
3. Insert a new bulb.
4. Mount the reflector.
5. Function test.

Replacing the front ring

1. Remove the reflector and bulb,
2. Unscrew the 3 screws on the back side.
3. Remove the front ring and replace, if necessary.



4. Align the position locks on the front ring and the reflector.
5. Screw on the front ring.
6. Mount the reflector.

Headlight housing:

Removal

1. Remove the reflector and disconnect the connection cable from the bulb.
2. Open the flap on the compact plug and pull out the cable form.
3. Remove the shoe insert from the plug.
To do so, undo the 2 locks on the shoe insert.
4. Pull the cable down and through.
5. Remove the 2 oval flange head screws on each side, pull out the headlight housing.



Installation

Install in reverse order.

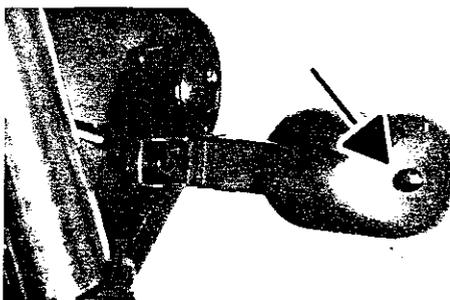
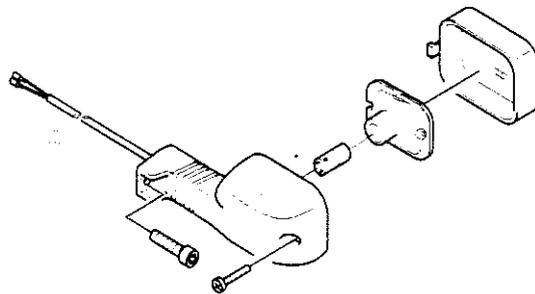
Perform a function test and adjust the headlight (see 3.6.4 "Adjusting the Headlight").

3.6.2 Turn Indicator Lights

All 4 turn indicator lights are almost identical.

The only difference is in the location of the water run-off notch on the light housing. This must always face downward when installed so that water can flow away.

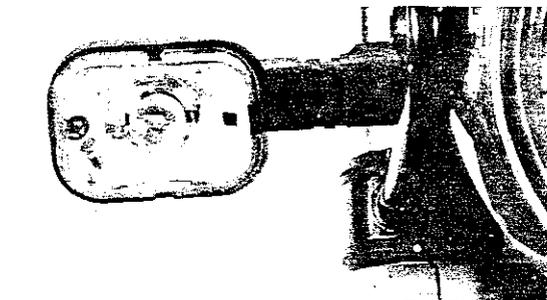
Perform the same work steps for all 4 turn indicator lights.



Changing the bulb

Type: 19/10-12 V/10 W

1. Unscrew the screw on the rear side.
2. Remove the light emission lens.
3. Turn the bulb slightly to remove it.
4. Check the terminals and clean if necessary.
The ends of the cable must be clean and tightly clamped in.
5. Insert the new bulb, turning slightly, and check that it sits tightly.
6. Install the light emission lens.



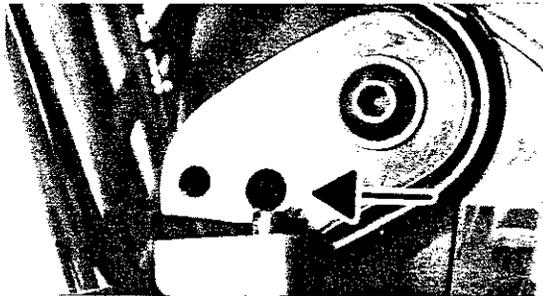
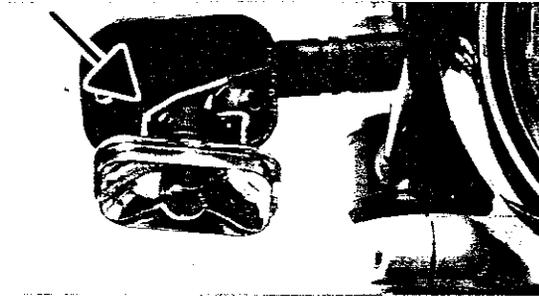
Turn indicator light housing:

Removal

1. Unscrew the cable from the negative pole on the battery.
2. Remove the light emission lens.
3. Note the connection locations.
Pull out the cable and remove the reflector.
4. Pull the cable out of the light housing through the indicator light rod.
5. Unscrew the hexagon socket head screw and self-tightening nut, remove the housing.

Installation

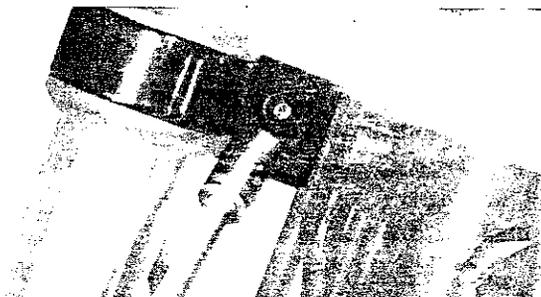
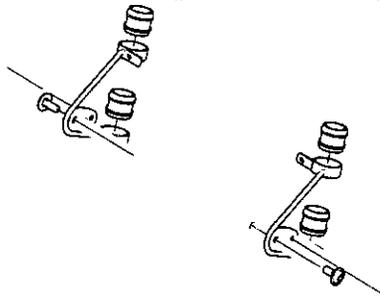
1. Insert the cable protector into the guide.
2. Screw on the housing.
3. Run the cable through the indicator light rod.
4. Connect the cable and insert the reflector.
5. Install the light emission lens.
6. Perform a function test.



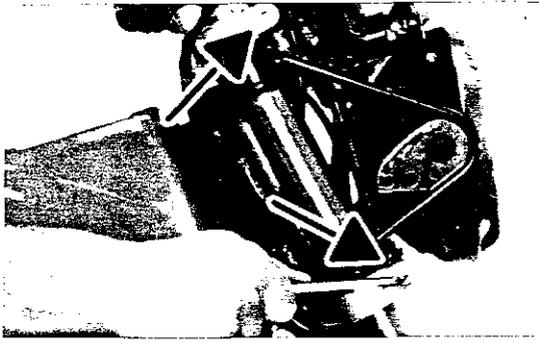
3.6.3 Headlight Mount

Removal

1. Remove the front wheel
(see 4.2.1 "Replacing the Front Wheel").
2. Remove the front turn indicator lights
(see 3.6.2 "Turn Indicator Lights").
3. Remove the speedometer shaft and brake hose from the guide.
4. Remove the front wheel mud guard
(see 3.9 "Front Wheel Mud Guard").
5. Remove the front brake caliper
(see 4.1.7 "Entire Brake Caliper").
6. Unscrew the 2 oval flange head screws on both sides of the headlight mount.



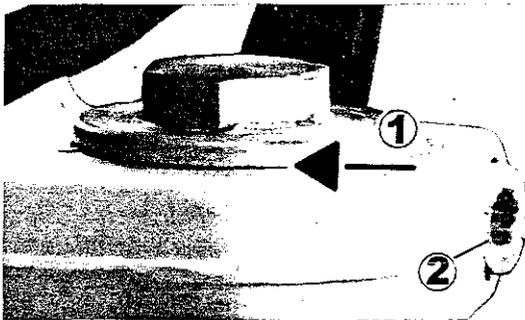
7. Unscrew the fixture for the instrument panel mount.



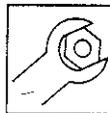
8. Remove the locking screws for the frontfork on both sides of the upper and lower fork bridge.
9. Pull the upright pipe down and out.
10. Remove the headlight mount.

Installation

Inspect the rubber sleeves between the headlight mount and the upright pipe, replace if necessary.



1. Insert the rubber sleeves into the headlight mount.
Wet the insides of the rubber sleeves with silicon spray.
2. Slide the headlight mount between the fork bridges.
3. Insert the fork spar.
The joint between the sealing cap and the upright pipe (arrow 1) must be flush against the upper flat surface of the top fork bridge.
4. Tighten the locking screw (2) on each side of the upper and lower fork bridges.
5. Screw the instrument panel mount and headlight onto the headlight mount.
6. Mount the turn indicator lights (see 3.6.2 "Turn Indicator Lights").
7. Insert the front wheel axle, mount the mud guard.
8. Remove the front wheel axle, install the front wheel.
9. Mount the brake caliper.
10. Attach the speedometer shaft and brake hose to the guides.
11. Perform a function test and adjust the headlight (see



Tightening torque:

Fork bridge locking screws:	25 ⁺⁵ Nm
Oval flange head screws:	10 ⁺¹ Nm
Instrument panel mount screws:	6 ⁺¹ Nm

3.6.4 "Adjusting the Headlight").

3.6.4 Adjusting the Headlight



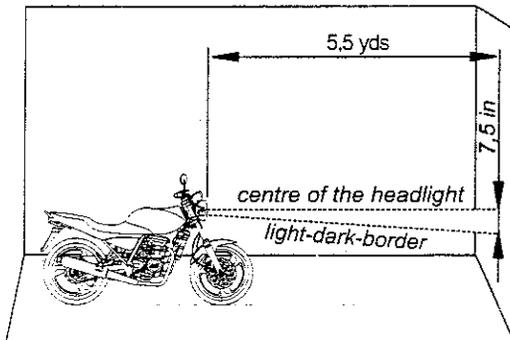
Attention!

Headlights set too high endanger the rider and other people in traffic!
 The headlight must always be correctly adjusted according to the typical load!
 The headlight must be readjusted after changes in the spring tension of the spring strut or other load changes!

Special adjustment tools are available for adjusting the headlight. If these devices are used, the manufacturer instructions must be followed.

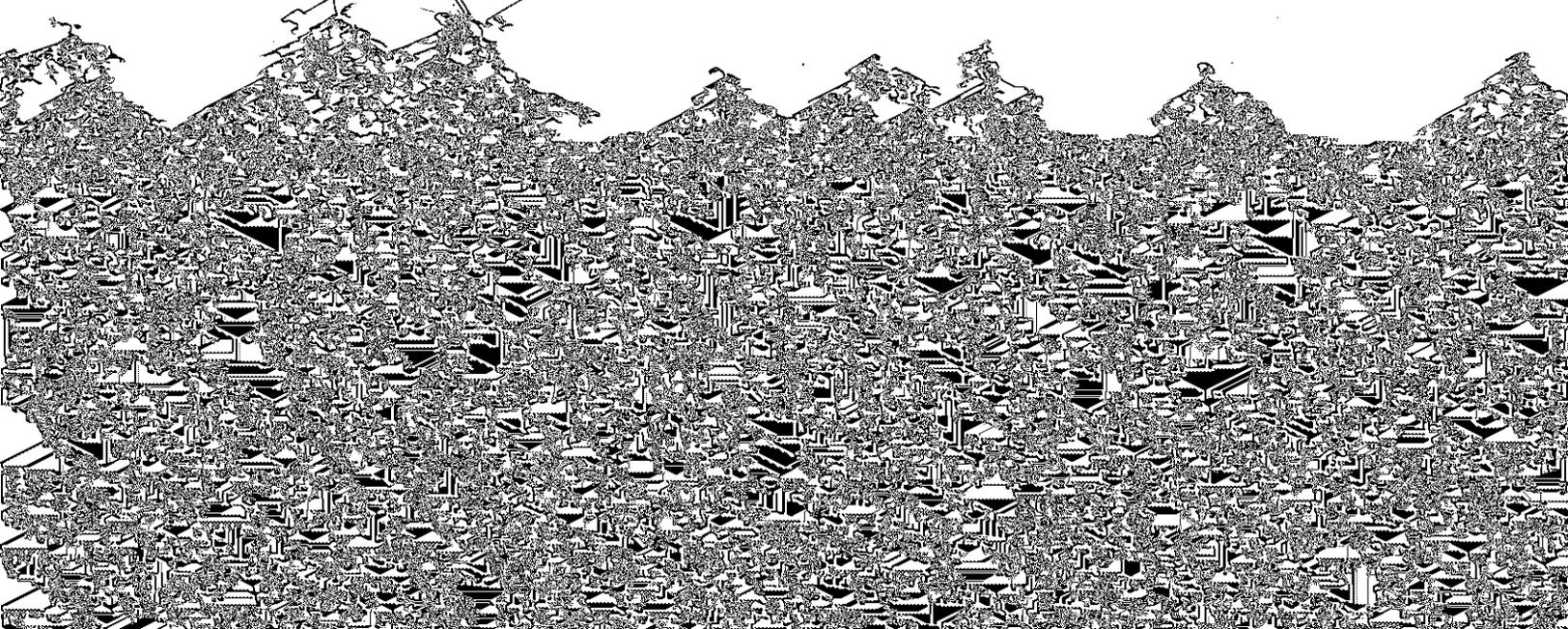
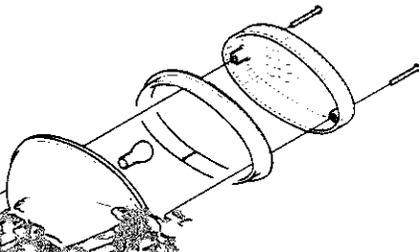
To manually adjust the headlight, do the following:

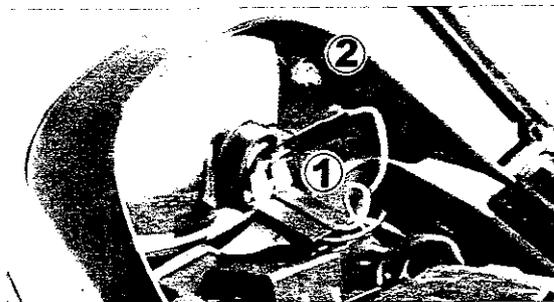
1. Mark the height of the centre of the headlight on a vertical wall.
2. Position the vehicle on a flat surface 5 m in front of this wall and load the motorcycle with a person weighing approximately 75 kg. Do not use the installation stand.
3. Loosen the mounting screws of the headlight by about 2 turns.
4. Switch on the dimmed headlight.
5. Adjust the headlight by tilting and turning the headlight housing.
 When the headlight is correctly adjusted, the light/dark border of the dimmed headlight cone must be 130 mm below the headlight centre marked on the wall.
6. Switch off the light.
7. Tighten the mounting screws.



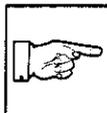
3.6.5 Tail Light

The bulb, **type 12-21/5W-P25-2** (two-filament bulb), fulfils the functions of tail light and brake light.



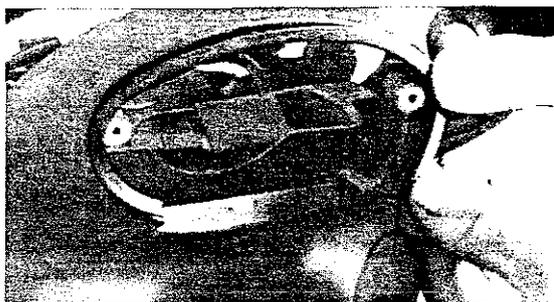


4. Disconnect the terminals (1).
5. Screw off the 2 M4 nuts (2).
6. Remove the tail light housing, inspect and replace, if necessary.
7. Remove the spacer sleeves and rubber spacer, inspect and replace, if necessary.



Note:

Make note of the cable connection locations.
 Danger of short-circuits! The terminals must not touch each other.



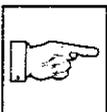
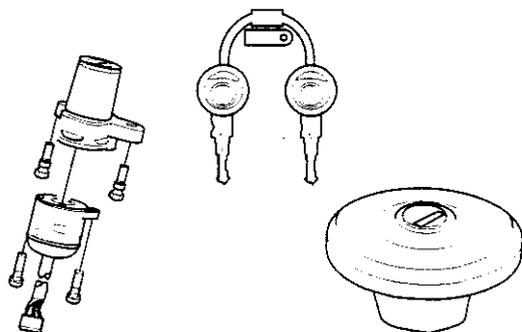
Installation

1. Insert the spacer sleeves.
2. Insert the profile piece between the mud guard and rubber spacer.
3. Mount the tail light housing and screw it on.
4. Insert the tail light.
5. Screw on the light emission lens.
6. Check the terminals and clean if necessary.
 The ends of the cable must be clean and tightly clamped in.
7. Connect the cable.
8. Install the seat.
9. Perform a function test.

3.6.6 Lock Set

The tank cap and ignition lock are operated with a single key. Every lock has a code number used by MZ to manufacture new keys.

If the code number is no longer readable, providing the VIN (Vehicle Identification Number, located on the right side of the steering head pipe) will make it possible for MZ to create a new key.



Note:

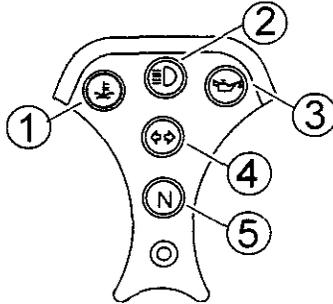
The two locks should always be replaced together to ensure that the one-key system is maintained and the vehicle can be operated with a single key.

Lock maintenance

Various environmental and weathering influences make it necessary to perform maintenance on the lock set. The locks must be treated with a suitable care agent, depending on the usage conditions. Frozen locks must be thawed before use. Otherwise the key may break off.

3.6.7 Control Lights

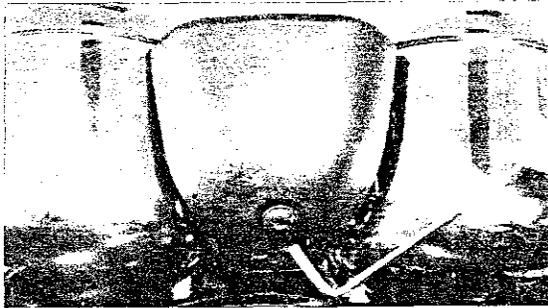
The light and symbol (housing) form a unit and can only be replaced together.



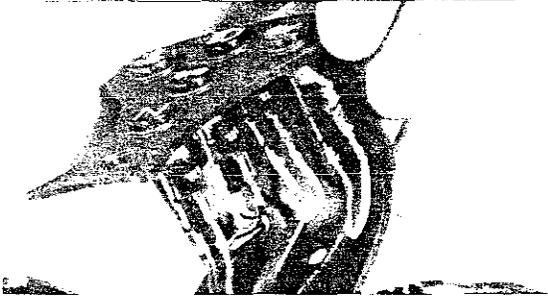
- (1) Water temperature
- (2) High beam
- (3) Oil pressure
- (4) Turn indicator
- (5) Neutral gear

Removal

1. Remove the 2 oval flange head screws (top and front).



2. Disconnect the cable from the defective control light.
3. Slide the control light upward all the way through the housing.
4. Check the terminals and clean if necessary.
The ends of the cable must be clean and tightly clamped in.
5. Insert the new control light.



Installation

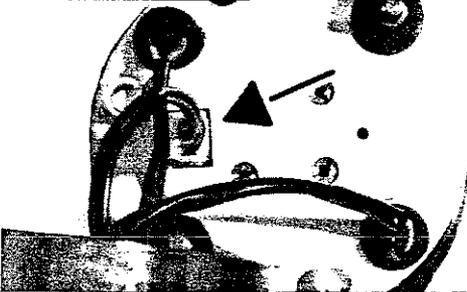
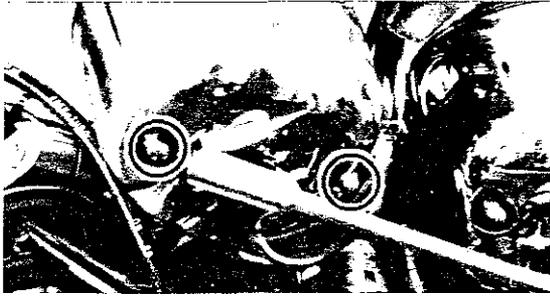
Install in reverse order.

3.7 Instruments

3.7.1 Tachometer

Removal

1. Remove the headlight (see 3.6. 1"Headlight").
2. Remove the control light housing.
3. Unscrew the 2 cap nuts and remove the washers.
4. Pull the tachometer upward out of the housing.



5. Fold up the safety lock, disconnect the 3-pin plug.
6. Pull the light out by the socket.
Do not pull on the cable!
7. Pull off the rubber ring.

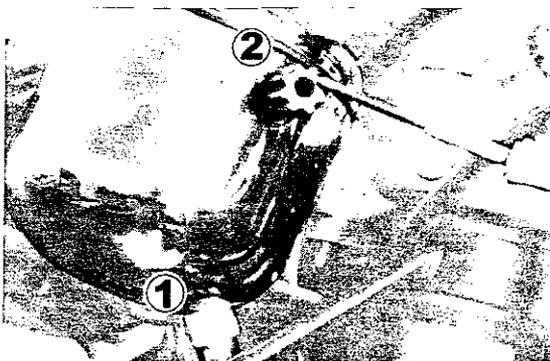
Installation

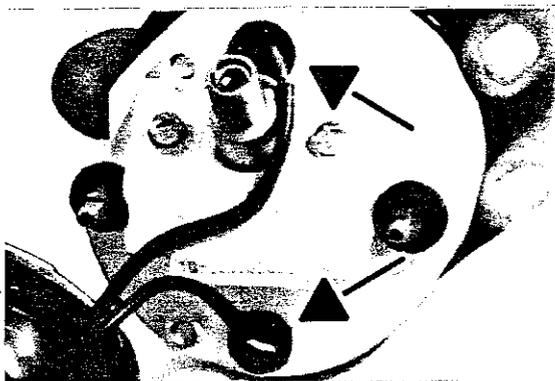
1. Inspect the wedge base bulb and replace, if necessary.
2. Coat the socket with silicon spray and insert it.
3. Inspect the rubber ring and rubber bushings, replace if necessary.
4. Slide the rubber ring onto the tachometer.
5. Insert the light, connect the plug.
6. Insert the tachometer into the housing and align it.
7. Slide the rubber bushings in between and screw on the tachometer.
8. Install the control light housing and headlight.

3.7.2 Speedometer

Removal

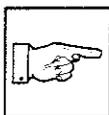
1. Unscrew the speedometer shaft (1).
2. Screw off the reset button (2).
Phillips head size 0, right-hand threading and screw locking agent.
3. Remove the headlight (see 3.6. 1"Headlight").
4. Remove the control light housing.
5. Unscrew the cap nuts, remove the washers.
6. Pull the speedometer upward out of the housing.





7. Remove the 2 wedge base bulbs.

Installation



Note:

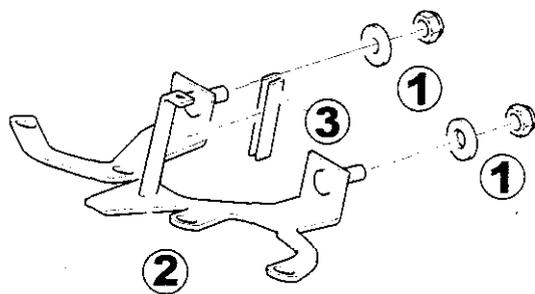
When installing the speedometer, the speedometer shaft should also be lubricated with oil.

1. Inspect the wedge base bulb and replace, if necessary.
2. Coat the socket with silicon spray and insert it.
3. Inspect the rubber ring and rubber socket, replace if necessary.
4. Slide the rubber ring onto the speedometer.
5. Insert the light.
6. Insert the speedometer into the housing and align.
7. Slide the rubber bushings in between and screw on the tachometer.
8. Install the control light housing and headlight.

3.7.3 Instrument Mount

Removal

1. Remove the headlight, control light housing, speedometer and tachometer.
2. Remove the cable binder.
3. Loosen the 2 rear self-tightening nuts (1).
4. Remove the instrument mount (2).
5. Inspect the 40 mm rubber piece (3), replace if necessary.



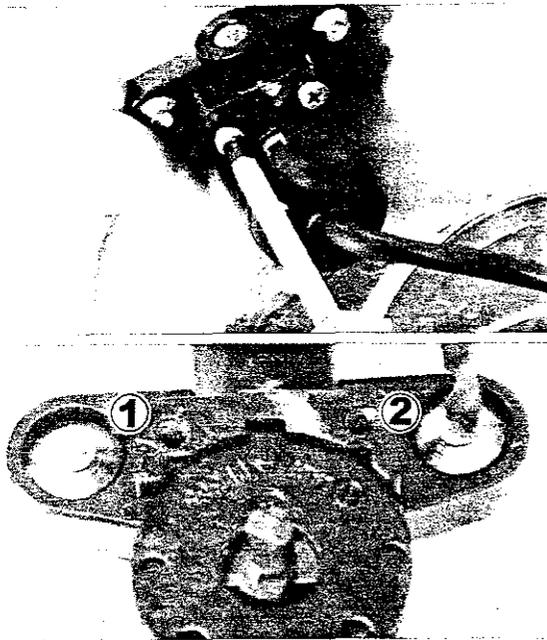
Installation

Install in reverse order.

3.8 Ignition Lock

Removal

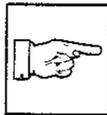
1. Remove the upper fork bridge (see above).
2. Unscrew the switch from the lock.



3. Mark the centres of the break-off screws (1).
4. Drill out the break-off screws (2).
5. Remove the ignition lock.
6. Heat up the stalk for the screws in the fork bridge to approx. 80°C (176 °F) to liquefy the screw locking agent.
7. Remove the remaining thread pieces with a pliers.

Installation

1. Rethread both M8 thread pieces.



Note:

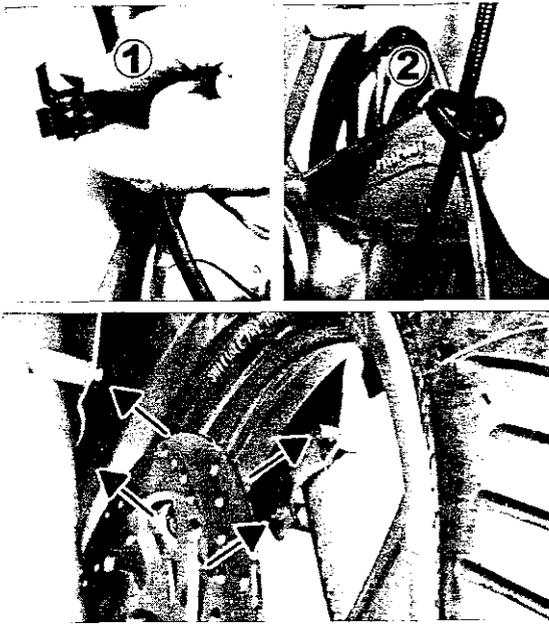
If the threading pieces are not rethreaded, the screws may break off before the ignition lock is firmly in place. Then the work must be performed again.

2. Clean the threads.
3. Apply the screw locking agent at "medium tightness" to the new break-off screws, screw on the lock.
Screw in the break-off screws until the screw head breaks off.
4. Place the switch on the ignition lock and screw it on.
The locking pins must fit exactly into the lock.
5. Set the upper fork bridge on the fork column and upright pipe, tighten the M24x1 nut with 80⁺¹⁰ Nm.
6. Tighten the locking screws on the upper fork bridge with 25⁺⁵ Nm.
7. Completely install the handlebars.
8. Run the ignition switch cable through the clamp and connect it to the cable form.
9. Lay the cable exactly and fasten the clamp to the lower fork bridge.
10. Connect the switch on the right/left of the cable form.
11. Install the fuel tank and seat.
12. Function test:
 - Electrical installation,
 - Front wheel braking function,
 - Ignition switch,
 - Locking of the ignition lock locking mechanism,
 - Easy motion of the steering bearing.

3.9 Front Wheel Mud Guard

Removal

1. Open the line clip (brake hose guide) (1) and remove the brake hose.
2. Turn the speedometer shaft guide eyelet (2) and pull it out.

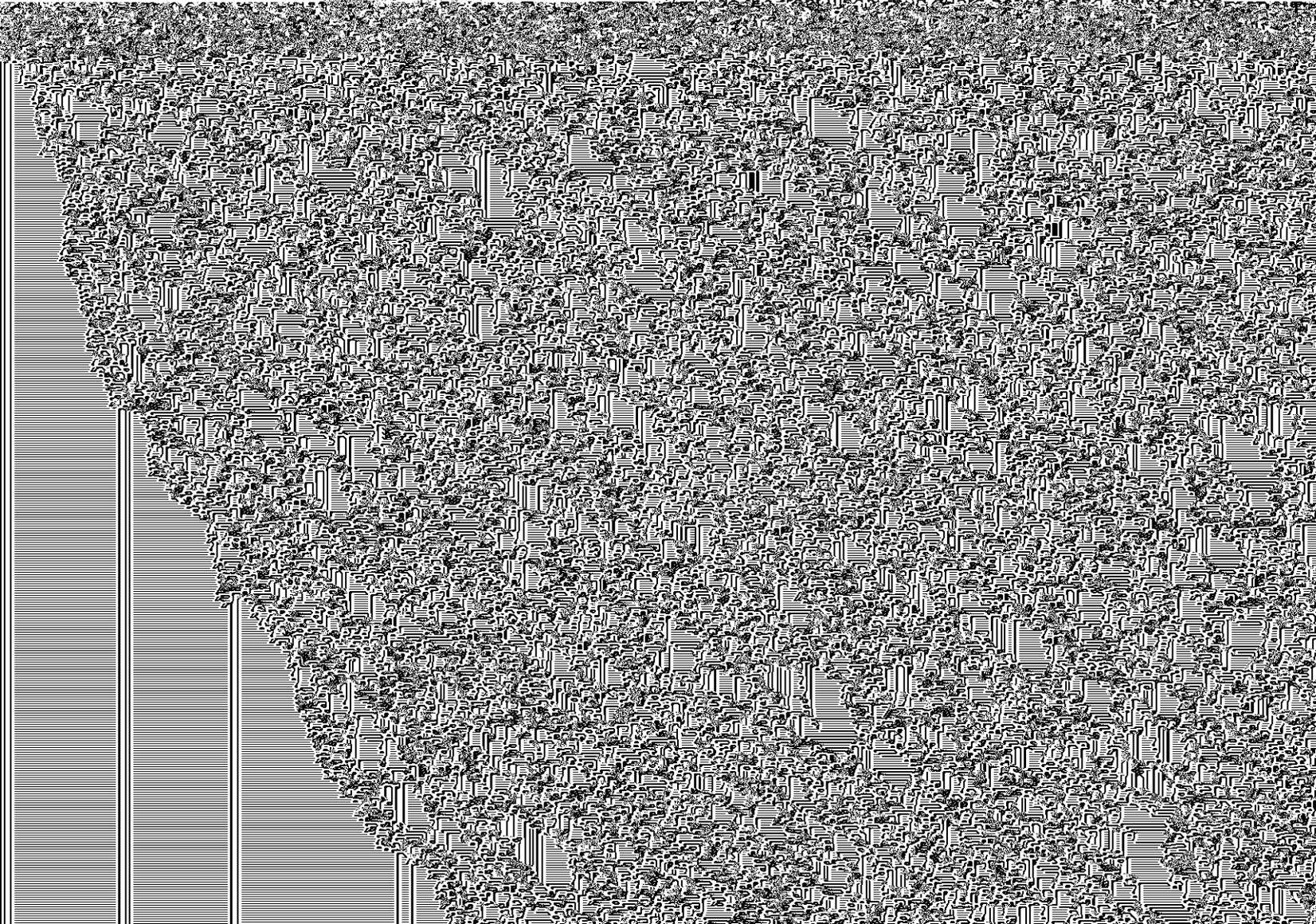


3. Unscrew the 4 M6 screws.
4. Pull out the front wheel mud guard between the sliding pipes.

Installation

1. Insert the 4 spacer washers on the left and right each (inside and outside).

2. Slide the front wheel mud guard between the sliding pipes.



3.10 Rear Mudguard

3.10.1 Rear End

Removal

1. Remove the seat (see 3.1 "Seat").
2. Remove bracket (see 3.4 "Bracket").
3. Disconnect the cable from the tail light (see 3.6.5 "Tail Light").
If the tail light is not being replaced, the rear end may remain installed.
4. Open the turn indicator light, disconnect the cable from the terminals and pull the cable out of the indicator light rod.

Remove the indicator lights and tail light, if necessary.

5. Unscrew the 2 M5 screws.
6. Remove the rear end.

Installation

Install in reverse order.

3.10.2 Rear Cat Eye

Removal

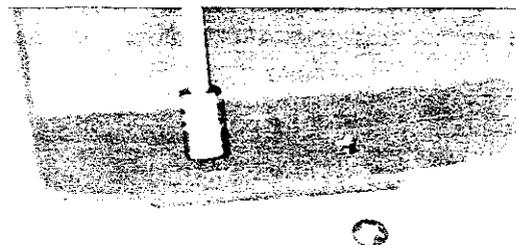
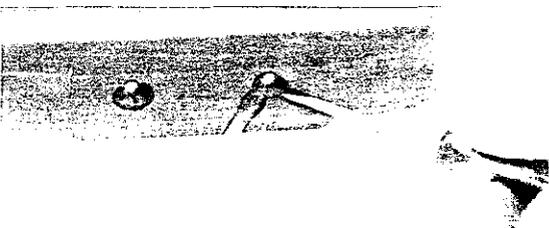
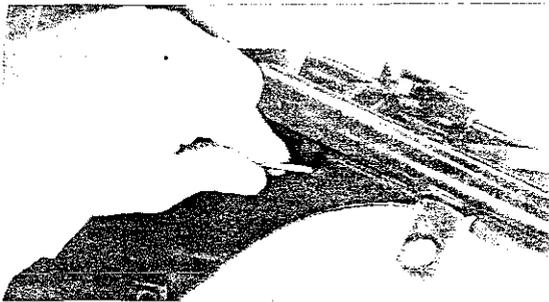
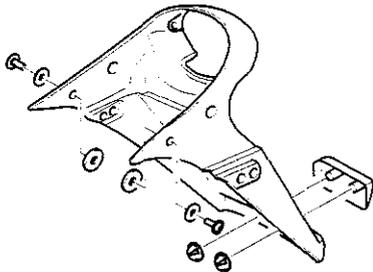
It is useful (but not necessary) to remove the rear end when replacing the rear cat eye.

1. Remove the rear end.
2. Lift up both spring nuts from the plastic pins on the rear cat eye using a screw driver.
3. Pull out the rear cat eye.

Installation

After inspection, the spring nuts can be reused.

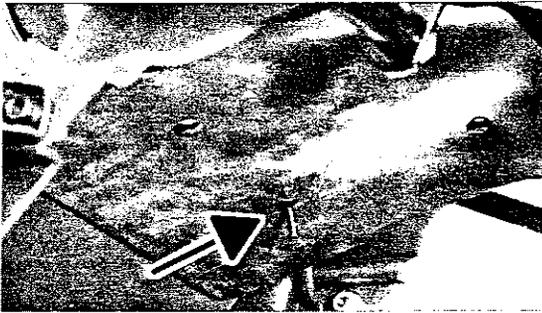
1. Insert the rear cat eye into the rear end.
2. Place the rear end flat on the scratch-protected base.
3. Press on the spring nuts with an appropriate piece of pipe (inside diameter 10 mm, e.g. tubular socket spanner, size 10).
4. Install the rear end.



3.10.3 Sealing Mat

Removal

1. Remove the seat.
2. Press the 4 body-bound rivets in the rear part downward from above.
3. Remove the sealing mat.



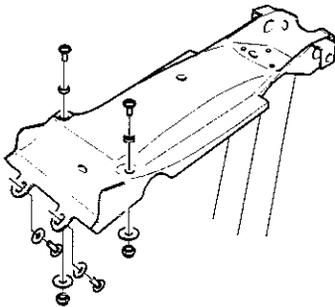
Installation

Install in reverse order.

3.10.4 Splash Shield

Removal

1. Remove the left side cover, unscrew the cable from the negative battery terminal.
2. Remove the tool bag.
3. Remove bracket, rear end and sealing mat.
4. Remove both indicator light housings.
5. Remove the ignition box and flasher.
6. Remove the starter relay, fuse box and rubber support.
7. Unscrew the 2 M5 screws (1) on top, holding the nuts still.
8. Unscrew the lower 2 M6 screws (2).
9. Remove the splash shield.



Installation

Install in reverse order.

3.10.5 Protector for Spring Strut

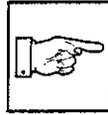
The protector for spring strut protects the spring strut against spraying water and dirt from the rear wheel.

1. Pull the 3 plastic rivets out of the airbox.
2. Spray rubber care agent on the new protector for spring strut.
3. Inspect the plastic rivets and replace, if necessary.
4. Connect the protector for spring strut to the airbox with the plastic rivets.



3.11 Handlebar

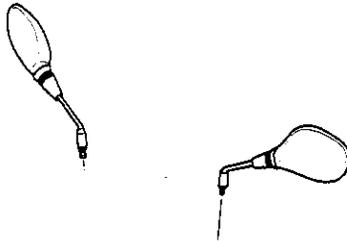
3.11.1 Mirror



Note:

Correctly adjusted mirrors improve driving safety.
The mirror must be adjusted individually for every rider.

The work steps apply to both mirrors.

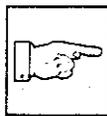
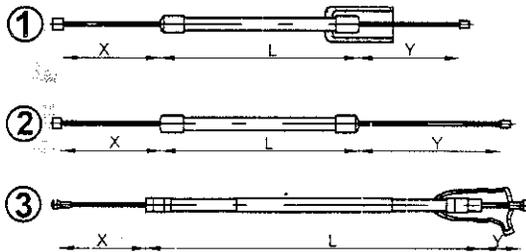


1. Slide up the rubber sleeve, loosen the lock nut (size 14).
2. Unscrew the mirror.
3. Grease the threads.
The grease protects the threads against corrosion.
4. Screw on the mirror.
5. Adjust the mirror and tighten the lock nut.
6. Slide on the rubber sleeve.

3.11.2 Bowden Cables

The following bowden cables are installed on the handlebar:

- Starter cable (1): $l = 910-2 \text{ mm}$, $x+y = 95\pm 1 \text{ mm}$
- Throttle cable (2): $l = 850+3 \text{ mm}$, $x+y = 140\pm 1 \text{ mm}$
- Clutch cable (3): $l = 850+3 \text{ mm}$, $x+y = 120+2 \text{ mm}$



Note:

Bowden cables must have freedom of motion in every position.
They must not be cramped or kinked!

Bowden cable must not be pre-tensioned, that is they must not apply force when not in use (e.g. grinding clutch, etc.).

Maintenance

The bowden cables must not tear under the required operation forces and they must be easily moved. For this reason, they must be inspected and maintained in regular intervals (see maintenance intervals).

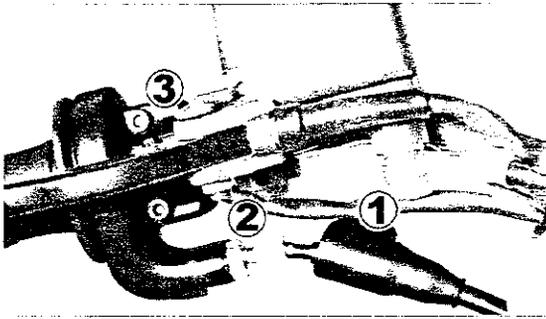
To ensure good sliding action, the inside of the bowden cable sheaths are coated with Teflon.

For lubrication, use an oil that does not attack Teflon (e.g.: thin silicon oil).

3.11.3 Twist Grip

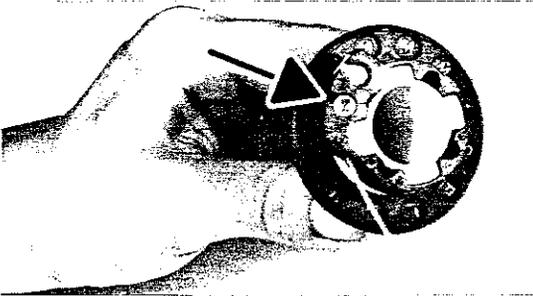
Removal

1. Slide back the rubber cap (1).
2. Loosen the lock nut (2), screw the adjusting screw into the throttle grip.
3. Unscrew the 2 hexagon socket head screws (3).
4. Remove the twist grip and dismantle.
5. Disconnect the bowden cable.



Installation

1. Inspect the connector pieces for damage and replace, if necessary.
2. Connect the bowden cable to the left hole (overhead view, holes face upward) of the connecting part. If the right hole is used, the bowden cable is too short.
3. Lubricate the steering pipe, slide on the throttle grip. Do not use grease, it reduces the twisting freedom.



3.11.4 Rubber Grips

Right rubber grip (twist grip)

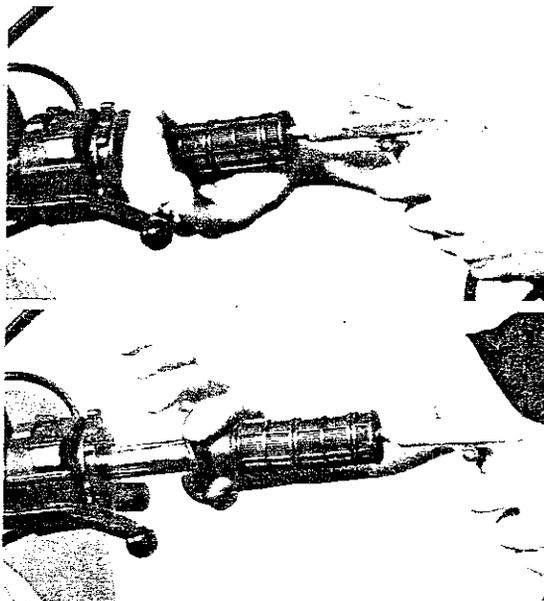
1. Cut through the rubber grip and remove it.
2. Slide on a new rubber piece with a suitable rubber adhesive.

Left rubber grip



Attention!

Always wear protective goggles when working with compressed air.

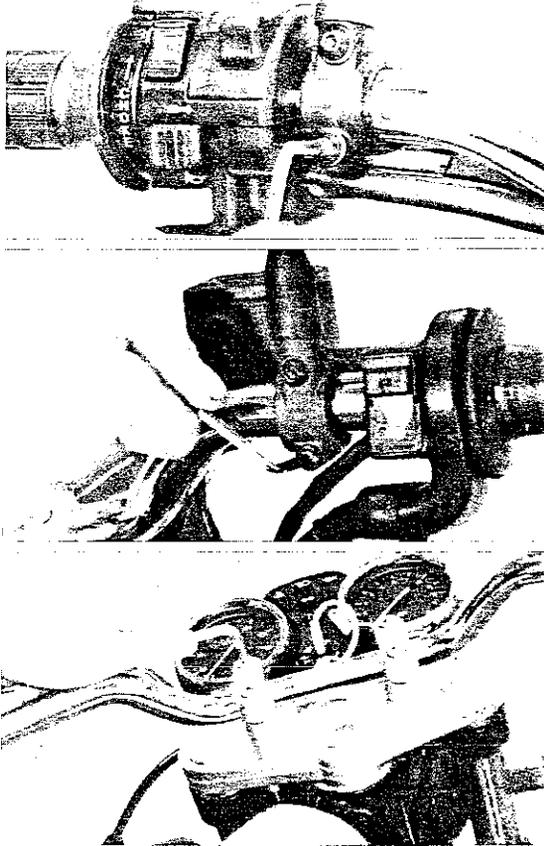


1. Make a small hole in the front side of the rubber piece using a needle.
2. Insert the compressed air gun.
3. Loosen the rubber piece from the handlebar using compressed air and remove it.
4. Treat the new rubber grip with suitable rubber adhesive.
5. Slide on the rubber grip using compressed air.

3.11.5 Handlebar

Removal

1. Remove the mounting clamp for the clutch mount and combination switch unit.
2. Remove the rubber grip, pull off the starting carburettor lever and washer.
3. Remove the main brake cylinder, switch and twist grip.
4. Unscrew the 4 screws on the top handlebar mount.
5. Remove the handlebar.

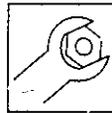


Installation

Install in reverse order. Install the handlebar centred. When positioning the handlebar mount, make certain that the gaps between the handlebar mount and the front and back of the fork yoke are equal.

Tightening torque:

M8 handlebar mount screws: 25⁺⁵ Nm

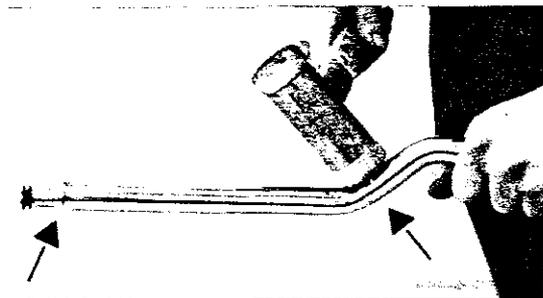


3.11.6 Swingarm

The swingarm smooths out vibrations in the handlebar that occur while riding. It is not a wearing part and normally need not be removed.

Removal

1. Remove the left rubber grip (see 3.11.4 "Rubber Grips").
2. Carefully drill out the plugs.
3. Remove the handlebar (see 3.11.5 "Handlebar").



- Carefully pound on the end of the handlebar and bend using a rubber or polyamide hammer.
The hammering forces out the swingarm.

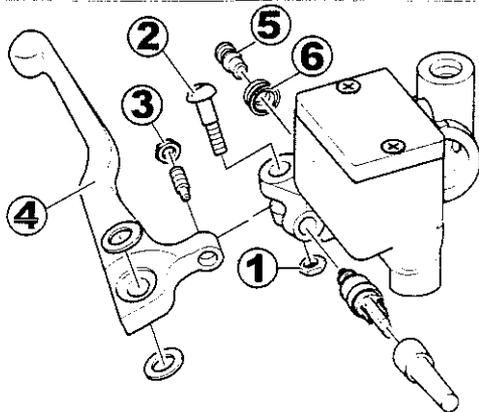
Installation

- Insert the swingarm flush into the handlebar.
- Seal the handlebar with new plugs.
- Mount the handlebar.

3.11.7 Hand Brake Lever

Removal

- Unscrew the locking nut (1) and screw the slotted screw (2) off upward.
- Loosen the locking nut (3) and unscrew the adjusting screw.
- Remove the brake lever (4) with 2 washers.
- Remove and inspect the pressure pins (5) and dust cover (6).



Installation

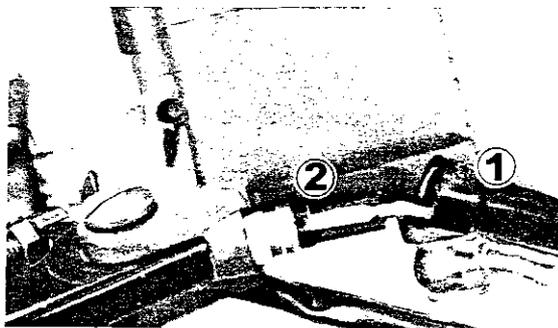
Install in reverse order.

3.11.8 Front Brake Light Switch

The brake light switch cannot be adjusted.

Removal

- Remove the protective cap (1) from the brake light switch.
- Disconnect the 2 cables (2).
Pull on the terminals, not the cable!
- Unscrew the brake light switch with a pliers.



Inspection

Perform continuity check. Brake lever not activated = switch closed (connection signal).

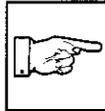
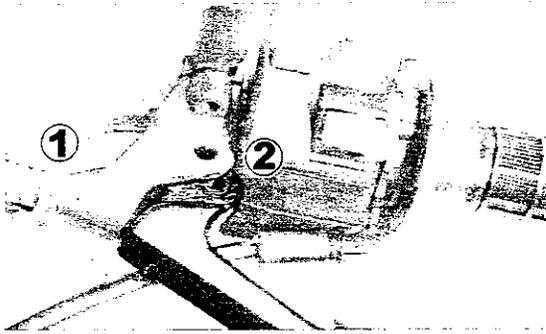
Installation

Install in reverse order.

3.11.9 Clutch Lever

Removal

1. Slide back the protective cover from the adjusting screw (1).
2. Screw in the adjusting screw (maximum play).
3. Remove the screw and lock nut (2).
4. Push the lever forward.
5. Disconnect the bowden cable.



Note:

The cable pulley is slotted and may fall down during removal.

Inspection

Inspect the bushing, replace if necessary. Grease the cable pulley and the cable pulley chamber.

Installation

Install in reverse order.

3.11.10 Switch/Mount

Removal

1. Unscrew the 2 screws in front and 1 in back.
2. Separate housing.
3. Remove switch.



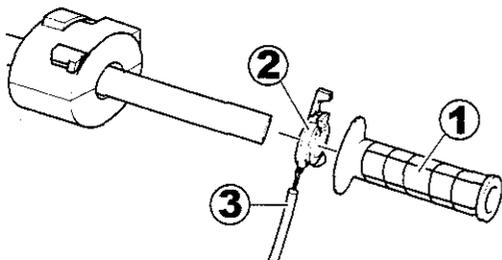
3.11.11 Starting Carburettor Lever

Removal

There are two options for replacing the starting carburettor lever.

1. Option:

1. Remove the left rubber grip (1) (see 3.11.4 "Rubber Grips").
2. Pull off the starting carburettor lever (2) to the left.
3. Remove the starter bowden cable (3).



2. Option:

1. Remove all mounts from the handlebar (except for the left rubber grip).
2. Remove the handlebar.
3. Pull off the starting carburettor lever to the right.

Installation

Install in reverse order.

Grease the inside of the starting carburettor lever.

3.12 Air Filter



Attention!

Dust and dirt entering the engine increase wear on the piston and cylinder. Only start the engine with an intact air filter. Observe the specified cleaning schedule.

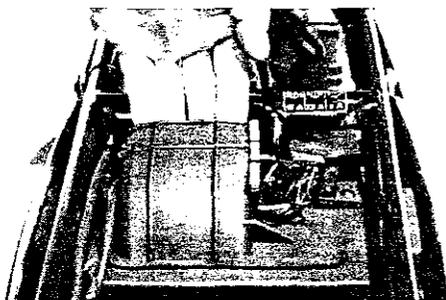
The air filter is located in the airbox under the seat. Its functioning has a significant influence on the composition of the fuel air mixture.

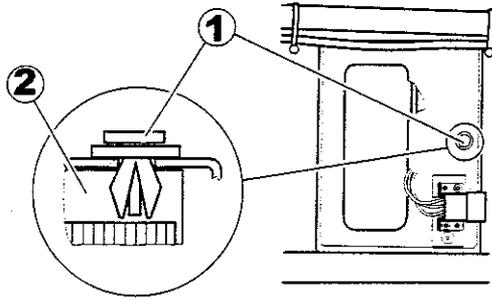
A dirty air filter leads to a fuel air mixture which is richer in fuel. The fuel consumption increases and the engine performance is reduced.

A defective air filter (e.g. filter paper torn) leads to a leaner (less fuel) fuel air mixture. The engine performance is reduced and damage may be caused due to overheating.

Removal

1. Remove the seat.
2. Lift up and remove the intake pipe.





3. Remove the tension from the body-bound rivet (1) by pulling out the middle part, then pull it upward and completely out.
4. Pull the air filter (2) out upward.

Cleaning



Attention!

Always wear protective goggles when working with compressed air!

If the filter paper is extremely dirty, defective or moist, the air filter must be replaced.

If the filter is only slightly dirty, knock the dirt out or blow it out with compressed air in the opposite direction of the intake flow.

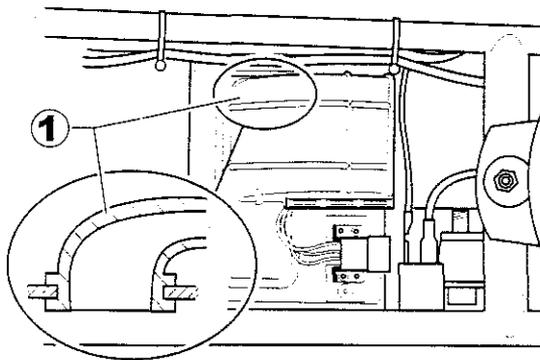
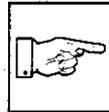
Installation

Note:

The foam seal surface must not be damaged.

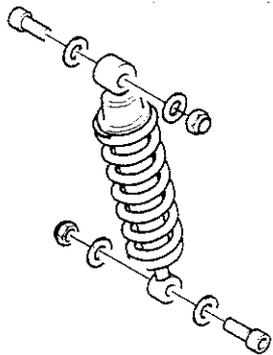
It must overlap the edge of the airbox exactly.

The cables for the fuse box and start relay may not be positioned in front of the intake pipe opening. They must be run underneath. Incorrect positioning of the cables can result in reduced performance!



1. Insert the air filter into the locking indentation; press the foam forward toward the carburettor.
2. Insert the body-bound rivet and tension it.
3. Connect the intake pipe (1), install the seat.

3.13 Spring Strut



Production models of the motorcycle are delivered with a spring length of 184.5 ± 2 mm. This is the proper setting for a load of approx. 75 kg.

If a pillion rider is along, the spring preload must be increased to a length of 177 mm.

The damping of the spring strut cannot be adjusted.

Guidelines:

Single rider, 75 kg: spring length 184.5 ± 2 mm

Two riders: spring length 177 ± 2 mm

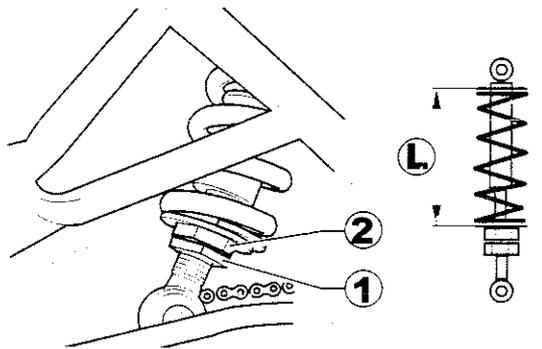
Intermediate settings are also possible.

Particularly light riders are also often very short. Adjusting the spring preload to a spring length of 190mm can lower the seat height by approx. 20 mm.



Attention

After changing the spring preload, the headlight must be readjusted.

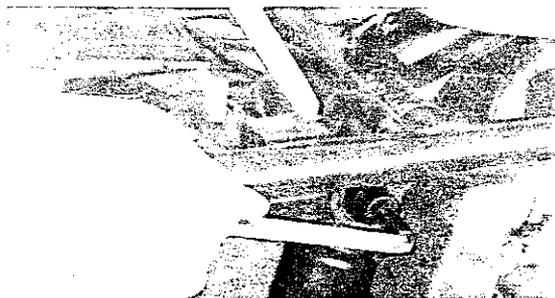


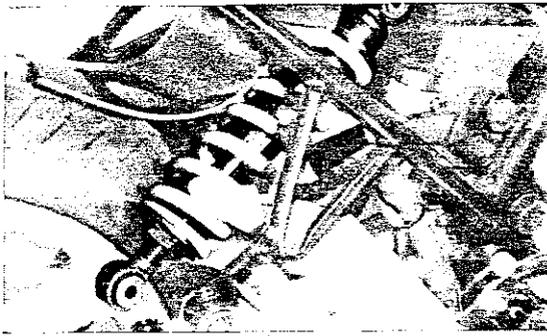
Adjustment

1. Loosen the locking nut (1).
2. Adjust the spring preload by changing the spring length (L):
 - screw in the adjustment nut (2) (higher spring preload),
 - loosen the adjustment nut (2) (lower spring preload).
3. Hold the adjusting nut in position and tighten the locking nut.
4. Adjust the headlight (see 3.6. 4"Adjusting the Headlight").

Removal

1. Remove the right covering.
2. Unscrew the upper M10 screw, holding the nut still.
3. Pull off the screw.
4. Unscrew the lower M10 screw, holding the nut still.
5. Pull off the screw.





- Pull out the spring strut down and to the rear.

Installation

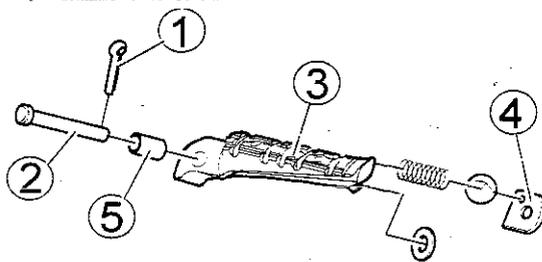
Install in reverse order.

The lower screw must be inserted from the left side of the vehicle.

3.14 Foot Rests

3.14.1 Rear foot rest (right/left)

- Bend up the splint (1), remove the splint and washer.
- Pull out clevis pin (2).
- Pull the foot rest (3) with ball spring and special washer (4) out of the mount.
- Remove the spring, ball and sleeve (5).
- Inspect all parts and replace, if necessary.

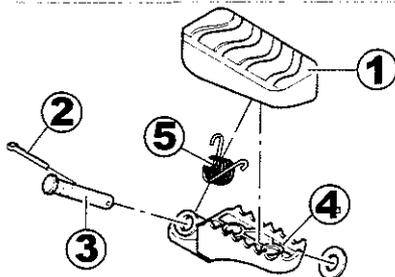


Installation

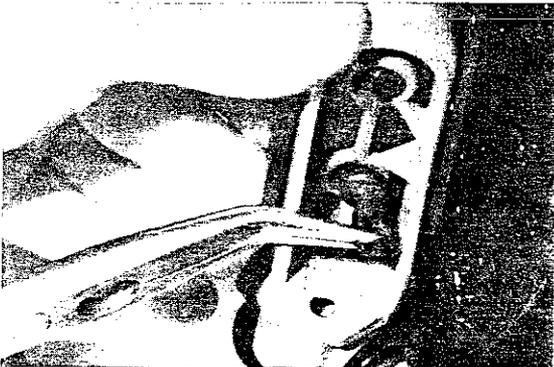
- Insert the sleeve, spring and ball into the foot rest with grease.
- Position the special washer such that the ball can snap into the hole of the special washer when the foot rest is folded up.
- Slide the clevis pin through from above.
- Position the washer and secure with a new splint.

3.14.2 Front foot rest
Removal

1. Pull off the foot rest rubber piece (1).
2. Bend up the splint (2), remove the splint and washer.
3. Pull out the pins (3).
4. Pull the foot rest (4) and spring (5) out of the mount.


Installation

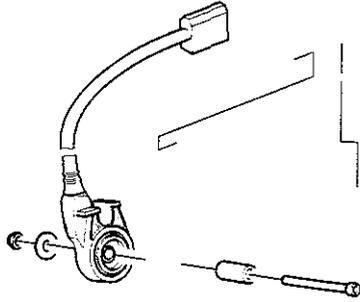
1. Slide the foot rest with spring onto the mount.
2. Lightly grease the pins and slide them through.
3. Position the washer.
4. Insert a new splint and bend it over.



5. Place the foot rest rubber piece on the foot rest, pull the rubber nipple through with a pliers.

3.15 Side Stand

3.15.1 Side Stand Switch



The side stand switch prevents riding with the side stand folded out, reducing the risk of accidents. It interrupts the ignition line when the stand is folded down and the motorcycle is put in gear.

Removal



Danger!

Accident risk!

A defective switch eliminates the safety function! To loosen the connection, only turn the mounting screw.

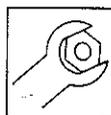
If the nut is also turned, the switch may be destroyed.



1. Disconnect cable from the cable form.
2. Hold the self-tightening nut on the switch and turn only the screw.
3. Remove the nut, washer and side stand switch.

Installation

1. Adjust the side stand switch with the nose of the switching part in the hole of the side stand fork.
2. Slide the side stand switch onto the mounting pins on the pivot bracket.
3. Position the washer and self-tightening nut, hold it tight.
4. First, tighten the screw with 5 Nm, then re-turn it by 90°.
5. Run the cable upward between the airbox and the frame and connect it to the cable form.
6. Function test of the side stand switch.



Tightening torque:

Screw M6:

5 Nm, re-turn by 90°

3.15.2 Side stand**Attention!**

Risk of injury!

The tension springs may jump away during removal/ installation!

Wear protective goggles!

Removal

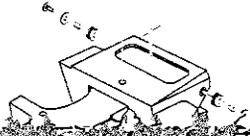
1. Remove the side stand switch.

2. Disconnect the tension springs.

3.16 Airbox

Removal

1. Secure the vehicle against tipping.
2. Remove the seat, fuel tank and both side panels.
3. Take the bowden cable for the seat lock out of the mount.
4. Remove the battery, fuse box, rectifier and relay.
5. Disconnect the cable from the parking light switch.
6. Remove the rear wheel (see 4.4 "Rear Wheel").
7. Remove the intake pipe (1), protector for spring strut (3), ventilation hose (5) and condensate collector (4).



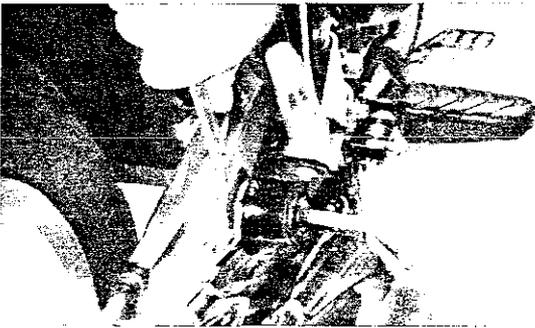
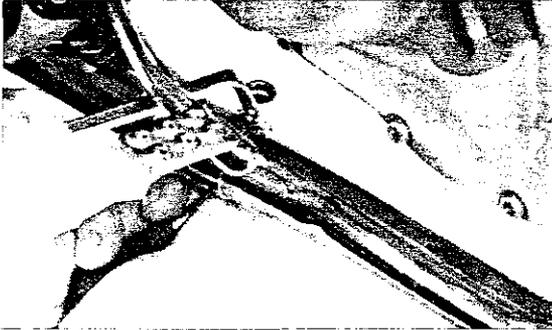
3.17 Silencer



Danger!

Risk of burns!

The exhaust system becomes very hot while the engine is running. Let the exhaust system cool before working on it.

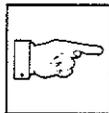


Removal

1. Loosen the locking screw on the exhaust pipe-silencer connection (exhaust clamp).
2. Remove the exhaust mount (frame) on the right pillion foot rest.
3. Pull silencer away from the exhaust pipe with turning movements.

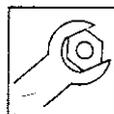
Installation

1. Slide the silencer onto the exhaust pipe.
2. Establish the rear connection.
3. Tighten the locking screws for the connection to the exhaust pipe.
The silencer must not be under mechanical stress.



Note:

Exhaust jointing compound can be used to seal the silencer-exhaust pipe connection.
The silencer must be treated with a suitable chrome care agent at regular intervals.



Tightening torque:

Exhaust clamp:	10 ⁺² Nm
Exhaust mount (frame):	30 ⁺⁵ Nm

3.17.1 Exhaust pipe

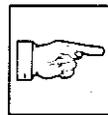
Removal

1. Remove the silencer (see 3.1 7" Silencer").
2. Unscrew the M6 nuts on the exhaust pipe flange.
3. Remove the exhaust pipe.
4. Remove the exhaust flange from the exhaust pipe.
5. Remove the exhaust pipe seal from the cylinder head.



Installation

1. Apply some grease to the new exhaust pipe seal and place it on the seal seat in the cylinder head.
2. Apply copper paste to the stud bolts.
The copper paste prevents the nuts from burning in tightly to the stud bolts.
3. Place the exhaust flange on the exhaust pipe and slide it onto the stud bolts.
4. Insert the exhaust pipe into the cylinder head and place the flange on the stud bolts.
5. Position the washers and push the exhaust pipe against the seal with the nuts (screw on a few turns). It must still be possible to move the exhaust pipe.
6. Install the silencer.
7. Screw the exhaust pipe on tight.



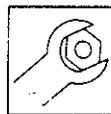
Note:

Avoid poor seals!

The stud bolts may break off!

Tighten the nuts evenly with the specified tightening torque. The flange must sit parallel on the seal surface.

Broken or unusable stud bolts can be drilled out and replaced.



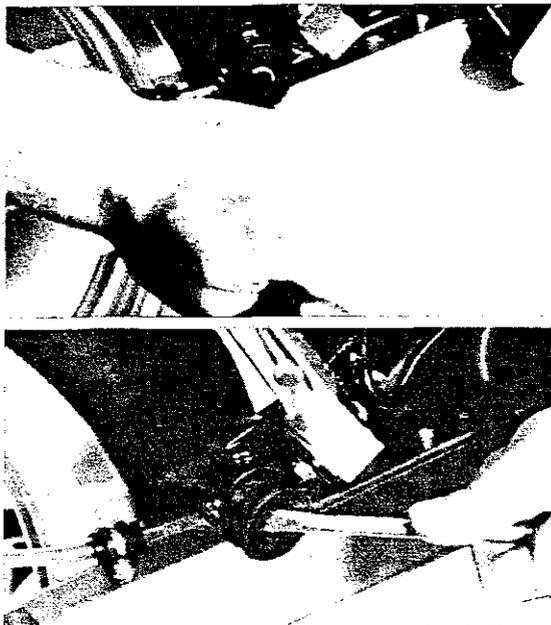
Tightening torque:

Exhaust flange nuts:

3⁺¹ Nm

3.17.2 Exhaust Mount Rubber Spacer

If the rubber spacer of the exhaust mount is porous or defective, it must be replaced.



1. Remove the silencer (see 3.17 "Silencer").
2. Pound the sleeve out of the rubber spacer using a suitable spike.
3. Press the rubber spacer out of the pipe.

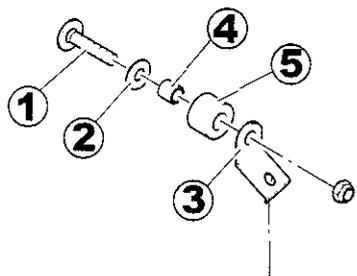
Installation

1. Treat the inside and outside of the rubber spacer with silicon spray.
2. Press the rubber spacer into the pipe.
3. Insert the sleeve.
4. Install the silencer.

3.17.3 Exhaust Mount Plate

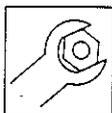
Removal

1. Remove the silencer (see 3.17 "Silencer").
2. Remove the oval flange head screw (1) and washer (2).
3. Remove the mount plate (3).



Installation

1. Inspect the sleeve (4) and rubber spacer (5), replace if necessary.
2. Install all parts loosely (provisionally).
3. Mount the silencer onto the mount plate.
4. Tighten the oval flange head screw.



Tightening torque:

Oval flange head screw: 30⁺⁵ Nm

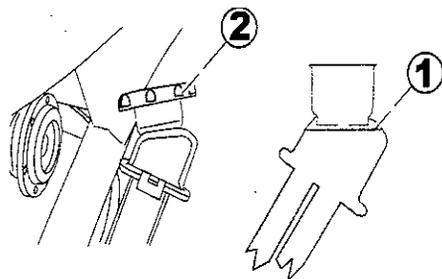
3.18 Cooling System

3.18.1 Coolant



Attention!

Insufficient coolant can damage the engine!
If coolant is lost, the cause must be eliminated.



The coolant system is filled with a mixture of high quality brand-name coolant for aluminium engines with anti-freeze characteristics and distilled water.

The coolant level (1) should be just under the lower seal surface of the radiator cap when the engine is cold.

The recommended mixture ratio of 1:1 (water: coolant guarantees anti-freeze protection down to 20°C (-4°F).

Take heed of any additional or different information provided by the coolant manufacturer!

Refilling Coolant

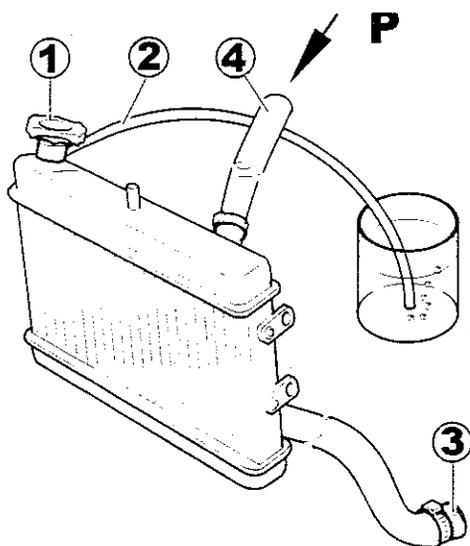
1. Shut off the engine and let it cool.
2. Remove the radiator cap (2) by turning it to the left.
3. Fill coolant (mixture of high-quality brand name coolant for aluminium engines and distilled water) up to under the lower seal surface of the radiator cap.
4. Close the radiator cap.

3.18.2 Radiator cap

The radiator cap functions as both a seal and a valve.

Inspection

1. Remove the radiator cap (1) by turning it to the left.
2. Place the hose (2) over the overflow outlet and hold the other end in a container filled with water to observe air bubbles upon opening of the valve in the radiator cap.
3. Close one connection with an air-tight seal. Mount the radiator hose, insert the plugs (3) and secure with the hose clamp.
4. Apply 1.2 bar of compressed air to the second radiator connection (4).



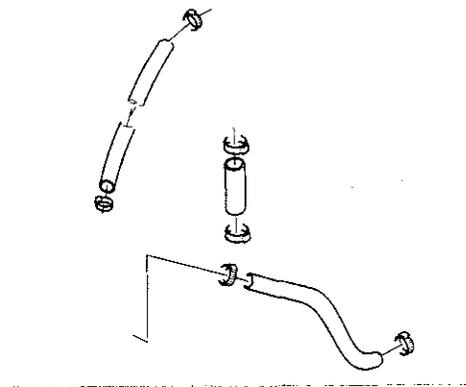
At 1.2 bar, the valve of the radiator cap must open.

Air escapes from the radiator cap and flows through the hose into the container. Air bubbles can be seen in the container.

If an opening pressure of over 1.2 bar is required, the radiator cap must be replaced.

3.18.3 Radiator Hoses

Inspect the radiator hoses for damage (e.g. cracks) and examine their condition (e.g. porosity).
Replace radiator hoses, if necessary.



Removal

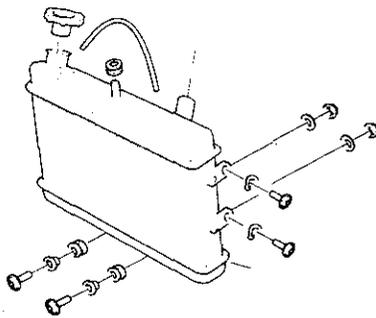
1. Drain the coolant.
2. Open the hose clamps.
3. Pull off the radiator hoses and remove the hose clamps.

Installation

1. Inspect the hose clamps.
Replace defective hose clamps.
2. Slide the hose clamps onto the new radiator hoses.
3. Push the new radiator hoses onto the connections.
4. Screw in the hose clamps.
5. Fill coolant up to the lower edge of the fill marks.

3.18.4 Radiator

Do not clean the radiator with a high pressure cleaner or an intense stream of water. The radiator plates may deform and the cooling performance will be reduced.
The radiator can only be replaced. Repair is not possible.



Removal



Danger!

Risk of scalding!

Coolant becomes very hot while the engine is running. Do not open the radiator cap while the engine is hot!

Let the radiator cool before starting work.

Risk of injury!

The coolant system works with overpressure. Wear protective gloves. Open the radiator cap carefully to release the pressure.



1. Let the engine cool.
2. Disconnect the fan cable from the power supply or fan (see 5.12 "Fan").
3. Open the radiator cap carefully and let the pressure escape.

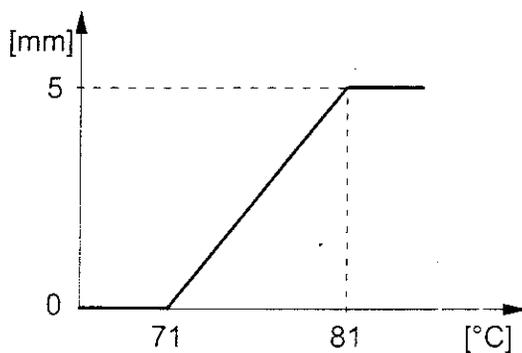
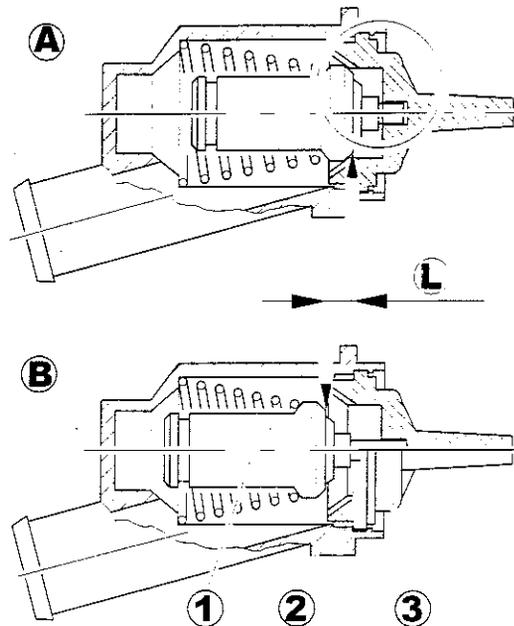
Testing

If the opening temperature range does not match the ones specified the thermostat must be replaced.

- (A) Position of the thermostat with coolant water temperatures $< 71\text{ }^{\circ}\text{C}$ ($160\text{ }^{\circ}\text{F}$) \Rightarrow closed.
- (B) Position of the thermostat (1) with cold water temperatures $\geq 81\text{ }^{\circ}\text{C}$ ($178\text{ }^{\circ}\text{F}$) \Rightarrow open.

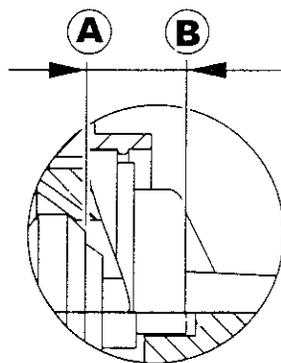
The difference between (A) and (B) must be $(L) > 5\text{ mm}$.

- (1) Thermostat
- (2) Housing
- (3) Cap



As shown by the line, the thermostat begins to open at $71\text{ }^{\circ}\text{C}$ ($160\text{ }^{\circ}\text{F}$).

At $81\text{ }^{\circ}\text{C}$ ($178\text{ }^{\circ}\text{F}$) the maximum opening of 5 mm is reached.



1. When the thermostat is cold, measure from the front edge of the cap (B) in the thermostat to the edge (A) (e.g. depth gauge).
2. Record the value.
3. Place the thermostat in a container filled with water.
4. Heat the water slowly with constant stirring.
5. Check the temperature with an exact thermometer.

**Attention!**

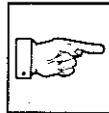
Risk of scalding!
Only use safe tools.

6. Upon reaching a temperature of 81 °C (178 °F), immediately remove the thermostat from the water with an appropriate tool and repeat the above measurement.
7. The front edge of the thermostat must have moved 5 mm toward the inside in comparison with the recorded value.
8. If the difference of 5 mm is not reached at 81 °C (178 °F), the thermostat must be replaced.

Installation**Attention!**

Risk of engine damage due to overheating!
The thermostat has bypass holes to ensure a minimum of water flow. These bypass holes must always be open.

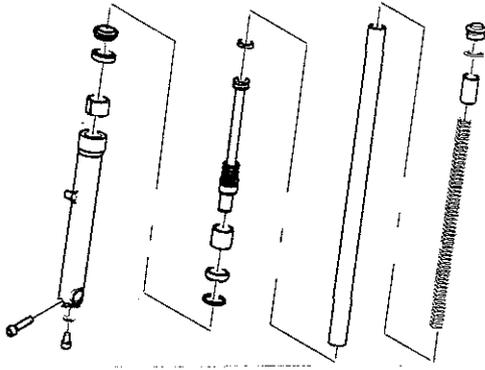
1. Slide the O-ring onto the thermostat and treat with silicon spray.
2. Position the top part and mount it with both screws.

**Note:**

The O-ring must not be crushed/damaged, otherwise the thermostat has no seal.

3. Connect the radiator hoses to the thermostat.
4. Mount and close the hose clamps.
5. Fill coolant up to the lower edge of the fill marks (approx. 0.95 litre).

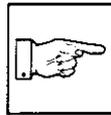
3.19 Frontfork



The frontfork has hydraulic damping.

The hydraulic system softens hard jolts from the road surface, preventing the shocks from bottoming. It also reduces the after-vibrations of the shocks. This function contributes significantly to the condition of the road, thereby improving safety.

Fork oil absorbs air humidity, altering its function. For this reason it must be replaced no later than every 2 years.



Note:

Fork oil attacks the paint.

Avoid drops and splashes on painted surfaces.

Volume per fork spar: 250 cm³

Recommendation:

fork oil SAE 5W, BP Autram GM-MP or BP Autram ATF.

3.19.1 Fork Spars

Removal



Attention!

The vehicle may tip over!

Ensure that the vehicle is standing securely.

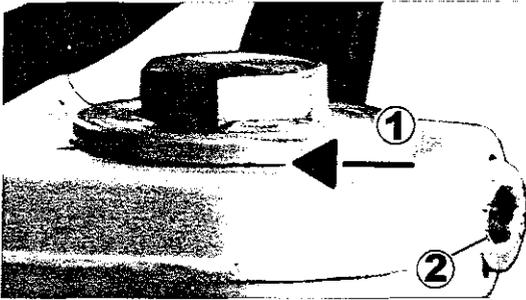
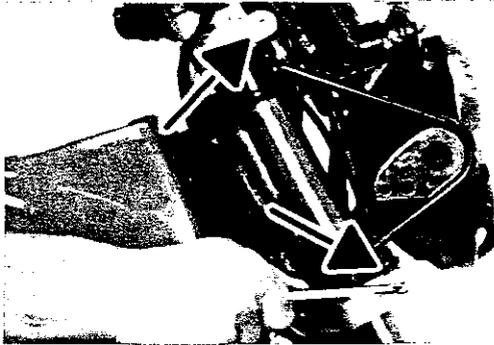
Place the vehicle in the installation stand on an elevated surface and secure with belts.

Reduced functioning of the frontfork!

Scrapes on the surface of the upright pipes interfere with their seal. Fork oil may leak.

Make certain that the surface of the upright pipes do not have or receive any scratches.

1. Place the vehicle on the installation stand, secure it against tipping with belts.
2. Remove the front wheel.
3. Remove the speedometer shaft and brake hose from the guide, remove the front wheel mud guard (see 3.9 "Front Wheel Mud Guard").
4. Remove the brake caliper.



5. Remove the locking screws for the frontfork from the upper and lower fork bridges.
6. Pull the spar down and out.
7. Inspect the surface.

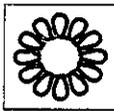
Defective rubber sleeves on the headlight mount can be replaced.

Installation

1. Wet the insides of the rubber sleeves with silicon spray.
2. Insert the fork spar.
The joint between the sealing cap and the sliding pipe must be flush against the upper flat surface of the fork bridge.
3. Tighten the fork bridge locking screws.
4. Install the front wheel axle.
5. Mount the mud guards.

Tightening torque:

Locking screws:



3.19.2 Dismantling the Frontfork

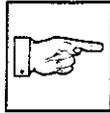
Environment!

Environmental hazard!
Fork oil may flow out!
Hold the open fork spar vertically to prevent escape of the fork oil.
Immediately collect escaped oil and dispose of it properly.



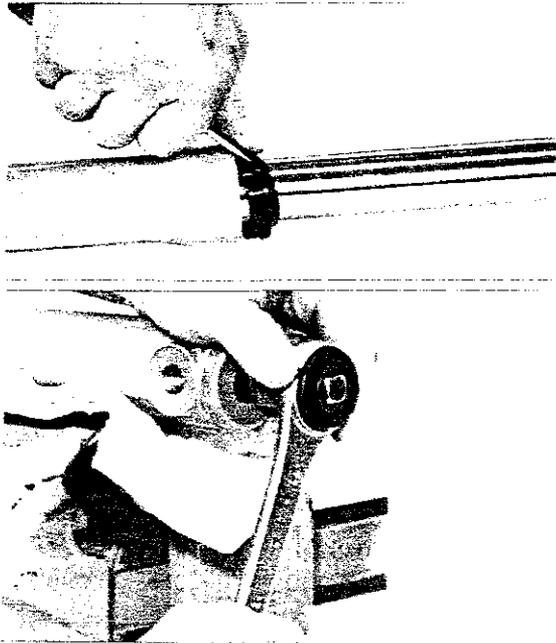
1. Loosen the locking screw of the top fork bridge (1).
2. Loosen the sealing cap (2) (do not screw it off).

3. Remove the frontfork (see 3.19 "Frontfork").
4. Remove the screw plug, remove the spacer sleeve, pull the spring far enough out of the spar that oil can drip from the spring.
5. Screw off the screw cap and compress the fork spar, let the fork oil flow into a suitable container.



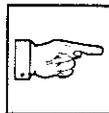
Note:

Lack of care in working with the screw driver can lead to nicking and scratching of the upright pipe surface!



6. Carefully remove the dust ring.

7. Place protective blocks and cleaning paper between vice jaws, stress the fork spar.
8. Remove the M10 cylinder screw and copper washer.
9. Slide the sliding pipe out of the upright pipe.



Note:

Possible paint damage and destruction of the dust ring seat!
Do not place the screw driver against the sliding pipe and apply leverage.

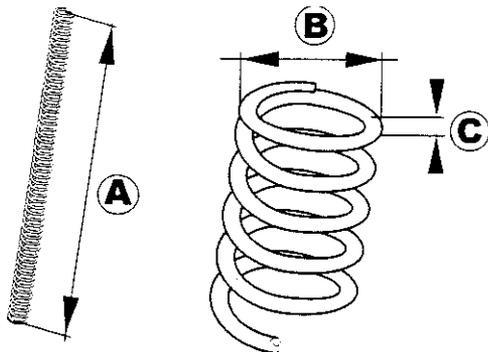


10. Lift the seal ring from the seat on the sliding pipe with turning motions of the screw driver blade.
11. Remove the locking ring.
12. Completely remove the piston rod from the upright pipe.
The stop washer and divider sleeve may fall down.
The piston rod is a complete replacement part and is not dismantled.
13. Clean all parts carefully.

Inspection

Perform the following inspections:

- Curvature of the upright pipe,
Bent upright pipes cannot be straightened.
- Wear/damage on the sliding bush,
- Piston ring
Replace the sliding surface piston ring in the event of excessive wear and/or damage.
- Inspect the spring length:
 - (A) Spring length, unstressed: 508.5 ± 7 mm
 - (B) Outer diameter: $25.2 +0.2 / -0.4$ mm,
 - (C) Wire diameter: 3.75 mm
 - Spring windings: 60, 9 of which less tightly coiled,
 - Spring constant: 3.5 N/mm.



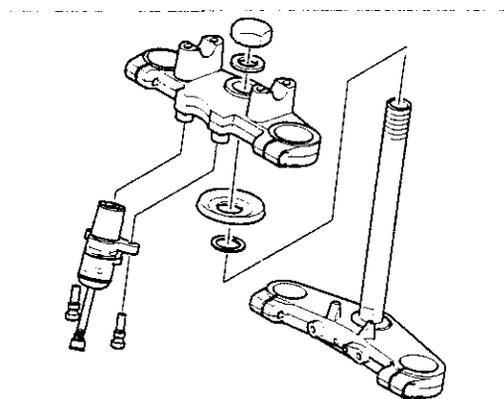
Installation

1. Brush the piston rod (7) and piston ring (6) with fork oil.

3.19.3 Fork Bridges

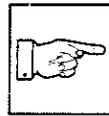
Removal

1. Remove the seat and fuel tank.
2. Completely remove the handlebar, disconnect the right/left plug connector switch and ignition lock (careful of barbs) under the fuel tank container.
3. Loosen the cable clamp on the lower fork bridge and pull the cable through.
4. Lift the handlebar over the instruments and rest it on a suitable surface with the headlamp facing downward.



Attention!

Accident risk!
Do not kink the brake hose when laying down the handlebar.



Note:

To prevent damage to the M24x1 nut, a piece of foil may be wrapped around the tool (socket/ring spanner).



5. Loosen the locking screws on right/left.
6. Remove the M24x1 nut and washer.
Take care that the frontfork and front wheel do not fall out.
7. Remove the upper fork bridge.
8. Pull out the lower fork bridge.

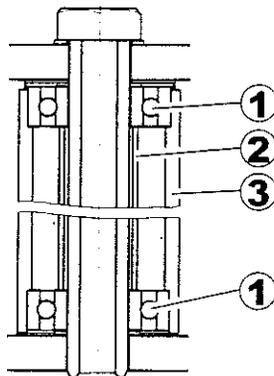
If additional work must be performed (lock replacement, etc.), the switch on the ignition lock can be removed.

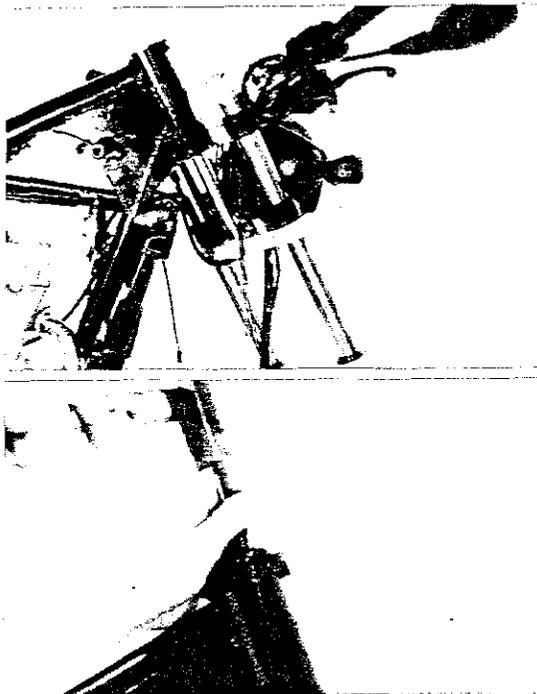
3.19.4 Steering Bearing

The steering bearing consists of two greased ball bearings (1) and a spacer sleeve (2).

The spacer sleeve (2) guarantees a specified distance between the bearings in the steering head (3).

Exact installation is made possible by a pressing tool.





Removal

1. Remove the fuel tank, seat, front wheel.
2. Disconnect the start, clutch and throttle bowden cables.
3. Disconnect the electrical system, 6 plug connectors (right/left switch, ignition switch, headlight, instruments).
4. Remove the handlebar.
5. Remove the upper fork bridge.
6. Completely pull the frontfork down and out.

7. Remove the cover and fitting washer from the top bearing.
8. Carefully pound out the lower bearing from above using a hammer and spike.



Attention!

Damage to bearing!
Do not jam the bearing when pounding it out!
Alternate pounding on opposite sides.

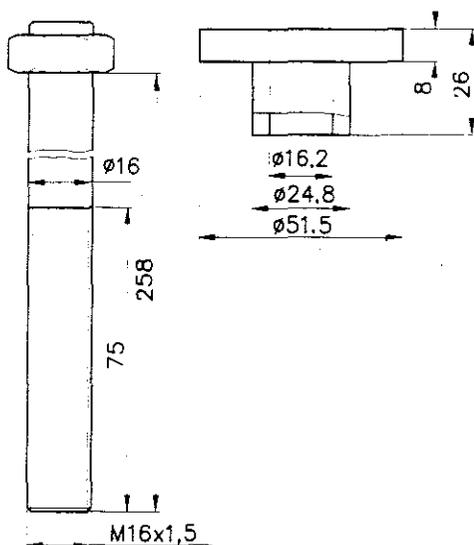
9. Remove the bearing and spacer sleeve.
10. Pound out the top bearing from below.

Installation



Attention!

Do not pound the bearing in with a hammer!
Always use a pressing tool.



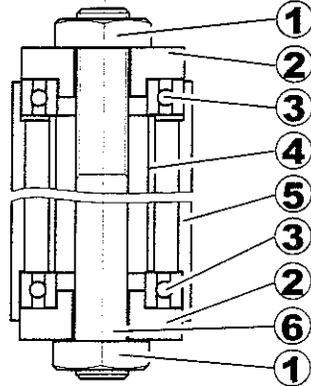
Dimensions for pressing tool

- Pressure piece: 2x
- Nut: M16x1.5, 2x
- Pressure piece material: Steel C15
- Threading pin material: Steel 50CrV4



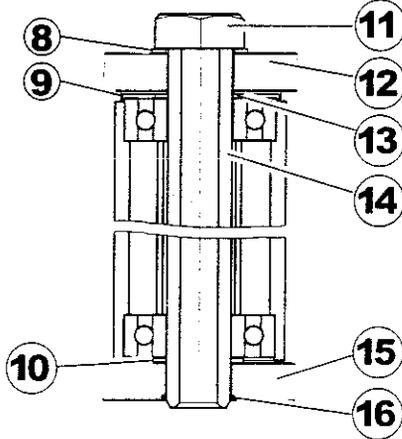
Attention!

**Only use original spacer sleeves!
Do not flatten or bend the spacer sleeve while pressing in the bearing!**



1. Insert the new, greased ball bearings (3) and spacer sleeves (4) into the steering head (5).
2. Press the ball bearings and spacer sleeve into the steering head using the pressing tool described above.

- (1) Hexagon nut
- (2) Pressure piece
- (6) Threading pin



3. Place the fitting washer (10) on the lower fork bridge (15), slide the front fork with steering pipe (14) into the pre-installed steering bearing from below.
4. Lay the fitting washer (13) onto the top bearing.
5. Position the cover (9).
6. Mount the top fork bridge (12), position the washer (8) and tighten with the M24x1 nut (11).

7. Mount the handlebar.
8. Connect the cable to the cable form and lay properly.
9. Connect the 3 bowden cables.
Make certain they do not kink.
10. Install the front wheel.
11. Install the fuel tank and seat.
12. Perform a function test on the front brake.



Tightening torque:

- Top locking screws: 25⁺⁵ Nm
- Bottom locking screws: 25⁺⁵ Nm

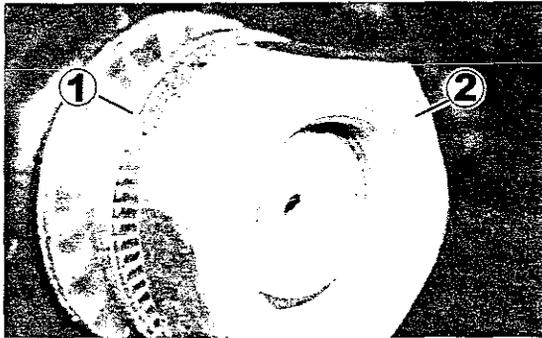
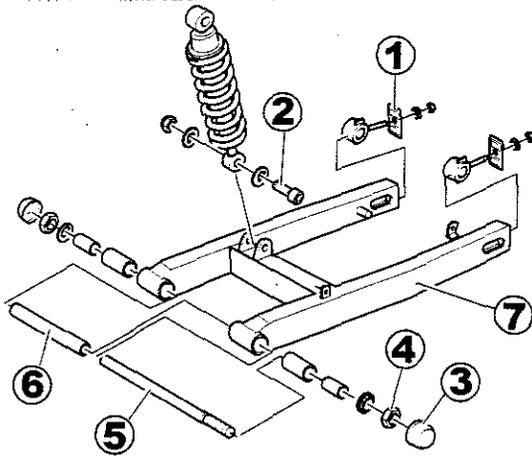
3.20 Swing Fork

The riding performance of the motorcycle depends heavily on the proper functioning of the swing fork.

The swing bearing must be installed such that it can move freely. But it may not possess any noticeable radial or axial play.

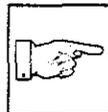
Removal

1. Remove the pinion cover and take off the chain.
2. Unscrew the brake hose clamps.
3. Remove the rear wheel, remove the chain adjuster (1) on both sides.
4. Unscrew the lower spring strut mount (2).
5. Remove the sealing cap (3), loosen the M16x1.5 hexagon nut (4).
6. Pull out the swing bearing pin (5) and spacer sleeve (6).
7. Pull the swing fork (7) out of the frame.



Installation

1. Insert the greased swing bearing pin with washer approx. 1 cm into the frame.
2. Insert the swing fork into the frame and slide the swing bearing pins up to the stop.
3. Position the locking washer Nord-Lock 16x25.4 (1) on the left and screw the nut (2) on a few turns. Do not tighten it yet.



Note:

Possible damage to the swing bearing!

First screw on the spring strut with the swingarm, then tighten the swing bearing bolts.

4. Screw the spring strut to the swing fork, press the locking caps onto the nuts of the swing bearing pin.
5. Mount the clamps with brake hose onto to the swing fork.
6. Position wheel, insert axle.
7. Install the chain (see above), adjust the chain slack. (see 4.5.2 "Adjusting the Chain Slack")
8. Screw the rear wheel on tight.
9. Inspect the wheel track, adjust if necessary.
10. Mount the pinion cover.
11. Activate the foot brake lever until braking action occurs.



Tightening torque:

Axle nuts: 100^{+10} NM

4 Brakes and Wheels

4.1 Brakes Front



Danger!

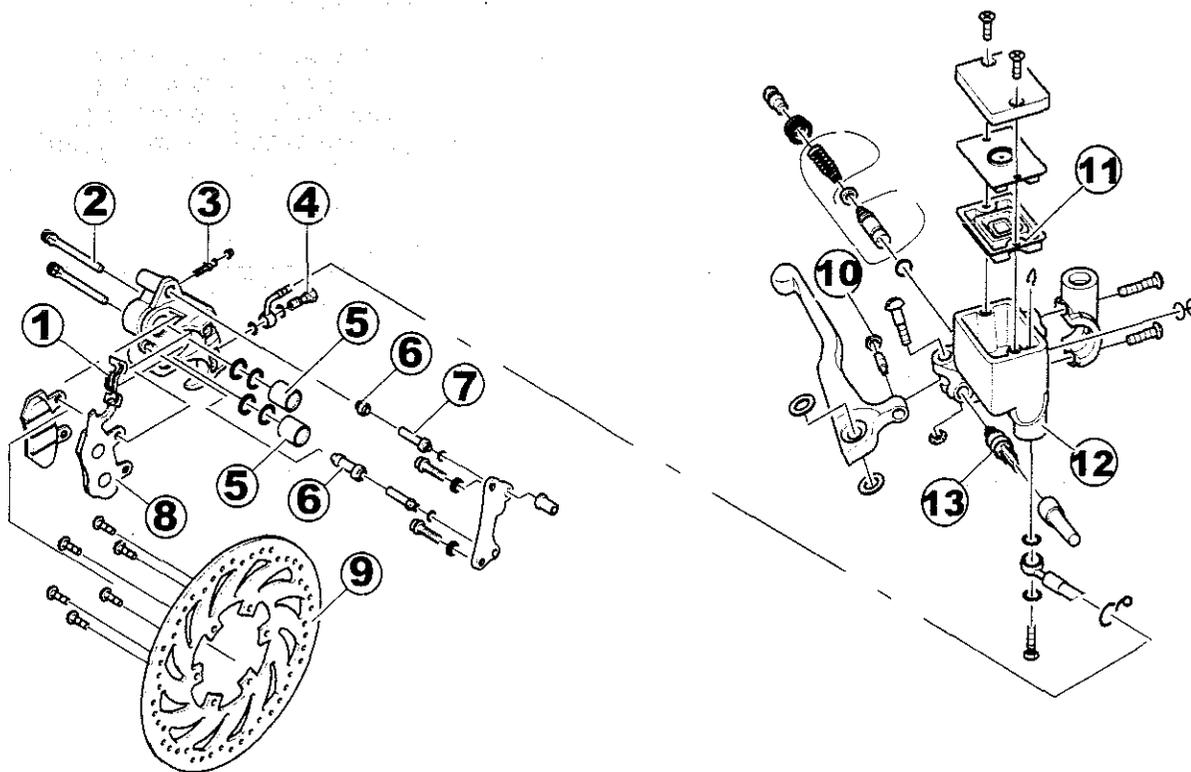
Risk of death!

Ineffectual or faulty brake systems put lives at risk!

Improper work can impair the functioning of the brake system, thereby reducing the safety of the vehicle in traffic.

Perform all work attentively and responsibly, based on this repair manual.

The front brake is designed as a hydraulic disc brake with a two-piston floating caliper.

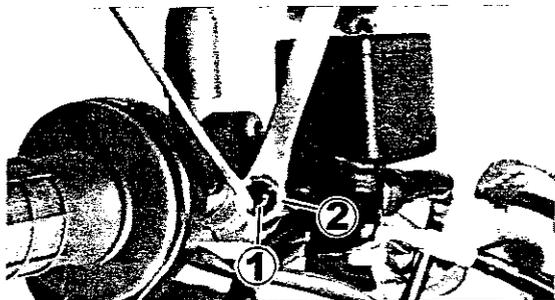


- (1) Tension bracket
- (2) Mounting pins
- (3) Air bleeding screw
- (4) Banjo bolt M10x1.25
- (5) Pistons
- (6) Seal collar
- (7) Sliding pin
- (8) Brake pad
- (9) Brake disc Ø 280 mm
- (10) Adjusting screw
- (11) Hermetic bellows
- (12) Front master cylinder
- (13) Front brake light switch

4.1.1 Front Wheel Brake Adjustment

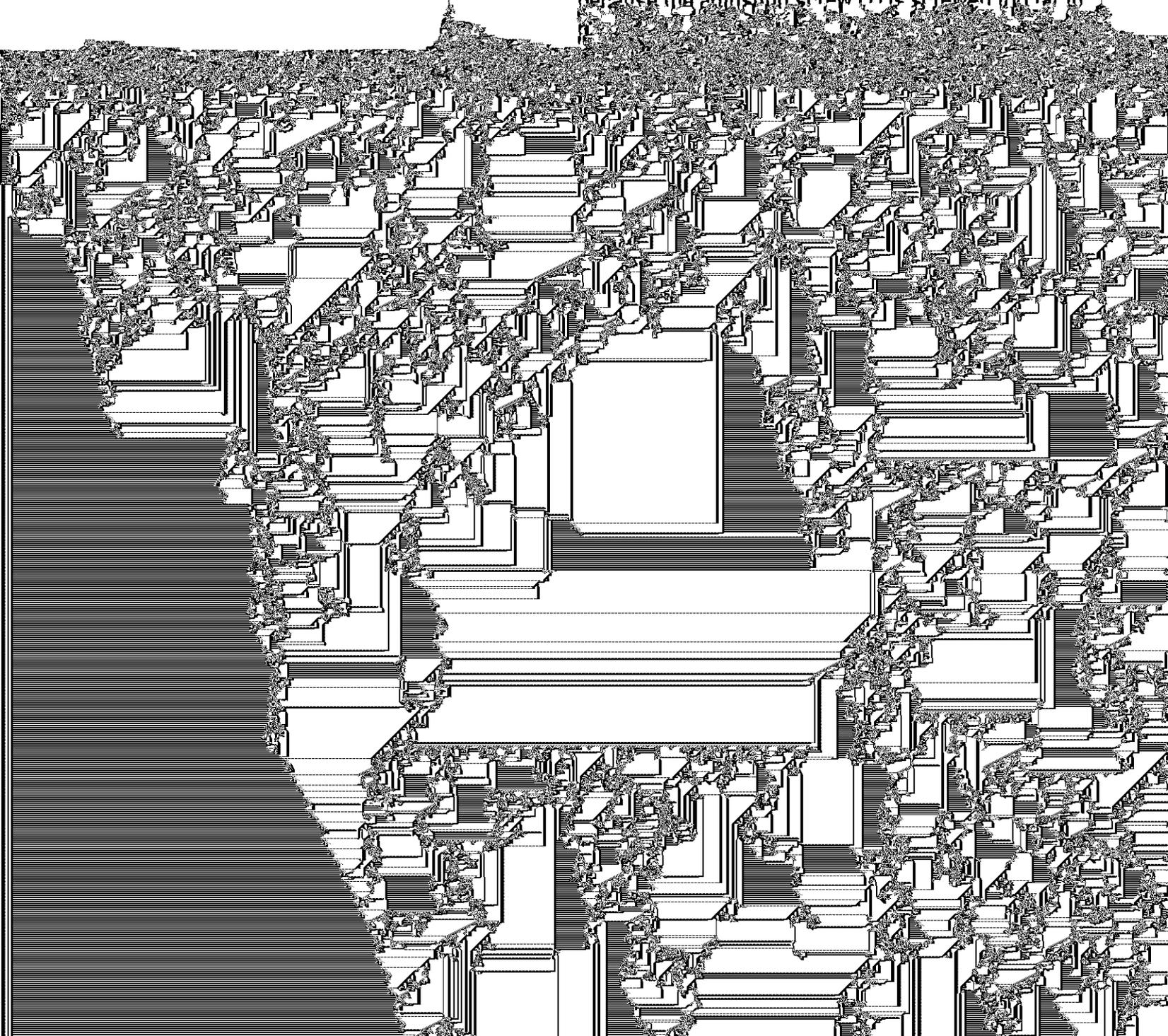
The adjusting screw (1) (hexagon socket 3 mm) is used to adjust the pressure point of the front wheel brake:

1. Loosen the locking nut (2) for the adjusting screw (1),



Attention!

If the equalisation hole (3) is covered by the seal ring (4) because the adjusting screw (1) is screwed too far in



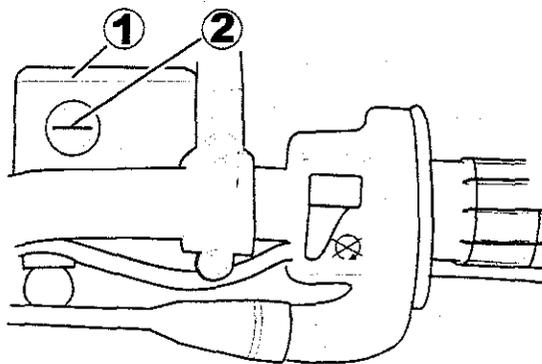
4.1.2 Brake Fluid



Attention!

If insufficient brake fluid is present, air can enter the braking system, reducing the braking performance. Always check the fluid level when bleeding the brakes. Add brake fluid - DOT 4 recommended - if necessary.

Always use the same type of brake fluid. Never mix different types of brake fluid!
Do not use dirty or old brake fluid.

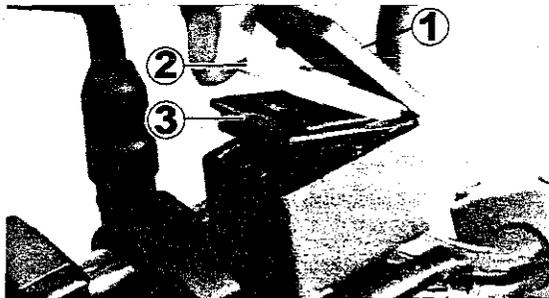


Inspection

The front master cylinder (1) is located on the left next to the hand brake lever.

Position the vehicle such that the front master cylinder sits horizontally.

When the front master cylinder is horizontal, the brake fluid level may not fall below the marking on the round inspection glass (2)!



Adding fluid

1. Position the vehicle such that the front master cylinder sits horizontally.
2. Unscrew the 2 screws from the front master cylinder cap.
3. Remove the cap (1), bolster plate (2) and hermetic bellows (3).
4. Inspect the hermetic bellows, replace if damaged.
5. Fill the front master cylinder with brake fluid up to the top edge of the inspection glass.
6. Position the cap, bolster plate and hermetic bellows, tighten the screws evenly.



Tightening torque:

Cap screws:

1⁺¹ Nm

Replacing

The brake fluid must be changed at least every two years. Old brake fluid tends to form bubbles under high stress (long descents/frequent braking), resulting in a significant reduction in braking performance and riding safety.


Attention!

Brake fluid is aggressive and poisonous.

Avoid contact with skin.

Do not spill onto paint, plastic or rubber surfaces. Immediately wipe up spilled brake fluid.

Always cover sensitive components with a rag while working on the brake system.

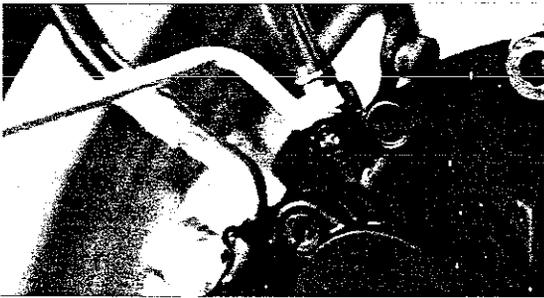
Only use new DOT4 brake fluid.

Do not mix different kinds.

Brake fluid absorbs water from the air.

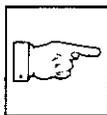
For this reason, only store brake fluid in closed containers.

Use a filling device to change the brake fluid - follow the manufacturer's instructions or do as follows:



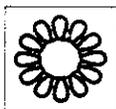
1. Position the vehicle such that the front master cylinder sits horizontally.
2. Remove the dust cap from the air bleeding screw.
3. Place a ring spanner and transparent hose on the air bleeding screw.
4. Place the other end of the hose in a suitable container.
5. Screw off the front master cylinder cap.
6. Open the air bleeding screw.
7. Pump all of the brake fluid into the container by operating the brake lever.

While doing so, constantly add new brake fluid.


Note:

New brake fluid is lighter in colour than used. Watch the brake fluid being pumped out. When it becomes light, the old brake fluid has been completely replaced by the new fluid.

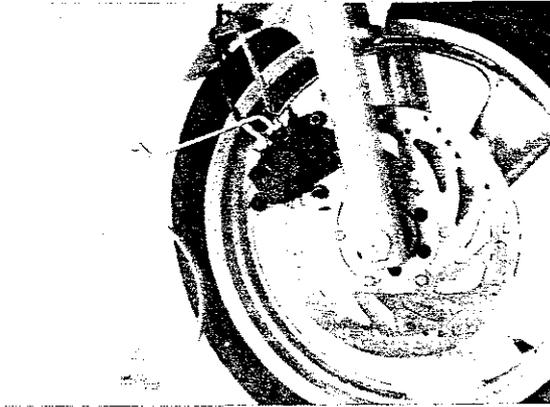
8. Close the air bleeding screw.
9. Add new brake fluid up to the marking on the brake fluid tank.
10. Position the bellows and seal, close the cap of the front master cylinder.
11. Function test.
If the lever play is larger than 30 mm, bleed the brake system.


Environment:

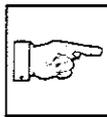
Properly dispose of used brake fluid.

4.1.3 Bleeding the Brake System

Use a bleeding device to bleed the brake system.
Follow the manufacturer's instructions or do as follows:

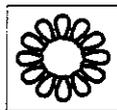


1. Position the vehicle such that the front master cylinder sits horizontally.
2. Unscrew the front master cylinder, add new brake fluid up to the top edge of the inspection glass.
3. Position the hermetic bellows, bolster plate and cap.
4. Remove the dust cap.
5. Place a ring spanner and transparent hose onto the air bleeding screw, place the other end of the hose in a suitable container filled with brake fluid.
6. Open the air bleeding screw, work the brake lever once and stop.
7. Close the air bleeding screw.
8. Let go of the brake lever, pump several times (10x), hold the lever down.
9. Open the air bleeding screw.
Old brake fluid and air escape.
10. Close the air bleeding screw.
11. Repeat the process until the escaping brake fluid has no bubbles.
12. Remove the ring spanner and hose, return the dust cap.
13. Add new brake fluid up to the marking on the inspection glass.
14. Perform function test.



Note:

Always make certain that sufficient brake fluid is present in the front master cylinder.
Add brake fluid, if necessary.

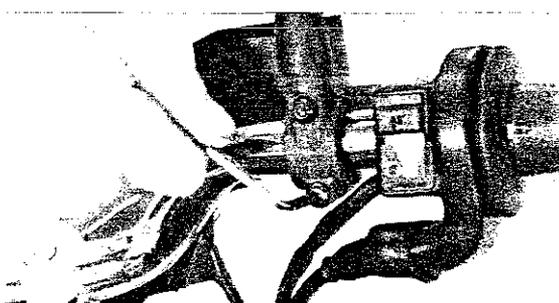
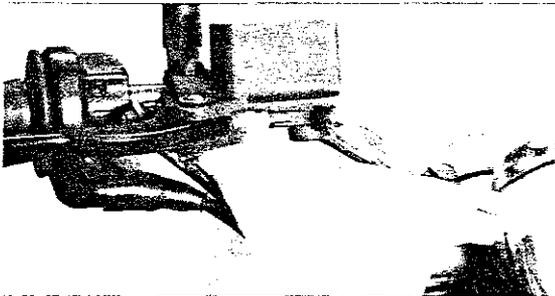
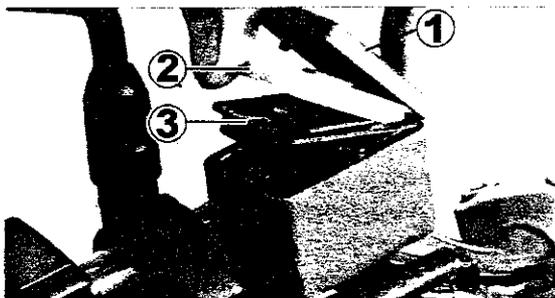


Environment:

Properly dispose of used brake fluid.

4.1.4 Front master cylinder

Removal



1. Position the vehicle such that the front master cylinder sits horizontally.
2. Unscrew the 2 screws on the cap.
3. Remove the cap (1), bolster plate (2) and hermetic bellows (3).
4. Suck the brake fluid out of the storage tank (e.g. with a syringe).
5. Press the brake caliper toward the middle of the vehicle against the brake disc, pressing back the pistons of the brake caliper.
6. Once again suck out the brake fluid.
7. Operate the brake lever 2-3 times to empty the piston chamber.
8. Place cleaning paper under the front master cylinder.
9. Unscrew the banjo bolt, remove the brake hose and the 2 seals.
The brake hose remains attached to the clamp head.
10. Unscrew the 2 screws of the mounting clamp.
11. Remove the front master cylinder.

Installation

Note:

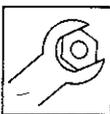
Always use new seal rings for the brake hose.
Grease and install the brake lever, adjusting screw and 2 screws of the clamp shell.



Install in reverse order.
Add brake fluid, bleed (see 4.1.3 "Bleeding the Brake System").
Perform function test.

Tightening torque:

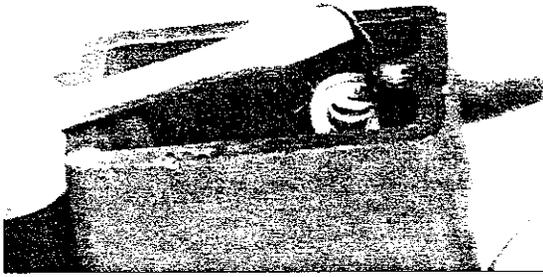
Banjo bolt:	20 ^{+2.5} Nm
2 M6 screws (handlebar shell):	6 ⁺¹ Nm



4.1.5 Inspection Glass

Removal

1. Position the vehicle such that the front master cylinder sits horizontally.
2. Open the front master cylinder cap.
3. Suck out the brake fluid until the level is under the lower edge of the inspection glass (e.g. with a suitable syringe).
4. Lift out the clasp with a screw driver.
5. Press out the inspection glass along with the seal ring.
6. Replace the seal ring and/or glass.



Installation

Install in reverse order.

The MIN mark must be parallel to the cap seal surface.

Add brake fluid, bleed (see 4.1.3 "Bleeding the Brake System").
Perform function test.

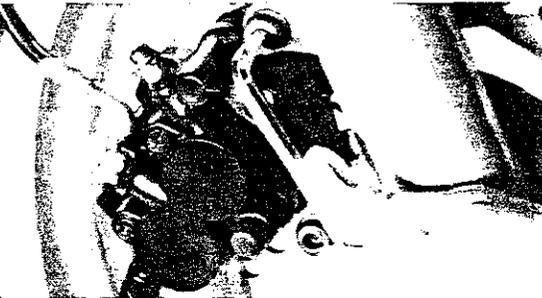
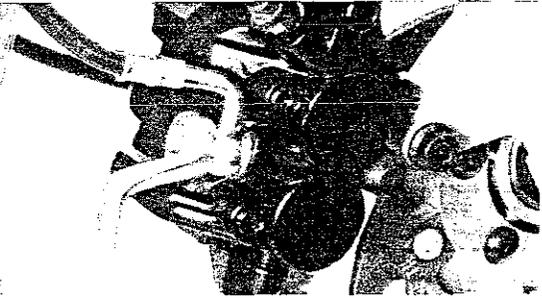
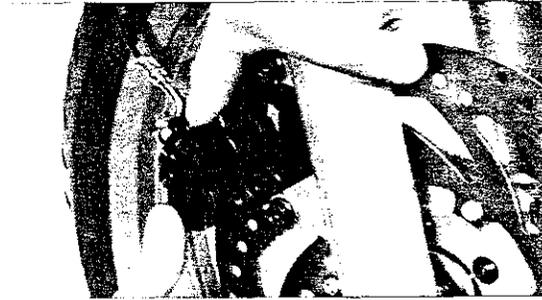
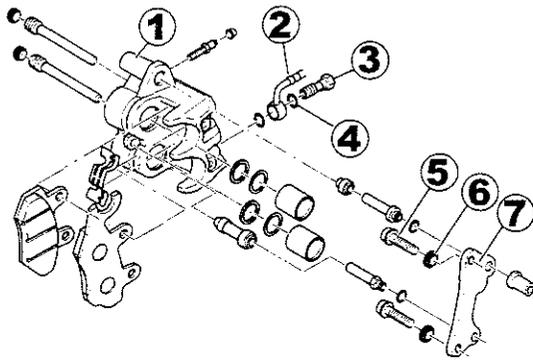
4.1.6 Replacing the Seal Set

1. Drain the front master cylinder.
2. Remove the seal collar.
3. Remove the piston.
4. Replace the seal rings.



4.1.7 Entire Brake Caliper

The front and rear brake calipers are identical.



Removal

1. Press the brake caliper (1) toward the middle of the vehicle against the brake disc, pressing back the pistons of the brake caliper.
2. Unscrew the banjo bolt (3).
3. Remove the 2 seal rings (4).
4. Place the banjo bolt on cleaning paper.
5. Wrap cleaning paper around the brake hose.
6. Elevate the opening of the brake hose, fasten it to the frame, if necessary.
This prevents the brake hose from draining. It simplifies the bleeding process.
7. Unscrew the 2 cylinder screws (5) with Nordlock washers (6) from the sliding pipe.
8. Remove the adapter plate (7) with the brake caliper.

Installation

1. Place the brake caliper (1) onto the brake disc.
2. Screw the adapter plate (7) and brake caliper onto the sliding pipe with the 2 cylinder screws (5), inserting the Nordlock washers (6) (with the corrugated side toward the adapter plate).
3. Screw the brake hose with banjo bolt (3) and new seals (4) tightly to the brake caliper.
4. Bleed (see 4.1.3 "Bleeding the Brake System").
5. Perform function test.

4.1.8 Brake Pads

Inspection

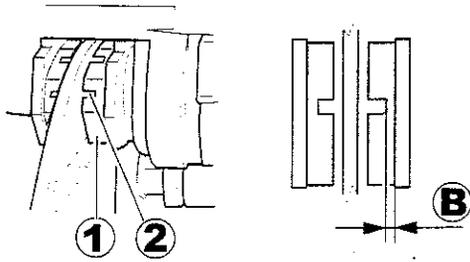


Attention!

Reduced braking performance!

The thickness of the brake pads must never be less than (B)= 2.0 mm.

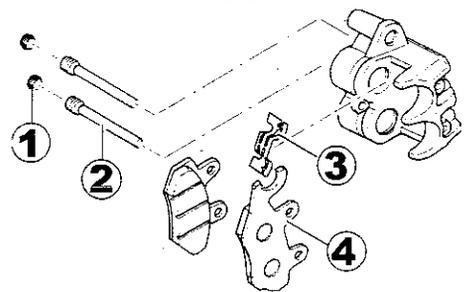
If the thickness is insufficient, the brake discs may be damaged.



The brake pads (1) have wear marks (2).

If these wear marks are no longer visible, the brake pads must be replaced.

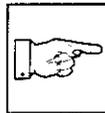
Always replace the brake pads in pairs.



Removal

1. Unscrew the cap screws (1).
2. Unscrew the mounting pins (2).
3. Remove the tension bracket (3).
4. Remove both brake pads (4).

Installation



Note:

The brake pad lining seats can be treated with copper paste or brake protector. This prevents the brake pads from squeaking. The tension bracket must be positioned under the mount pins.

1. Insert new brake pads (4).
2. Insert the tension bracket (3).
The wide sliding side must face toward the pistons.
3. Slide in the mounting pins (2) and screw them tight.
4. Screw in the cap screws (1).

4.1.9 Brake Caliper/Components

Removal

1. Remove the brake caliper (see 4.1.7 "Entire Brake Caliper").
2. Clean the brake fluid from the brake caliper (e.g. with brake cleaner).
3. Remove the brake pads (see 4.1. 8" Brake Pads").



Attention!

**Be careful of high pressure!
Always wear protective goggles.**

The pistons may "shoot out" with significant velocity.

4. Press out the pistons by applying compressed air to the connection hole.



4.1.10 Brake Hose



Attention!

Accident risk!
Immediately replace defective brake hoses!
In general, replace brake hoses every 4 years.



Removal

1. Unscrew the banjo bolt from the front master cylinder.
2. Remove the seal rings.
3. Drain the brake fluid from the brake hose into a suitable container.

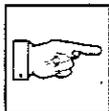
4. Unscrew the banjo bolt from the brake caliper.
5. Remove seals.
6. Remove brake hose.

Inspection

Inspect the brake hose for

- damage
- poor seal
- kinks
- crushed points

Installation



Note:

Always use new seal rings!

Install in reverse order.

Add brake fluid.

Bleed brakes (see 4.1.3 "Bleeding the Brake System").

Perform function test.

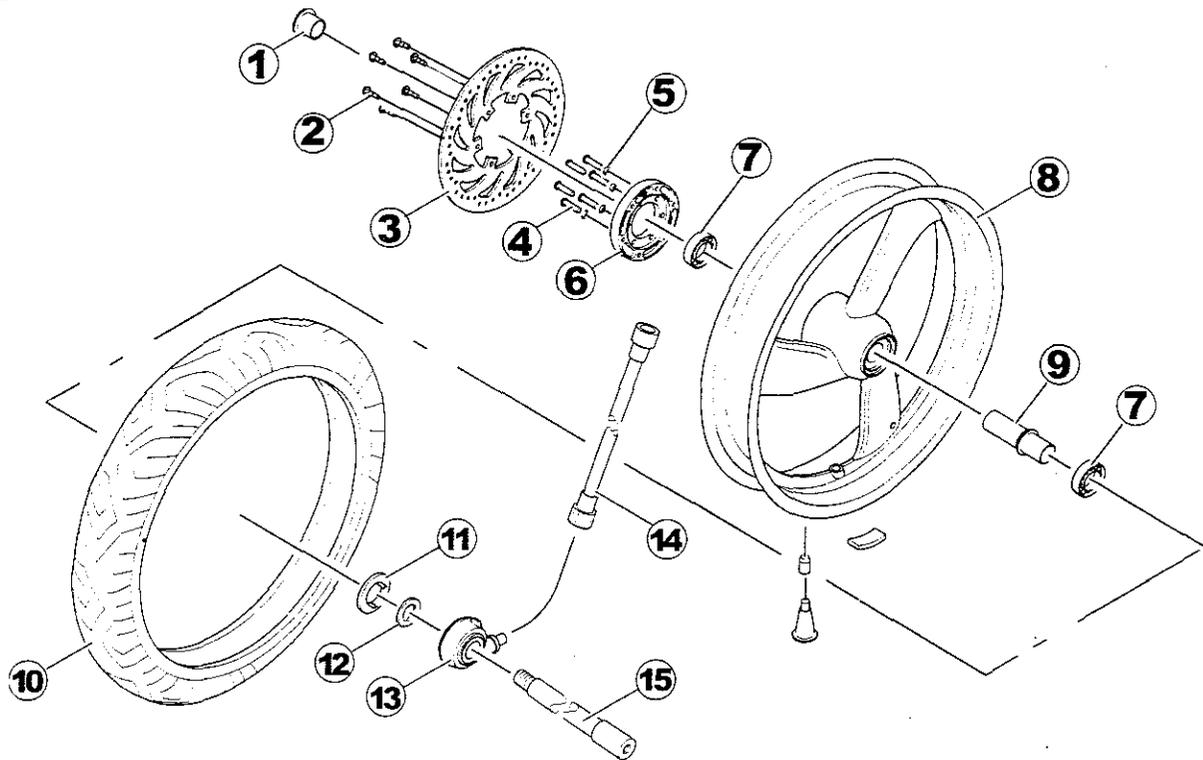


Tightening torque:

Banjo bolt:

20^{+2.5} Nm

4.2 Front Wheel



- (1) Spacer sleeve
- (2) M6x16 tallow-drop screws
- (3) Brake disc Ø 280 mm
- (4) M8x25 tallow-drop screw
- (5) VS-8 Schnoor locking washer
- (6) Adapter
- (7) Deep groove ball bearing
- (8) Front wheel rim
- (9) Spacer sleeve
- (10) Tyres 110/70-17
- (11) Dog
- (12) Seal ring
- (13) Speedometer drive
- (14) Speedometer shaft
- (15) Axie

4.2.1 Replacing the Front Wheel

Removal

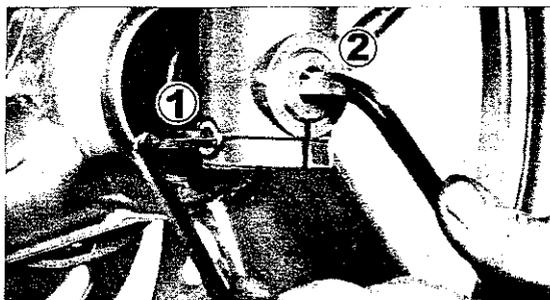


Attention!

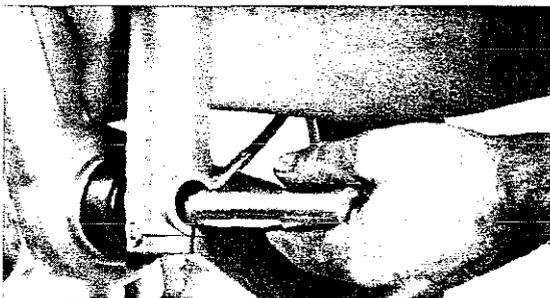
The vehicle may fall over.

Properly secure the vehicle on the installation stand before beginning work.

When using tension belts, be careful not to damage the paint.



1. The front wheel must be free of load.
2. Open the locking screw (1), loosen the axle (2).



3. Pull out the axle, holding the wheel in its installed position.
4. Remove the speedometer drive.
5. Remove the brake disc from the brake caliper.
6. Remove the wheel.

Installation

(For positions, see 4.2 "Front Wheel")



1. Place the front wheel between the fork spars, approximately in its installation position.
Slide the brake disc into the brake caliper.
2. Place the speedometer drive (13) onto the dog (9) in the wheel.
In doing so, slide the twisting lock of the speedometer drive into the counter mount of the left sliding pipe.
3. Slide the greased axle (15) far enough from the left fork spar that it is flush against the right bearing.
4. Insert the spacer sleeves (1).
5. Lift on the front wheel.
6. Slide the axle through the right fork spar.
7. Screw on the axle.
8. Tighten the locking screw (1, see above).



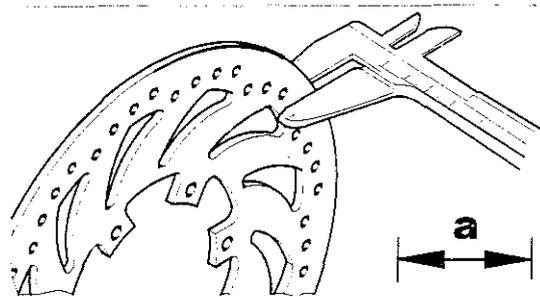
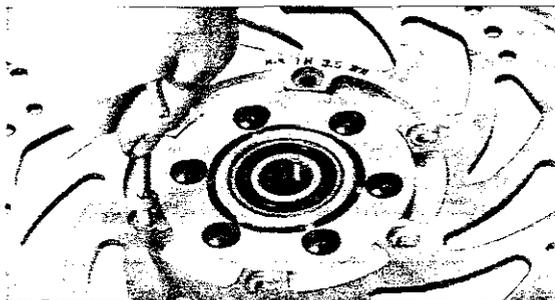
Tightening torque:

Axle: 60⁺⁵ Nm
 Locking screw: 25⁺⁵ Nm

4.2.2 Brake Disc

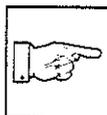
Removal

1. Remove the front wheel.
2. Loosen the 6 tallow-drop screws, remove the brake disc. If necessary, heat the aluminium to approx. 80°C - 100°C (176°F - 212°F) using a hot air pistol.



Inspection

1. Measure thickness (a).
Minimum thickness: **3.5 mm.**
2. Check that the brake disc is level using a straight-edge.
Maximum deviation: **0.05...0.08 mm.**
3. Check that it is parallel.
Maximum deviation: **0.03 mm.**
4. Check the eccentricity (mounted on hub, with new bearings installed in the swingarm, measured on outside \emptyset).
Maximum deviation: **0.25 mm.**

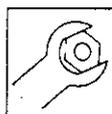
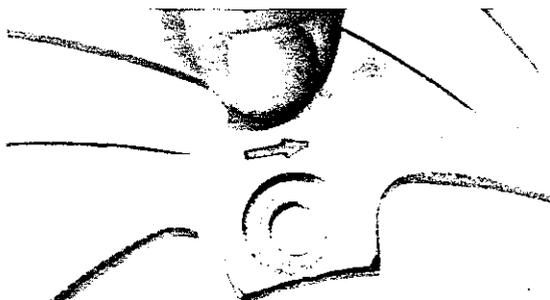


Note:

With an eccentricity of > 0.1 mm, it is permissible to unscrew the brake disc from the hub to achieve a reduction in the measurement value by twisting the brake disc and reinstalling it. If this does not have the desired result, the brake disc must be replaced.

Installation

1. Place the brake disc on the adapter with the proper orientation (arrow).
2. Turn the disc one turn with pressure against the adapter to ensure a flat seat.
3. Apply screw locking agent to the screws.
4. Tighten the screws in a crosswise manner.
5. Wipe off excess screw locking agent.
6. Clean the disc with brake cleaner.
7. Install the front wheel.



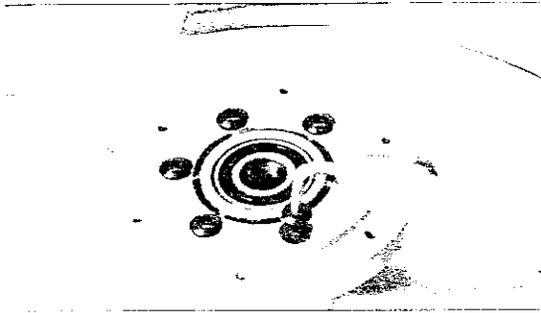
Tightening torque:

Tallow-drop screws: 10^{+2} Nm

4.2.3 Brake Disc Adapter

Removal

1. Remove brake disc (see 4.2.2 "Brake Disc").
2. Unscrew the 6 M8 oval flange head screws.
If necessary, heat the aluminium to approx. 80 ° - 100°C (176 - 212 °F) using a hot air pistol.
3. Remove the adapter.



Inspection

- Threading,
- Flat surfaces.

Installation



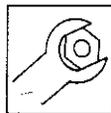
Attention!

Risk of accidents and part destruction!

Improperly positioned VS-8 Schnorr locking washers have no locking function!

The outside circumference of the VS-8 Schnorr locking washers must rest on the adapter, the inside circumference facing the screw head.

1. Position adapter.
2. Insert the VS-8 Schnorr locking washers into the indentation.
The outside circumference must rest on the adapter.
3. Tighten the screws.
4. Install the brake disc.
5. Install the front wheel.



Tightening torque:

Adapter screw:

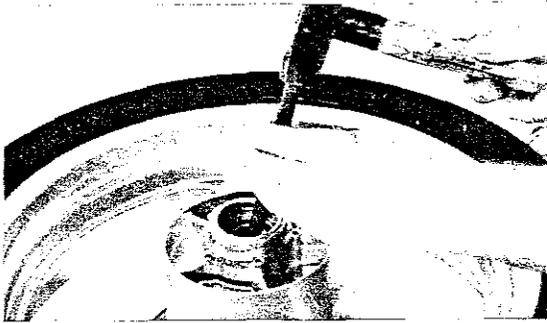
20⁺⁵ Nm

4.2.4 Wheel Bearing

2 deep groove ball bearings DIN 635-6204-2RS serve as the wheel bearing.

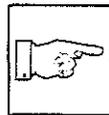
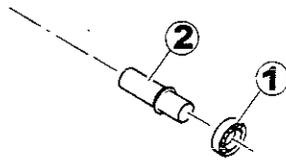
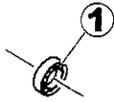
Removal

1. Remove the front wheel.
2. Remove the adapter with brake disc.
3. Carefully pound out the left and right bearing and spacer sleeve using a spike.



Inspection

1. Inspect the bearing play of the wheel bearing (1).
2. Measure the length of the spacer sleeve (2).
Minimum length: **65.5 mm.**



Note:

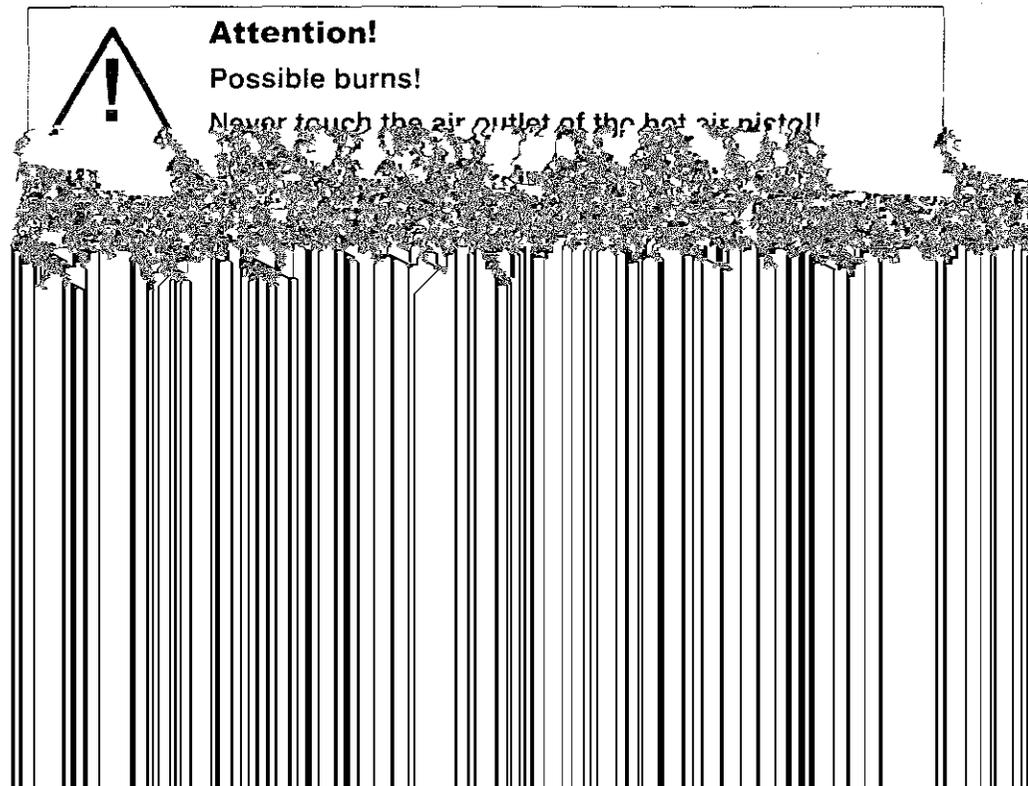
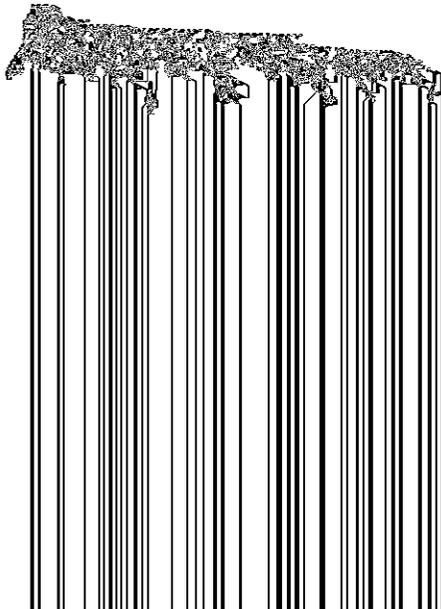
Should the wheel bearing have too much play or the wheel no longer runs smoothly, the wheel bearings must be replaced. If the spacer sleeve (2) length is < 65.5 mm, it must be replaced. Otherwise the wheel bearings may be damaged.



Attention!

Possible burns!

Never touch the air outlet of the hot air pistol!



4.2.5 Speedometer Drive

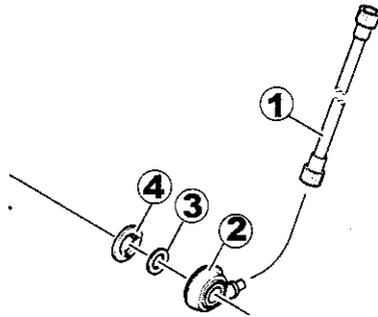
The speedometer drive cannot be repaired, it can only be replaced.

Removal



Attention!

The brake disc can damage the paint on the fork spars. Make certain that the brake disc does not touch the fork spars. A cleaning rag can also be placed between them.



1. Screw off the speedometer shaft (1).
2. Remove the front wheel (see 4.2.1 "Replacing the Front Wheel").



3. Remove the seal ring (3) and dog (4) from the wheel hub.

Inspection

- Check the teeth for completeness and wear,
- Check the seal ring for wear,
- Check the dog for wear.

Replace defective components.

Installation

1. Insert the dog and seal ring into the wheel hub.
2. Lubricate the speedometer drive.
3. Install the front wheel and speedometer drive (see 4.2.1 "Replacing the Front Wheel").
4. Screw on the speedometer shaft.

4.3 Rear Brakes

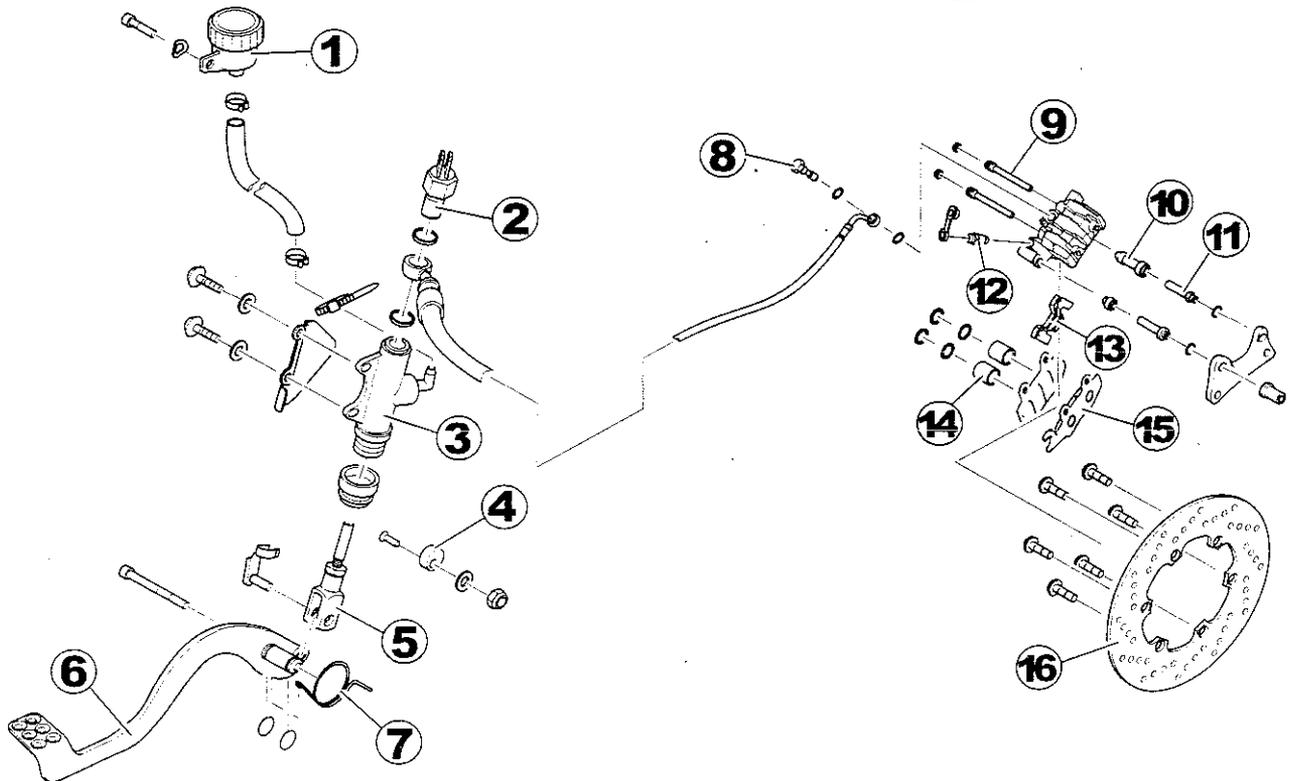

Danger!

Risk of death!

Ineffectual or faulty brake systems put lives at risk!

Improper work can impair the functioning of the brake system, thereby reducing the safety of the vehicle in traffic. Perform all work attentively and responsibly, based on this repair manual.

The rear brake is designed as a hydraulic disc brake with a two-piston floating caliper.



- (1) Storage tank
- (2) Brake light switch
- (3) Rear wheel brake cylinder \varnothing 13 mm
- (4) Eccentric disc
- (5) Pressure rod L 55 mm
- (6) Brake lever
- (7) Reset spring for brake lever
- (8) Banjo bolt M10x1.25
- (9) Mounting pins
- (10) Seal collar
- (11) Sliding pin
- (12) Air bleeding screw
- (13) Tension bracket
- (14) Pistons
- (15) Brake pad
- (16) Rear brake disc \varnothing 220 mm

4.3.1 Brake Fluid**Attention!**

If insufficient brake fluid is present, air can enter the braking system, reducing the braking performance.

Always check the fluid level when ventilating the brakes. Add brake fluid - DOT 4 recommended - if necessary.

Always use the same type of brake fluid. Never mix different types of brake fluid!

Do not use dirty or old brake fluid.

The storage tank is located on the right underneath the seat on the intake muffler.

Inspection

Position the vehicle such that the storage tank sits horizontally. The brake fluid level must be between the **MAX** and **MIN** markings, never lower!




Attention!

Brake fluid is aggressive and poisonous!

Avoid contact with skin.

Do not pour onto paint, plastic or rubber surfaces. Immediately wipe up spilled brake fluid.

Always cover sensitive components with a rag while working on the brake system.

Only use new DOT4 brake fluid.

Do not mix different kinds.

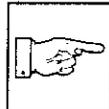
Brake fluid absorbs water from the air.

For this reason, only store brake fluid in closed containers.

Use a filling device to change the brake fluid - follow the manufacturer's instructions or do as follows:

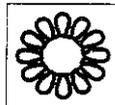


1. Position the vehicle horizontally.
2. Remove the dust cap from the air bleeding screw.
3. Place a ring spanner and transparent hose on the air bleeding screw.
4. Place the other end of the hose in a suitable container.
5. Screw off the storage tank cap.
6. Remove the hermetic bellows.
7. Open the air bleeding screw.
8. Pump all of the brake fluid into the container by operating the brake lever.
While doing so, constantly add new brake fluid.


Note:

New brake fluid is lighter in colour than used. Watch the brake fluid being pumped out. When it becomes light, the old brake fluid has been completely replaced by the new fluid.

9. Close the air bleeding screw.
10. Add new brake fluid up to the MAX marking on the storage tank.
11. Position the hermetic bellows.
12. Screw on the storage tank cap.
13. Bleed brake.
14. Perform function test.


Environment:

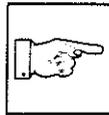
Properly dispose of used brake fluid.

4.3.2 Bleeding the Brake System

Use a bleeding device to bleed the brake:
Follow the manufacturer's instructions or do as follows:

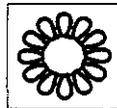


1. Position the vehicle horizontally.
2. Unscrew the cap on the storage tank, add brake fluid up to the MAX marking of the storage tank.
3. Screw the cap onto the storage tank.
4. Remove the dust cap from the air bleeding screw.
5. Place a ring spanner and transparent hose onto the air bleeding screw, place the other end of the hose in a suitable container filled with brake fluid.
6. Open the air bleeding screw, work the brake lever once and stop.
7. Close the air bleeding screw.
8. Let go of the brake lever, pump several times (10x), hold the lever down.
9. Open the air bleeding screw.
Old brake fluid and air escape.
10. Close the air bleeding screw.
11. Repeat the process until the escaping brake fluid has no bubbles.
12. Remove the ring spanner and hose, return the dust cap.
13. Check the fluid level, add brake fluid up to the MAX marking of the storage tank, if necessary.
14. Perform function test.

**Note:**

Always make certain that sufficient brake fluid is present in the storage tank.

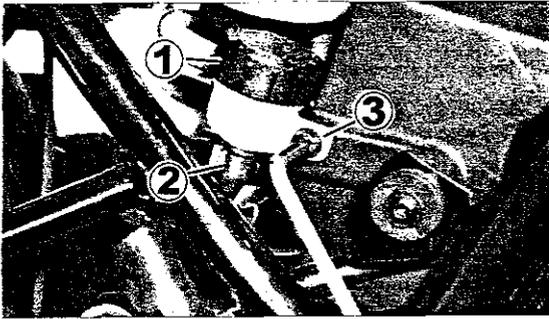
Add brake fluid, if necessary.

**Environment:**

Properly dispose of used brake fluid.

4.3.3 Storage Tank

Removal

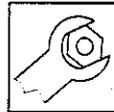


1. Position the vehicle horizontally.
2. Screw off the cap (1), remove the hermetic bellows and inspect.
3. Suck the brake fluid out of the storage tank (e.g. with suitable syringe).
4. Open the clamp (2) with a small screw driver.
5. Pull off the hose, inspect, replace if necessary (see 4.3.4 "Hose").
6. Unscrew the screw (3), remove the storage tank.

Installation

Install in reverse order.

1. Add brake fluid. Bleed the brake system (see 4.3.2 "Bleeding the Brake System").
2. Perform function test.

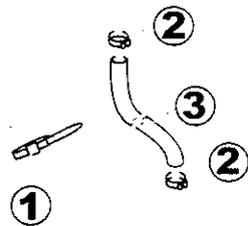


Tightening torque:

Screw: 1+1 Nm

4.3.4 Hose

Removal



1. Unscrew the cover plate of the rear wheel brake cylinder.
2. Open the cable binder (1).
3. Unscrew the storage tank.
4. Screw off the storage tank cap.
5. Remove the hermetic bellows.
6. Completely drain the brake fluid out of the storage tank and hose into a suitable container.
7. Open the hose clamps (2), remove the hose (3).

Installation

Inspect the components for damage, particularly the hose.

1. Connect the hose to the rear wheel brake cylinder and storage tank, close clamps.
Undamaged clamps can be used again.



Attention!

Reduction in the hose cross-section leads to reduced braking performance.

Do not bind the cable binder too tightly.

2. Position the new cable binder around the hose and rear wheel brake cylinder and close it.
3. Fill the storage tank.
4. Squeeze the hose hard 5-10 times.
Air rises upward, followed by brake fluid.
5. Completely bleed the brake system (see 4.3.2 "Bleeding the Brake System"), perform a function test.

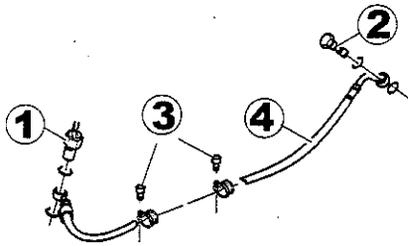
4.3.5 Brake Hose



Attention!

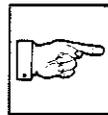
Accident risk

Immediately replace defective brake hoses!
In general, replace brake hoses every 4 years.



Removal

1. Unscrew the storage tank.
2. Open the cable binder and let the storage tank hang down. The brake fluid level must be under the level of the rear wheel brake cylinder.
3. Push back the rubber cap of the brake light switch (1), disconnect the contact.
4. Screw off the brake light switch, remove the seal rings.



Note:

Place cleaning paper around the rear wheel brake cylinder before screwing off the brake light switch to soak up any brake fluid that might flow out.

The openings of the brake hose must always point upward.

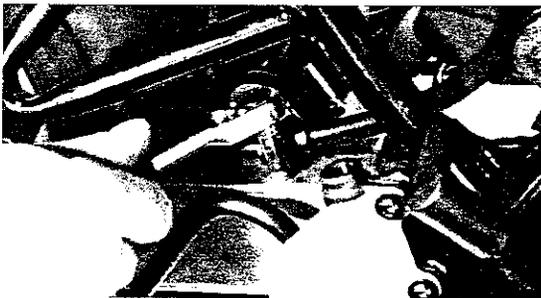
5. Remove the banjo bolt (2) and seals from the brake caliper.
6. Let the hose drain into a suitable container.
7. Open both hose clamps (3), remove the hose.

Inspection

Inspect all parts for damage, poor seal, kinks, crushed points, etc. and replace, if necessary.

Installation

1. Screw the brake hose tightly to the rear brake caliper with the banjo bolt and new seal rings.
2. Attach the hose to the swingarm with the clamps.
3. Run the hose in an arc under the intake muffler.
4. Screw the brake hose tightly to the rear wheel brake cylinder with the banjo bolt and new seal rings.
5. Connect the plug contacts, slide the rubber cap over.
6. Screw on the storage tank, close the cable binder.
7. Completely bleed the brake system (see 4.3.2 "Bleeding the Brake System").
8. Perform a function test.



Tightening torque:

Banjo bolt:	20 ^{+2.5} Nm
Brake light switch:	20 ^{+2.5} Nm

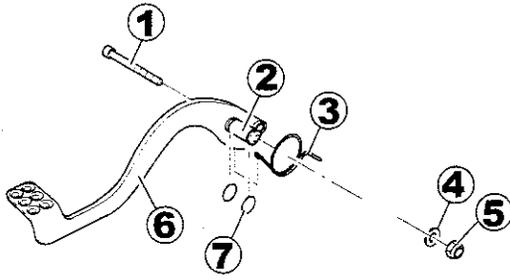
4.3.6 Brake Caliper

Removal

1. Screw off the banjo bolt, remove the 2 seal rings.
2. Wrap cleaning paper around the brake hose and banjo bolt.
3. Elevate the opening of the brake hose, fasten it to the frame, if necessary.

This prevents the brake hose from draining. Doing so simplifies the bleeding process.





Installation

1. Inspect the O-rings (7) on the bearing pins (2) of the brake lever (6), replace if necessary.
2. Grease the bearing pins.
3. Latch the spring (3) in the brake lever and slide it onto the pin.
4. Slide the cylinder screw (1) through the bearing pins.
5. Insert the bearing pins into the frame. In doing so, insert the spring into the corresponding hole in the frame and use force to lift it onto the spring hanger.
6. Insert the washer (4) and screw on the nut (5).
7. Adjust the play (A) of the brake lever.

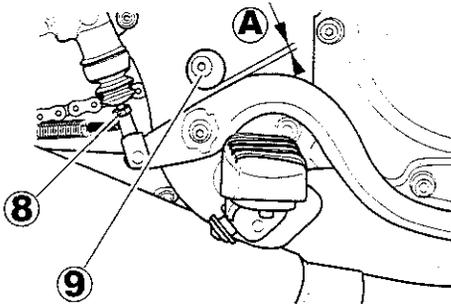
Adjusting the rear wheel brake



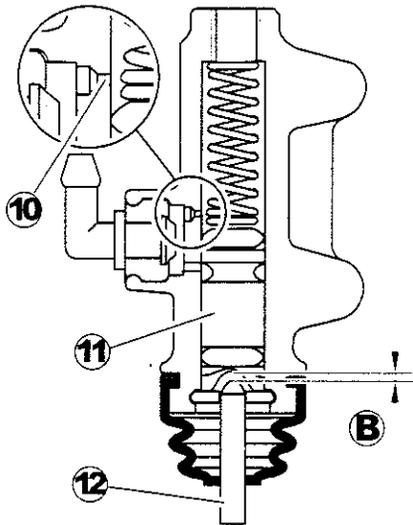
Attention!

Accident risk!

There must be at least 1 mm clearance between the eccentric disc (9) and the brake lever (6).



The position of the foot brake lever with respect to the foot rest can be adjusted with the eccentric disc (9). After adjusting the foot brake lever on the pressure rod (8) set a clearance of (A) = 1...1.5 mm.



This results in a clearance of (B) approx. 1...1.5 mm between the end of the pressure rod (12) and the face of the piston (11).

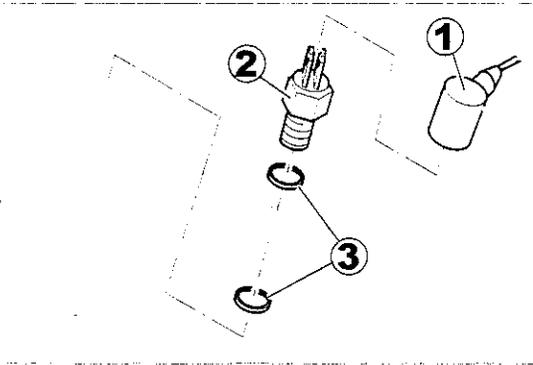
If this adjustment is not made, there is a risk that the equalisation hole (10) may remain blocked.

The brake fluid can no longer flow back. The brake pressure is maintained, the brake system overheats and the wheel may jam! Damage to the brake system and higher risk of accidents results.

4.3.8 Rear Brake Light Switch

Removal

1. Unscrew the storage tank.
 2. Open the cable binder and let the storage tank hang down. The brake fluid level must be under the level of the rear wheel brake cylinder.
 3. Slide back the rubber cap (1).
 4. Disconnect the plug contacts.
 5. Place cleaning paper around the rear wheel brake cylinder to soak up any brake fluid which may flow out.
 6. Unscrew the brake light switch (2), remove the seal rings (3).
- The brake hose must always point upward.



Inspection

The brake light switch can only be tested while installed and with a functional brake system.

Use a voltmeter set to the 20V range for measuring.

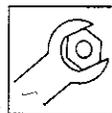
1. Switch on the ignition.
The 12V vehicle power supply is on the black/red cable.
2. Operate the foot brake lever.
3. Test the voltage on the black cable.
 - Voltage: Switch OK.
 - No voltage: Switch defective, replace.

Installation

Always use new seal rings.

inspect the seal surfaces on the hose, rear wheel brake cylinder and switch.

1. Screw the brake hose with the brake light switch and new seal rings onto the rear wheel brake cylinder.
2. Connect the plug contacts, slide the rubber cap over.
3. Bleed the brake system.
4. Perform function test.



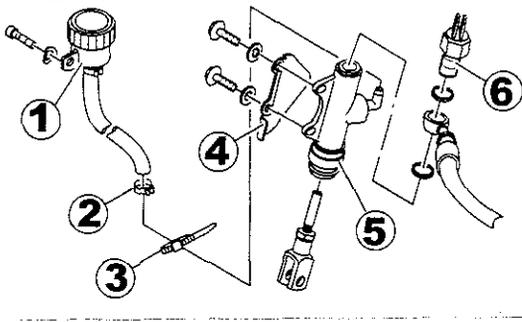
Tightening torque:

Brake light switch:

20^{+2.5} Nm

4.3.9 Rear wheel brake cylinder

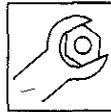
Removal



1. Screw off the brake light switch (6).
2. Remove the brake hose and seal rings.
3. Remove the cable binder (3), screw off the storage tank (1) and hold it downward.
4. Open the clamp (2), pull out the hose with the storage tank.
5. Pour the brake fluid into a suitable container, lay the storage tank on its cover.
6. Unscrew the 2 screws, remove the cover plate (4).
7. Pull the rear wheel brake cylinder (5) away from the pressure pins of the brake lever.

Installation

1. Slide the rear wheel brake cylinder onto greased pressure pins.
2. Fasten the rear wheel brake cylinder to the frame with the cover plate and both screws.
3. Mount the hose with the storage tank and fluid.
4. Close the clamp.
Undamaged clamps can be reused.
5. Bleed the brake system
(see 4.1.3 "Bleeding the Brake System").
6. Perform function test.

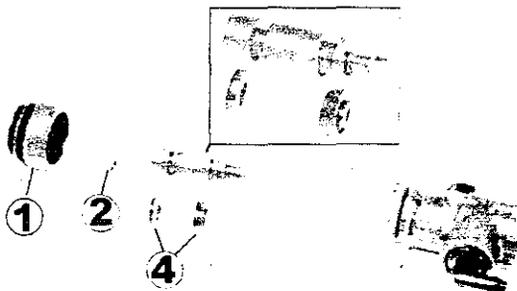


Tightening torque:

M6 screws: 10^{+2} Nm

4.3.10 Seal Set

Replacing



1. Drain the rear wheel brake cylinder.
2. Remove the seal collar (1).
3. Remove the locking ring (2) underneath.
4. Remove the piston (3).
5. Replace the seal rings (4).
6. Clean all parts with brake cleaner.
7. Moisten new parts with brake fluid and insert them into the rear wheel brake cylinder.
8. Insert the spring, press in the piston and install the retaining ring.



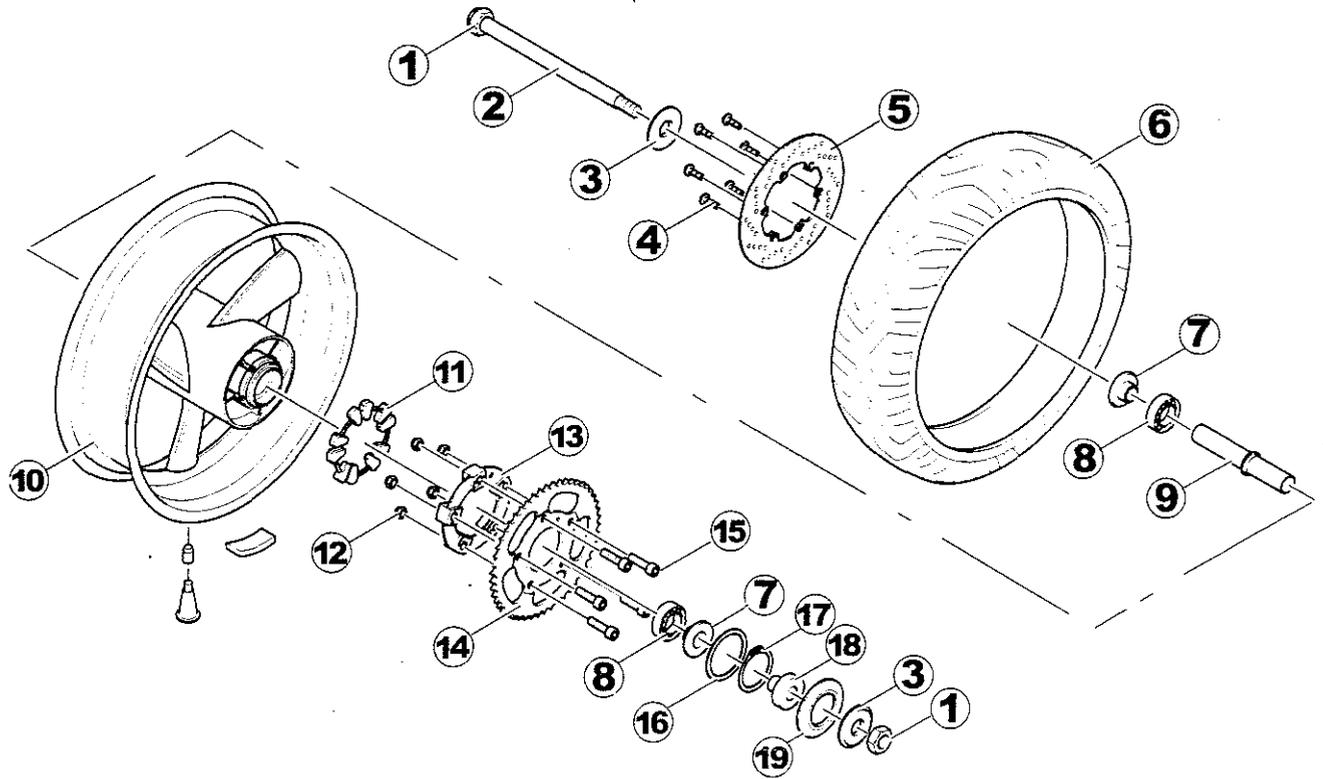
Danger!

Accident risk!

The seal lip of the seal collar must face inward when installed. Otherwise no braking pressure can be established and the brake does not function.

9. Slide on the seal collar.

4.4 Rear Wheel



- (1) Hexagon nut M16x1.5
- (2) Axle
- (3) Axle washer
- (4) M6x16 screws
- (5) Rear brake disc
- (6) Tyres 130/70-17
- (7) Reducing bush
- (8) Deep groove ball bearing
- (9) Spacer sleeve
- (10) Rear wheel
- (11) Dog rubber piece
- (12) M8 hexagon nuts
- (13) Dog
- (14) Chain plate, 49 teeth
- (15) M8x30 cylinder screws
- (16) Washer
- (17) Retaining ring
- (18) Reducing bush
- (19) Cap

4.4.1 Replacing the Rear Wheel

Removal



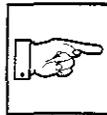
Attention!

The vehicle may fall over!

Properly secure the vehicle on the installation stand before beginning work.

Be careful not to damage the paint when using tension belts.

1. Unload the rear wheel.
2. Remove the brake caliper and lay it aside properly (unscrew the 2 screws on the adapter plate).



Note:

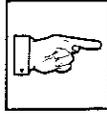
Do not operate the foot brake lever.



3. Screw off the left axle nut.
4. Pull the axle out halfway to the right.
5. Remove the chain.
6. Pull the axle out completely.
7. Remove the adapter plate from the counter bearing.
8. Carefully pull out the wheel to the rear.

Installation

1. Place the rear wheel between the swingarms.
2. Mount the chain.
3. Slide the axle into the chain adjuster from the right.
4. Insert the adapter plate.
5. Slide the axle through the adapter plate and wheel, screw on the axle nut.
6. Adjust the chain slack (see 4.5. 2" Adjusting the Chain Slack").
The cover plate of the chain adjuster must sit tight against the swingarm on both sides.

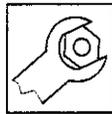

Note:

Place a 4 mm spike between chain and chain plate.
Turn the wheel a ¼ to ½ turn so that the cover plate of the chain adjuster sits tight against the swingarms.

Important!

Do not apply force. Otherwise the chain/chain plate may get damaged.

7. Tighten the axle nut, observe the specified torque.
8. Inspect the wheel tracking.
9. Expand the brake pads.
10. Install the brake caliper over the brake disc.
11. Observe the specified torque and use screw locking agent.
12. Operate the foot brake lever until the you feel the pressure point and the braking effect sets in.
13. Test the smooth rotation of the wheel.

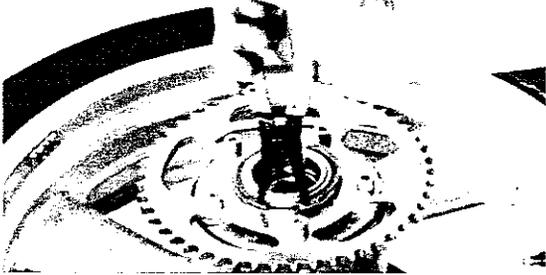
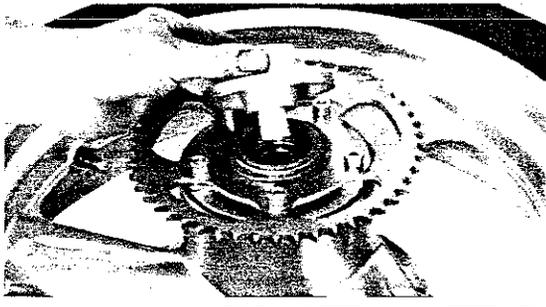

Tightening torque:

Axle nuts: 100⁺¹⁰ Nm

4.4.2 Chain Plate

Removal

1. Remove the rear wheel (see 4.4 "Rear Wheel").
2. Remove the cap, pull out the left reducing bush.



3. Remove the retaining ring and washer.

4. Pull of the chain plate with the dog.

MP4

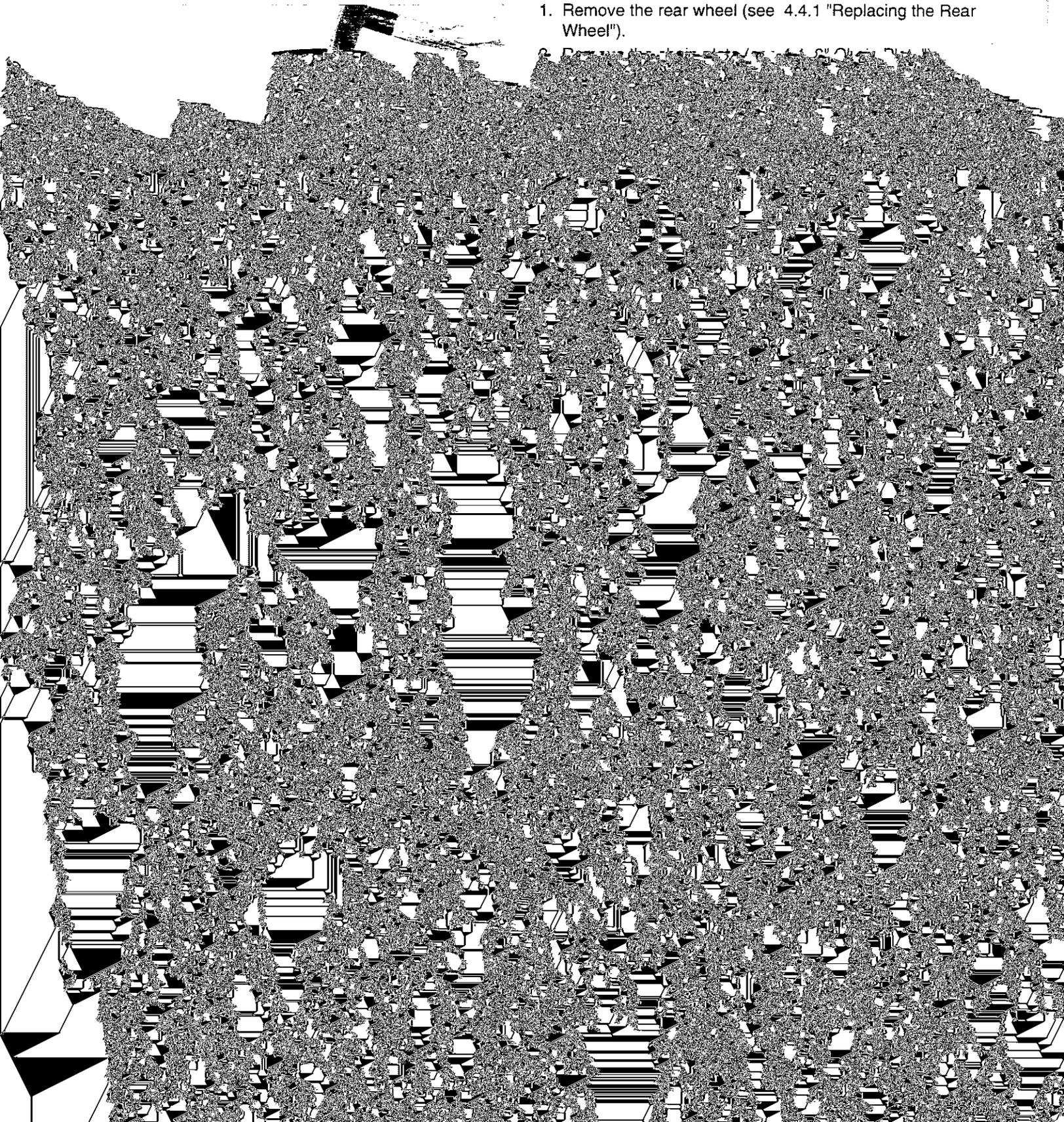
Doc Wheel

4.4.3 Wheel Bearing

Inspect the bearing play of the wheel bearing. Should the wheel bearing have too much play or the wheel no longer runs smoothly, the wheel bearings must be replaced. 2 deep groove ball bearings DIN 635-6204-2RS serve as the wheel bearing.

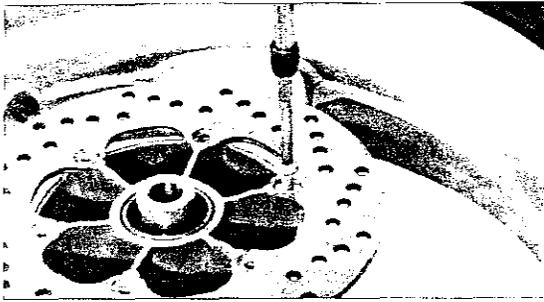
Removal

1. Remove the rear wheel (see 4.4.1 "Replacing the Rear Wheel").



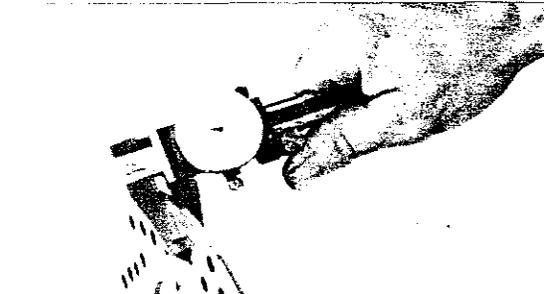
4.4.4 Brake Disc

Removal



1. Remove the rear wheel (see 4.4.1 "Replacing the Rear Wheel").
2. Unscrew the 6 screws, remove the brake disc.
If necessary, heat the aluminium to approx. 80 °- 100°C (176 - 212 °F) using a hot air pistol.

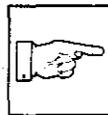
Inspection



1. Inspect the thickness
Minimum thickness: **min. 3.5 mm.**
If the thickness is **< 3.5 mm**, the brake disc must be replaced.



2. Check that the brake disc is level using a straight-edge.
Maximum deviation: **0.05...0.08 mm.**
3. Check that it is parallel.
Maximum deviation: **0.03 mm.**
4. Check the eccentricity (mounted on hub, with new bearings installed in the swingarm, measured on outside Ø).
Maximum deviation: **0.25 mm.**



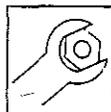
Note:

With an eccentricity of > 0.1 mm, it is permissible to unscrew the brake disc from the hub to achieve a reduction in the measurement value by twisting the brake disc and reinstalling it. If this does not have the desired result, the brake disc must be replaced.

Installation



1. Position the brake disc.
The arrow must point in the direction of travel.
2. Apply screw locking agent to the screws and screw them in.
3. Tighten the screws in a crosswise manner.
4. Wipe off excess screw locking agent.
5. Clean the disc with brake cleaner.
6. Install the rear wheel (see 4.4.1 "Replacing the Rear Wheel").



Tightening torque:

Tallow-drop screw: **10⁺² Nm**

4.5 Chain

Chain (428) 1/2" x 5/16" - 126 links

Closing link 1/2" x 5/16"

4.5.1 Chain Maintenance

Regular chain maintenance significantly lengthens its service life. Make certain the chain is clean, lubricated and has the correct slack.

Clean the chain with large amounts of water with no pressure.

Treat it with O-ring chain spray.

4.5.2 Adjusting the Chain Slack



Attention!

Incorrect chain slack overloads the engine and other important components!

Always keep the chain slack within the specified limits (30 - 40 mm).

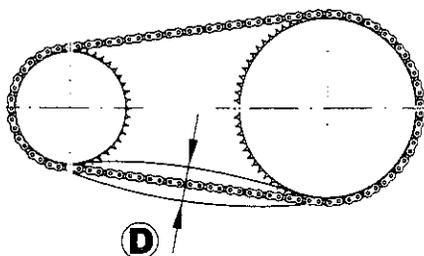
Position the motorcycle vertically to inspect the chain slack. Support the vehicle under the front part of the frame with a suitable support. The rear wheel must turn freely.



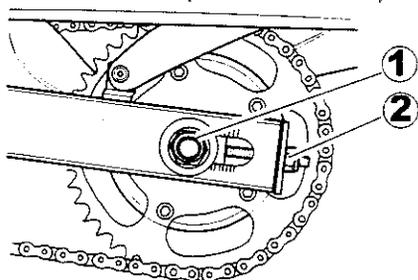
Danger!

Risk of injury!

Make certain that your fingers do not come between the chain and the chain wheel.



Turn the rear wheel several times. Measure the chain slack (D) at various points to find the tightest point. The valid measurement must be taken at the tightest point of the chain. To do this, move the chain up and down.

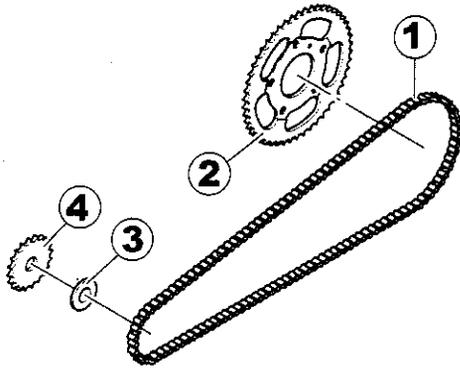


If the chain is too tight (slack (D) < 30 mm) or too loose (slack (D) > 40 mm), adjust the chain slack:

- Loosen the axle nuts (1) on each side by approx. 1 turn.
Reducing the chain slack: Turn the nuts (2) on each side of the chain adjuster the same distance to the right.
Increasing the chain slack: Turn the nuts (2) on both sides of the chain adjuster the same distance to the left and push the wheel forward.
- Tighten the axle nuts (1) on both sides.
- After completing the adjustment, check the wheel track and correct it, if necessary.

4.5.3 Chain Set

- (1) Chain
- (2) Chain plate (49 teeth)
- (3) Locking plate
- (4) Pinion



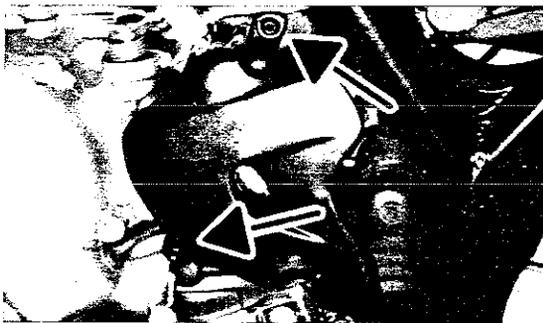
Replacing the chain



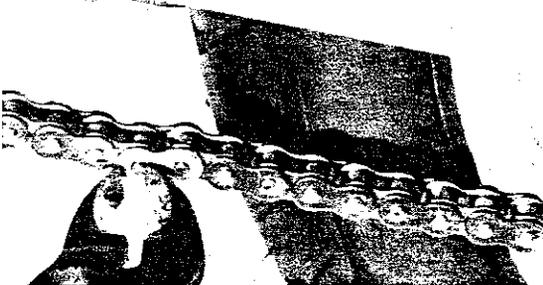
Danger!

Risk of injury!

Make certain that your fingers do not come between the chain and the chain wheel.

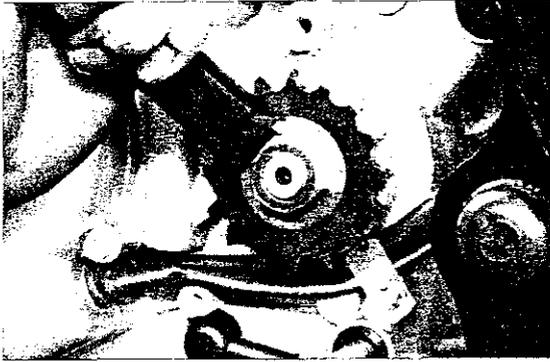


1. Unscrew the 2 screws of the pinion cover.
2. Remove the pinion cover.



3. Carefully open the chain lock with a pliers.
4. Remove the chain lock.
5. Remove the chain.

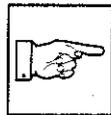
6. Loosen the axle nuts on each side by approx. 1 turn.
7. Mount the new chain.
8. Loosen the chain adjuster on both sides until the chain lock can be inserted.
9. Insert the chain lock and close it.
The closed end of the chain lock must point in the direction that the chain moves.
10. Adjust the chain slack (see 4.5.2 "Adjusting the Chain Slack").
11. Screw on the axle nuts.
12. Spray with O-ring chain spray.
13. Mount the pinion cover.



Replacing the pinion

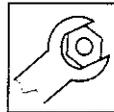
1. Unscrew the 2 screws of the pinion cover.
2. Remove the pinion cover.
3. Bend up the locking plate.
4. Engage a gear.
5. Unscrew the nut.
6. Remove the pinion.

7. Install in reverse order.



Note:

Always use a new locking plate.



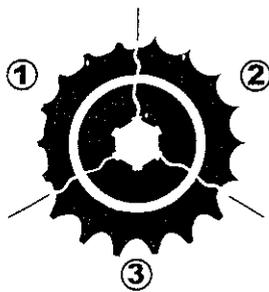
Tightening torque:

Pinion hexagon nut: 70^{+5} Nm

Inspection

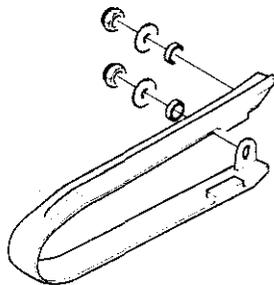
Inspect the following components:

- Drive shaft,
- Threading,
- Shaft seal,
- Teeth of the pinion and chain plate: (1) and (2) worn, (3) OK.



When replacing the pinion or chain wheel, a new chain should also be used.

Replace defective components.



4.5.4 Replacing the Chain Slider

1. Unscrew the two nuts from the threaded pins on the swingarm.
2. Pull the chain slider forward away from the swingarm.
3. Position a new chain slider and screw it tight.

4.6 Tyres



Attention!

Worn tyres reduce riding stability and can lead to accidents.

Only the tyres certified for the vehicle may be used (see the technical data and entries in the certification documents).

Make certain that the tyre pressure is correct.

The tyres must have the minimum legally required tread depth. Independent of this, the tyres should be replaced when they have a minimum tread depth of **2 mm**.

Tyre installation and balancing machines must be used to replace the tyres.

Consult the operating manual of the machine manufacturer. The use of other tools and equipment may lead to damage or unbalanced wheels.

The static unbalanced mass of a wheel in the direction of travel should ideally be 0 g. A maximum of 50 g is permissible.

The directional markings must be observed when installing the tyres. These specify the direction of travel of the vehicle.

Tyre pressure

Load	1 or 2 persons at 75 kg each	max. permissible axle load
Front	180 kPa 1.8 bar 26 psi	180 kPa 1.8 bar 26 psi
Rear	230 kPa 2.3 bar 33 psi	260 kPa 2.6 bar 38 psi

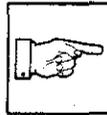
5 Electrical Installation

5.1 General Principles

Connect all cables according to the circuit diagram (appendix). Always disconnect the battery from the vehicle network before performing work on the electrical installations and fuel supply. To test electrical components, reconnect the battery; careful work is required.

In general, the following applies:

- During disconnection, first disconnect the negative pole, then the positive pole!
During connection, first connect the positive pole, then the negative pole!
- All connections must be clean with secure contacts.
- The connection between the wire and connection terminals must always be inspected for tears in the individual wires.
- Replace the connection if wires are broken.



Note:

Only operate the vehicle with an intact, connected battery.

5.2 Fuses



Attention!

Fire hazard and risk of serious damage to electrical components!

Never use fuses with a higher current rating than the one specified.

Never bypass the fuses or mend the fuses.

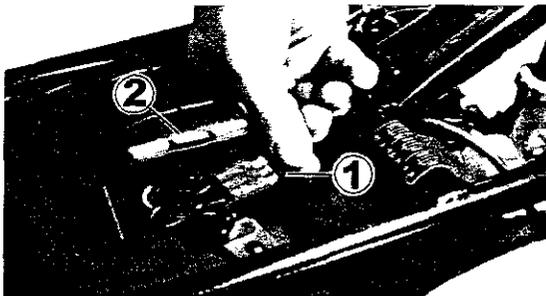
Specified Fuses

Main fuse	light blue Fuse cartridge FKS-15 A
Fan fuse	brown Fuse cartridge FKS-7.5 A
Indicator fuse	purple Fuse cartridge FKS-3 A

Replacing

1. Switch off ignition.
2. Remove the seat.
3. Remove the cover (1) for the triple fuse box.
4. Replace the burnt-out fuse cartridge.
Observe the correct amperage.
5. If necessary, refill the reserve fuse cartridges (2).
6. Return the cover, mount the seat.
7. Perform function test.

Should the fuse cartridge burn out again during the function test, inspect the corresponding electrical components.



5.3 Battery

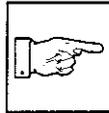


DANGER!

Risk of acid burns!

Always wear protective goggles and gloves when working with battery acid.

Electrolyte (battery acid) is highly acidic. It must never come into contact with eyes, skin or clothing! Immediately wash affected areas of skin thoroughly with water and see a doctor!



Note:

Always follow the manufacturer's instructions when working with the battery!

Performance data:

Nominal voltage: 12 V
Nominal capacity: 9 Ah

The battery is located behind the left side panel.

In the series production models, lead batteries from various manufacturers are used. A maintenance-free lead gel battery may also be used.

The battery connections must be kept clean and preserved with battery grease.

5.3.1 Checking the Electrolyte Level

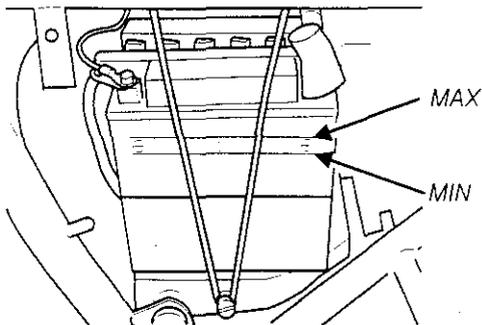
The electrolyte level must be above the lead contacts in each cell by a few millimetres. Observe the markings. The level may not fall below the "MIN" mark.

Only demineralised or distilled water may be used to refill the battery.

1. Remove seat.
2. Remove side cover.
3. Visually inspect whether the electrolyte level is between the "MIN" and "MAX" markings.

If the electrolyte level is too low:

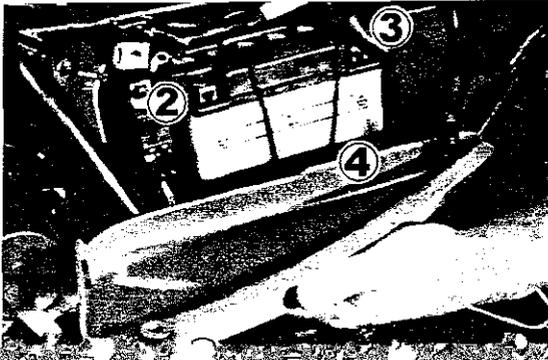
1. Remove the plastic plug from the cells.
2. Add distilled or demineralised water to the removed battery up to the "MAX" mark.
3. Return plastic plug.
4. Return side panel and seat.



5.3.2 Replacing the Battery

Removal

1. Switch off ignition.
2. Remove seat.
3. Unscrew the M6 screw and remove the side panel (1).
4. Unscrew the cable from the negative pole (2).
5. Unscrew the cable from the positive pole (3).
6. Store the M5x20 screws and spacer sleeve safely.
7. Remove the degassing hose.
8. Remove the retaining strap (4).
9. Remove the battery.
10. Inspect the cell rubber strip and retaining strap, replacing if



5.3.3 Charging

**Attention!****Risk of explosion!**

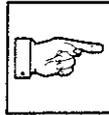
**Smoking and the use of fire and open lights is forbidden! Avoid the generation of sparks!
Ensure proper ventilation at the installation location!**

Risk of destruction!

Charging the battery while installed and connected can lead to the destruction of electronic components and cause fires!

Disconnect and remove the battery!

Recharging of the battery is recommended at an open-circuit voltage of <12.4 V at the battery terminals.

**Note:**

Always follow the manufacturer's instructions!

Remove the battery for recharging (see 5.3.2 "Replacing the Battery").

1. Connect the charging cable with correct polarity.
2. Unscrew the plastic plug.
3. Check the electrolyte level, refill if necessary (see 5.3.1 "Checking the Electrolyte Level").
4. Switch on the charger.

The charging current should be **0.9 A** (= 10% of the nominal capacity) for normal charging.

The electrolyte temperature may not fall below 55 °C (131 °F), otherwise stop the charging process.

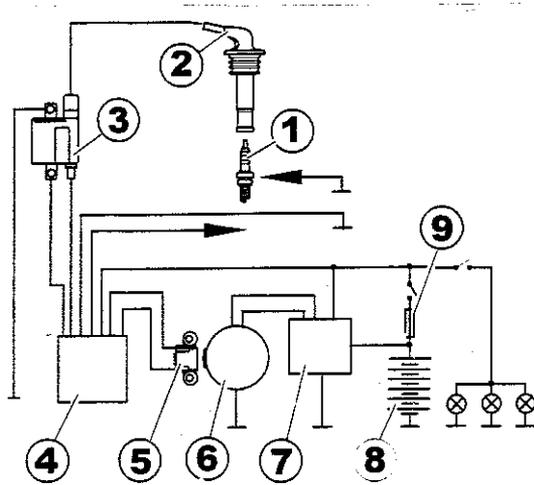
The battery is full when the acid density (1.28 kg/l) and the charging voltage (ca. 14.4 V) do not increase within 2 hours.

5. Switch off charger.
6. Disconnect the charging cable.

At full capacity, the open-circuit voltage should be > 12.8 V.

7. Check the electrolyte level (see 5.3.1 "Checking the Electrolyte Level").
8. Securely screw in the plug.
9. Install the battery (see 5.3.2 "Replacing the Battery").

5.4 Ignition



- (1) Spark plug with connection nut
- (2) Spark plug connector
- (3) Ignition coil
- (4) Ignition box, version A / version B (80 km/h)
- (5) Sensor coil
- (6) Alternator
- (7) Regulator
- (8) Battery
- (9) Fuse

5.4.1 Spark plug

Type: **NGK CR 8 E**
 Test spark distance: approx. **0.7 mm**

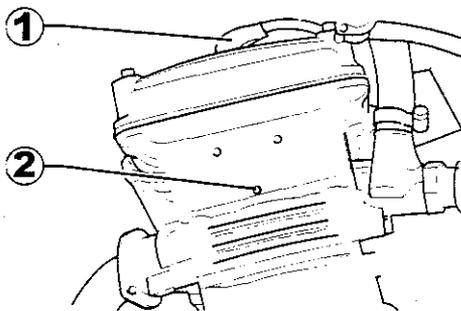
The spark plug influences the preparation for starting, the idling behaviour, acceleration, fuel consumption and the maximum speed of the vehicle.



Attention!

Risk of burns

Do not touch the spark plugs while the engine is still hot.
Never disconnect the spark plug cable to switch off the engine.



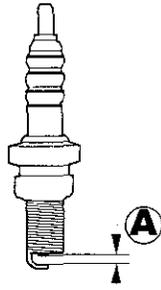
Replacing

1. Switch off ignition.
2. Remove the spark plug connector (1).
3. Puncture the spark plug cavity discharge hole (2) with a wire.
Any water in the spark plug cavity flows out.
4. Unscrew the spark plug using the spark plug spanner (with rubber insert) and a reversible screw driver.
5. Replace the spark plug.
6. Clean the gasket and unscrew the connection nut before installing the spark plug.
7. Screw on the spark plug using the spark plug spanner.
8. Connect the spark plug connector.



Tightening torque:

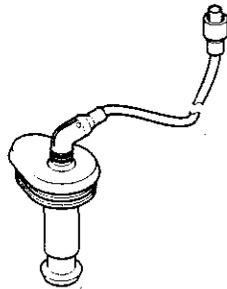
Spark plug: 15^{+2} Nm



Inspection

1. Inspect the electrode. If the electrode is defective or corroded, replace the spark plug.
2. Clean the combustion residue from the electrode using a brass wire brush.
The electrode must show no visible signs of burning out.
The insulator foot must be greyish yellow to brown.
3. Check the electrode distance: **(A) = 0.7 mm**.
4. Adjust as required.

Colour of the Electrode	Possible Causes/Faults
greyish yellow to brown	correct carburettor setting and correct spark plug use
black	air-fuel mixture too rich
light grey	air-fuel mixture too lean
oily/wet	Spark plug misfiring or poor seal on the piston rings



5.4.2 Spark Plug Connector with Ignition Cable

The spark plug connector and ignition cable form a unit. Correct functioning of the spark plug connector is only guaranteed when it is securely connected to the spark plug (with the connection nut screwed onto the connection screw). The ignition cable must be clean, dry and free of tears in the insulation.

Removal

1. Remove the spark plug connector from the spark plug.
2. Unscrew the ignition cable from the ignition coil.
3. Perform a visual inspection for exterior damage.
4. Inspect the continuity, if necessary.
5. If defective, replace the component.

Installation

Install in reverse order.

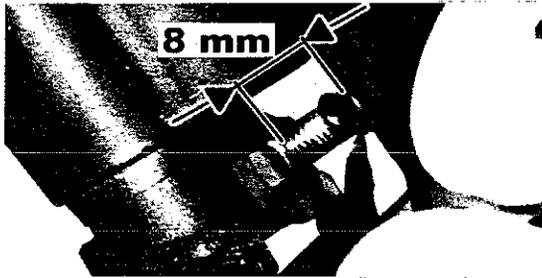
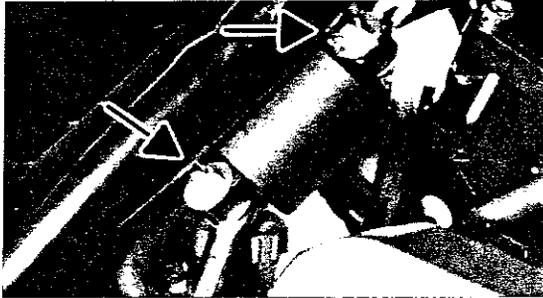
5.4.3 Ignition Coil



Danger!

Risk of electric shock!

The ignition coil may only be replaced while the ignition is switched off.



Removal

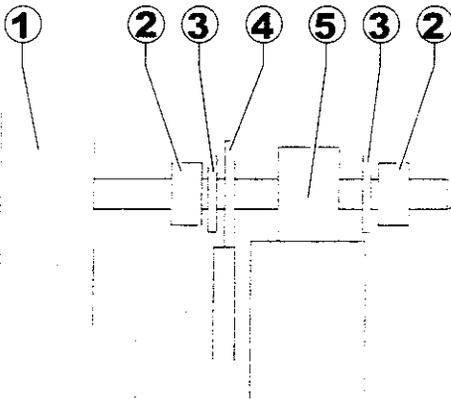
1. Remove the seat and fuel tank.
2. Unscrew nuts, remove the ignition coil from the mounting bolts.
3. Disconnect the earth cable and plug contact.
4. Remove the spark plug connector. Do not pull on the cable!

Installation

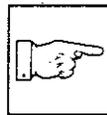
Space between lock nut and frame tube: 8 mm.

Sequence of upper bolts: lock nut, washer, earth cable.

1. Position the earth cable on the lock nut of the upper bolt, position the washer, screw on the nut.
2. Connect the plug contact to the ignition coil.
3. Connect the ignition coil, position the washer, screw on self-locking nut.
Observe the correct tightening torque, otherwise the welded bolt may tear.
4. Connect the spark plug connector.

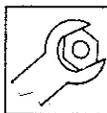


- (1) Frame
- (2) Hexagon nut
- (3) Washer
- (4) Earth cable lug
- (5) Ignition coil



Note:

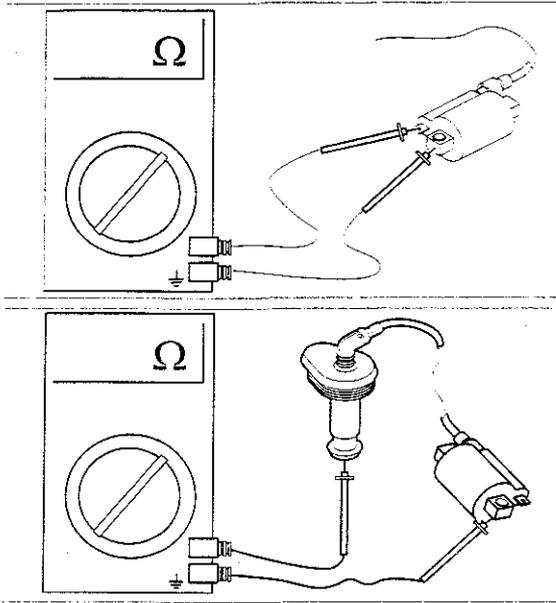
Make certain that the connection of the earth cable is secure and free of corrosion and that it is correctly positioned with regard to the ignition coil.



Tightening torque:

Ignition coil nuts:

3⁺¹ Nm



Inspection

Measure the coil resistance.

1. Primary coil resistance (supply - earth):
- $0.72 \Omega \pm 15\%$ at 20°C (68°F).
2. Secondary coil resistance (spark plug connector - earth):
- $7.6 \text{ k}\Omega \pm 20\%$ at 20°C (68°F).

5.4.4 Ignition Box

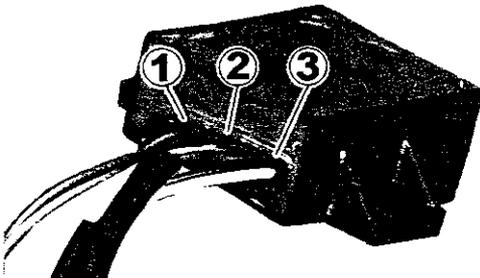
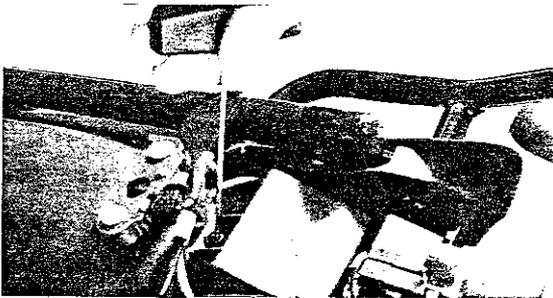
The ignition box is located under the seat.

The following designs are available:

- Series production unit (replacement part)
- Ignition box refit set, no performance reduction, with certification,
- Ignition box for limiting speed to 80 km/h (replacement part),
- 80 km/h retrofit variant, with certification.

Removal

1. Remove seat.
2. Unscrew the 2 oval flange head screws.

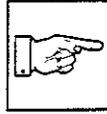


3. Remove connector (at end of cable, turned away from the ignition box):
 - connector (1), 2-pin,
wires bk, wh to pick-up.
 - connector (2), 3-pin,
wires br, chassis earth
gn/rd to tachometer
rd/wh to shut-off relay via rd/bk
fuse 15 A.
 - connector (3), 2-pin
wires br, ignition coil earth
bl, ignition coil.
- 80 km/h variant (only for Germany)
 - additional cable for wheel sensor.
4. Cut cable binder, remove ignition box.

Installation

Install in reverse order.

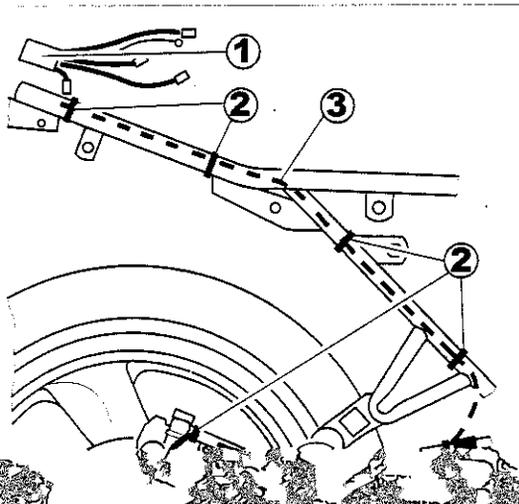
5.4.5 Conversion to the 80 km/h Variant



Note:

Conversion to the 80 km/h variant is only intended for Germany. Only the ignition box and retrofit set listed above may be used. After the conversion, the appropriate modifications to the vehicle documents must be made by the competent certification institute in accordance with the certification! The same applies for the removal of the speed limitation.

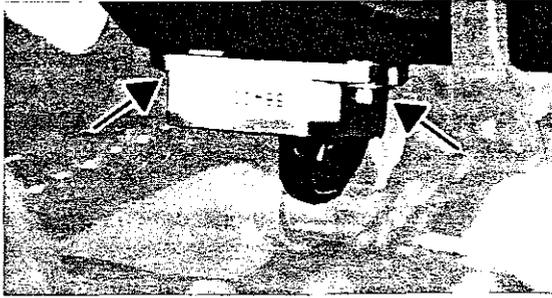
The retrofit set includes the ignition box, the manufactured sensor (sensor, cable, plug connector) and all mounting elements.



1. Properly secure the vehicle on the installation stand.
2. Remove seat.
3. Remove the ignition box for the non-performance reduced variant.
4. Open the retrofit set, check for completeness based on the enclosed information.
5. Install the ignition box (1) for the performance reduced variant.
6. Remove the rear wheel (see 4.4 "Rear Wheel").
7. Attach the PVC sensor support angle (7) to the adapter plate (9) with blind rivets (8) from the wheel side.
8. Screw the sensor (5) onto the sensor support angle (7) at

5.4.6 Regulator/Rectifier

The regulator/rectifier is attached to the underside of the intake muffler and accessible from the right side of the vehicle.



Performance Data:

U_{on-off} : 11.2 V AC at 1500 rpm with 1.62 Ω ,
23.5 V AC at 10500 rpm with 1.62 Ω .

U_{off} : 13.8...14.4 V DC regulated,

$I_{eff\ max}$: 14 A

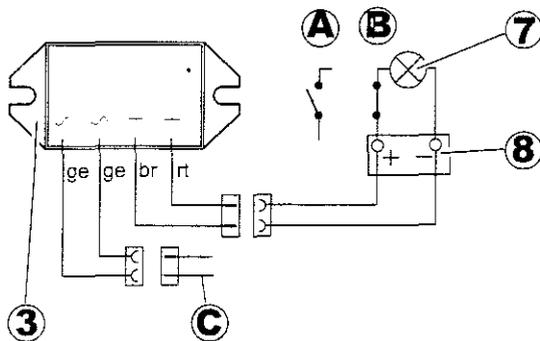
Protection level: IP 67

internal fuse

The vehicle may only be operated with an intact, connected battery. Otherwise the regulator and ignition box may be damaged.

Inspection

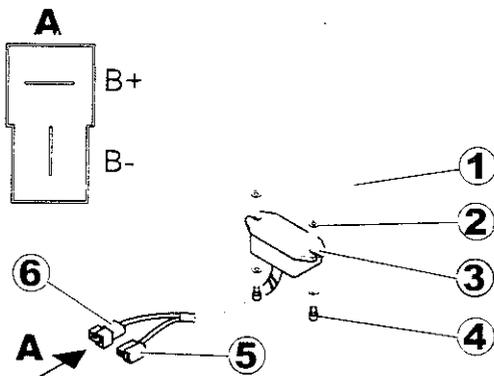
Test the correct functioning of the battery before testing the component.



1. Properly secure the vehicle on the installation stand.
2. Ensure sufficient ventilation.
3. Unscrew the left side panel.
4. Make the battery terminals (8) accessible.
5. Securely connect the measurement device, measurement range 20 V DC.
6. Switch on the ignition.
7. Start the engine.
8. Set the speed to approx. 3000 rpm.
9. (A) Electrical consumer (7) switched off:
Voltage with full battery: **13...14.5 V**.
10. (B) Electrical consumer switched on:
Voltage with full battery: **12.5...14.5 V**.

If the regulator/rectifier is defective, the measured values will be quite different from these.

Replacing



1. Remove the seat and fuel tank.
2. Disconnect the plug connector (5) from the alternator cable and the plug connector (6) on the battery cable, open the cable binder.
3. Unscrew the 2 screws (4) on the underside of the intake muffler (1), remove the regulator/rectifier (3) and the spacers (2).
4. Screw on the new regulator/rectifier.
At least 1 washer (2) must be placed between the intake muffler and the regulator/rectifier as a spacer.
5. Run the cable upward between the frame and the intake muffler and connect the plug (6) to the jack on the battery cable, insert the plug from the alternator cable into the jack (5), making certain that good contact is made.
6. Attach the cable to the frame using cable binders.
Do not run the cable in front of the intake opening of the intake muffler.
7. Install the seat and fuel tank.

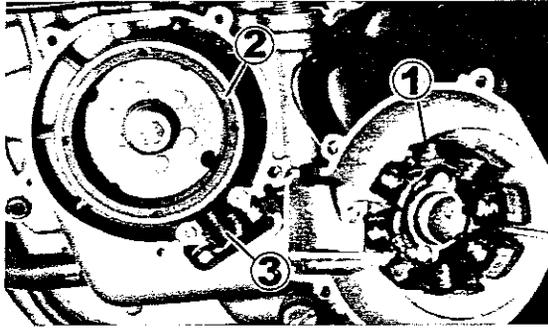


Tightening torque:

Regulator/rectifier screws: max. 4⁺¹ Nm

5.5 Alternator

The alternator is located under the left side engine cover.

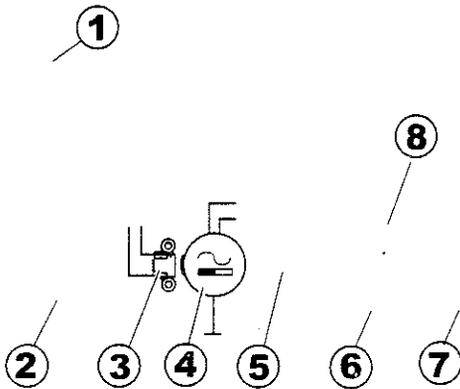


- (1) Stator
- (2) Rotor
- (3) Sensor (pick-up)

Performance data

- $U_{\text{on-eff}}$: 11.2 V AC at 1500 rpm with 1.62 Ω ,
23.5 V AC at 10500 rpm with 1.62 Ω ,
- $P_{\text{off-eff}}$: 26 W AC at 1500 rpm for $U=\text{const.}=13.5$ V at R_{var} ,
190 W AC at 10500 rpm for $U=\text{const.}=13.5$ V at R_{var} .
- T_{outside} : -15 $^{\circ}\text{C}$...+85 $^{\circ}\text{C}$ (5 - 185 $^{\circ}\text{F}$).

Block diagram



- (1) Ignition coil
- (2) Ignition box
- (3) Sensor coil
- (4) Alternator
- (5) Regulator
- (6) Battery
- (7) Consumer
- (8) Fuse

5.5.1 Stator

Removal

1. Unscrew the 5 alternator cover screws, remove the cover.
2. Remove the screw and support plate.
3. Unscrew the two stator locking screws (micro encapsulated), move the stator.
4. Remove the plug.



Inspection

1. Measure the coil resistance:
 R_{coil} : 0.38 $\Omega \pm 0.04$ Ω at T_{ambient} : 23 ± 2 $^{\circ}\text{C}$ (73 ± 4 $^{\circ}\text{F}$),
measured with HP3457A, 4-wire method.
2. In the event of deviating measurement values, replace the stator.

Installation

Install in reverse order.

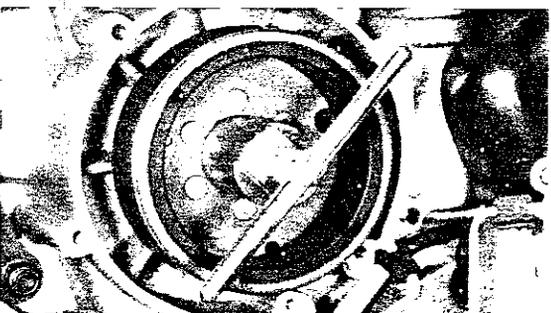
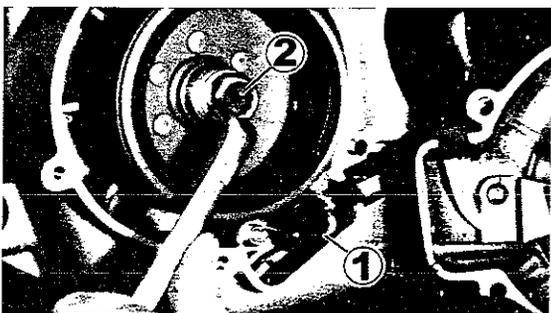
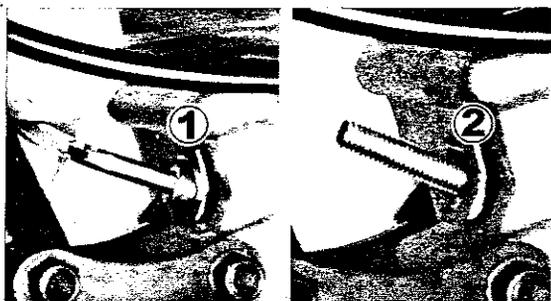
Apply screw locking agent to the stator locking screws at medium tightness. Remove the cover without the gasket.

User the 2 longer cover screws for the fitting sleeves.

5.5.2 Rotor

**Attention!**

Risk of pinched fingers!
Be aware of the magnet strength.
Do not let go of the cover near the rotor.

**Removal**

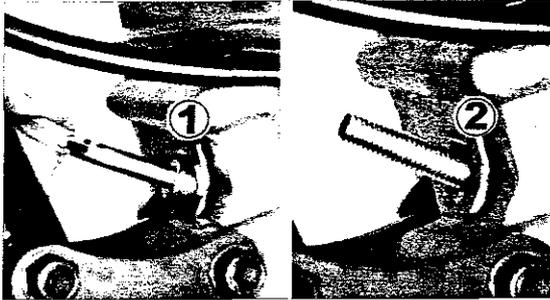
1. Unscrew the 5 alternator cover screws, remove the cover with the stator.
2. Turn the crankshaft to the top dead point (see 6.7.1 "Removal").
3. Unscrew the holding screw (1) for the locking screw and ring seal.
4. Screw in the locking screw (2) and screw it into the bulge in the cam shaft.
5. Remove the screw (2), washer and sensor (pick up) (1).
6. Screw the rotor removal tool tightly onto the rotor and pull the rotor away from the crankshaft by pulling on the pressure screw.
The process can be assisted with a light blow to the clamping bolt of the removal tool.
7. Remove rotor.
The shaft seal ring on the left and the curved washer can be replaced.

Installation

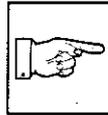


Attention!

Possible damage to the sliding bearing!
Do not pound too hard on the crankshaft/curved washer when removing the curved washer.



1. To install the rotor and adjust the sensor, lock the crankshaft with the locking screw (2) in the top dead point.
2. Insert curved washer.
3. Lubricate the cone of the crankshaft and the cone of the rotor well with brake cleaner.



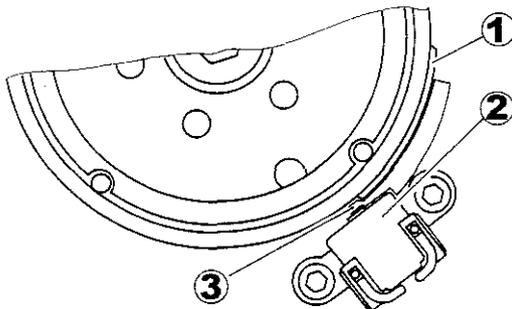
Note:

No brake cleaner may come into contact with the rotary shaft seal!

4. Position the rotor such that the curved washer nut and the curved washer slide into each other.
5. Screw on the rotor with the micro encapsulated screw and washer.

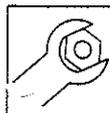
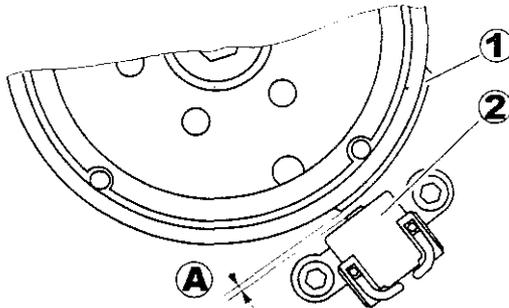
Sensor adjustment with the sensor adjustment tool

1. Temporarily fasten the sensor (2) with two screws.
2. Insert the sensor adjustment tool (3) between the sensor and the break-away plate (1) of the rotor.
3. Lightly place the sensor on the sensor adjustment tool and screw it tight.
This sets the distance between the sensor and the rotor to 0.5 ± 0.1 mm.
4. Remove the sensor adjustment tool.
5. Install the alternator cover with stator.
6. Remove the locking screw and plug the hole.



Sensor adjustment without the sensor adjustment tool

1. Remove the locking screw and plug the hole.
2. Temporarily fasten the sensor (2) with two screws.
3. Turn the front edge of the break away plate (1) over the sensor.
4. Adjust the distance (A) = 0.5 ± 0.1 mm using a thickness gauge.
5. Screw the sensor in tight.
6. Install the alternator cover with stator.



Tightening torque:

Rotor screws:

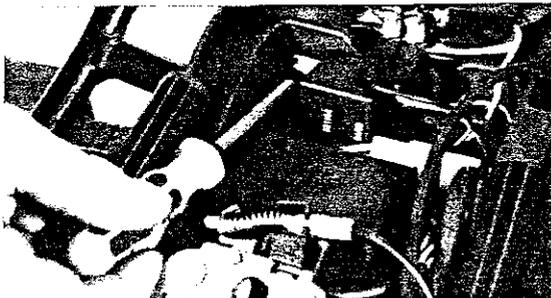
26^{+4} Nm

5.6 Flasher

The flasher is attached on the rear inner side of the splash shield.

Removal

1. Remove the seat.
2. Unscrew the screws.
3. Remove the 3 cables.



Installation

Install in reverse order.

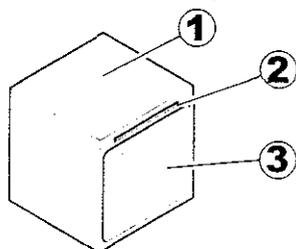
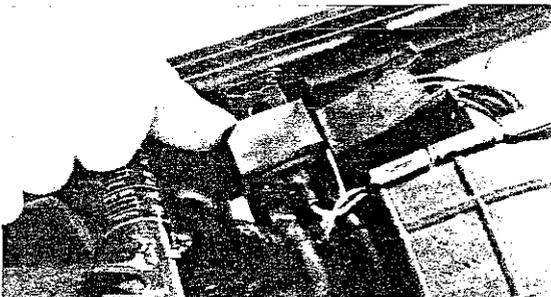
Treat the plug contact with a suitable care product to prevent corrosion.

5.7 Starter Relay

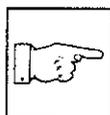
The starter relay is located in a relay pocket which is attached to a bracket on the right inner side of the frame.

Removal

1. Remove the seat.
2. Pull out the relay pocket (1) toward the middle of the vehicle.
3. Remove the cable.



- (1) Relay pocket
- (2) Groove for the frame bracket
- (3) Groove for the starter relay



Note:

Only slide on the relay pocket with the groove (2) on the frame bracket!

Installation

Install in reverse order.

Treat the plug contact with a suitable care product to prevent corrosion.

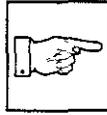
Bind the two thicker cables together approx. 40 mm behind the relay using a cable binder.

5.8 Shut-off Relay

The shut-off relay is located under the left side panel on the left next to the battery.

Function

The relay shuts off the ignition current when the side stand is extended and the vehicle is put in gear. The activation of the starter is also blocked.



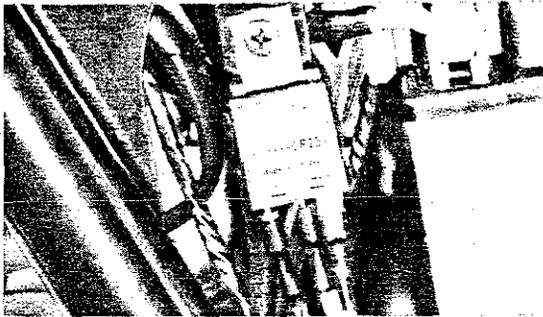
Note:

If the engine continues to run while the vehicle is in gear and the side stand is extended or if the engine can be started while the side stand is extended, then

- the relay or
- diode 31 (see circuit diagram) or
- the side stand switch (see 3.15.1 "Side Stand Switch") is defective.

Removal

1. Unscrew the left side panel.
2. Unscrew the relay.
3. Disconnect the plug connector from the cable form.



Installation

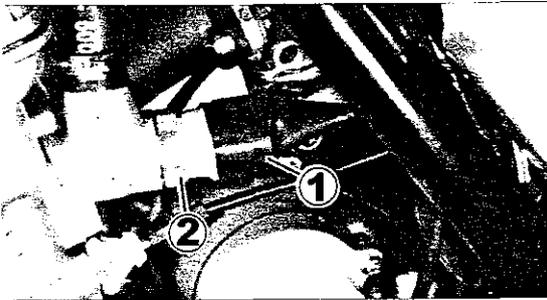
Install in reverse order.

5.9 Thermal Switch

The thermal switch is bolted to connection piece on the left rear of the cylinder head cooling system.

Removal

1. Remove the lower clamp shell on the radiator, remove the radiator hose and drain the coolant into a suitable container.
2. Remove the rubber sleeve (1), remove the plug contact.
3. Carefully unscrew the switch (2) using ST 29.
Be careful not to damage the oil pressure switch.



Test

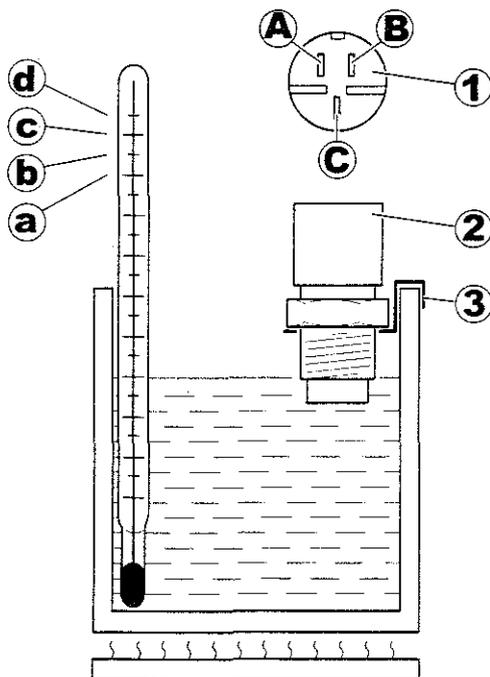
To test the thermal switch (2), switch points must be triggered with controlled heating.



Attention!

Risk of scalding!

The liquid is heated over 100 °C!
It is recommended that a three-wire cable be equipped with appropriate cable lugs on one side.
Before heating the thermal switch (2) in the liquid, connect the cable to the contacts (top view (1)).



1. Heat coolant (anti-freeze), preferably undiluted, in a container and stir continuously.
Check the temperature with a thermometer.
2. Hang the thermal switch (2) in the liquid with the brass probe.
3. Use an appropriate tool, such as an angle iron (3), to do this.
4. The following switch states must be observed upon reaching the specified limit temperature.
(Continuity tester, see top view (1) for contacts):

		Switch (A)-(C)	Switch (B)-(C)	Result
(a)	90°C	open	open	
(b)	95°C	open	closed	- fan on
(c)	100°C	open	closed	- fan on
(d)	105°C	closed	closed	- fan on, lamp on

If the behaviour does not match that described above, the thermal switch (2) must be replaced.

Installation

Install in reverse order.

Cable connection:

- (A) orange temperature indicator lamp,
- (B) bk/ye fan,
- (C) bk positive.

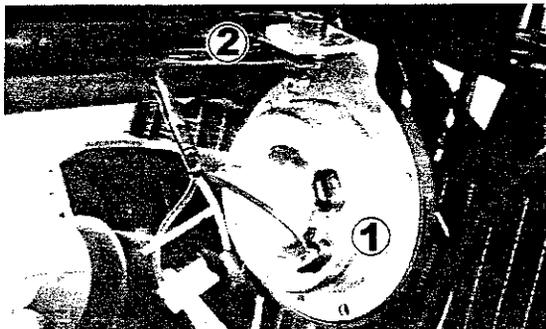
Add water, add anti-freeze if necessary.

5.10 Horn

The horn is attached to the right side of the steering head pipe. It is designed as an electromagnetic striking horn.

Removal

1. Carefully (1) remove the plug contact using a pliers.
2. Unscrew the nut (2), remove horn.

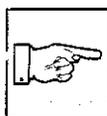


Installation

Install in reverse order.

Note:

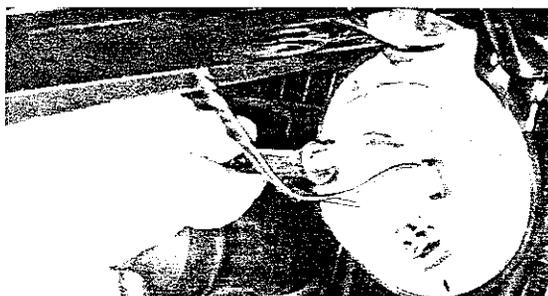
The horn must not be in contact with the fuel tank! It is attached to the right side of the steering head pipe on the bottom of the clamp shell.



Adjusting

The sound of the horn can be changed with the adjusting screw.

1. Remove nut.
2. Sound horn.
3. Turn the adjusting screw until a clear tone can be heard.
4. Tighten the nut.



5.11 Starter

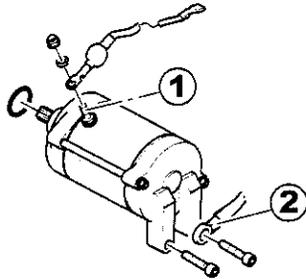
The starter is mounted on the left side of the crankcase. Its drive pinion catches in the right crankcase.

The starter is replaced as a unit and should not be further dismantled.

Inspection

To prevent damage to electrical components (starter button, starter relay, supply), first test the voltage at the starter cable terminals.

1. Connect the voltmeter in parallel with the positive cable (1) and earth cable terminal (2).
 2. Press starter button.
 3. Measure voltage.
- If a voltage (12 – 14 V) is detected on the positive cable, the circuit is OK. The starter must be replaced.



Removal

1. Remove the left side panel, disconnect the negative pole on the battery.
2. Remove the cable (1) from the oil pressure switch.

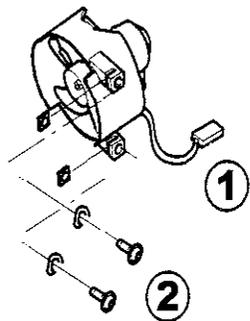


5.12 Fan

The fan is bolted to the rear side of the radiator.

Removal

1. Disconnect the fan power supply from the cable form at the plug (1).
2. Unscrew the 2 flat mushroom head screws (2).
3. Remove the fan.



Inspection

Test the smooth rotation of the fan wheel.

The fan wheel is jammed or turns with difficulty if the fan motor is corroded. The engine overheats, the fuse blows out.

6 Engine

6.1 General Information

Before individual components of the disassembled engine can be

If the compression pressure is below the minimum permissible value:

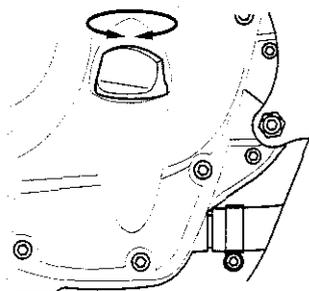
1. Add a few drops of motor oil to the cylinder.
2. Repeat measurement.

Compression Pressure	Diagnosis
Higher than without oil	Piston worn out or damaged
Same	Piston ring(s), valves, cylinder head seal or piston may be defective, poor seal on valve
Over the maximum pressure	Check the cylinder head, valve surface or piston head for combustion residue.

6.2.2 Oil Level

Check the oil level while the engine is cold.

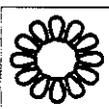
1. Position the vehicle vertical on a flat, horizontal surface.
A slight incline (approx. 5° or more) results in an inaccurate reading.
2. Unscrew the oil cap with oil dipstick from the oil filler neck, and wipe off the dipstick.
3. Re-insert, then unscrew the cap again and check the oil level on the dipstick.
The oil level must be between the MIN and MAX markings.
4. Add oil, if necessary, but never more than the maximum!



Note:

If the oil level is at MIN, up to 200 cm³ (0.2 l) of oil may be added.

6.2.3 Oil Change



Environment!

Discharged motor oil can contaminate ground water and soil.

No oil may enter the sewer system or the soil. Immediately collect discharged oil and dispose of it properly.

Old oil must be collected in suitable containers until it is properly disposed of.

Oil types to be used (usable year-round):

- SAE 15 W-50 API SG/SH
- SAE 10 W-40 API SG/SH

Oil volumes

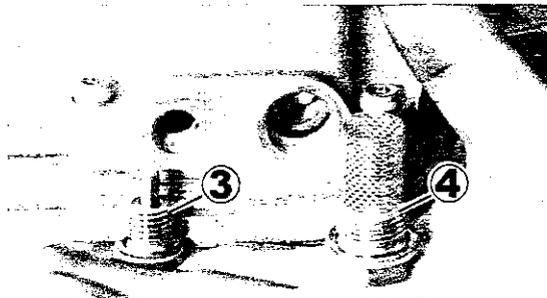
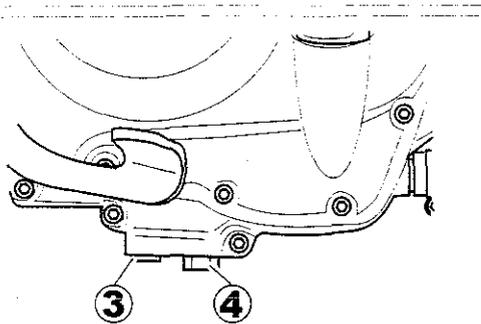
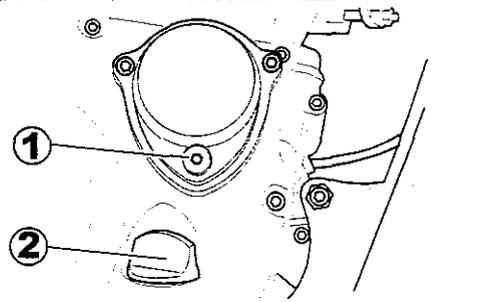
Oil volume after dismantling the engine: 1.2 l

Oil change with filter change: 1.2 l

Change

The oil should be changed according to the intervals listed in the maintenance plan.

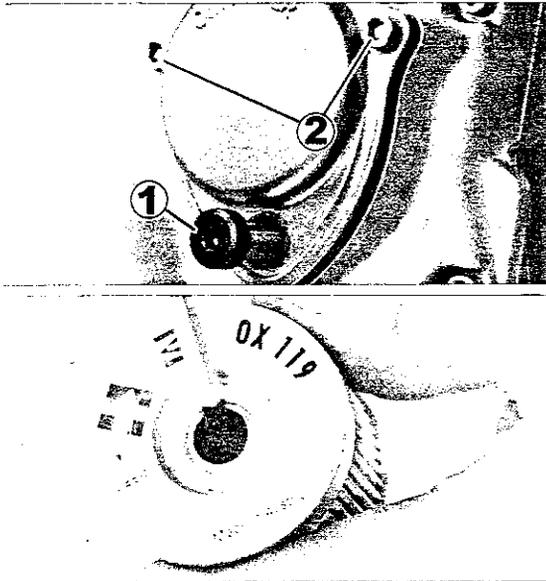
1. Allow the engine to run until it (and the oil) is warm.
2. Position the vehicle vertically on a flat, horizontal surface.
3. Position a suitable oil collector under the engine.
4. Loosen the oil return plug (1) and pull it out as far as the stop.
5. Unscrew the oil filler plug (2).



6. Unscrew the oil drain plug (3).
7. Unscrew the screw plug together with the oil screen (4), handling the seal carefully!
8. Let the oil drain out completely.
9. Unscrew the 2 screws of the oil filter cap.
10. Remove the oil filter.
11. Soak the new filter and O-ring in oil, then insert it, renew the seal and screw the cap on tightly.
12. Clean the coarse screen of the screw plugs and the magnet of the oil drain plug.
13. Screw in the oil drain plug (3) and the screw plug with the coarse screen (4) and tighten.
14. Pour 1.2 l of oil into the engine and screw in the oil filler plug.
15. Check the oil level (see 6.2.2 "Oil Level").

6.2.4 Oil Filter

The oil filter is changed with a special...



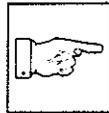
Removal

1. Position a suitable container under the vehicle.
2. Open the oil return plug (1) and let the oil drain out of the oil filter cavity.
3. Unscrew the 2 cylinder screws (2), remove the cap and seal.
4. Pull out the oil filter.

The oil filter has a bypass opening in the centre of the filter. This bypass opening guarantees an emergency oil supply to the engine, even when the oil filter is dirty. The opening pressure of the bypass opening is 1.4 ± 0.2 bar.

Installation

1. Spread oil on the seat for the seal ring on the inside of the filter.
2. Soak the filter paper lightly in oil.
Improvement in the oil flow after the oil filter change.
3. Place the filter on the seat on the clutch cover, install the clutch cover with seal.
4. Check the oil level.
5. Test run the engine at idling speed only until the oil pressure has returned to normal.



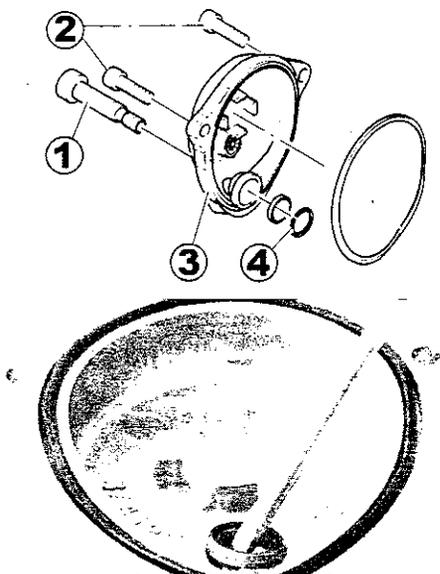
Note:

Possible engine damage!
Never run the engine faster than idling speed during test running.

6.2.5 Oil Return Plug

Removal

1. Open the oil return plug (1), let the oil drain from the oil filter cavity in the clutch cavity
2. Unscrew the 2 cylinder screws (2), remove cap (3) with seal ring.
3. Remove the retaining ring (4) with a spreading pliers. Remove the oil return plug from the cap.
4. Remove the shaft seal from the cap.



Installation

1. Press in the shaft seal with your thumbs, lips facing inward (toward oil filter).
2. Press the oil return plug into the hole.
The plug must not damage the shaft seal.
3. Insert the retaining ring into the nut of the oil return plug.
4. Return the cap, fasten with two cylinder screws.

6.2.6 Oil Pressure Switch

Type: Bosch 0344101090
Switch pressure: 0.5-0.8 bar

Inspection

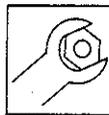
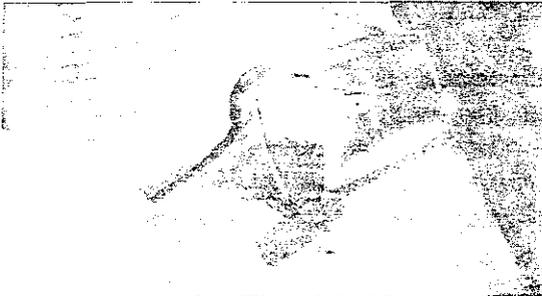
The oil pressure switch operates as an opener. If there is no oil pressure (e.g. insufficient motor oil, damage to the oil circuit, engine not in operation), it switches to earth and the indicator lamp lights.

If it is determined that no fault exists in the oil circulation, then:

- Cable broken, lamp does not light when switched on
Check the cable and lamp.
- Oil pressure sensor is defective.
Replace the oil pressure sensor.

Change

1. Remove the cable.
2. Unscrew the switch, remove with seal ring.
3. Use a new seal ring for installation.


Tightening torque:

Oil pressure sensor: 10^{+2} Nm

6.2.7 Checking the Oil Pressure

The external oil pressure check for diagnosis purposes is performed with the engine at operating temperature.

1. Remove the oil pressure sensor.
2. Screw in the pressure gauge.
3. Start the engine.

Oil pressure at idling speed (1800 rpm): at least 1 bar
Oil pressure at nominal speed (9500 rpm): at least 2.2 bar

6.3 Engine Removal

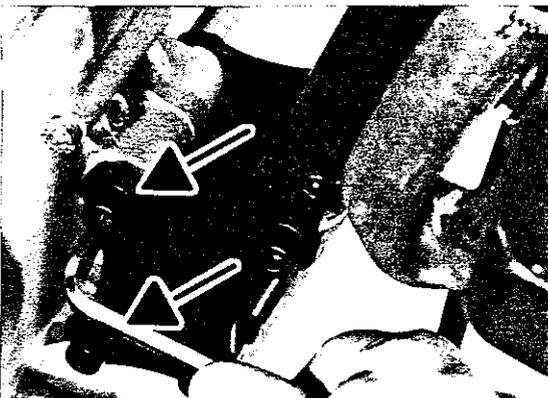
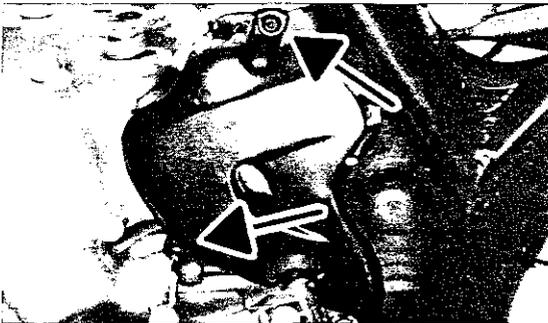


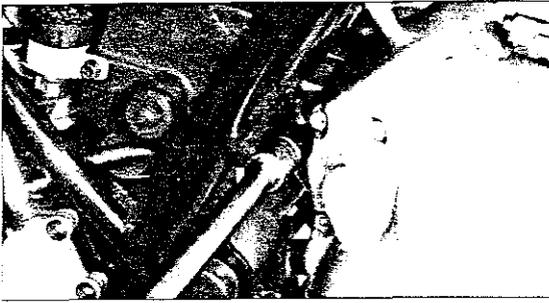
Attention!

Dirt and other foreign materials cause faults and defects when they are present in the engine.

The engine must be thoroughly cleaned before it is removed and dismantled.

1. Position the vehicle on the installation stand and secure it with tension belts.
2. Switch off the ignition, disconnect the battery terminals (see 5.3.2 "Replacing the Battery").
3. Drain the radiator fluid into a suitable container (see 3.18.4 "Radiator").
4. Drain the motor oil into a suitable container (see 6.2.3 "Oil Change").
5. Disconnect the clutch bowden cable.
6. Remove the spark plug connector.
7. Completely remove the exhaust system (see 3.17 "Silencer").
8. Remove the cable from the thermal switch.
9. Open the carburettor hose clamp of the air intake fitting, remove the air intake fitting from the intake manifold.
10. Remove the radiator hose from the intake manifold.
11. Protect the stud bolts near the exhaust so that the frame is not scratched.
12. Remove pinion cover.
13. Open the secondary chain on the chain joint, remove chain (see 4.5 "Chain").
14. Remove gearshift lever.
15. Remove the starter and unscrew the cable.
16. Remove the seat, disconnect the sensor cable pull it out near the frame and intake muffler.
17. Disconnect the cable from the idling switch.
18. Disconnect the alternator-rectifier cable (yellow).
19. Remove the engine ventilation hose.
20. Unscrew the 2 cylinder screws on the front engine support plate while holding the nuts still.
21. Pull out the cylinder screws.



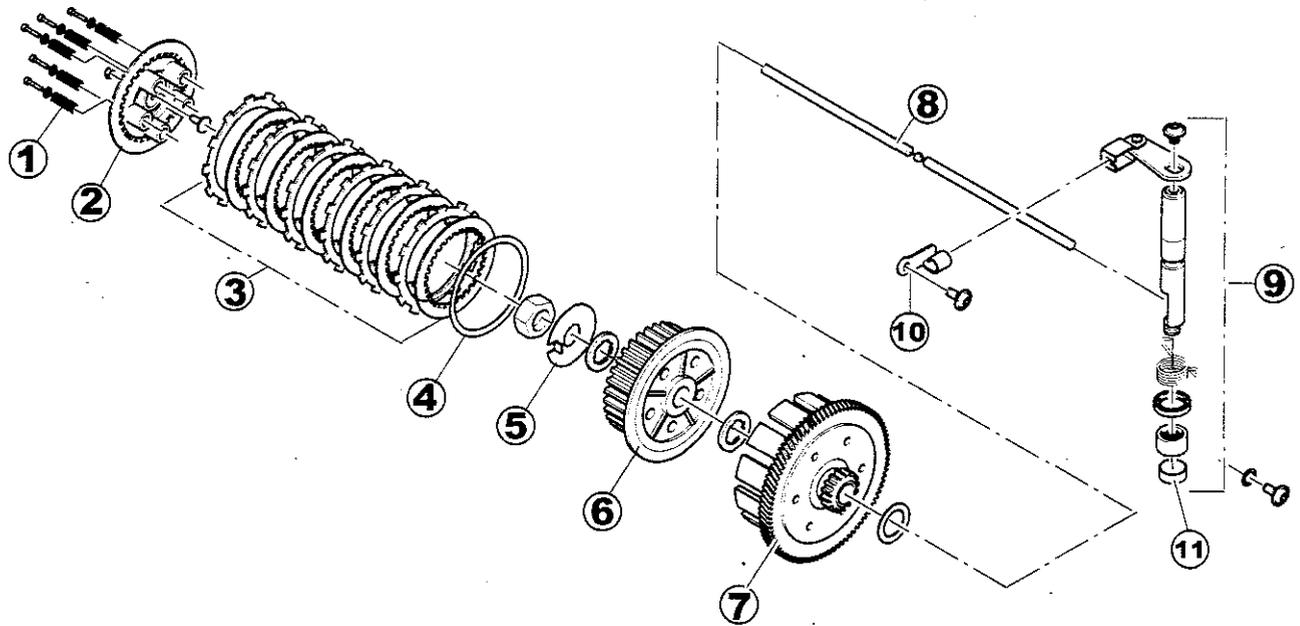


22. Unscrew and pull out the screws of the rear engine suspension.



23. Tilt the engine upward near the cylinders and pull it out toward the front right.

6.4 Clutch



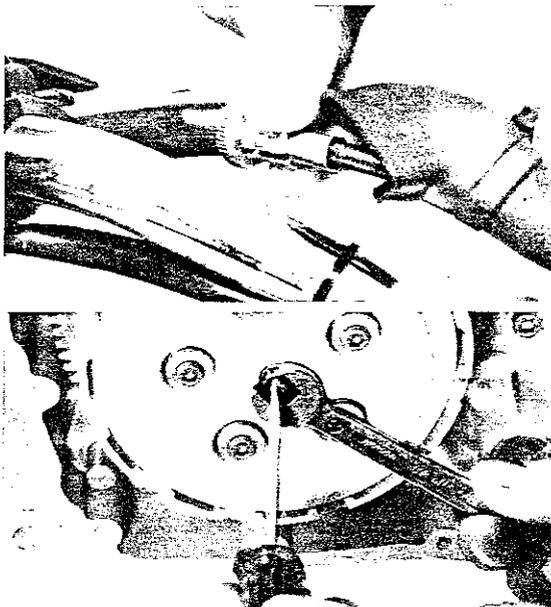
- (1) Spring, 5x
- (2) Pressure plate with threaded insert
- (3) Plate packet
- (4) Disc spring
- (5) Locking plate
- (6) Dog
- (7) Clutch basket
- (8) Pressure rod with ball
- (9) Clutch activation lever
- (10) Clutch cable counter bearing
- (11) Sliding bearing

6.4.1 Adjustment

The bowden cable play is adjusted at the clutch lever. It is measured at the end of the clutch lever and should be **3 - 5 mm**.

1. Push back the rubber cap.
2. Loosen the lock nut.
3. Screw the adjusting screw inward or outward as required.
4. Hold the adjusting screw, tighten lock nut.
5. Push on the rubber cap.

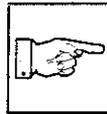
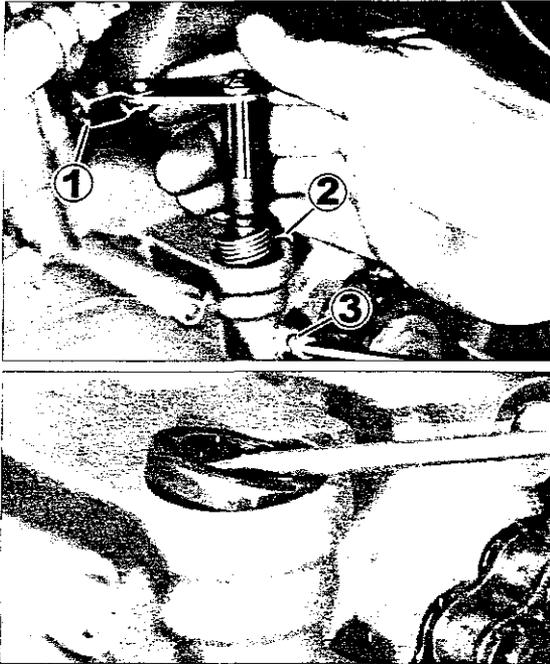
The basic adjustment is performed at the clutch basket.



6.4.2 Clutch Activation Lever

Removal

1. Remove starter (see 5.1 "Starter").
2. Remove pinion cover.
3. Disconnect the bowden cable at the counter bearing and clutch activation lever (1) on the engine.
4. Remove the pull-back spring (2).
5. Unscrew the screw (3) for the clutch activation lever.
6. Pull the shaft completely out of the housing, remove spring.
7. Remove the shaft seal ring and needle bush, inspect and replace if necessary.

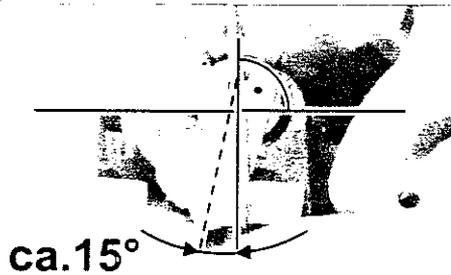


Note:

The sliding bearing for the shaft of the clutch activation lever can only be replaced on a dismantled engine.

Installation

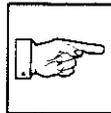
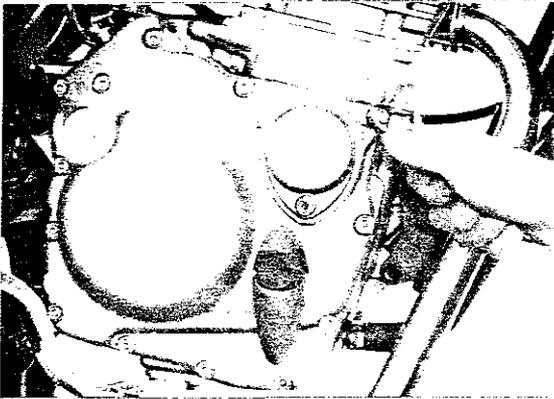
1. Insert needle bush and seal ring.
2. Insert the clutch activation lever with spring at an angle of 15° toward the direction of travel.
3. Screw in the screw for the clutch activation shaft with screw locking agent at medium tightness.
4. Connect the bowden cable at the clutch connection lever and clutch lever.
5. Return pull-back spring.
6. Perform a function test.



Tightening torque:

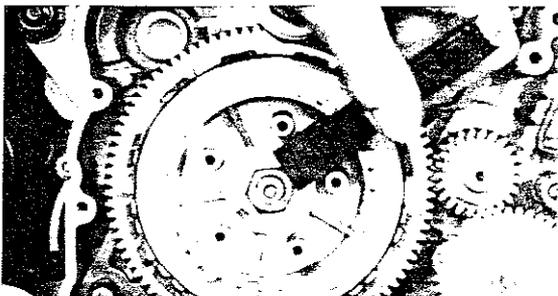
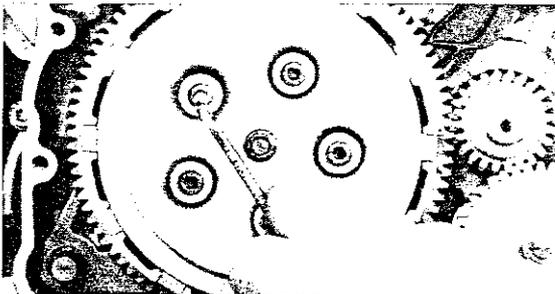
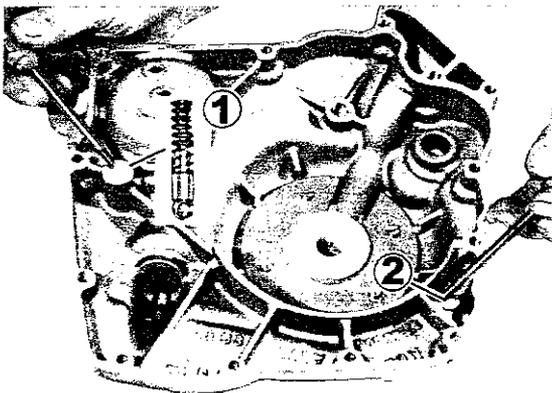
6.4.3 Removing the Clutch

1. Allow the engine to run until it is warm.
2. Position the vehicle vertically on a flat, horizontal surface. Position a suitable container under the engine.
3. Open the oil drain plug under the engine. Drain the oil.
4. Unscrew the 13 cylinder screws, remove crankcase cover with seal.

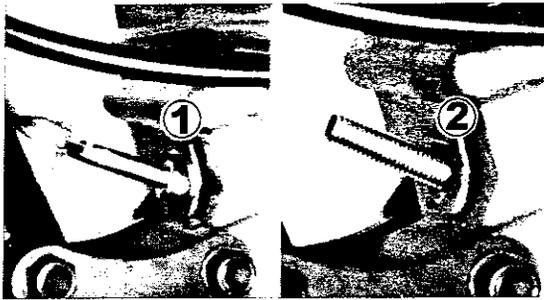


Note:

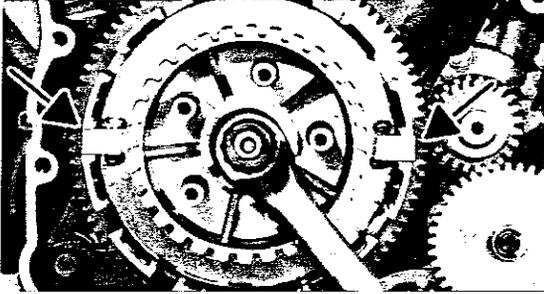
The parts for the oil pressure regulator are easy to lose! For this reason, tilt the engine to the left, remove the spring, oil pressure adapter and ball.



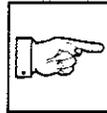
5. The spring for the oil pressure regulator (1) is supported by the surface under the oil filter cavity. Changing the position of this surface results in changes to the engine oil pressure. **Engine damage is possible!**
6. The selector shaft is supported axially by the surface (2) on the rear of the clutch cover. If the seal for the crankcase cover is forgotten, the selector shaft may get jammed against the surface.
7. Thoroughly clean the inside of the cover near the plastic bush for engine ventilation.
8. Unscrew the 5 screws, remove the washers, springs and pressure plate.
9. Remove the plate packet and disc spring.
10. Bend up the locking plate under the nut.



11. Unscrew the valve cap and set the crankshaft to the top dead point (see 6. 7" Cylinder Head").
12. Unscrew the cylinder screw (1), insert the crankshaft locking bolt (2) (ST).

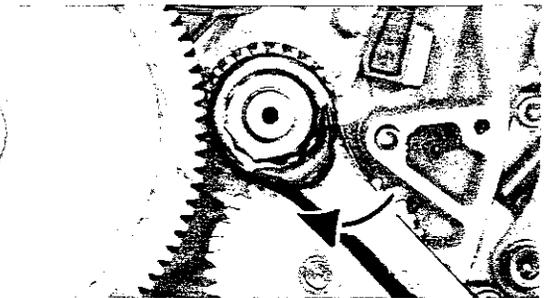


13. Slide the clutch locking tool (ST) onto the dog. Insert the bolts of the locking tool into the grooves of the clutch basket.
14. Unscrew the nut.
15. Remove the clutch locking tool.
16. Remove the locking washer and the first washer for the clutch, also remove the dog and second washer for the clutch.

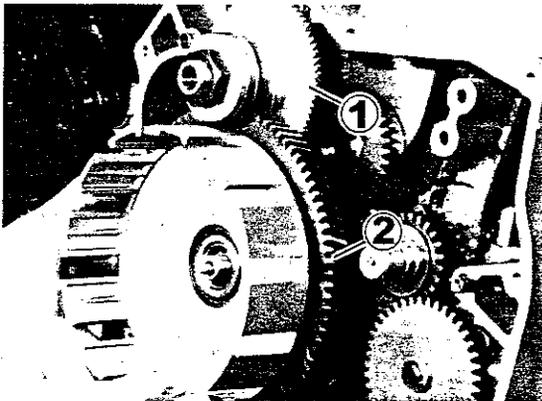


Note:

The nut that holds the pump drive gear against the crankshaft has left-hand threading.



17. Unscrew the nut for the pump drive gear. Left-hand threading!



18. Remove the shock absorber (1) and clutch basket (2) at the same time.



Note:

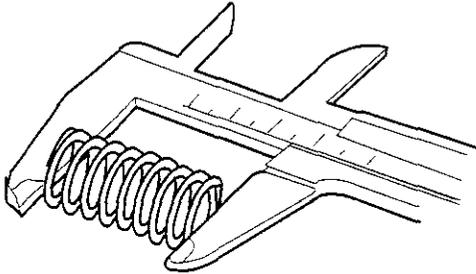
The spacer and thrust washers behind the clutch basket may stick together. Loss possible!
The shock absorber is a complete component. It cannot and may not be disassembled by unauthorised personnel!

Inspection

Inspect and measure the following components.
Replace defective or worn out components.

Compression spring:

Measure the length of the compression springs.

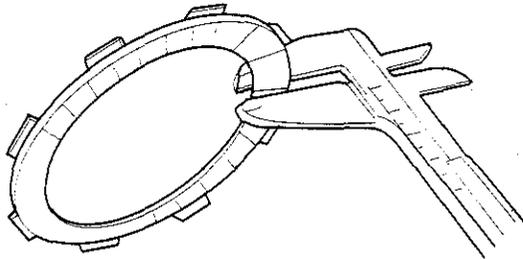


Unstressed: 38.5 mm
Wear limit: 37.7 mm

Always replace the compression springs as a set.

Lining plates:

Measure the thickness of the lining plates at four locations.

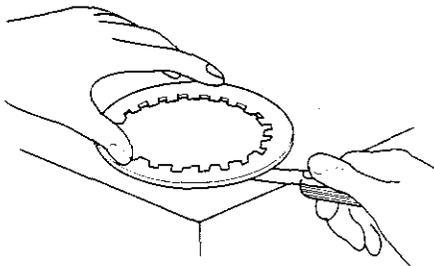


New: 3 ± 0.05 mm
Wear limit: 2.7 mm

Replace worn or burnt-out clutch plates.
Always replace clutch plates as a set.

Inner plates:

Check the inner plates for warping and bending.
Place them on a flat surface and check with a thickness gauge.



Thickness: 1.5 ± 0.05 mm
Wear limit: 1.3 mm

Always replace the inner plates as a set.

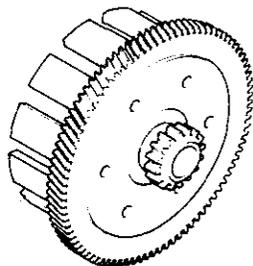
Clutch basket:

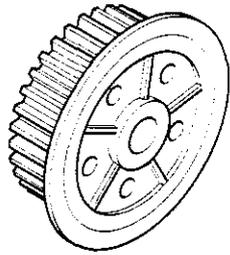


Attention!

Always replace the clutch basket completely together with the drive gear (primary drive).

Check the clutch gear for wear, damage and pit formation.
Inspect the riveted joint.
Check the clutch basket for pressure marks.





Dog:

Check the inner plate guide grooves for wear and damage, replace dog if necessary.

Bulges in the dog key grooves lead to jerky clutch operation.

Pressure rods:

The faces of the pressure rods must not exhibit "mushrooming" from the pressure of the ball.

Roll the pressure rods over a flat surface and check for deformation.

Wear limit: max. 0.5 mm

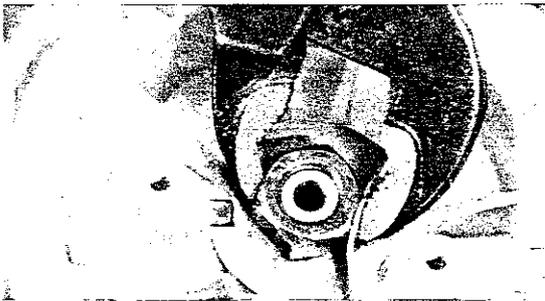
Shock absorber:

The shock absorber cannot be dismantled.

It is equipped with colour markings to protect against tampering. Inspect the shock absorber for wear and damage, replace if necessary.

6.4.4 Installation

The crankshaft must be locked with the crankshaft locking bolt.



1. Slide on the clutch basket and shock absorber at the same time.
2. Slide the clutch locking tool ST onto the dog.
3. Insert the washer and locking plate.
4. Screw the M12 nut on tightly, turn the locking plate.
5. Insert one pressure rod, then insert the ball and the second pressure rod.
6. Insert the disc spring.
The inner circumference lies on the dog, the outer circumference points to the plate packet.
If the disc spring and plates are not replaced, the same plate must be positioned next to the disc spring.
7. Starting with an inner plate, insert 6 inner and 6 lining plates in alternation.
8. Loosen the lock nut of the adjusting screw, snap the pressure plate with gear onto the clutch packet.
9. Install the springs with screws and washers. Tighten in crosswise manner.
10. Adjust the clutch.

Tightening torque:

Clutch dog nut: 58⁺⁴ Nm
Clutch spring screws: 5⁺¹ Nm

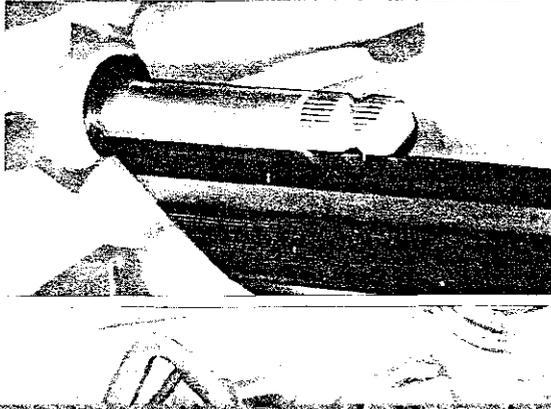


6.5 Gearshift

6.5.1 Selector Shaft

Removal

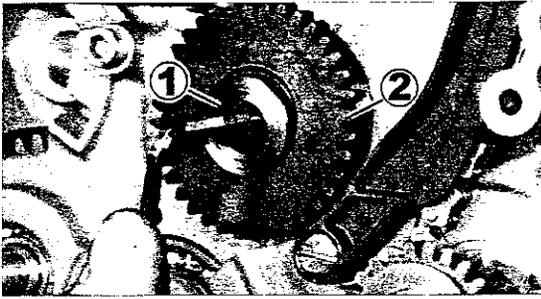
1. Remove clutch (see 6.4.3 "Removing the Clutch").
2. Remove gearshift lever.
3. Thoroughly clean the selector shaft near the secondary chain.
Soiling can cause the selector shaft to jam when sliding through the engine housing.
4. Remove pinion cover.
5. Check the selector shaft for deformation.
To do this, place a steel ruler or angle iron on the part that juts outward.
6. Pull out the selector shaft.



6.5.2 Free Wheel

Removal

1. Completely remove the clutch.
2. Remove the shock absorber.
3. Unscrew the countersunk screw (1), remove the washer, remove the free wheel (2) from the balancing shaft.



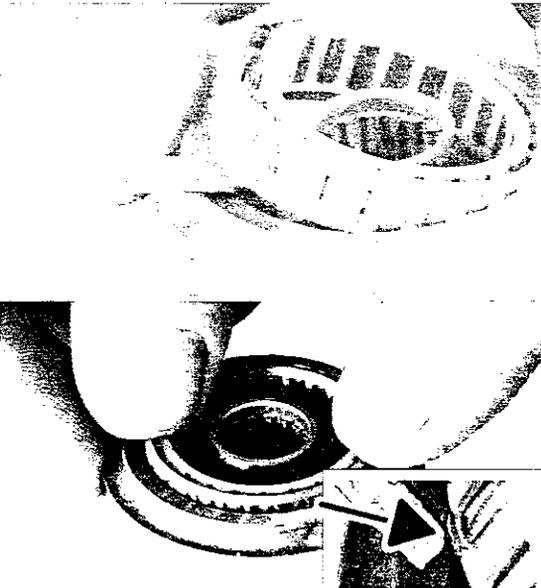
Inspection

The free wheel must lock at every position (360°).

1. Hold the free wheel drum in place.
2. Turn the free wheel in 5° steps, alternating between clockwise and counter-clockwise.
If the locking function does not work in the counter-clockwise direction, the free wheel is defective and must be replaced.
If pronounced chatter marks are found on the free wheel, the free wheel must be replaced.

Removal of the free wheel is only useful for determining the extent of wear. The free wheel is destroyed by removing it.

To do this, pry the free wheel away from the free wheel drum using a screw driver.



The free wheel is only available mounted in the free wheel drum. Inspect for correct installation:
The barbs of the free wheel must point in the direction of the free wheel drum.

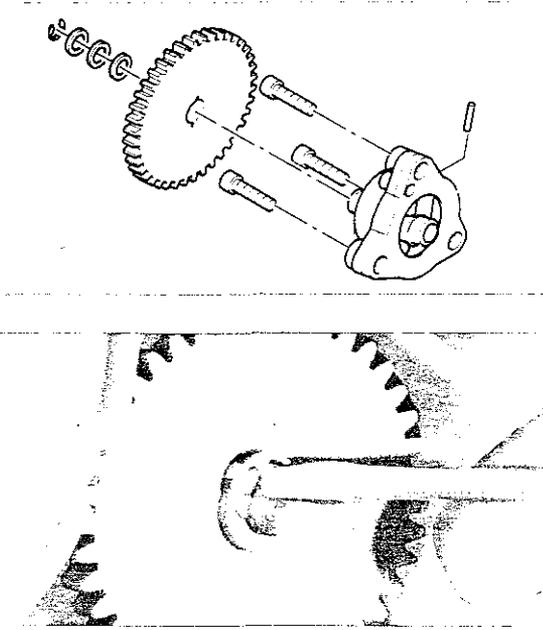
Installation

Install in reverse order.

6.6 Pumps

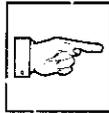
6.6.1 Oil Pump

The engine has a pump circulated lubrication system. The oil is supplied to the lubrication points of the engine and transmission by a feed pump.



Removal

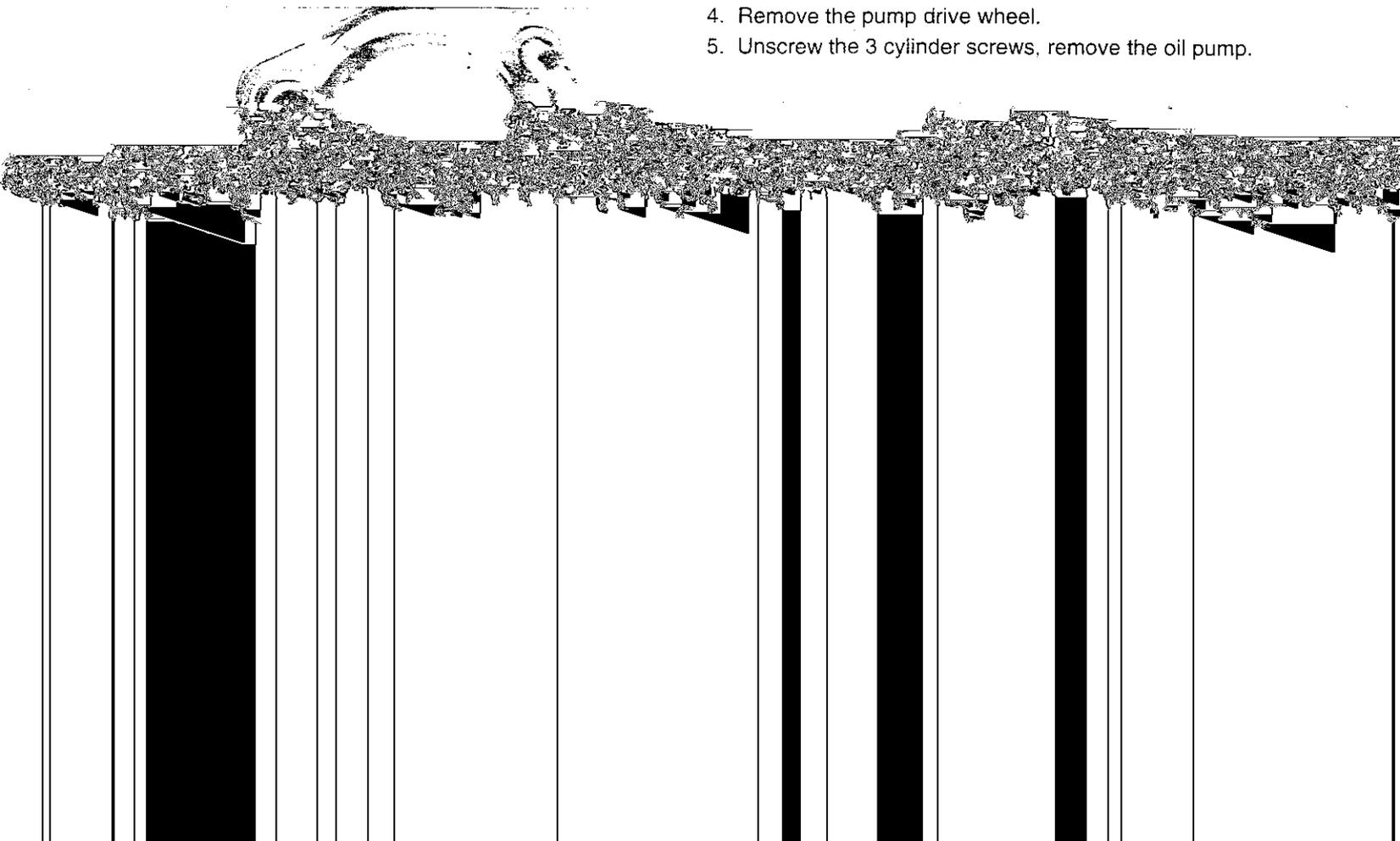
1. Drain oil from the engine, remove the crankcase cover (see 6.4.3 "Removing the Clutch").
2. Remove the locking washer from the pump shaft, remove the 3 thrust washers.
3. Pull off the oil pump gear.



Note:

Be careful, the straight pin can fall out of the hole into the oil pump. Loss possible!

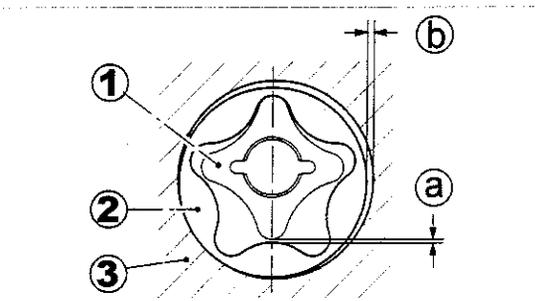
4. Remove the pump drive wheel.
5. Unscrew the 3 cylinder screws, remove the oil pump.



Inspection

Inspect the following components for wear/cracks/damage, replace the oil pump if necessary:

- Housing (3)
- Gear, oil pump
- Inner rotor (1)
- Outer rotor (2)

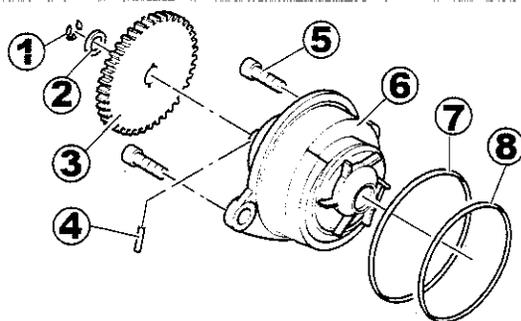


If significant wear marks are found, replace the oil pump. Also take the oil pressure into consideration (see 6.2.7 "Checking the Oil Pressure").

Install in reverse order.

The cylinder screws are micro encapsulated.

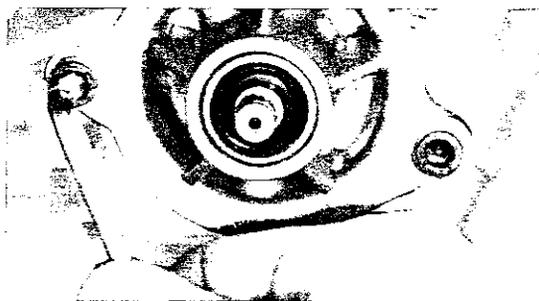
6.6.2 Water Pump

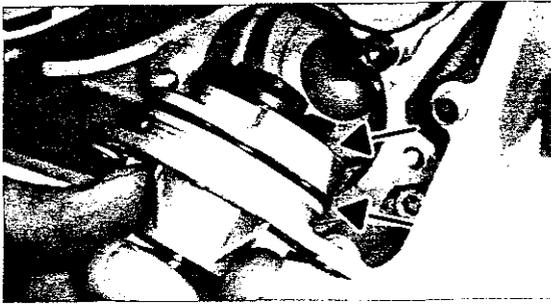


- (1) Locking washer
- (2) Thrust washer
- (3) Gear, water pump
- (4) Straight pin
- (5) 2 cylinder screws
- (6) Water pump
- (7) O-ring 52x2 HBR
- (8) O-ring 56x2 HBR

Removal

1. Drain oil from the engine, remove the crankcase cover (see 6.4.3 "Removing the Clutch").
2. Remove the locking washer from the oil pump shaft, remove the 3 washers.
3. Remove the oil pump gear.
Make certain that the straight pin does not fall out of the hole, as it may get lost.
4. Unscrew the nut for the pump drive gear. Left-handed threading! Remove the drive gear.
5. Remove the locking washer, thrust washers and water pump gear from the pump shaft.
6. Unscrew the 2 screws.

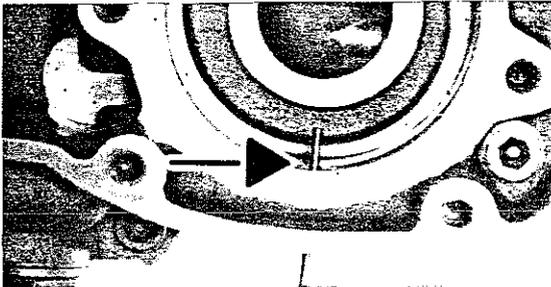




7. Pull the pump out of the housing. The O-rings may offer resistance in the housing.
Make certain that the straight pin does not fall out of the hole, as it may get lost.



- 2 holes are located in the centre of the water pump.
- Discharge hole for oil that may have entered due to a defective O-ring or a defective shaft seal ring (under the drive wheel).
 - Discharge hole for water that may have entered due to a defective O-ring or a defective seal under the pump wheel.



There is a hole in the water pump seat in the engine housing which allows oil or water to flow out through the housing. Clean the hole, if necessary.

Test

Inspect the following components for wear/cracks/damage, replace the water pump if necessary:

- Housing
- Gear, water pump
- O-rings
- Impeller

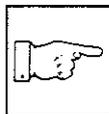
O-rings can be replaced separately. The water pump is replaced as a unit.

Installation

Install in reverse order.

Note:

Carefully place the oil pump in the housing. The impeller must not be damaged.



6.6.3 Oil Pressure Regulator

No foreign parts may be used in the oil pressure regulator:

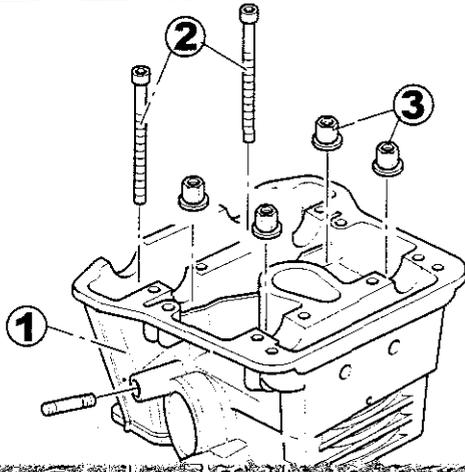
- no longer or shorter springs,
- no ball with a different diameter.



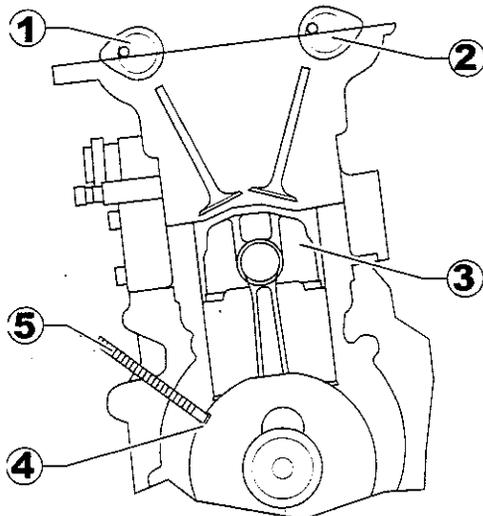
6.7 Cylinder Head

If work is only being performed on the cylinder head, the engine can remain in the frame.

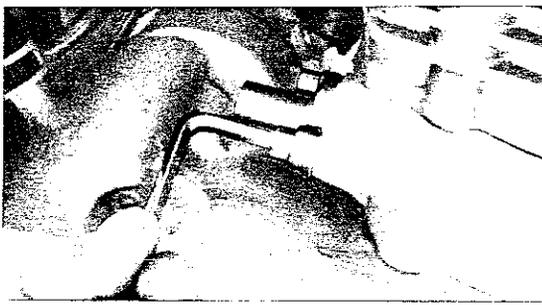
Before working on the cylinder head, the spark plugs should be removed.



- (1) Cylinder head
- (2) Cylinder screws
- (3) Nuts



6. Bring the engine to the "top dead point" position.
The piston (5) is located at the top dead point when the holes in the camshaft (1) + (2) point to the left.
7. Unscrew the cylinder screw and screw in the crankshaft locking bolt (5).
This inserts the crankshaft locking bolt (5) into the groove (4) in the crankshaft.



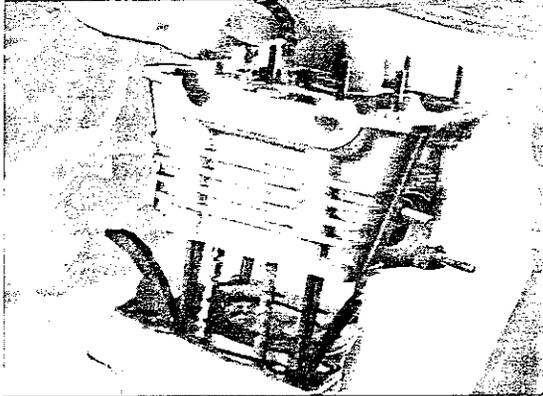
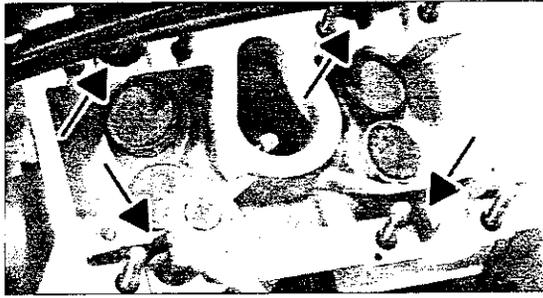
8. Unscrew the M6 hexagon head screw from the chain adjuster.
The tension is removed from the chain adjuster.
9. Unscrew the 2 cylinder screws, remove the chain adjuster from the cylinder.
The top side of the chain adjuster is marked with an "o".



10. Press down on the locking catch of the timing chain adjuster from above using a screw driver. Insert the pressure pin.

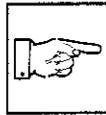


11. Remove the guide rail and bearing covers 1 - 4.
12. Remove the timing chain and pull out the camshafts.



14. Loosen the 4 M6 nuts for the cylinder head mount in a crosswise manner, turning them approx. 90° each until the counter pressure from the cylinder is eliminated.
15. Completely unscrew the nuts for the cylinder head mount.

16. Pull the timing chain upward so that the tension rail can be moved freely.
17. Pull the cylinder head away from the stud bolts.



Note:

Only replace the cylinder head seal together with the cylinder base seal.

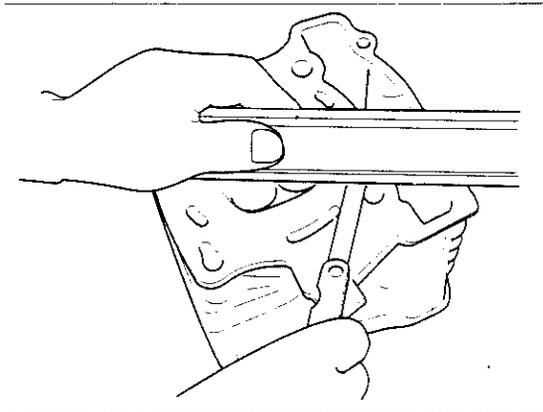
Inspection

Use an oil stone to clean combustion residue from the sealing surfaces.

Inspect the cylinder head for cracks.

Check that the sealing surface is level by placing a straight-edge over both diagonals.

Wear limits: 0.05 mm



6.7.4 Chain Wheel, Camshaft

Removal

1. Hold the camshaft with the open-jawed spanner, size 16 and screw off the chain wheel screw with size 13.

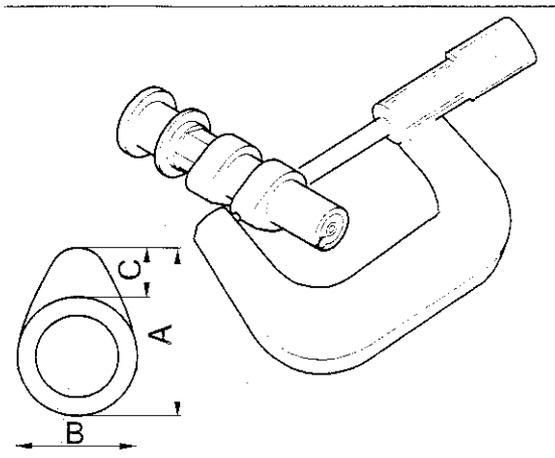


Inspection

Camshaft:

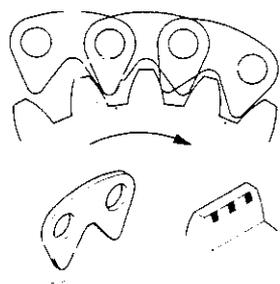
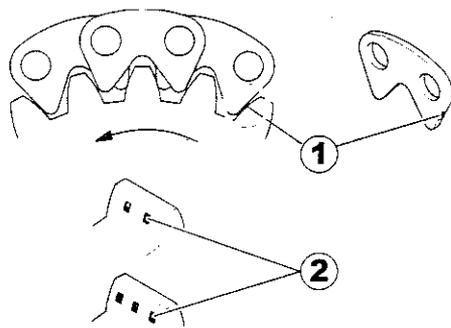
- (A) Intake: 32.80 - 32.90 mm; min. 32.65 mm
Exhaust: 31.95 -32.05 mm; min. 31.80 mm
- (B) Intake: 25.95 -26.05 mm; min. 25.80 mm
Exhaust: 25.95 -26.05 mm; min. 25.80 mm
- (C) Intake: 6.85 mm
Exhaust: 6.15 mm

Outer diameter at the bearing: 19.967 - 19.980 mm
Clearance between the camshaft and cover: 0.020 - 0.046 mm
max. permissible eccentricity at the bearing: 0.03 mm



Chain wheel, camshaft:

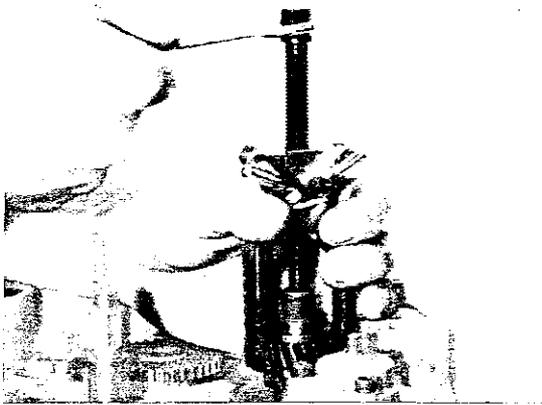
When the components are adjusted correctly, light markings can be seen centred on the edges of the timing chain (1) and the edges of the chain wheels (2).



If there is too little tension in the timing chain, the chain links do not grip the teeth of the chain wheels correctly. These are worn out more quickly, the markings are located near the edges.

If the chain wheel is worn out or damaged: Replace the timing chain and chain wheels as a set.

Replace the crankshaft as well, if significant wear is found.

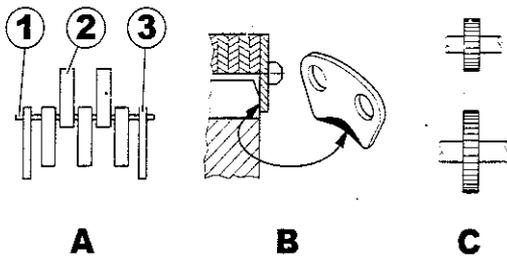


4. If necessary, unscrew the M15 nut and primary drive, and remove the pump drive gear.
5. Pull off the primary drive wheel using the claw removal tool (ST).

Inspection

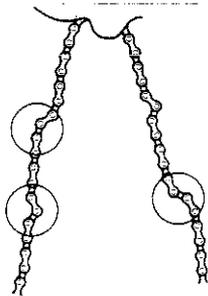
Timing chain:

Parts of the timing chain (A):



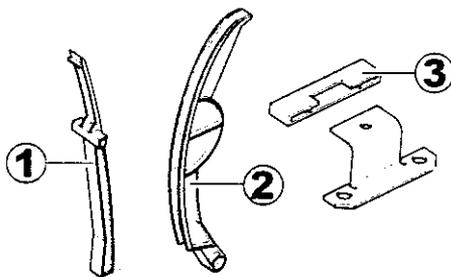
- (1) Pin
- (2) Chain link
- (3) Guide

In the event of significant wear on the lower edge of the inside of the guide (B), correct the axial position of the chain wheels. The chain wheels must stay in alignment (C).



Timing chain jams or has cracks:

Replace the timing chain and chain wheels as a set.

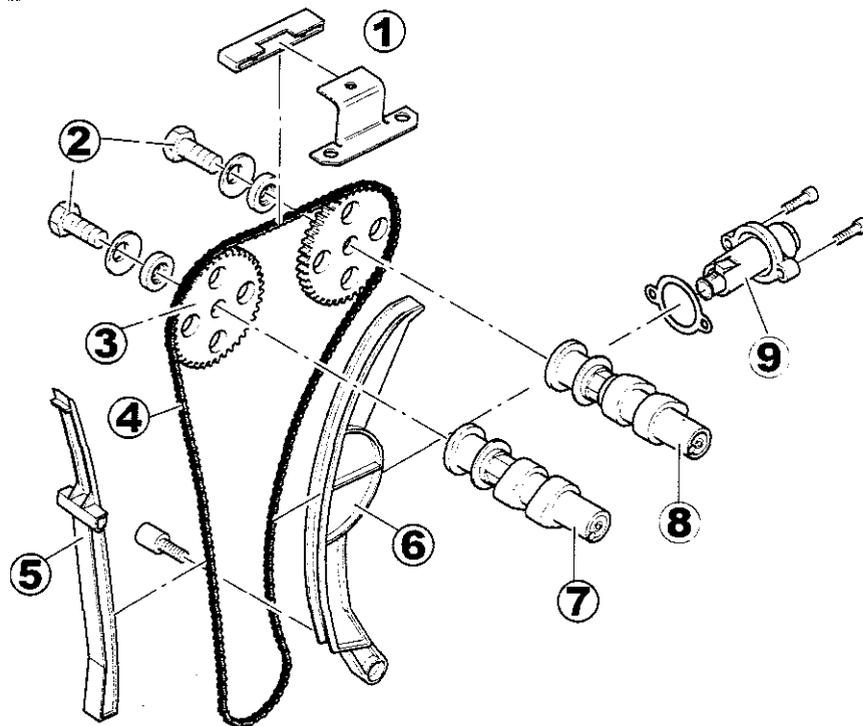


Guide rail:

Check for excessive wear.

- (1) Guide rail
- (2) Tension rail
- (3) Top guide rail

6.7.2 Valve Train

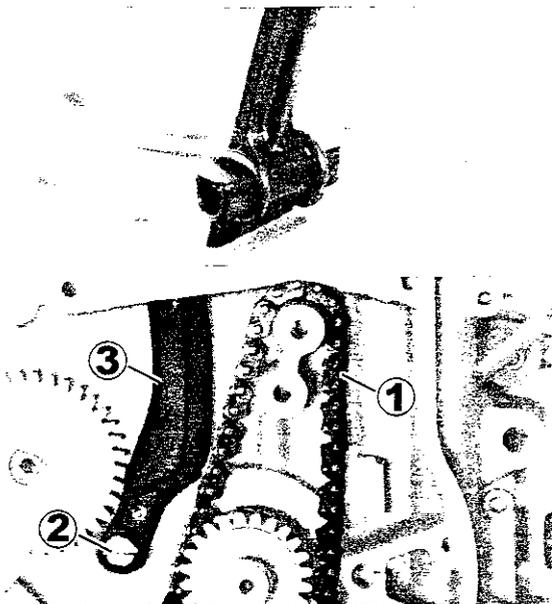


- (1) Guide rail and support plate
- (2) Hexagon head screws
- (3) Chain wheels, camshaft
- (4) Timing chain 92 RH 2010-122M
- (5) Guide rail
- (6) Tension rail
- (7) Exhaust camshaft
- (8) Intake camshaft
- (9) Chain adjuster

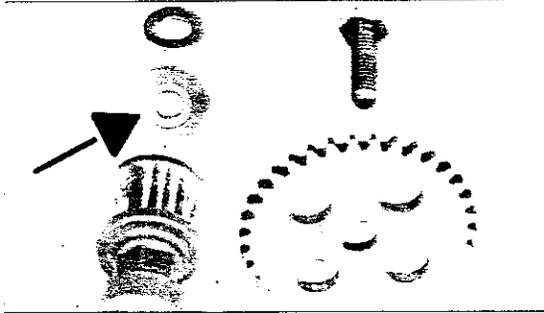
6.7.3 Timing Chain, Tension and Guide Rails

Removal

1. Remove the guide rail.



2. Run the timing chain (1) downward.
3. Unscrew the screw (2), pull out the tension rail (3) upwards.

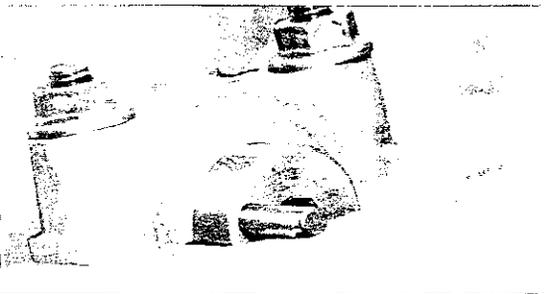
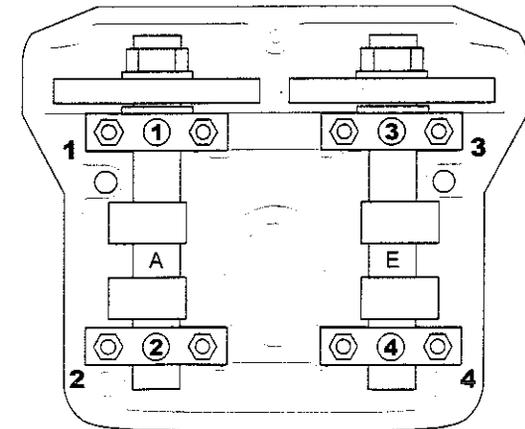


Installation

1. Replacing the chain wheel and/or camshaft.
Always position the chain wheel with the writing facing the screw.
The curved side of the curved washer must always be toward the screw head.
2. Insert the thrust washer, screw on the chain wheel.

6.7.5 Installation

1. Lubricate the camshaft bearings.
2. Insert the camshafts.
Intake camshaft: Designation **(E)**
Exhaust camshaft: Designation **(A)**



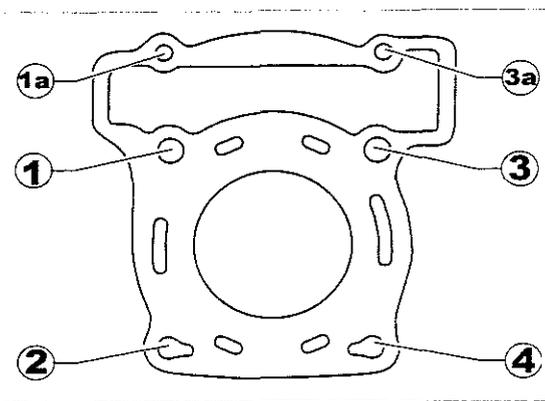
3. Insert the locking pins into the holes in the camshaft.
The locking pins for both camshafts must rest against the cylinder head on the left next to the centre of the camshaft.
Now the camshafts are pre-adjusted.
4. Position the bearing covers correctly, screw on the bearing covers and guide rails.
5. Inspect the bearing clearance.
6. Slide the sleeves onto both right stud bolts.



Attention!

A new head seal and a new base seal must be used after every removal of the cylinder head.

7. Position the new head seal.
Always use a new head seal and a new base seal.
8. Insert the timing chain rail with O-rings!
If this is the first disassembly, it is possible that there are no O-rings yet.
9. Carefully position the complete cylinder head.
Do not damage the tension and guide rails!
10. Screw on the 4 collar nuts and the 2 cylinder screws.



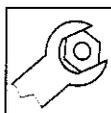
11. Screw on the screws and nuts as follows:

- Lubricate the threads of the M8 tie rod (numbers 1 - 4), the two inner M6 hexagon head screws (numbers 3a and 1a) and the supporting surface with MoS₂.
 - Screw on the M6 screws and M8 nuts and tighten by hand.
 - Screw on the M8 nuts in the order **3 - 2 - 4 - 1** (see sketch) with 15 Nm torque.
 - Turn every nut at an angle of 80° +10° in the same order.
- Never turn the nuts back!**
- Tighten both M6 screws with 10⁺² Nm.

12. Screw on the chain adjuster.

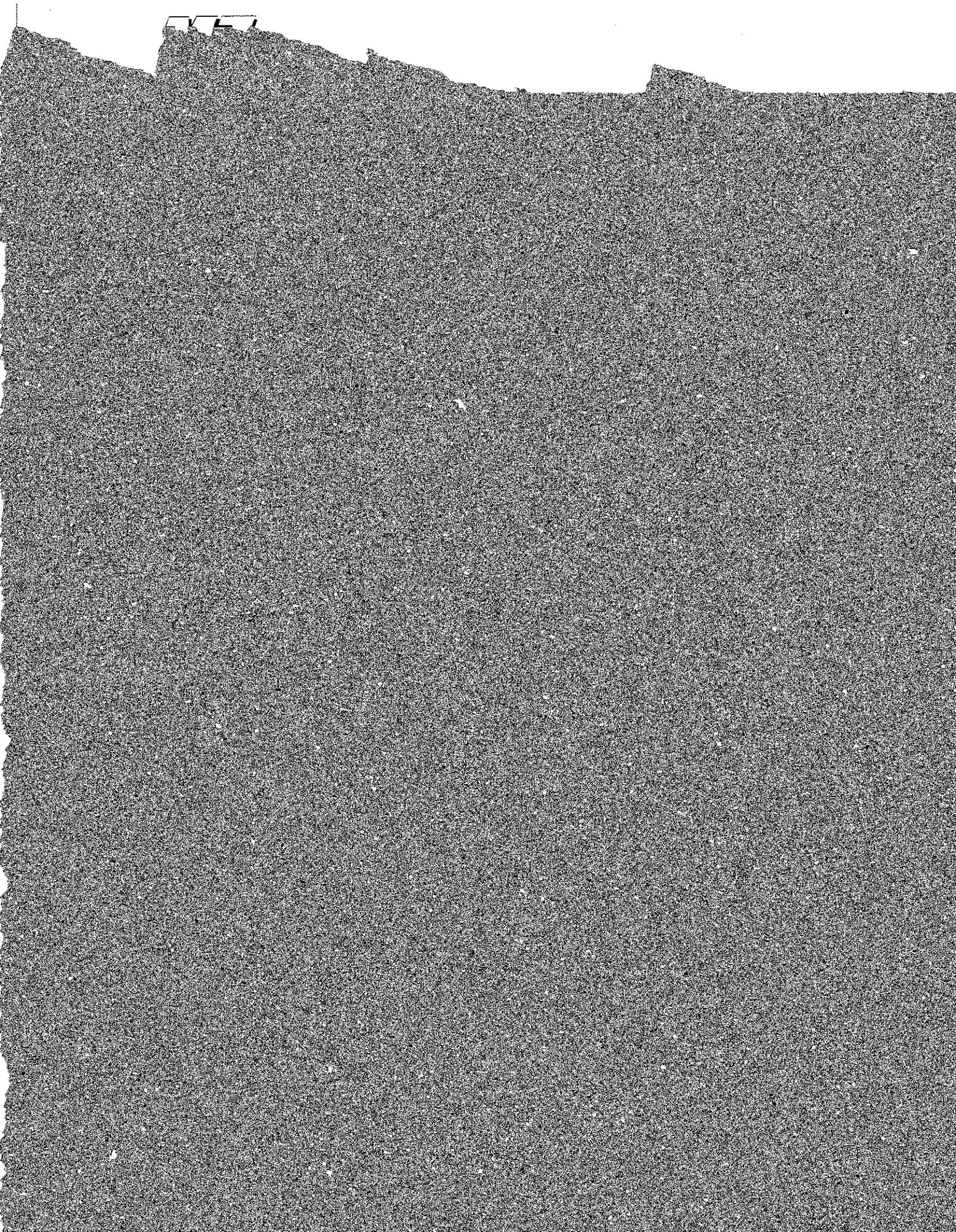
The "o" mark on the toothed rack must point upward.

13. Tension the timing chain.



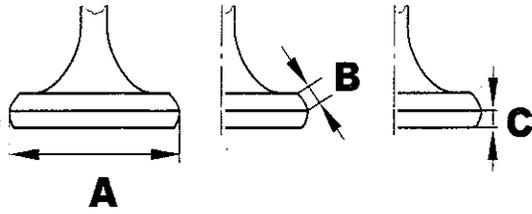
Tightening torque:

Bearing cover screws:	10 ⁺² Nm
M8 collar nuts:	22 Nm + 80°+10°
M6x90 cylinder screws:	10 ⁺² Nm



Inspection

Valve dimensions:



	ON in mm	OFF in mm
(A) Valve plate diameter	23.9 - 24.1	20.4 - 20.6
(B) Valve plate width	3.44 - 4.04	3.44 - 4.04
(C) Valve plate thickness	0.63	0.63
Valve stem outside diameter	3.978 - 3.992 min. 3.95	3.968 - 3.982 min. 3.95
Valve stem guide inside diameter	4.000 - 4.012 max. 4.05	4.000 - 4.012 max. 4.05
Valve stem - valve stem guide clearance	0.008 - 0.034 max. 0.07	0.018 - 0.044 max. 0.09

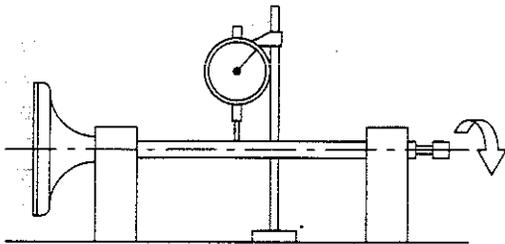
Tappet clearance [while cold, 20±5 °C (68 °F)]:

ON: 0.09 - 0.11 mm

OFF: 0.11 - 0.14 mm

Valve stem eccentricity:

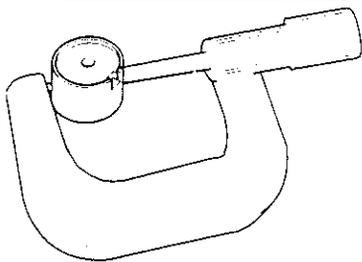
max. permissible valve stem eccentricity: 0.01 mm

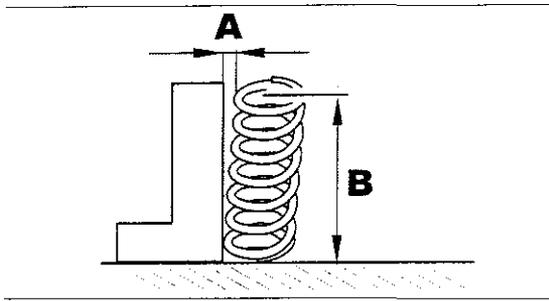


Bucket tappet:

Outer diameter: 24.967 - 24.980 mm

Clearance: 0.020 - 0.054 mm





Valve Springs:

(A):
 max. perm. inclination: ON 1.1 mm (1.5°)
 OFF 1.1 mm (1.5°)

(B):
 Length, untensioned: ON 41.8 mm
 OFF 41.8 mm

Length, installed: ON 33.5 mm
 (Valve closed) OFF 33.5 mm

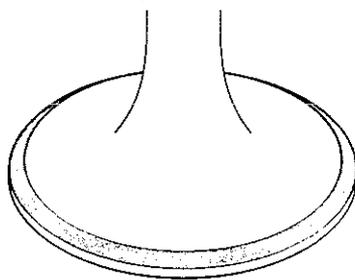
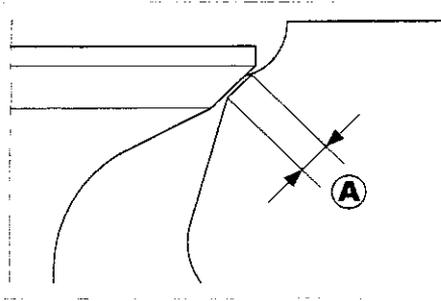
6.8.1 Valve Seat

Carbon deposits must be removed from the valve plate and valve seat.

Inspect the valve seat for pits and wear.

Measure the valve seat width:

Intake: 1 - 3 mm
 Exhaust: 1 - 3 mm



Measurement procedure

The valve that corresponds to the given valve seat must be used for the measurement process.

1. Apply touch-up paint to the valve plate.
2. Insert the valve into the cylinder head.
3. Press the valve against the valve seat with the valve stem guide to receive an accurate result.
4. Measure the valve seat width.
 The paint is worn off at all points where the valve plate and valve seat surface come into contact.

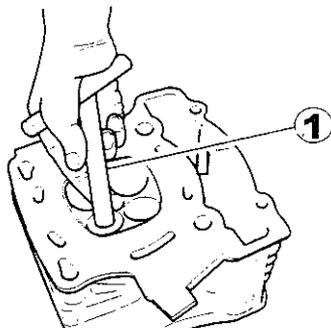
If the valve seat is too wide, too narrow or not centred properly, the valve seat must be reworked.

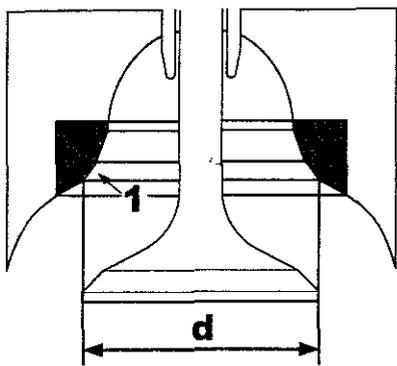
Regrinding

Grind the valve seat 45° with the specified valve seat grinder.

Always use the appropriate valve seat grinder.

1. Position valve seat grinder (1).
2. Turn the valve seat grinder downward onto the valve seat with even pressure (approx. 4 - 5 kg).
 Avoid uneven grinding!





Grind the valve seats as follows:

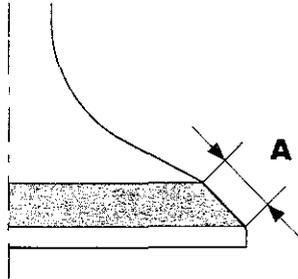
Section	Valve Seat Grinder
1	45°

d: Intake: max. \varnothing 23.75 mm
 Exhaust: max. \varnothing 20.25 mm

Fault Correction

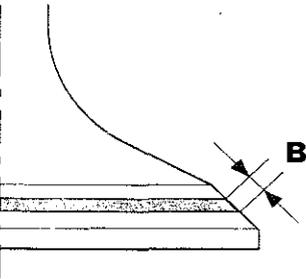
(A): The valve seat is centred, but too wide.

Valve or valve seat ring worn out.
 Replace the cylinder head!



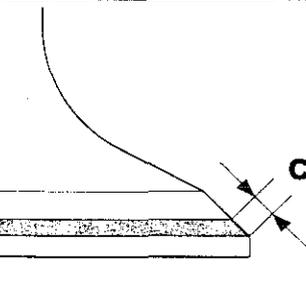
(B): The valve seat is centred, but too narrow.

Valve Seat Grinder Set		Goal
Use	45° grinder	even valve seat width of at least 1 mm



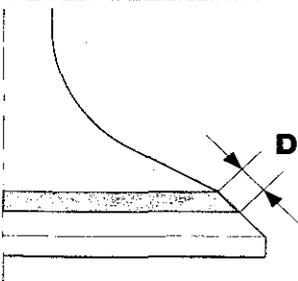
(C): Valve seat too narrow and near upper edge.

Valve or valve seat ring worn out.
 Replace the cylinder head!



(D): Valve seat too narrow and near the lower valve plate edge.

Valve Seat Grinder Set		Goal
Use	45° grinder	even valve seat width of at least 1 mm

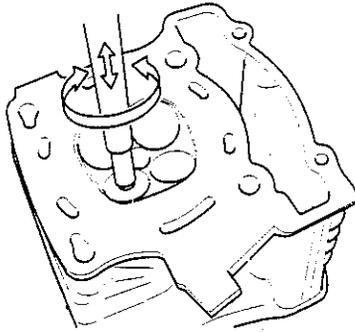
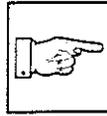


Condition (D) only occurs with the use/replacement of new valves.

Replace the cylinder head!

Fine Grinding

After the valve seat has been reworked and the valve replaced, if necessary, the valve seat and the valve plate must be lapped in.



Note:

No lapping material may come between the valve stem and valve stem guide!

1. Apply some lapping agent to the valve plate.
2. Apply some molybdenum disulphide oil to the valve stem.
3. Insert the valve into the head.
4. With the help of an appropriate tool, turn the valve until the valve and valve seat are evenly polished.
To achieve optimum lapping results, press the valve lightly against the valve seat while alternatingly turning the tool left and right between your hands.
5. Repeat the procedure until optimal results are achieved.
6. Completely remove the lapping agent from the valve plate and valve seat after completing the lapping process.

Inspection

1. Apply touch-up paint to the valve plate.
2. Insert the valve into the cylinder head.
3. Press the valve against the valve seat with the valve stem guide to receive an accurate valve seat measurement.
4. Measure the valve seat width again.
If the valve seat width does not correspond to the specified value, regrind and lap the valve seat.

Installation

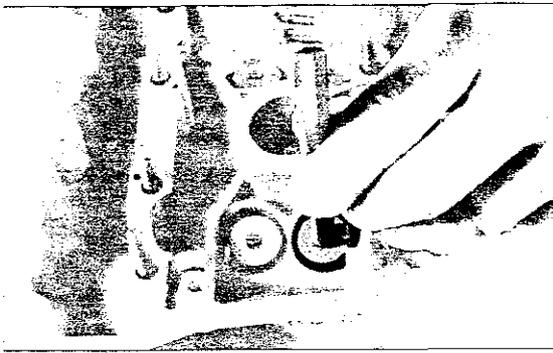


Note:

Valve collets may not be installed with a magnetic screw driver. The valve collets will become magnetised and residue will cling tightly. Installation is performed with a tweezers or screw driver and some grease.

1. Remove any burrs on the collet groove.
2. Position the valve spring supports.
3. Install valves.
4. Press the valve stem seal against the valve stem guide with the other side of the special tool.
5. Insert the valve spring and pre-tension with the special tool.
6. Install the valve collets.





7. Centre the valve spring and plate.
8. Install the bucket tappets according to the numbering.
9. Insert the camshaft and determine the valve clearance, correct if necessary.

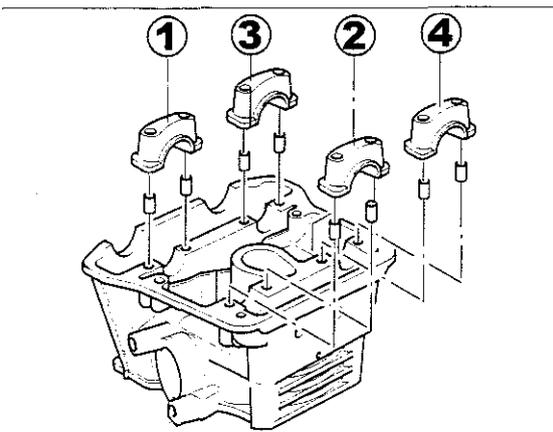
Installation

1. Lubricate the running path, insert camshafts. "E" for intake, "A" for exhaust.



Attention!

The smallest amount of contamination can result in stiffness in the camshafts.
Clean meticulously.

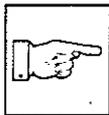


2. Lubricate the running surface before inserting the camshaft end brackets.
3. Position the camshaft end brackets with the guide rails facing up, tighten.

Observe the numbers on the camshaft end brackets:

- Right exhaust camshaft: (1)
- Left exhaust camshaft: (2)
- Right intake camshaft: (3)
- Left intake camshaft: (4)

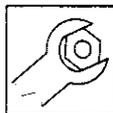
4. Tension the timing chain using the timing chain adjuster.
5. Adjust the camshafts (see 6.7.5 "Installation").
6. If necessary, screw in the oil drain plug and screw plug, screw in dipstick.
7. Carefully pour 1.2 l of oil over the camshafts, bucket tappets and timing chain wheels with timing chain.
(SAE 15W 50 API SG/SH or SAE 10W -40 API SG/SH)



Note:

The motor oil must not run into the spark plug cavity.

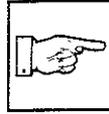
8. Provide the valve cap with a seal and screw onto the cylinder head with the decoupler elements.
9. Install the inspected/replaced spark plugs.
10. Remove the ST locking bolt, screw in the cylinder screw with a new seal.



Tightening torque:

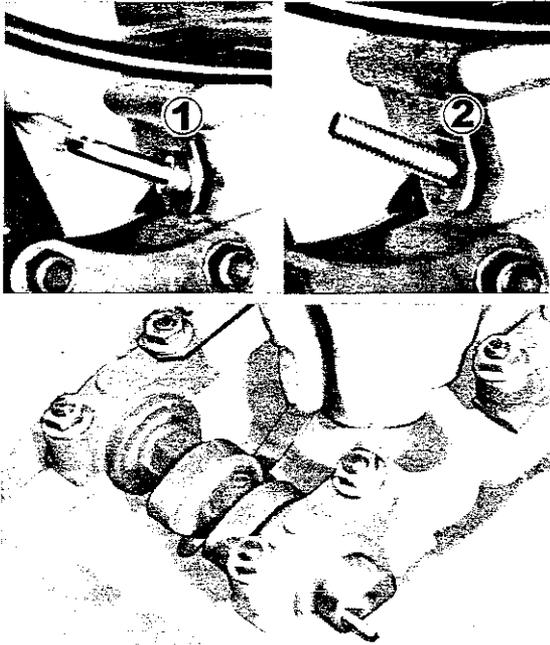
Camshaft bearing cap nuts: 10^{+2} Nm
Cylinder screws: 8^{+2} Nm

6.8.2 Adjusting Valve Clearance



Note:

Only adjust the valve clearance on a cooled engine [approx. 20 °C (68 °F)]!



1. Remove valve cap.
2. Set the engine to the top dead point with the help of the camshaft and open-jawed spanner, size 16 (see 6.7.1 "Removal").
3. Unscrew the cylinder screw (1), screw in the crankshaft locking bolt (2) (ST).
4. Determine the clearance for all valves using a thickness gauge, adjust if necessary. Insert adjusting plates of the required thickness to make the adjustment.

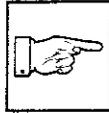
Valves	Clearance in mm
Iniake	0.09 - 0.11
Exhaust	0.12 - 0.14

Replacing the shims

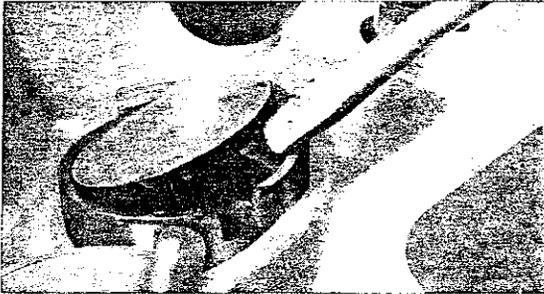
The shims are available in thicknesses from 2.000 mm to 3.300 mm in 0.025 mm steps.



1. Unscrew the M6 screw on the timing chain adjuster.
2. Unscrew the 2 cylinder screws, remove the timing chain adjuster from the cylinder.
3. Remove the guide rail and camshaft bearing caps.

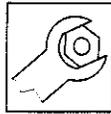
**Possible engine damage!**

The nuts and sleeves must not fall into the timing chain shaft!



4. Remove the timing chain from the chain wheels.
5. Remove the camshafts.
6. Lift out the shims using a tweezers or screw driver.
7. Insert an appropriate shim into the cleaned bucket tappet.

8. Lubricate the camshaft bearings, insert camshaft.
9. Install the bearing caps and guide rails on top and screw on.
10. Inspect the bearing clearance.
11. Screw on the valve caps.

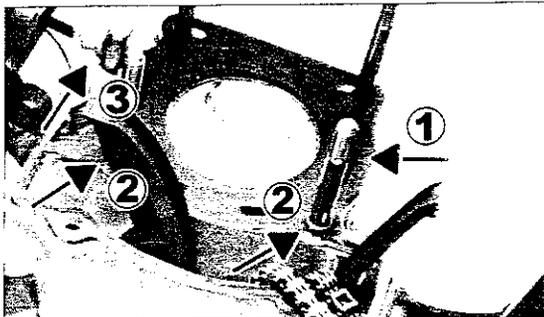
**Tightening torque:**

Decoupling element:

8⁺² Nm

6.9 Cylinders

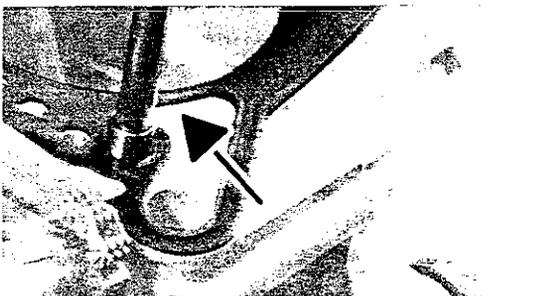
6.9.1 Removal



1. Remove the cylinder head seal (1)
2. Remove the 2 fitting sleeves (2) for locking the cylinder head from the cylinder.
3. Remove the cable (3) from the oil pressure sensor.



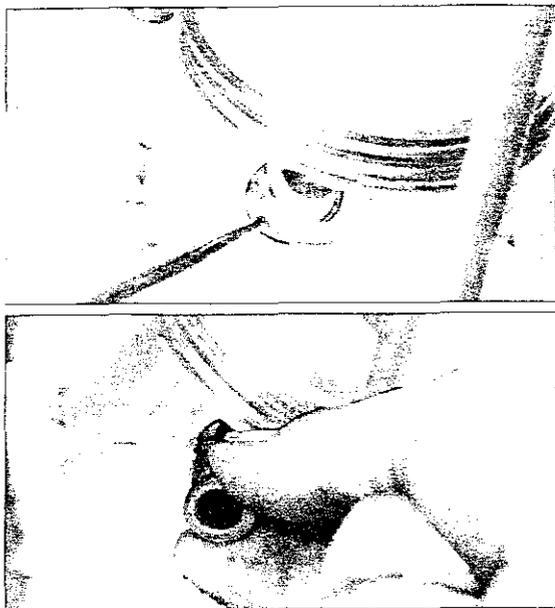
4. Pull the timing chain upward and remove the cylinder. Protect the pistons against damage!



5. Remove the base seal.

6.9.2 Pistons

Removal



1. Place cleaning paper or a clean rag into the crankshaft and chain shaft.
2. Remove the wire retaining ring with a pliers.

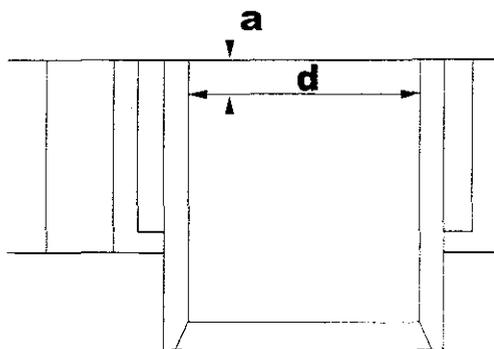
3. Debur the retaining ring groove and pin hole, if necessary. The retaining ring groove must have sharp edges, otherwise secure seating of the wire retaining ring is not guaranteed.
4. Slide out the piston pin from the piston. Do not drive out the piston pin with a hammer!
5. Pull out piston.
6. Remove piston rings. Carefully remove piston rings with a piston ring removal pliers. Otherwise the piston rings may break.

Inspection

Remove the combustion residue from the piston head using a brass brush. Inspect the piston for cracks. Inspect the piston running surface for any pressure marks, replace piston if necessary. Clean the piston ring grooves.

Piston installation clearance:

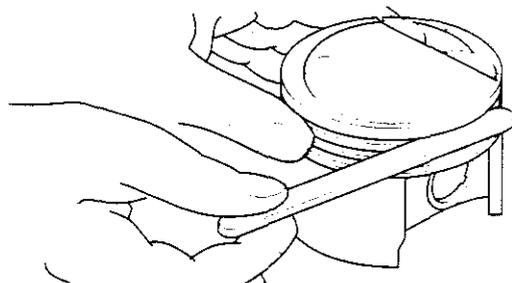
There are "A", "B" and "C" cylinders in accordance with the cylinder diameters. Also measure the diameter of the cylinder hole (d) at a distance of (a) = 12 mm from the upper edge. The piston dimension is imprinted on the piston head.



Cylinder hole - piston outside diameter: 0.020 - 0.040 mm
 Wear limit: 0.06 mm

Piston ring grooves:

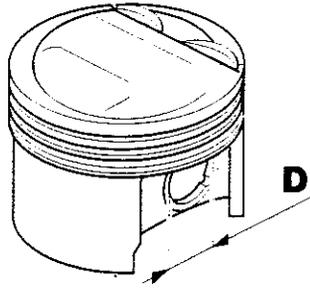
Measure the space between the piston rings and the piston ring grooves with a thickness gauge.



	Clearance	Ring Heights
Ring 1 (rectangular ring)	0.015 -0.060 mm	0.965 - 0.995 mm
Ring 2 (tapered compression ring)	0.020 -0.055 mm	1.170 - 1.190 mm
Oil wiping ring	0.020 -0.055 mm	2.470 - 2.490 mm

Piston pin hole:

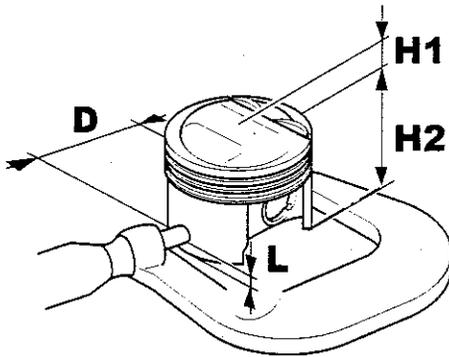
Check the inside diameter (**D**) of the piston pin hole.
Wear limit: 15.005 mm



Outside dimension:

Measure the outside diameter (**D**) of the piston at 90° to the piston pin axis and (**L**)=7 mm above the lower edge of the piston.

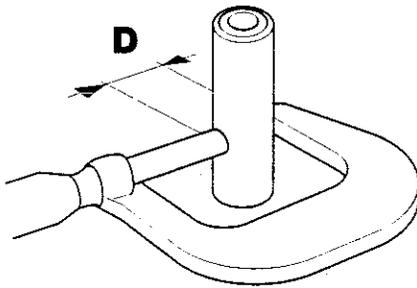
Height **H1**: 44.9 mm
Height **H2**: 3.8 mm



Piston pins:

In the event of blue discoloration, replace the piston pin and inspect the lubrication system.

Measure the outside diameter of the piston pin.
Wear limit: \varnothing 14.995 mm



6.9.3 Piston Rings

Inspection

Deformed piston rings result in higher oil consumption, local over-heating and early wear.

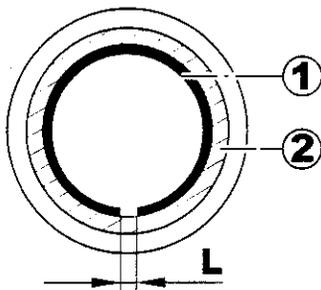
The running surfaces must be clean.

Annular gap:

1. Slide every piston ring (1) approx. 20 mm into the cylinder (2), at a right angle to the cylinder hole.
2. Measure the annular gap (**L**) with a thickness gauge.

Ring 1 (rectangular ring):	0.15 - 0.35 mm
Ring 2 (tapered comp. ring):	0.20 - 0.40 mm
Ring 3 (oil wiping ring):	0.20 - 0.45 mm

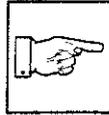
If the gap size of one piston ring is outside of this tolerance, the entire ring set must be replaced.



Thickness:

Ring 1 (rectangular ring):	0.965 - 0.995 mm
Ring 2 (tapered comp. ring):	1.170 - 1.190 mm
Ring 3 (oil wiping ring):	2.470 - 2.490 mm

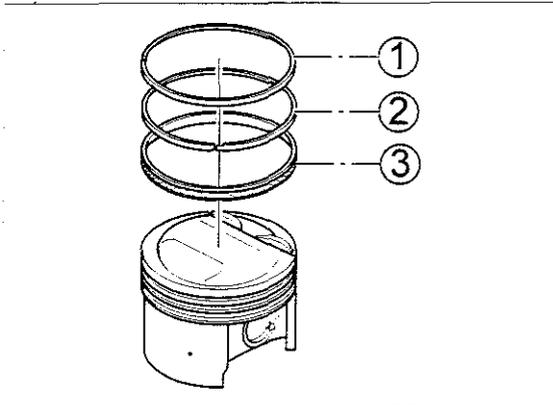
Installation



Note:

Piston rings are brittle and break easily. Slide them on carefully, preferably using a typical installation tool! The piston and piston rings must not be damaged.

The gaps of the piston rings must be positioned 120° apart.



1. Install the oil wiping ring (3) with spring and wire ring.
2. Install the tapered compression ring (2).
Install the tapered compression ring such that the "O" designation faces upwards (toward the piston head/valves).
3. Install the rectangular ring (1).

The piston rings must sit loosely on the piston.

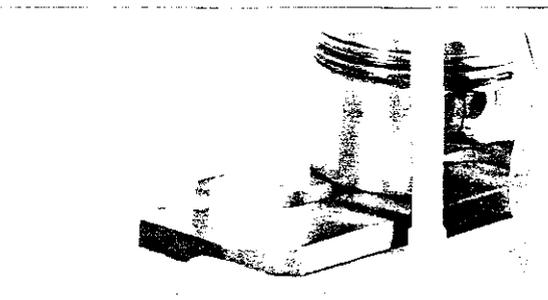
6.9.4 Installation



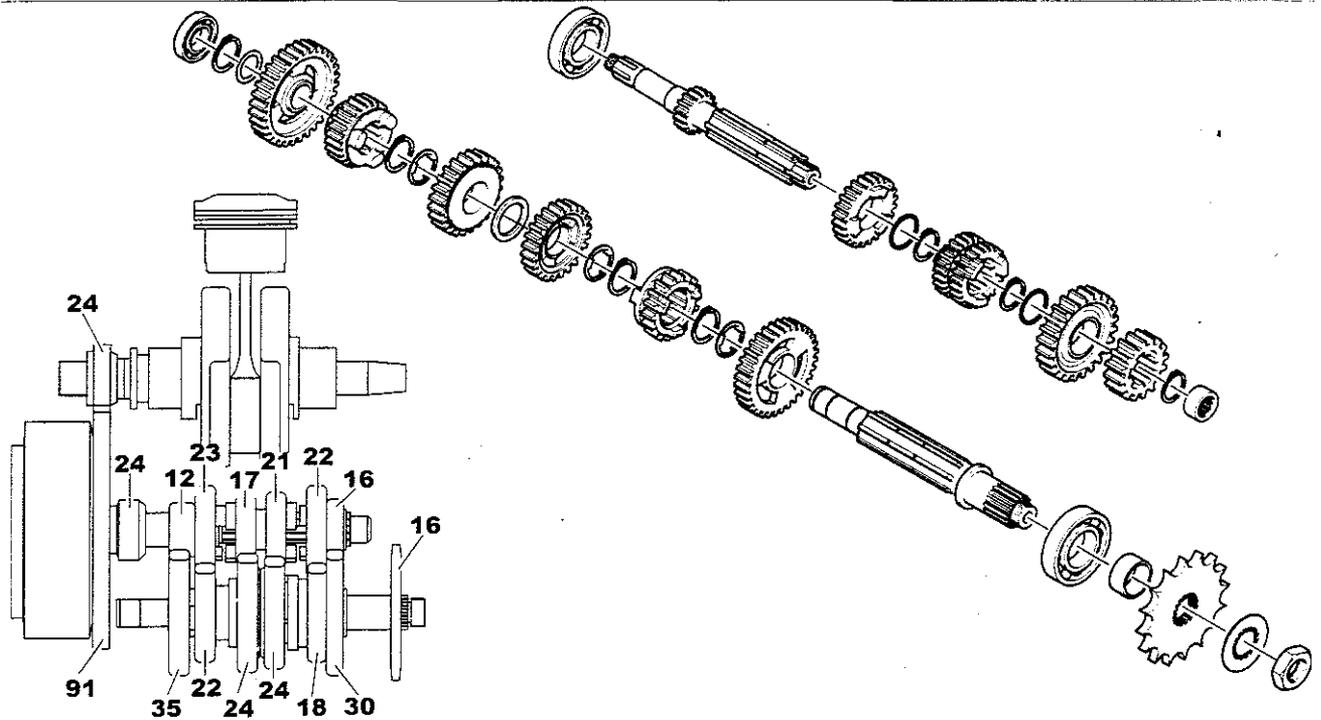
Attention!

A new head seal and a new base seal must be used after every removal of the cylinder.

1. Slide the sleeves onto the right stud bolts.
2. Position the new cylinder base seal.
Always use a new cylinder base seal.
3. Cover the crankshaft well with cleaning paper.
4. Lubricate the piston pin, slide it through the piston and connecting rod eye.
5. Snap the wire retaining ring for the piston pin into the ring groove with the opening facing down.
6. Lubricate the piston running surface of the measured cylinder.
7. Slide the piston installation plate (ST) between the housing and piston skirt such that the piston stands at a right angle to the cylinder.
This makes installation easier.
8. Carefully slide the cylinder over the piston and set it flat.
Risk of piston ring breakage!



6.10 Transmission

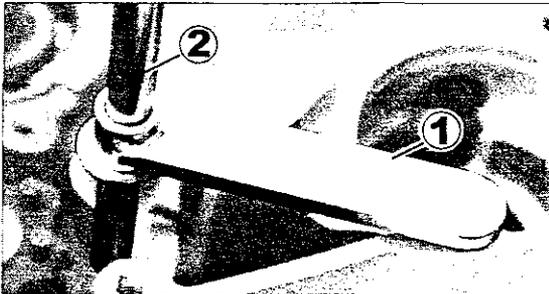


6.10.1 Removal

The index lever catches in the star wheel.

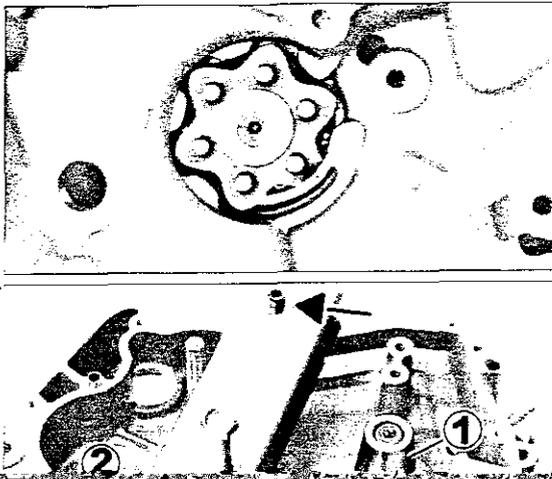
If it does not need to be removed upon separation of the crankcase halves, it must be locked in place using the ST index lever counter lock.

1. Insert the pin of the lever (1) of the ST into a hole in the housing half.
2. Press back the index lever with the pin (2) of the ST and affix it tightly to the housing ledge next to the star wheel.



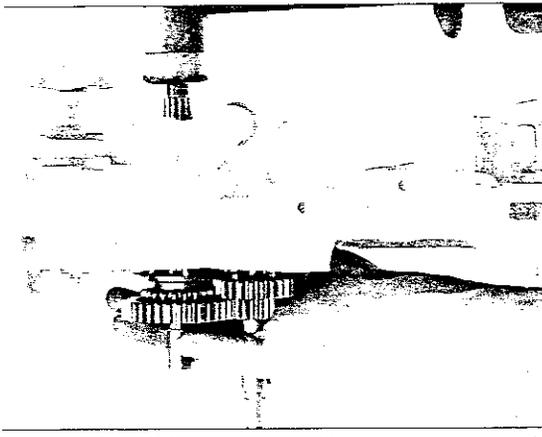
If the index lever counter lock ST is not used:

1. Unscrew the M6 pin (3), remove the index lever (4) and torsion spring (5).
2. Remove pinion and sleeve.
3. Completely remove the alternator cover.
4. Remove the sensor and stator.
5. Remove the curved washer.
6. Turn the crankshaft locking bolt back 10 turns so that the crankshaft turns freely.
7. Unscrew the 11 screws from the housing.

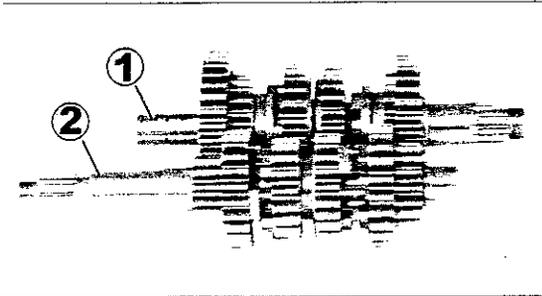


8. Bring the star wheel into idling position, such that it does not touch the crankcase halves when they are separated. In any other position, the star wheel does not fit through the housing opening, the gears may jam.

9. Slide the protective sleeve ST (1) onto the tail shaft.
10. Screw the housing separation tool ST (2) onto the right half of the housing using the 2 longer cylinder screws of the alternator cover. The tool must be positioned parallel to the housing. If necessary, loosen a screw somewhat to align the tool.



16. Remove the transmission from the left housing half with light taps on the drive shaft.



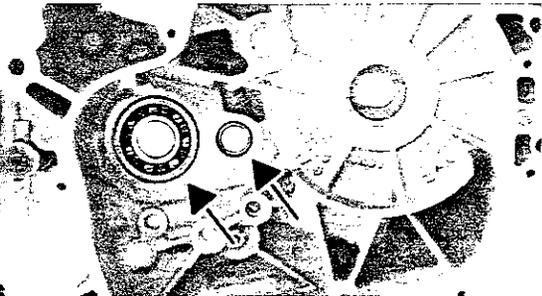
The driven shaft (1) and drive shaft (2) can be further dismantled.

17. Remove the locking rings, washers and spacer washers, pull of the gear wheels.

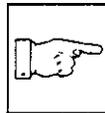


Risk of burns!

Only touch heated housing halves with suitable protection gloves.



The ball bearing, needle bearing and shaft seal rings can now also be replaced.
To do this, heat the housing halves evenly to 100 °C (212 °F), for instance with a heating plate.



Note:

The needle bearing of the clutch shaft must be removed to dismantle the sliding bearing of the clutch activation shaft.

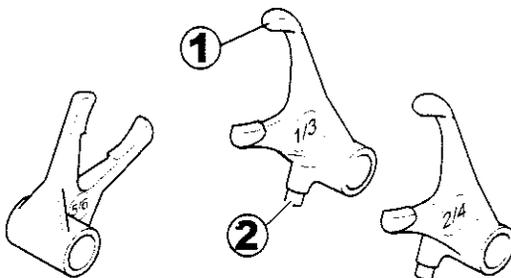
6.10.2 Inspection

Selector Forks:

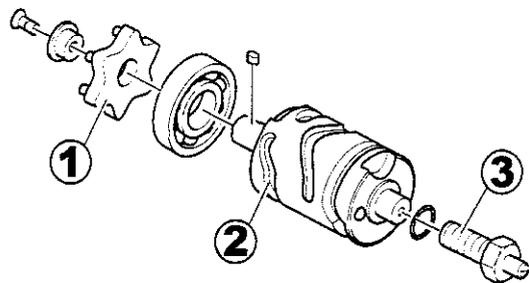
Inspect every selector fork for pit formation on the control gear and dog pins.

Measure:

- (1) Control gear guide, width 5 mm, minimum 4.85 mm
- (2) Dog pin, Ø 7 mm, minimum 6.8 mm oval

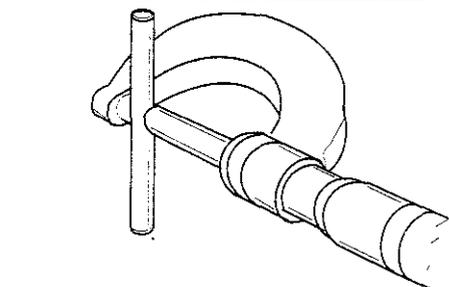


Test the movement of the selector fork shaft in the selector fork. If it is stiff, replace the selector fork and/or the selector fork shaft.



Camshaft controller:

Inspect the tight seat of the star wheel.
 Check the control cam grooves for wear.
 Inspect the idling switch and flat seal ring for wear and proper functioning.



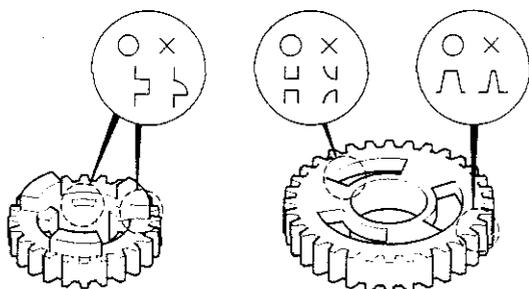
Selector fork shafts:

Measure the thickness of the selector fork shaft.
 Wear limit: 9.95 mm

Roll the selector fork shaft over a flat surface (such as a surface plate), maximum warping 0.05 mm.
 Replace the selector fork shaft if deformed.

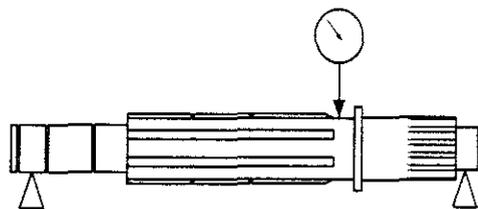


Attention!
 Never attempt to straighten the selector fork shafts.



Gear wheels:

Inspect every gear wheel for wear and damage, look for indications of heat damage (blue discoloration).
 Every control gear must slide easily along its shaft.
 Check the grip of each gear into its opposite gear. Inspect the teeth of the transmission gear wheels for pit formation and wear, replace if necessary.
 Inspect the shifting claws and apertures for rounded edges, cracks and missing parts, replace if necessary.
 O = OK; X = worn = replace.



Driven and drive shaft:

Measure eccentricity:
 Drive shaft: max. 0.05 mm
 Drive shaft: max. 0.05 mm

The shafts cannot be aligned. They must be replaced.

6.10.3 Crankshaft and Balance Shaft

Inspection

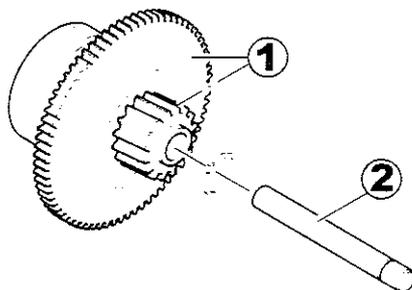
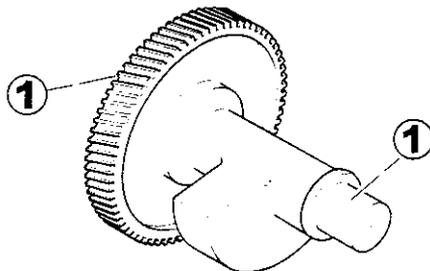
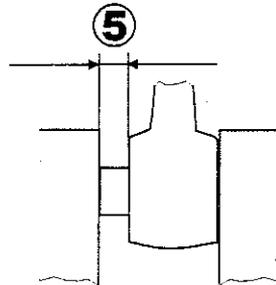
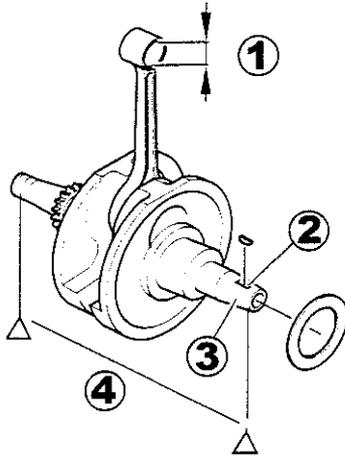
Crankshaft:

- (1) Measure the radial clearance on the connecting rod eye.
Max. diameter of the connecting rod eye \varnothing 15.035 mm

Apply a light film of oil to the piston pins,
insert into the connecting rod eye and measure clearance.
Max. clearance: 0.050 mm

- (2) Inspect the grooves for the curved washers.
- (3) Inspect the cone surface for wear and damage.
- (4) Inspect curvature.
Max. clearance: 0.03 mm

- (5) Measure the axial clearance of the connecting rod eye.
max. clearance: 0.5 mm



Balance shaft:

Inspect the bearing (1) and shaft for wear and proper curvature.

Shock absorber:

- (1) Inspect the teeth for wear and damage.
- (2) Check the roundness of the shaft.

Adjusting the clearance between the engine housing and crankshaft or balance shaft

After replacing the crankshaft and balance shaft and/or the housing, the clearance between the crank and balance shafts must be adjusted.

Clearance: 0.08 - 0.13 mm

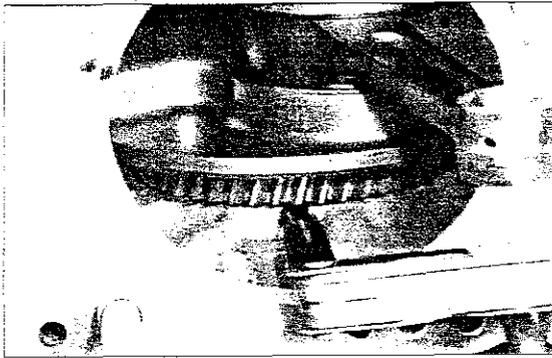
This adjustment is made using thrust washers.

The difference in thickness between the washers may not be greater than 0.1 mm on the left and right.

Do not use any washers of less than 0.8mm.

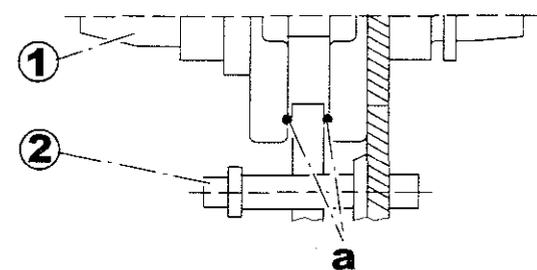
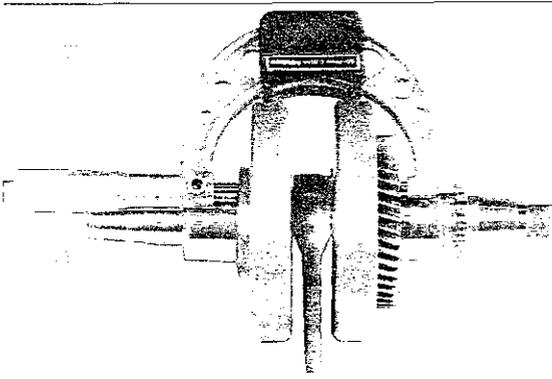
1. Option:

1. Screw the housing onto the crankshaft or balance shaft without transmission.
2. Slide the shafts to one side, turn multiple times and measure the clearance between the crankshaft and housing.



2. Option:

1. Measure the housing clearance near the crankshaft bearing using a depth indicator.
2. Measure the width of the crankshaft cheeks (e.g. with a micrometer):
3. Housing clearance minus crankshaft cheek width = clearance.



There must be a distance of at least (a) = 0.85 mm on both sides between the eccentric discs of the crankshaft (1) and the balance shaft (2).

6.10.4 Intake Manifold**Removal**

1. Unscrew the 2 cylinder screws.
2. Remove the intake manifold and seal.



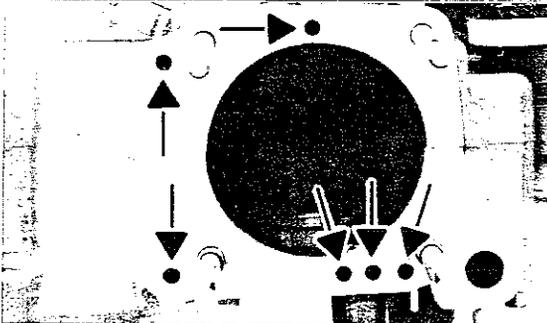
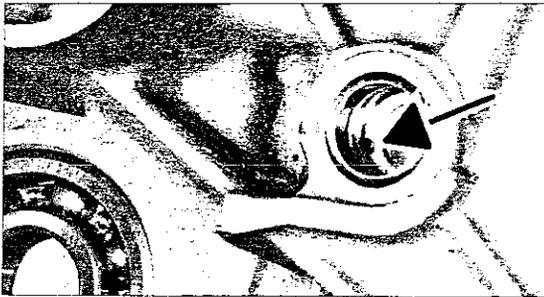
6.11 Engine Installation and Adjustment



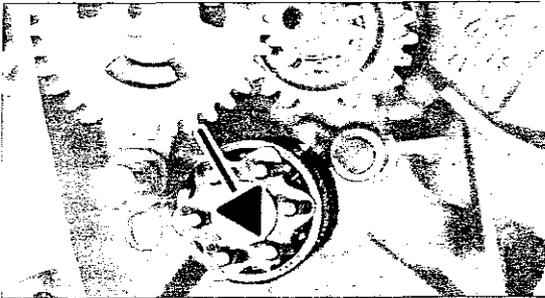
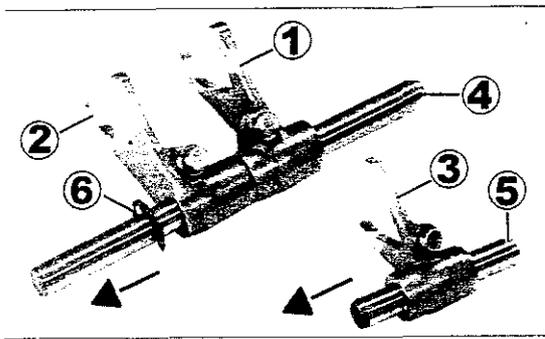
Attention!

When installing the engine, the following parts must be replaced:

- O-rings
- Seals
- Locking washers
- Retaining rings



1. Use an oil stone to clean sealing material residue from the sealing surfaces.
Do not use a sealing material remover.
2. Clean all parts thoroughly.
3. Thoroughly clean the oil channel of the balance shaft in the housing.
4. Insert the crankshaft.
5. Do not forget the washer on the left side of the crankshaft when replacing the seal ring.
6. Clean oil channels.
7. Install the idling switch.
8. Install the transmission.
9. The transmission shaft must rest against the inner bearing rings.
Tap down using a plastic hammer, if necessary.



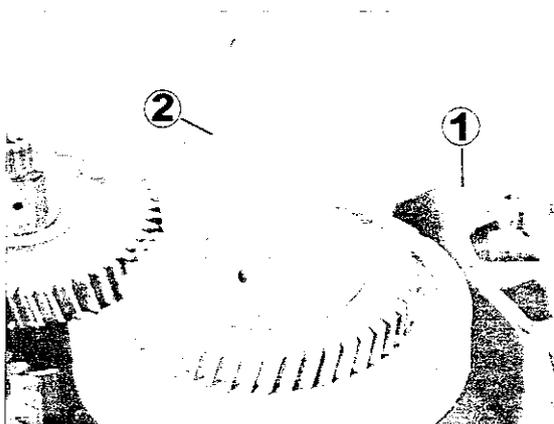
10. Clean oil away from the holes for the guide pins in the housing.
11. Insert the selector fork into the guide path of the control gears:
 - Selector fork 2/4 (1) in drive shaft, (designation 033 toward observer).
 - Selector fork 1/3 (2) in drive shaft, (designation 034 toward observer) and
 - Selector fork 5/6 (3) with pin in drive shaft, (designation 031 toward observer).
12. Install the camshaft controller and insert the selector fork into the camshaft controller.
13. Slide the guide pins into the guides (4) + (5).
 - Locking washer (6) toward observer.
 - Phase of the pin (5) toward observer.
14. Turn the camshaft controller to the "idle" position. Take note of the following:

15. Lubricate sliding bearing.
16. Install the crankshaft and balance shaft such that the gear wheels interlock at the points.

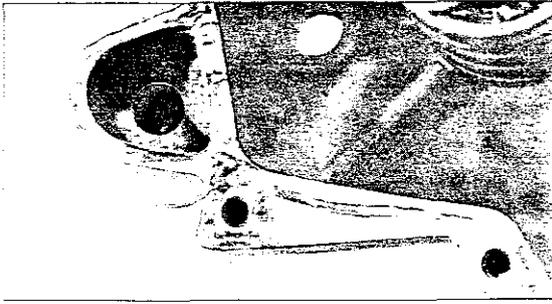


Attention!

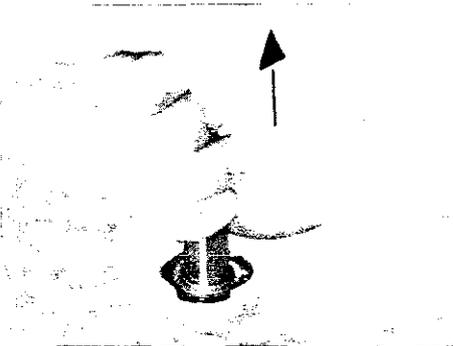
The protective sleeve protects the crankshaft sliding bearing. If it is not used, the sliding bearing may be destroyed!



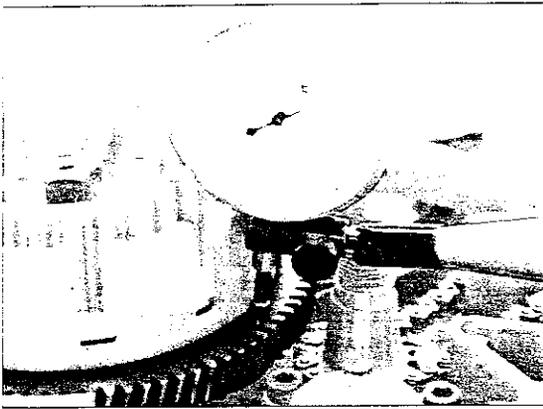
17. Slide the protective sleeve (2) onto the right tail shaft.
18. Apply the Loctite 518 sealant thinly but evenly to the seal surfaces (1) of the left half of the housing.



Also spread the sealant around the holes for the bolts.
The sealant only hardens when a surface is pressed on.

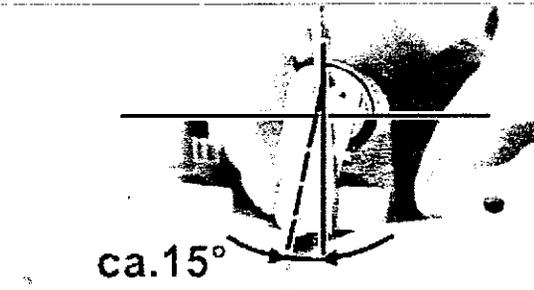
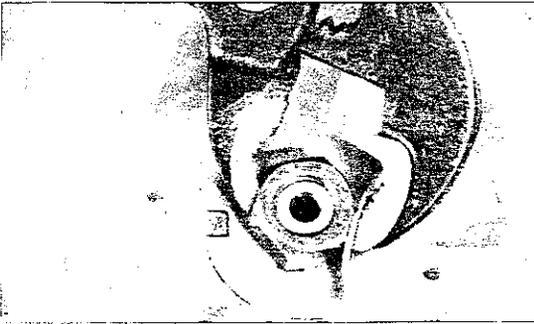


19. Place the housing on.
20. Inspect the freedom of motion and gears.
21. Position the right half of the housing, screw on the housing with the 11 screws, tightening in a crosswise manner.
22. Use brake cleaner and cleaning paper to remove the sealant forced out.
23. If necessary, install the index lever and lock in the camshaft controller at idle.
24. Install the screw plug with screen and the oil drain plug. Use new seals.
25. If the gears do not turn easily, pull the crankshaft free by hand.
26. Lightly oil the selector shaft and install.
27. Connect the selector shaft to the camshaft controller and switch through the gears.
In doing so, turn the clutch and driven shafts against each other so that the gears can snap together.
28. Place the transmission in neutral after checking the gears.
29. Lock the crankshaft at the top dead point using the crankshaft locking bolt (ST).
30. Mount the timing chain, install the guide rail and tension rail. Apply screw locking agent to the threading at medium tightness.
31. Connect the inspected and/or new starter free wheel to the balance shaft.
32. Apply screw locking agent at medium tightness, fasten the free wheel with washer and bolt.
Observe the specified torque!
33. Install the water pump with new O-rings.
Use new micro encapsulated screws or screws with screw locking agent.
34. Install the oil pump.
Use new micro encapsulated screws or screws with screw locking agent.
35. Slide the thrust washer onto the clutch shaft.
36. Install the clutch basket, slide on the washer.
37. Install the dog, slide on the washer.
38. Insert special clutch tool, tighten nut.
39. Hold the clutch by hand to prevent turning, remove the special tool.



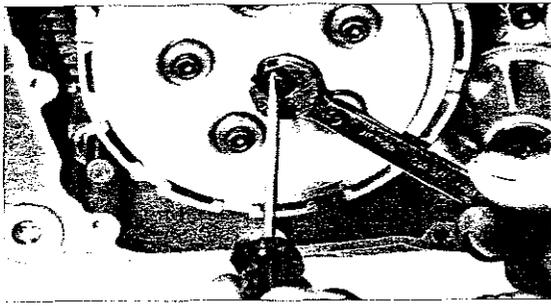
40. Place a dial gauge or depth indicator on the gear rim of the clutch and determine the axial clearance.
Clearance: 0.05 - 0.15 mm
41. Re-insert the special clutch tool, remove the clutch basket, washer and dog.
42. Adjust the axial clearance of the clutch basket using thrust washers of the required thickness.
The thrust washers are placed under the clutch basket.

43. Lightly lubricate the clutch shaft, install with shock absorber.
44. Install the clutch basket.
45. Install the washer for the clutch.
46. Install the clutch dog.
47. Install the washer for the clutch, position a new locking plate.
48. Insert special clutch tool, tighten nut.
49. Degrease the cone in the primary chain wheel with brake cleaner. The engine must be in a vertical installation position to prevent the brake cleaner from rinsing out the oil in the sliding bearing.
50. Position the drive gear for the pumps, tighten the left-hand threaded nut.
Observe the specified torque.
51. Tighten the nut for the clutch (observe the proper torque), turn the locking plate.
52. Insert one clutch pressure rod into the clutch shaft, then the ball and the second pressure rod.
53. Remove the special clutch tool, test the easy turning of the clutch dog.
54. Insert the disc spring.
The inner circumference lies on the dog, the outer circumference points to the plate packet.
55. Starting with an inner plate, insert 6 inner and 6 lining plates in alternation.
56. Loosen the lock nut of the adjusting screw, snap the pressure plate with gear onto the clutch packet.
57. Install the springs with screws and washers. Tighten in crosswise manner.

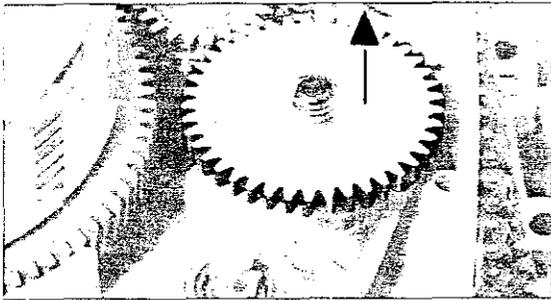


Basic clutch adjustment:

Screw in the adjusting screw until the lever of the clutch activation shaft is pressed approx. 15° to the rear.



58. Lock the adjusting screw with the locking nut.
This completes the basic clutch adjustment.

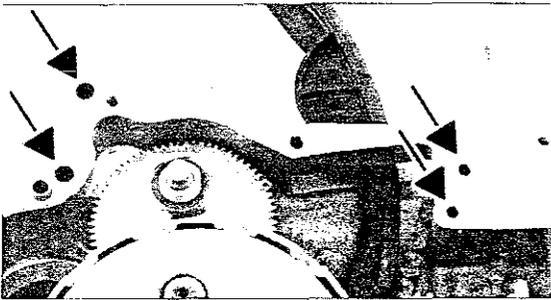


59. Insert the dowel pins into the pump shafts and mount the pump drive wheels.
60. Open the primary drive again (left-hand threaded nut), if necessary, to simplify the installation.
61. The shaft of the oil pump must be lifted so that the 3 washers and locking washer can be installed.
62. Install the ball, oil pressure adapter and spring.



Attention!

The seal must not change the cross-section of the supply and drainage openings for the oil filter and engine ventilation.



63. Position the new crankcase cover seal.

64. Position the crankcase cover, screw on with 14 cylinder screws.
65. Install the oil filter (see 6.2.4 "Oil Filter").
66. Install the cylinder with new base seal.
67. Screw in the chain adjuster, tension the timing chain.
68. Install valve cap.
69. Install the complete cylinder head with new head seal.
70. Install the engine into the chassis.

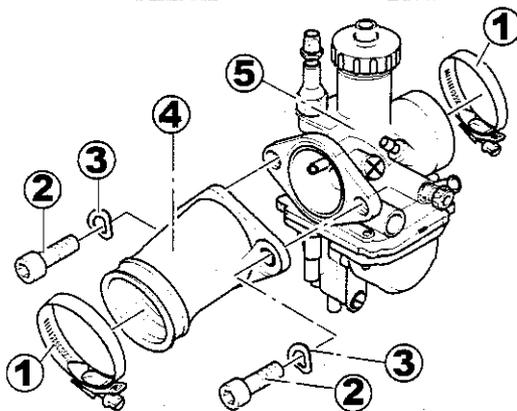
6.12 Carburettor



Risk of fire and explosion!

Fuel is a flammable liquid of hazard class A1 and therefore an extreme fire risk. Fuel fumes are highly explosive.

Exercise extreme care when working with fuel and other easily flammable substances. Only work with the engine switched off and in well-ventilated areas. Do not smoke, keep flames and sparks away from the entire work area. Safely remove drained or leaked flammable liquids away from the work area.



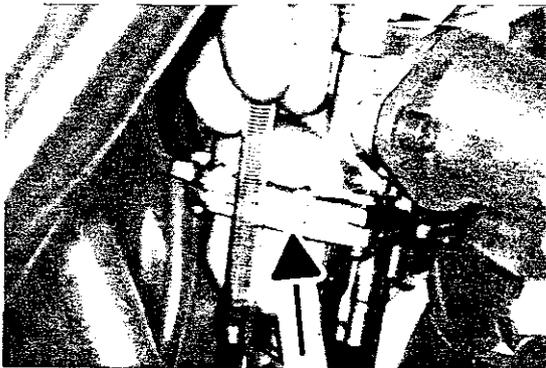
- (1) Shell
- (2) Cylinder screw
- (3) Spring washer
- (4) Carburettor connection piece
- (5) Carburettor

The carburettor must be free of wear and contamination for the engine to function properly. Contamination in the carburettor and the fuel system must be removed before adjustments are made to the carburettor.

6.12.1 Adjustment

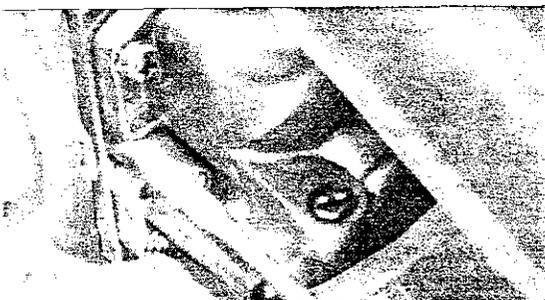
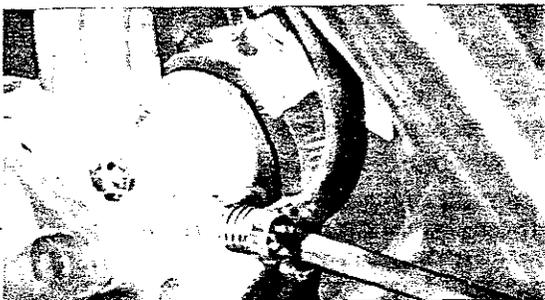
Fuel level

Proper functioning of the carburettor is only guaranteed when the specified fuel level is maintained. The fuel level depends on how the float is set.



1. Position the vehicle upright on the installation stand. The carburettor must be positioned vertically.
2. Attach a fuel gauge to the drainage hose.
3. Open the filter valve, open the drainage plug and start the engine.
4. Hold the fuel gauge vertical next to the carburettor. Fill the carburettor and hose up to the same level. The fuel level must be at the level of the housing joint.
5. Read the fuel level, adjust by bending the bracket on the float support plate, if necessary (see 6.12.3 "Dismantling and Inspecting", float).

Fuel level: 6 mm under the housing joint.



Idling speed

The nominal idling speed should be 1800^{+100} rpm.

The slide valve stop screw acts on the throttle slide valve to prevent it from closing completely.

1. Start the engine and bring it to operating temperature.
2. Screw the slider valve stop screw in or out until the nominal idling speed is reached.

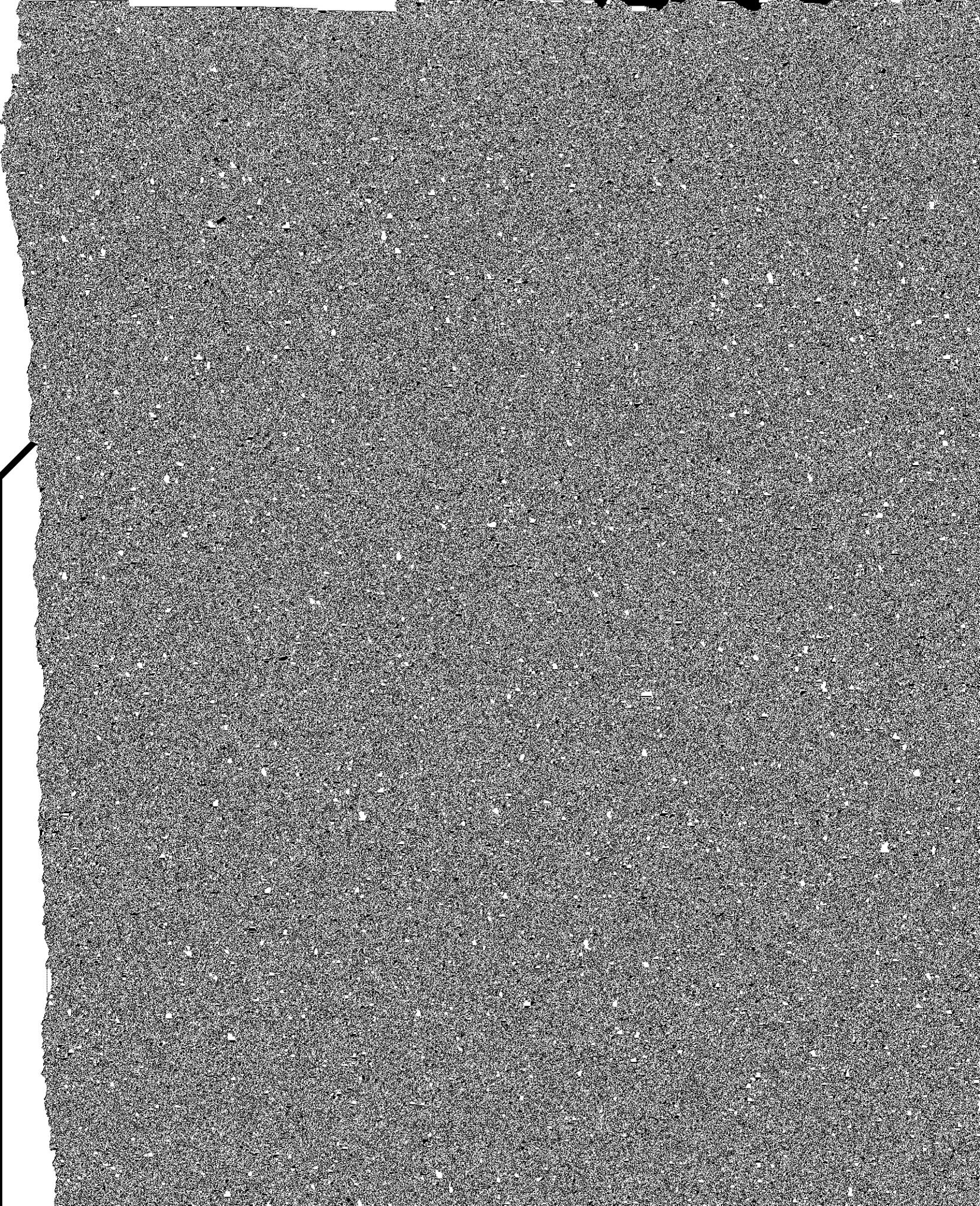
Idle

Without exhaust measurement:

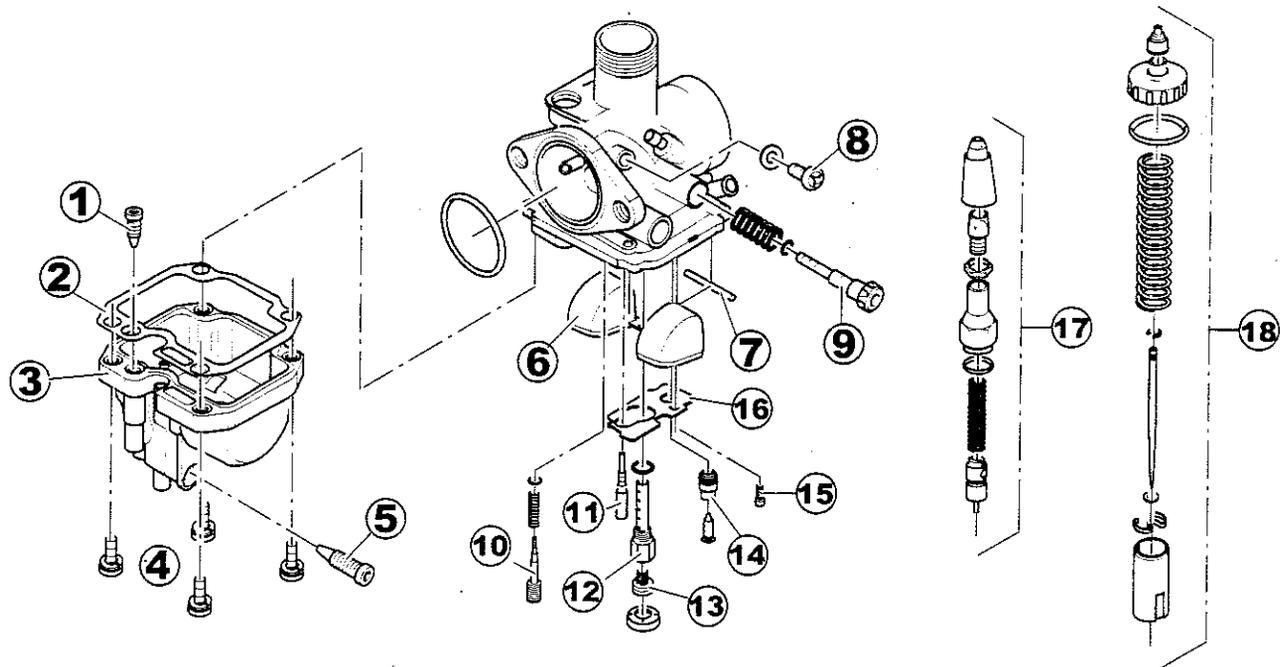
1. Screw in the idling mixture screw up to the stop.
2. Then unscrew it 1.5 -2 turns.
3. Turn the slide valve stop screw until 1800^{+10} rpm is reached.
4. Repeat this alternating procedure until the engine runs properly.

With exhaust measurement:

1. Run the engine until it reaches operating temperature.
2. Connect the exhaust measurement device according to the manufacturer's operating instructions.
If the depth of the measurement probe is insufficient, connect an adapter to the exhaust silencer end which ensures the proper depth.
3. Turn the idling mixture screw until the engine runs properly, in compliance with a maximum CO emission of 4.5 %.
4. Set the idling speed to 1800^{+10} rpm.

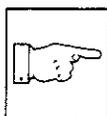


6.12.3 Dismantling and Inspecting



- (1) Starting jet
- (2) Seal, float chamber
- (3) Float chamber
- (4) Screws
- (5) Screw
- (6) Float
- (7) Pin
- (8) Screw with seal ring
- (9) Slide valve stop screw
- (10) Idling mixture screw
- (11) Idling jet
- (12) Main jet mount with needle jet
- (13) Main jet
- (14) Carburettor needle valve
- (15) Plate screw
- (16) Plate
- (17) Starting carburettor, complete
- (18) Throttle slide valve, complete

Removal



Note:

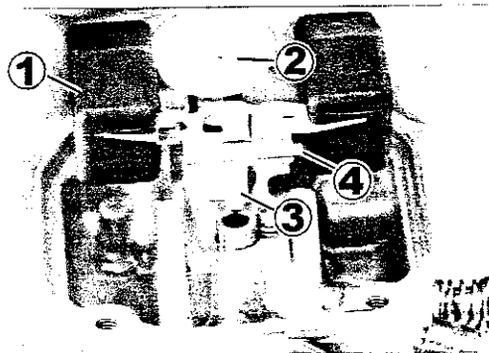
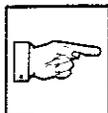
Never clean the jets with hard objects. Changes to the jet cross-section increase fuel consumption. Use a petroleum-based solvent for cleaning. Blow through all channels with compressed air.

1. Thoroughly clean the carburettor.
2. Unscrew the 4 screws on the underside.
3. Remove the top part of the housing.
4. Remove all components, clean thoroughly and inspect.

Float

Note:

Never apply compressed air while the float is still in the float chamber.

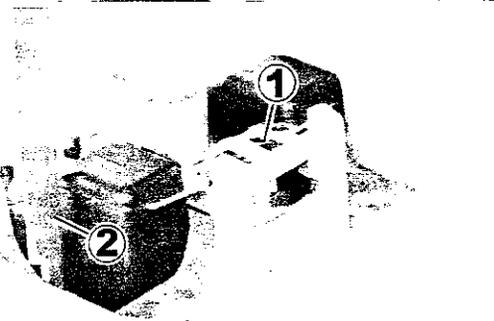


- (1) Float
- (2) Main jet with mount
- (3) carburettor needle valve
- (4) Pin



1. Pull out pin.
2. Remove the float and carburettor needle valve.
3. Inspect parts.

Always replace the carburettor needle valve and the valve seat as a set.



4. Attach the needle valve to the bracket on the float mounting plate (1).
5. Install the float, slide in the pin. The float mounting plate should touch the needle valve but not press it down.
6. Measure the distance between the parting joint of the carburettor housing and the upper edge of the float, adjust if necessary (2).

Distance: 20^{+1} mm

If the float height does not match the specified value, inspect the needle valve and valve seat, replacing if necessary.

If both parts are in good condition, bend the bracket of the float mounting plate until the value is set correctly.

Starting jet

Inspect for wear and contamination.
Clean if necessary.

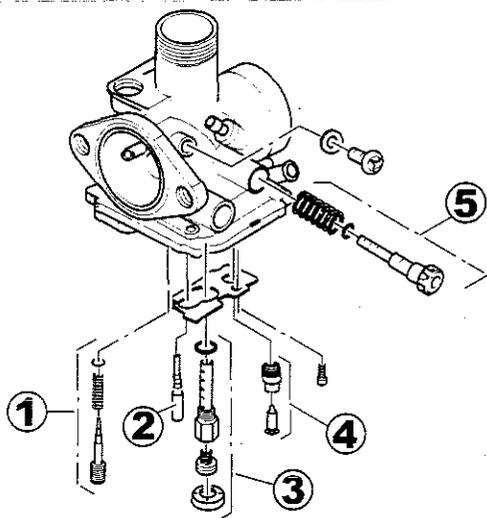
Carburettor needle valve

Inspect for wear and contamination.
Inspect rubber ring.


6.12.4 Installation

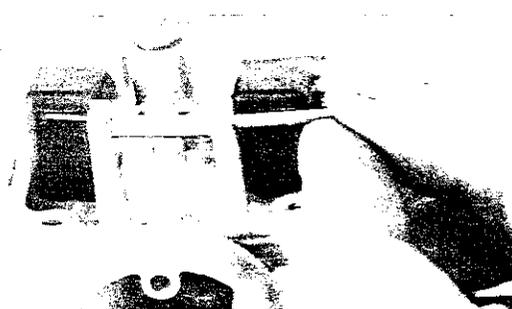
Always use new seals.

1. Insert the plate (1) and screw on with the screw (2).
2. Screw in all jets.



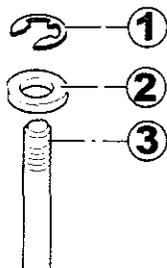
- (1) Idling mixture screw
- (2) Idling jet
- (3) Main jet with jet mount
- (4) Carburettor needle valve
- (5) Slide valve stop screw

3. Screw the starting jet into the float chamber.



4. Insert the float, slide the pin through the mount.
5. Measure the distance from the float to the edge of the housing, adjust if necessary.
6. Screw the two housing halves together.

7. Assemble the injector needle.

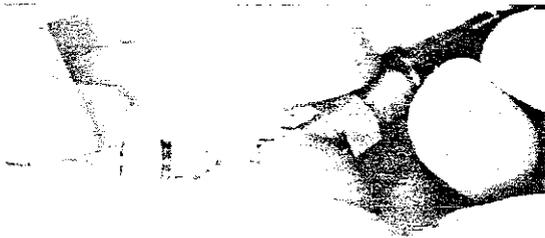
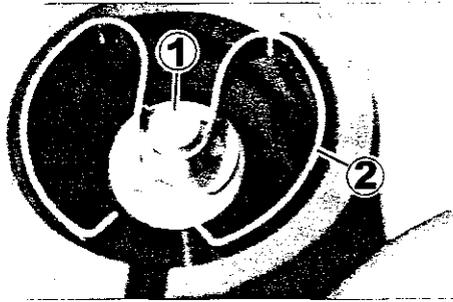


- (1) Locking washer
- (2) Seal
- (3) Injector needle

The injector needle normally hangs in the 3rd (middle) notch.

Other settings:

- Injector needle hung deeper (1st - 3rd notch):
Mixture lower in fuel
- Injector needle hung higher (5th notch):
Mixture richer in fuel



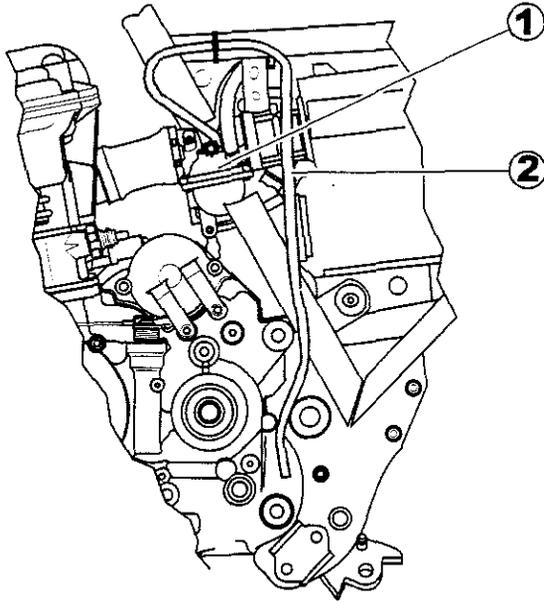
8. Insert the injector needle (1) into the throttle slide valve. insert the E-ring (2).
9. Install the carburettor.

10. Pull the end of the throttle bowden cable out as far as possible.
11. Press the spring back toward the sealing cap and hold it there.
12. Attach the end of the throttle bowden cable to the throttle slide valve.
13. Insert the throttle slide valve into the carburettor, screw on the sealing cap.
14. Inspect the O-ring under the starting carburettor housing. replace if necessary.
15. Compress the spring of the starting carburettor, connect the starter bowden cable to the starter piston.
16. Install the starting carburettor in the carburettor.
17. Inspect the fuel level.

18. Connect the overflow and ventilation hoses.
19. Adjust the play in throttle bowden cable.
20. Adjust the play in the starting carburettor bowden cable.
21. Functional test with adjustment of the idling and the idling speed (see 6.12.1 "Adjustment").

Ventilation hose

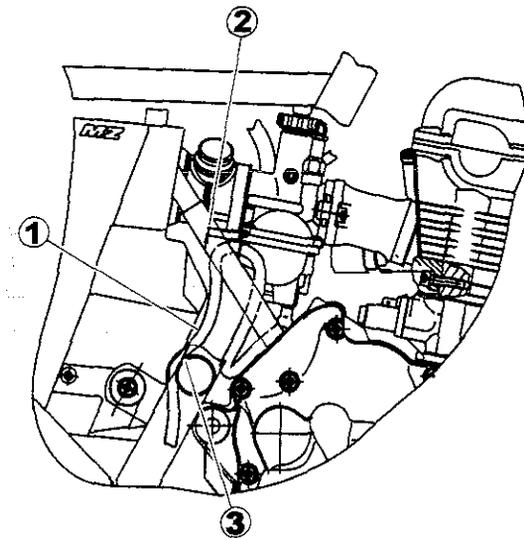
- (1) Carburettor
- (2) Ventilation hose



The ventilation hose must be run as shown in the sketch. It may not be pinched. The end must not extend past the underside of the engine.

Overflow hose

The overflow hose must be run as shown in the sketch. It may not be pinched, the end must not extend past the underside of the engine.



- (1) Carburettor overflow hose
- (2) The top of the hose should not be above the lower edge of the carburettor parting joint near the hose clamp.
- (3) Overflow hose clamped between the frame pipe and intake muffler.

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