TOMBERLIN™

USA

Repair Instructions

Edition December 2005

Tomberlin Outdoor

MadAss 50

PREFACE

This repair manual serves as guideline for professional repair activities.
See the illustrated spare-parts catalog for further assistance.

All figures, dimensions and descriptions correspond to the state of the version concerned. All changes are reserved in the interest of further development of the construction models.

See also the "technical information", which provides data about technical changes implemented after this repair manual was sent to the printer .

The technical information is intended for master mechanics, since its careful and constant observation is a requisite for preserving the operability of the individual assemblies of the motorcycle.

Apart from such information, the usual basic safety rules that apply to the repair of motorcycles must be observed.

Use the tools provided for in the "Motor" section.
The use of unsuitable tools may adversely affect engine operability.

This manual is provided only for internal use within the Tomberlin organization.
It may not be reproduced or made available to third parties.

Use only original MadAss spare parts.

TECHNICAL DATA

Engine type	FY139FMB
Construction	One cylinder 4-stroke petrol engine
Valve steering	1 overhead cam with rocker arms
Valve	2 valve
Valve clearance, cold	intake + exhaust 0.05 mm - 0.08 mm
Pistion displacement	49,5 cm^3
Bore	ø 39 mm
Stroke	41,4 mm
Compression ratio	10:1
Lubrication system	forced oil lubrication
Cooling	air cooled
Maximum net power output	2,0 kW at 7.000 rpm
Maximum net torque	3,2 Nm at 4.300 rpm
Air-filter	paper air-filter
Type of starter	electric starter / kick starter
Ignition system	transistorized ignition system with electronic ignition control (CDI)
Ignition timing	15 ° before TDC at 2.000 rpm / 30 ° before TDC at 3.500 rpm
Pickup coil resistance	110-130 Ohm (bl/w-ground)
Ignition coils resistance	Primary 550-570 Ohm
Spark plug	NGK CR7 HSA electrode gap 0,6- 0,8 mm
Carburetor	Mikuni type VM 12 101 6
Main jet #	47,5
Idle jet	15
Jet needle setting groove	3 rd from top
Mixture regulation screw	Initial opening 2 turns out
Idle speed	1.800 +/- 200 rpm
Float level	13 mm - 1 mm
Throttle cable free play	1,0 - 2,0 mm
Power transmission	
Clutch	Wet multi-plate type
Gear box	4-seed constant mesh, foot operated
Gear ratios	1. gear = 36/11 (3,273)
	2. gear = 31/16 (1,938)
	3. gear = 27/20 (1,350)
	4. gear = 24/23 (1,044)
Primary transmission ratio	4,059
Chain pinion	11 teeth
Sprocket	53 teeth
Drive chain	420, 116 links

TECHNICAL DATA

Chassis	
Motorbike version:	Type 649
Frame:	Center-type frame made of tubular steel
Front suspension:	Telescopic fork ø 37 mm , hydraulic shock absorption, travel 100 mm
Rear suspension:	Mono shock absorber, travel 65 mm
Wheels:	Light metal (Alu) Front rim size: = 1,85 x 16" Rear rim size: = 2,50 x 16"
Tires:	Front = 90/90-16 48J Rear = 120/80-16 60J
Tire pressure solo driver Tire pressure with pillion driver	Front = 29 rear = 36 psi Front = 32 rear = 39 psi
Brakes, front Minumim lining thickness	Disc brake ø 260 mm, hydraulic two piston floating caliper 2,5 mm
Brakes, rear Minumim lining thickness	Disc brake ø 215 mm, mechanical two piston caliper 1,5 mm
Lubricants and operating fluids	
Fuel tank capacity	1,22 gal, including 0,09 gal reserve
Fuel	Unleaded fuel min. 91 octane
Telescopic-fork oil	Viscosity SAE 10 W
Filling quantity per fork tube	180 cm^3
Engine oil Filling quantity	SAE 15 W 40 mineral oil API (SG or higher) 0,8 litres
Brake fluid	DOT 4
Electrical Equipment	
Generator	12 V 120 W
Charging coil resistance	0,6-0,9 Ohm
Regulator voltage	13,0-14,0 V
Battery	12 V 6 Ah MF
Fuse:	15 A
Lights - Headlight - Position light - Instrument lights - Brake/rear light: - Turn signal light	 Low beam 2x 12V 55W 12 V 5W Direction-indicator 12V 3W Change over gear 12 V 3W Cockpit 12 V 3W 12 V 21/5W 12V 21W
Dimensions and weights	
Overall length:	1830 mm
Width across handlebars without rear view mirror	780 mm
Maximum height	1010 mm without rear view mirror
Wheel base	1235 mm
Seat height	865 mm
Weight empty	85 kg
Weight in running order	89,5 kg
Max. transport weight allowed	190,5 kg
Max. permitted total weight	280 kg

SERVICE DATA

Tightening torques for inspection plan	**Nm**
Engine	
Cylinder head nuts and bolts	10-12
Cam chain tension adjuster bolt	25–28
Crankcase cover bolts	10-12
Manifold bolts	10-12
Clutch lock nut	40-45
Generator rotor nut	40-45
Engine oil drain plug	22-25
Valve cover lock	10-12
Chassis	
Rear-wheel axle nut	50-60
Front-wheel axle nut	45-55
Swing axle nut	45-55
Disc brake screws	12-14
Front brake calliper bolts	60-65
Rear brake calliper bolts	30-35
Handle bar holder bolt upper	22-25
Rear shock mounting bolts	38-42
Exhaust pipe mounting nuts	10-12
Engine mounting bolt upper / below	33-35
Sprocket bolts	12-14
Headlight fastening	10-12

SERVICE DATA

Spare parts for inspection plan

part no	Description	Q'ty	1.000 km	4.000 km	8.000 km	12.000 km
43235-FYBQ-300	Brake pad (rear)	2		X	X	X
46630-FYBQ-000	Brake pad (front)	2		X	X	X
17220-FYBQ-000	Core cleaner	1		X	X	X
17223-FYBQ-000	Gasket air cleaner	1		X	X	X
90701-30003-002	O-gasket valve cover	2	X	X	X	X
90701-13002-000	O-gasket cover side hole upper	1	X	X	X	X
90701-27002-000	O-gasket cover side hole	1	X	X	X	X
30700-FYBF-000	Spark plug	1			X	
90301-12020-15AL0	Gasket drain plug	1	X	X	X	X
	Engine oil SAE 10W40	1	0,8 Liter	0,8 Liter	0,8 Liter	0,8 Liter
23682-FYBF-000	Sprocket 11 T	1	Replace if necessary			
GB894.1-86-17001	Spline gear driven	1	Replace if necessary			
41201-FYBQ-000	Sprocket 420/53 gear driven	1	Replace if necessary			
GB1243.1-83-06B112	Chain 420-112B	1	Replace if necessary			
42711-FYBQ-000	Tire 120/80-16 (rear)	1	Replace if necessary			
44711-FYBQ-000	Tire 90/90-16 (front)	1	Replace if necessary			
42712-FYBQ-000	Tube (rear)	1	Replace if necessary			
44712-FYBQ-000	Tube (front)	1	Replace if necessary			

SERVICE DATA

Inspection plan						
I = Inspection, retighten, adjust, replace if necessary, or grease **W = Change** **R = Clean** **S = Grease**						
	Maintenance Kilometers	**Delivery**	**1.000**	**4.000**	**8.000**	**12.000**
	Months	**NEW**	**1**	**4**	**8**	**12**
Component Assembly	**Servicing Tasks**					
Valves	Check and adjust valves if necessary	**I**	**I**	**I**	**I**	**I**
Spark plug	Check condition and accordingly clean or replace	**I**	**I**	**I**	**W**	**I**
Air filter	Clean filter and housing		**R**	**R**	**R**	**R**
	Replace paper filter		**I**	**W**	**W**	**W**
Carburetor	Check and adjust idle and cold start	**I**	**I**	**I**	**I**	**I**
	Throttle cable	**I**	**I**	**I**	**I**	**I**
Fuel filter	Clean (petcock)		**R**	**R**	**R**	**R**
Fuel hoses	change at least every 4 years		**I**	**I**	**I**	**I**
Engine oil	Change (operating temperature)	**I**	**W**	**W**	**W**	**W**
Exhaust system	Check for leads and repair if necessary	**I**	**I**	**I**	**I**	**I**
Brakes	Check brake function and brake fluid	**I**	**I**	**I**	**I**	**I**
	Check and replace brake pads	**I**	**I**	**W**	**W**	**W**
	Adjust rear brake	**I**	**I**	**I**	**I**	**I**
Brake fluid	Change	**change every 2 years**				
Brake hoses	Check and renew min. every 4 years	**I**	**I**	**I**	**I**	**I**
Clutch	Check and adjust	**I**	**I**	**I**	**I**	**I**
Rear suspension	Check, retighten, replace if necessary	**I**	**I**	**I**	**I**	**I**
Tires	Check general condition and profile depth and replace as necessary	**I**	**I**	**I**	**I**	**I**
	Check air pressure	**I**	**I**	**I**	**I**	**I**
Wheels	Check for damage, balance	**I**	**I**	**I**	**I**	**I**
Stearing and bearings	Check and adjust free play	**I**	**I**	**I**	**I**	**I**
Front forks	Check general condition as well as for leaks and repair if necessary	**I**	**I**	**I**	**I**	**I**
Chain	Check adjustment and condition and grease, adjust and renew if necessary	**I/S**	**I/S**	**I/S**	**I/S**	**I/S**
Side stand	Check, grease, repair if necessary	**I/S**	**I/S**	**I/S**	**I/S**	**I/S**
Nut and bolt tightness	Check tightened to the correct torque settings	**I**	**I**	**I**	**I**	**I**
Cables	Check for damage and smooth operation, if necessary replace	**I**	**I**	**I**	**I**	**I**
Headlight	Check and adjust	**I**	**I**	**I**	**I**	**I**
Battery	Check, recharge if necessary	**I**	**I**	**I**	**I**	**I**

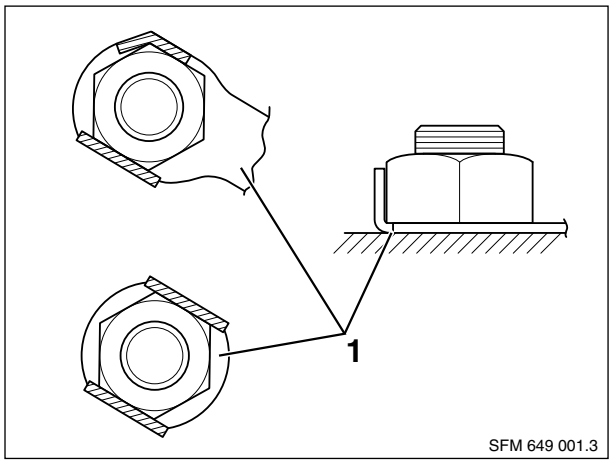
GENERAL NOTES

Gaskets, seal rings and O-rings

- Gaskets, seal rings and O-rings must generally be replaced when overhauling the engine. The sealing faces must be thoroughly cleaned.

Lock washers and split pins

- After removal replace all lock washers (1) and split pins. After tightening the nut, lock washer (1) must be bent up against the side of the nut.

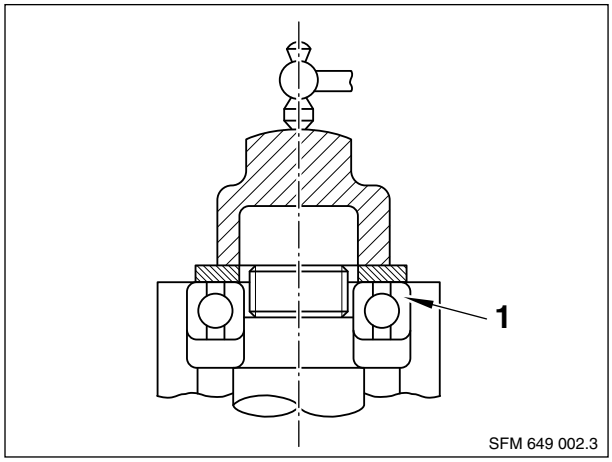


SFM 649 001.3

Bearings and radial seals

- When assembling bearings (1) make sure that manufacturer name or number point to the outside. Lubricate the bearings with oil.

ATTENTION
Do not use compressed air to dry the bearings since this could damage the surface of the bearings.

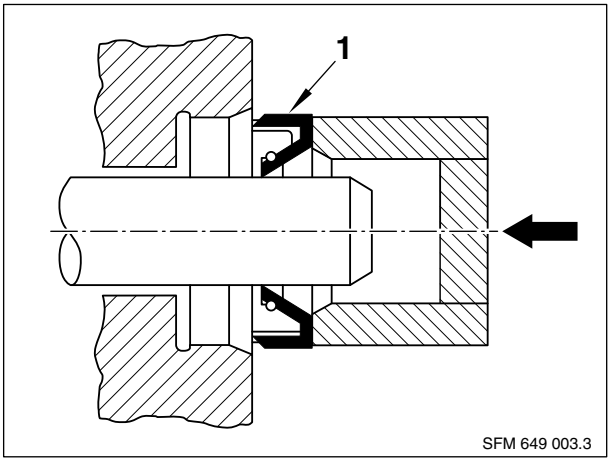


SFM 649 002.3

- When assembling radial seals (1) make sure that manufacturer name or number point to the outside. Apply a thin coat of light viscosity engine oil to the seal lips.

Circlips

- Circlips must be thoroughly inspected before installation.
- Piston pin circlips must not be assembled again.
- Warped circlips must be renewed.
- When assembling a circlip (1) make sure that the sharp edged side (2) is positioned opposite the side subjected to the force (3) applied to the circlip. See cross-sectional drawing (4 = shaft).



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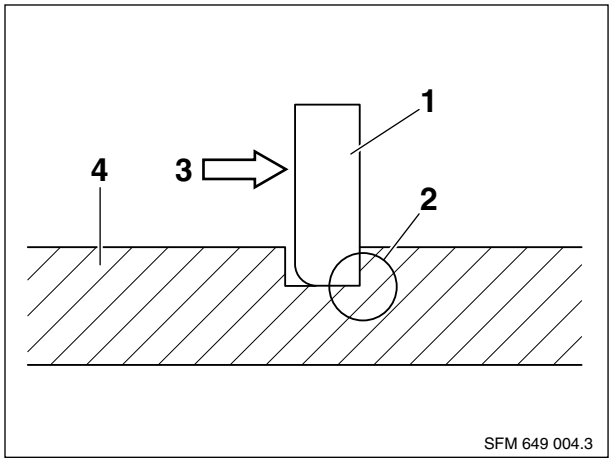

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TORQUE VALUES

TORQUE VALUES ENGINE			
Item	**Q'ty**	**Thread Dia mm**	**Nm**
Clutch lock nut	1	14	40-45
Flywheel nut	1	10	42
Cam sprocket bolt	3	5	9
Valve adjuster lock nut	2	5	9
Cylinder head nut	4	6	10-12
Cylinder head bolt	2	6	10-12
Cam chain guide roller pin bolt	1	6	10
Intake manifold bolt	2	6	10-12
Exhaust pipe joint nut	2	6	12
Shift drum stopper arm bolt	1	6	10
Shift drum stopper plate bolt	1	6	17
Shift spring pin bolt	1	8	30
Oil drain bolt	1	12	22-25
Cam chain tensioner sealing bolt	1	14	25-28
Cam chain tensioner pivot bolt	1	8	16
Shift drum bolt	1	6	12
Crankcase cover bolt	11	6	10-12
Drive sprocket bolt	2	6	12-14

TORQUE VALUES FRAME	
Connection	**Nm**
Handle bar holder	22-25
Fastening screws for upper fork bridge	25-28
Fastening screws for lower fork bridge	38-42
Screw plug for fork pipe	40
Closing nut of control-head bearing	40
Brake shoe, front	60-65
Brake shoe, rear	30-35
Brake disk on wheel hub, front	12-14
Brake disk on wheel hub, rear	12-14
Brake pipe connection	20-25
Ventilating valve on calliper	10-12
Screws for brake lining, rear	22-25
Footbrake lever on frame	25-28
Gear pedal	25-28
Footrest support, front	25
Footrest support, rear	25
Chain wheel to hub	10-12
Engine fastening	33-35
Exhaust pipe nuts	10-12
Front-wheel axle	45-55
Rear-wheel axle	50-60
Swing axle	45-55
Telescopic leg	38-42
Side standard	40

TORQUE VALUES

TOURQE VALUES FOR ENGINE/CLUTCH/GEARBOX/FRAME	
Tightening torques, gerneral	**Nm**
Srew connection M5	5-6
Srew connection M6	8-10
Srew connection M8	22-25
Srew connection M10	38-42
Tightening torques for plastic connections	Nm
Srew connection M5	3-5
Srew connection M6	5-7
Srew connection M8	13-15

MAINTENANCE

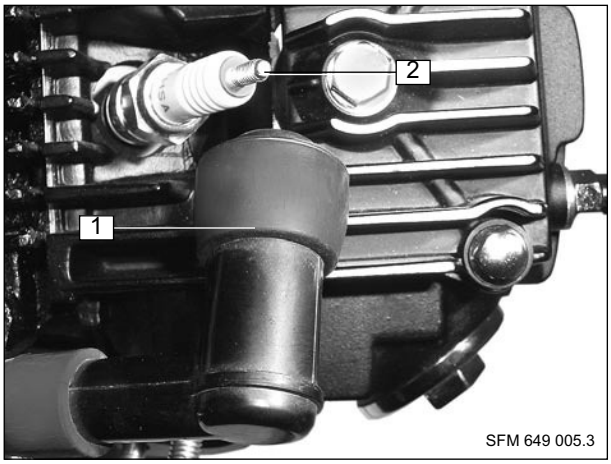
Spark plug

Recommended spark plug: NGK CR7 HSA

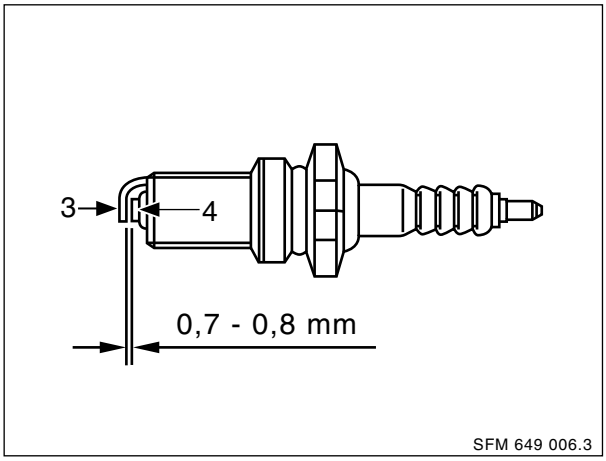
CAUTION
Check or change the spark plug only when the engine is cold.

Pull the spark plug connector (1).

Unscrew the spark plug (2).



Clean any dirt from around the spark plug base.
Visually inspect the spark plug electrodes for wear.
The center electrode (4) should have square edges and the side electrode (3) should have a constant thickness.
Discard the spark plug if there is apparent wear or if insulator is cracked or chipped.
Measure the spark plug gap using a wire-type feeler gauge.



Check the electrode gap (0,7-0,8 mm), replace the plug if it is severely burnt away.

Adjust the gap by bending the side electrode carefully. With the plug washer attached, thread the spark plug in by hand to prevent cross threading. Tighten the spark plug with a spark plug wrench to compress the plug washer.

Torque 20 Nm.

Plug in the connector (1).

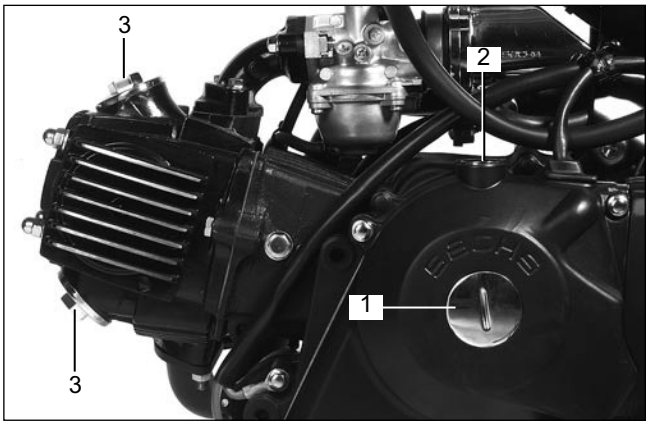
MAINTENANCE

VALVE CLEARANCE

NOTE
Adjust the valve clearance while the engine is cold (below 35°C)

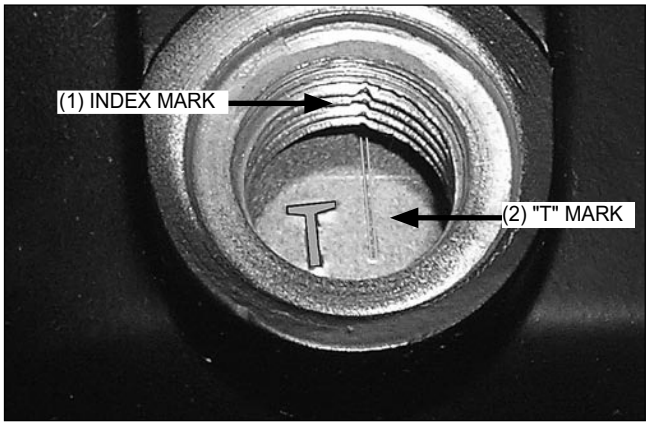
Remove inspection plugs (1 and 2) of the left side engine cover.

Remove the valve adjuster covers (3).



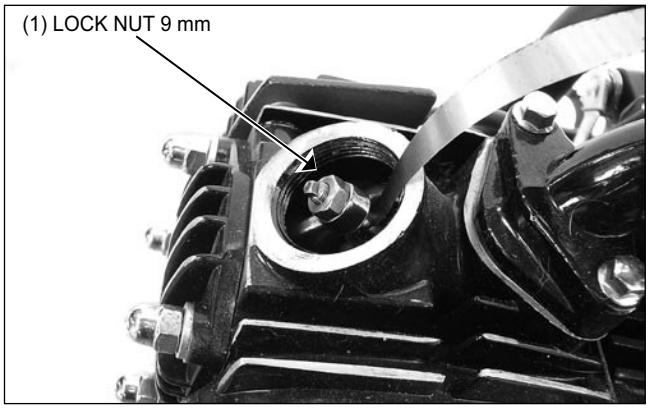
Rotate the crankshaft counterclockwise and align the "T" mark with index mark on the left crankcase.

Make sure the piston is at TDC on compression stroke.



Check the valve clearance by inserting a feeler gauge between the adjusting screw and valve stem.

VALVE CLEARANCES (Cold):
IN and EX: 0.05 ± 0.02 mm - 0.08 ± 0.02 mm

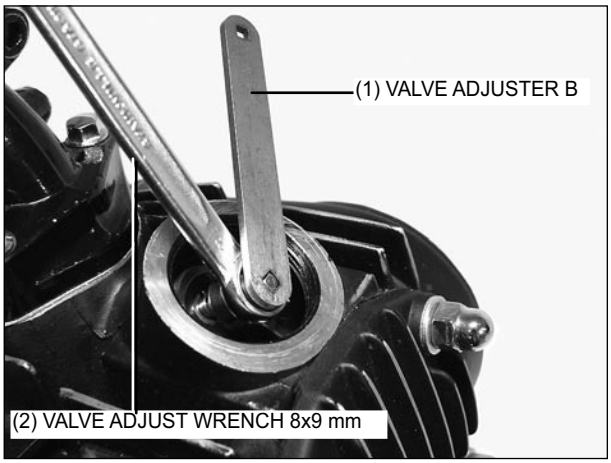


MAINTENANCE

Adjust by loosening the lock nut and turning the adjusting screw until there is slight drag on the feeler gauge. Hold the adjusting screw and tighten the lock nut. Recheck the valve clearances.

TOOLS:
Valve adjust wrench, 9 mm
Valve adjuster B

Install the valve adjuster covers and the inspection plugs.



CARBURETOR IDLE SPEED

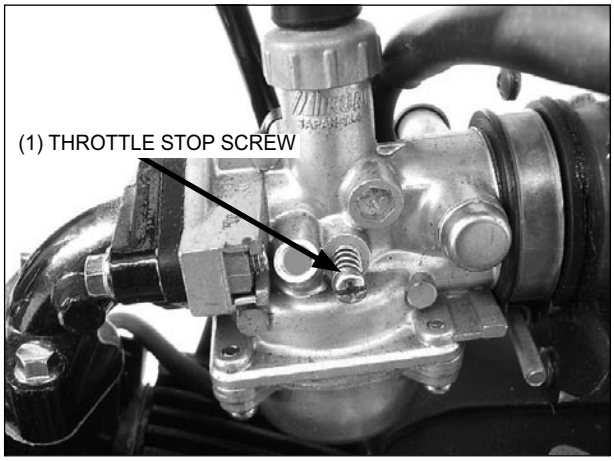
NOTE
Inspect and adjust the idle speed after all other engine maintenance items have been performed and are within specifications.
The engine must be warm for accurate idle speed inspection and adjustment.

Shift the transmission into neutral and place the motorcycle on its center stand on level ground.
Warm up the engine for about ten minutes and connect a tachometer.

WARNING
If the engine must be running to do some work, make sure the area is well-ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and lead to death.

Turn the throttle stop screw as required to obtain the specified idle speed.

IDLE SPEED: 1.800 +/- 200 rpm

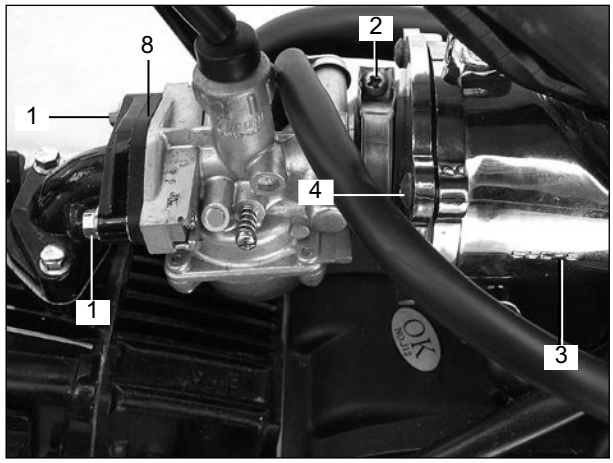


MAINTENANCE

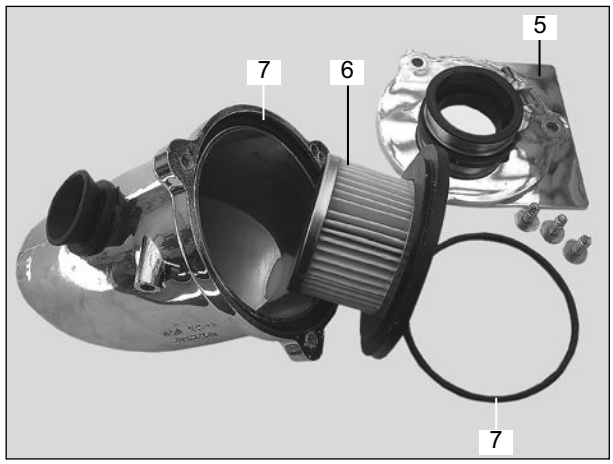
AIR CLEANER

Clean initally at	**1.000 km**
Replace every	**4.000 km**

Remove the air cleaner
- Unscrew the screws (1) of the manifold and take off the carburetor with the air cleaner.
- Unscrew the clamp (2) and remove the air cleaner (3) from the carburetor.



Opening the air filter
- Remove the three screws (4).
- Take off the cover (5).
- Clean the filter case and filter element (6) or replace if necessary.



NOTE
Before installation, check the O-rings (7) for damage and correct position.

Assembly of the cleaned or new filter element takes place in reverse order of removal.

Tightening torque
screw (1) 10-12 Nm
screw (4) 6 Nm

MAINTENANCE

Adjusting the clutch lever play

CAUTION
If you drive with no clutch lever play, the clutch will be damaged.

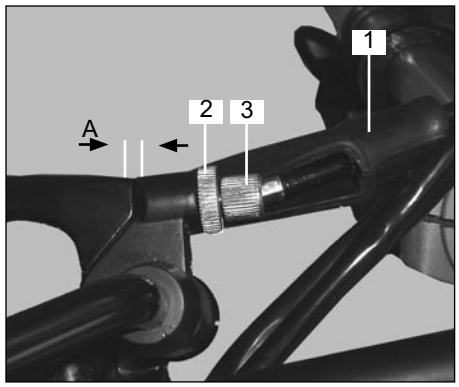
Check:
- Pull the lever until there is discernable resistance.
- Measure the play. Required value:
  Standard: A = min. 3-4 mm

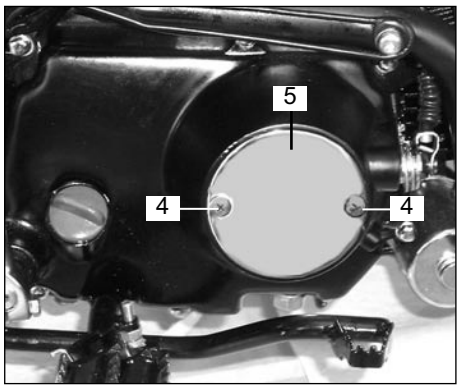
Adjustment:
- Push back protective cap (1).
- Release the lock nut (2).
- Turn setting screw (3) as required.
- Tighten the lock nut (2).
- Check the play.

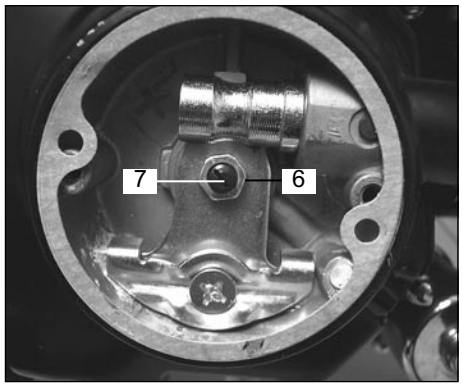
NOTE
If the clutch play cannot be corrected with this adjustment, the following adjustment must be made.

- Release the lock nut (2).
- Tighten setting screw (3) all the way, so that the clutch cable can be made as slack as possible.
- Tighten up the lock nut (2).

- Remove screws (4) and take off the clutch cover (5).
- Release the lock nut (6).
- Adjust the setting screw (7) until the desired clutch lever play (A = 3-4 mm) is reached.
- Tighten the lock nut (6).
- Reassemble the clutch cover (5) with gasket.

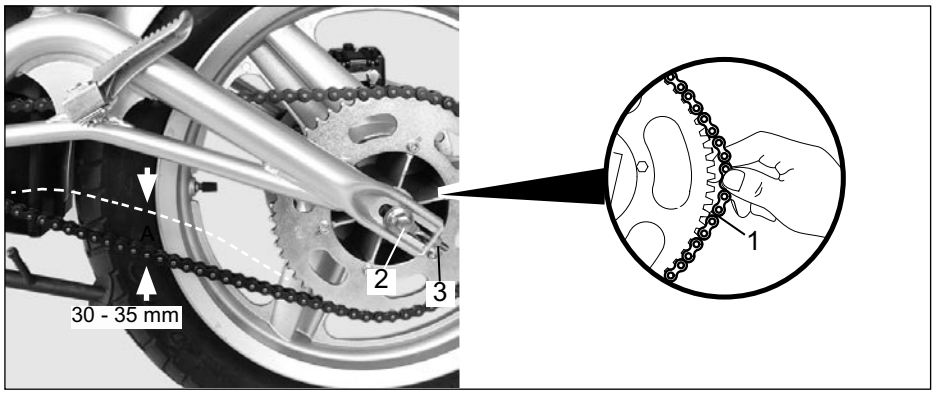






MAINTENANCE

Checking, adjusting the drive chain



Checking the chain for wear

CAUTION
The chain, sprocket and pinion must be changed as a single unit.

- Prop the motorbike up on the side stand.
- Hold the chain (1) at the furthest rear point of the sprocket and pull it
- With correct chain tension, it should not be possible to lift the chain higher than the teeth of the sprocket.
- If the chain can be pulled higher, chain, sprocket and pinion have to be replaced.

Adjusting the chain

CAUTION
The adjustment of the chain influences the wear of chain and sprocket.
Too tight off an adjustment of the chain will cause bearing damages on engine and rear wheel and result in excessive wear of the chain.

- Unscrew the axle (2).
- Adjust the setting nuts (3) evenly on both sides of the chain tensioner (rear wheel must be in line with the front wheel).
- Let rear end of the motorbike drop to the suspension limit.
- Push in the drive chain half way between sprocket and pinion. Measure the travel.

30

Required value: A =30-35 mm

- Tighten axle (2).
- Tighten lock nuts (3).

Torque
Axle nut: 50-60 Nm

MAINTENANCE

Brake system

Checking the brake system for leaks
- Check the brake lines for damage and correct position.
- Wipe off all screw connections of the brake lines.
- Firmly operate the front and rear brakes and shortly keep them operated.
- Check the brake lines for any leaks.
- Replace any faulty brake lines and seals/washers.

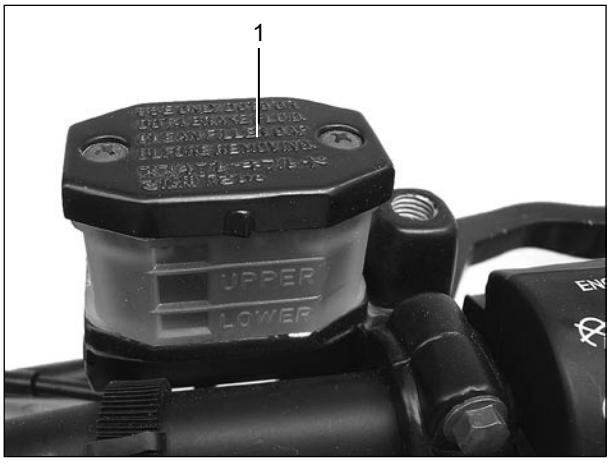
Checking/adjusting the front and rear brake-fluid level

CAUTION
Brake fluid damages paint and plastic parts! Before filling the tank with brake fluid, check the brake lining for wear and the brake system for leaks. Only use new brake fluid of specification DOT 4. Brake fluid is exposed to high temperatures and absorbs moisture from the ambient air.

NOTE
Cover the painted parts to avoid damage.

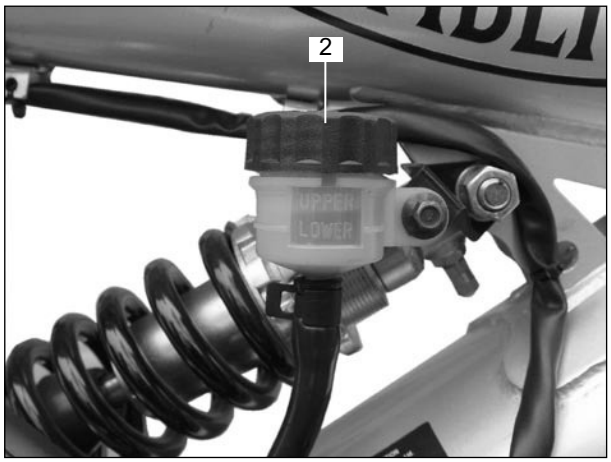
Checking the front brake-fluid level:
- Turn the handlebar until the line near the "LOWER" mark on the brake-fluid tank is horizontal.
- The brake-fluid level must be between the "LOWER" and "UPPER" marks.
- If air bubbles are visible: check the brake lining for wear, if neseccary replenish the brake fluid.

Replenishing the brake fluid:
- Remove the cover (1) and the rubber gasket.
- Replenish the brake fluid up to the "UPPER" mark and reinsert the rubber gasket.
- Reinstall on the cover.



Checking the rear brake-fluid level:
- Park the motorbike on a flat surface.
- The brake-fluid level must be between the "LOWER" and "UPPER" marks.
- If air bubbles are visible: check the brake lining for wear, if neseccary replenish the brake fluid.

Replenishing the brake fluid:
- Remove the cover (2) and the rubber gasket.
- Replenish the brake fluid to the "UPPER" mark and reinsert the rubber gasket.
- Reinstall on the cover.



MAINTENANCE

Checking/replacing the lining of the front brakeshoes

Checking the lining thickness

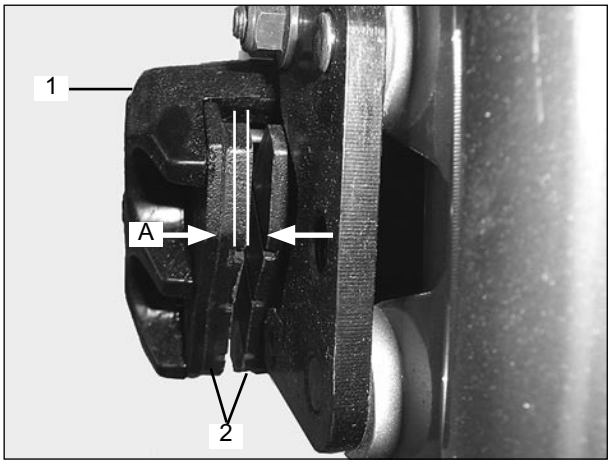
CAUTION
Make sure the minimum lining thickness is observed.

- Visually inspect the calliper (1).
- Check the minimum lining thickness.

  Minimum lining thickness (A): 2.5 mm

If the thickness is less than the minimum:
replace the brake lining (2).

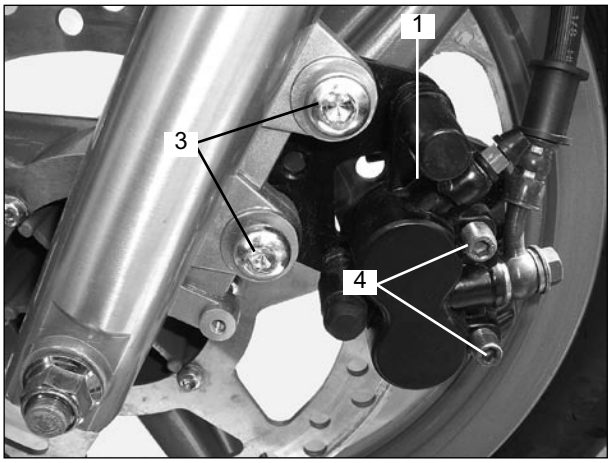
- Check the brake disk for wear and wobble.



Replacing the brake linings:

NOTE
Brake linings may only be replaced in pairs.

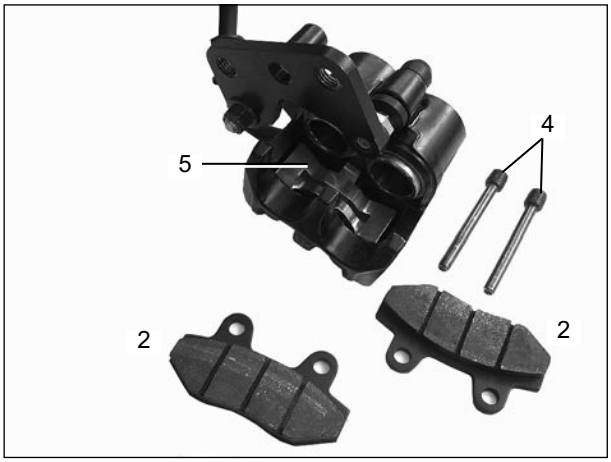
- Remove the screws (3).
- Remove the caliper.
- Remove the holder bolts (4) from the caliper (1).
- Remove the brake linings (2).
- Check the lock plate (5) for damage.
- Insert the new brake linings and fasten them with the holder bolts.
- Reassemble in reverse order.



Tightening torques
calliper screws (3): 35-38 Nm
Holder bolts (4): 25-28 Nm

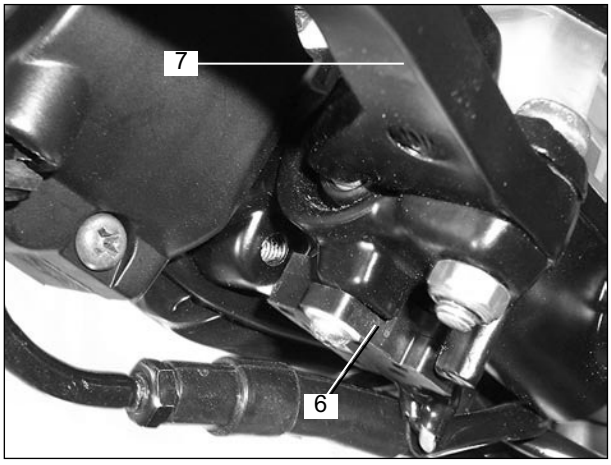
WARNING - RISK OF ON-ROAD ACCIDENT
Operate the brakes several times, until the brake linings make contact.

- Check the brake - fluid level and the handbrake play.
- Check the operation.



Brake light switch

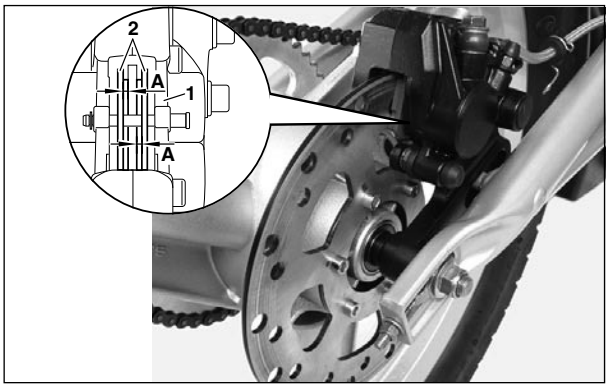
NOTE
The brake light switch (6) is placed in the hand brake lever.
By operating the front brake lever (7) the brake light must flash immediately.
An adjustment is not required.



MAINTENANCE

Checking/replacing the lining of the rear brake-shoes

Checking the lining thickness:

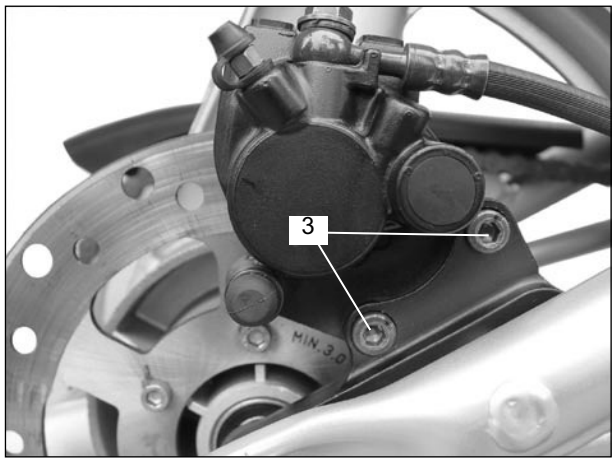


CAUTION

The minimum lining thickness must not be fallen short of.

- Visually inspect the brake calliper (1).
- Check the minimum lining thickness.
  Minimum lining thickness (A): 1.5 mm

  If the lining thickness is less than the minimum: replace the brake lining.
- Check the brake disk for wear and wobble.



Replacing the brake lining:

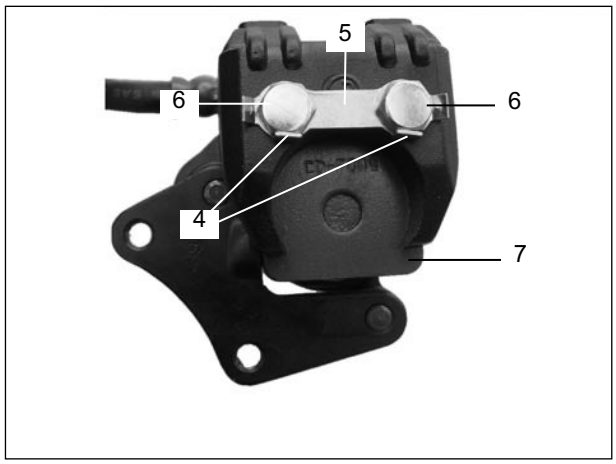
NOTE

The brake linings may only be replaced in pairs.

Use heatproof lubricant e.g. copper paste for mechanical movable parts.

Use screw-lock e.g. Loctite 242 for brake screws.

- Unscrew the bolts (3)and remove the brake calliper (1).
- Bend back the lugs (4) of the locking plate (5).
- Unscrew the bolts (6).
- Remove the brake linings (7).
- Insert the new brake linings (7) and screw the fixation bolts (6) in the brake capiller by using a new locking plate (5).
- Lock the bolts (6) by bending the lugs (4).



WARNING - RISK OF ON-ROAD ACCIDENT

Allways use a new locking plate (5). Make sure that the bolts (6) are locked fail-safe.

Tightening torques

Bolts (6): 25-28 Nm

- Reassemble in reverse order.

Tightening torques

Bolts (3): 30-35 Nm

WARNING - RISK OF ON-ROAD ACCIDENT

Operate the brakes several times, until the brake linings make contact.

- Check the operation.

MAINTENANCE

Setting the footbrake pedal position

NOTE
The footbrake pedal position can be adjusted with the setscrew (1).

WARNING
The adjustment measuremet A must not exceed 14 mm!

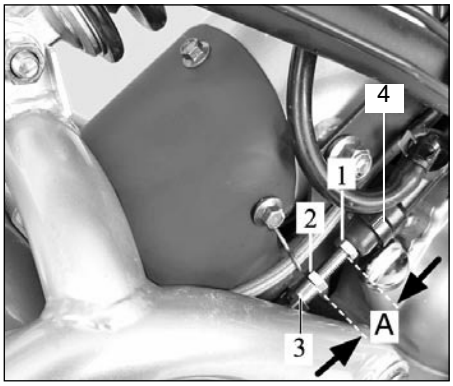
- Loosen lock nut (2) and adjust the foot brake pedal position (3) with the setscrew (1).

- Tighten lock nut (2).

CAUTION
A footbrake lever play that is too small will lock the rear wheel.

Brake light switch

NOTE
The brake light switch is placed in the rear brake pump (4).
By operating the rear brake lever the brake light must flash immediately.
An adjustment is not required.

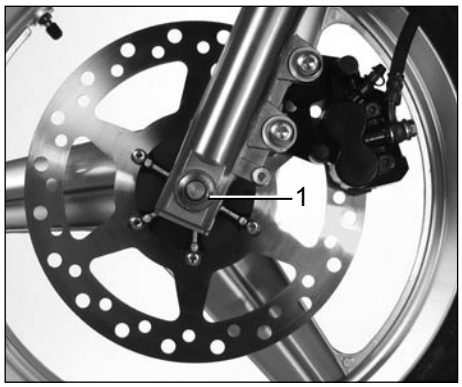


MAINTENANCE

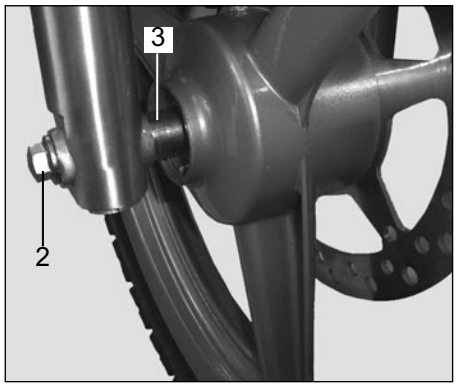
FRONT WHEEL

Removing the front wheel

CAUTION
Take care not to damage the brake discs and linings while removing them.
Do not operate the handbrake lever after the wheel has been removed.
Protect the wheel bearings from dirt and moisture.



- Support the motorcycle so that the front wheel can move freely and the motorcycle is standing securely.
- Loosen the axle nut (1).
- Lift the front wheel and pull out the full-floating axle (2) and remove the spacer bushing (3).
- Remove the front wheel by pulling it down.



Installing the front wheel

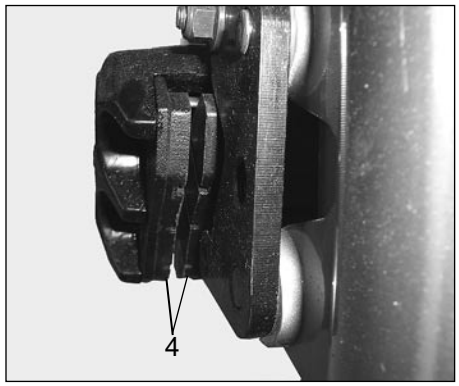
CAUTION
Take care not to damage the brake discs and linings (4) while installing them.

- Roll the front wheel in between the fork tubes and insert the spacer bushing (3) (on the right as seen from the riding direction).

- Grease the full floating axle (2) and push it in from the right as far as it will go.

- Attach the axle nut (1) and tighten.

- Before tightening the screws, stand the motorbike on its wheels and push the telescopic forks several times to prevent twisting of the fork struts.



Torque
Axle nut (1): 45-55 Nm

MAINTENANCE

REAR WHEEL

Removing the rear wheel

CAUTION
Do not damage brake disc and linings during disassembly!
Protect the wheel bearings from dirt and moisture!

- Support the motorbike so that the rear wheel can move freely.
- Counter the axle (4) and loosen the axle nut (1).
- Back the lock nuts on left and right-hand sides of the chain tensioner (2) completely off.
- Take off the drive chain (5).

NOTE
When taking off the rear wheel, make sure that the bush (3) to the left of the wheel hub is not lost.

- Lift up the rear wheel, remove axle (4) and brake counter bracket (6) with brake caliper and pull the rear wheel out towards the back.

Installing the rear wheel

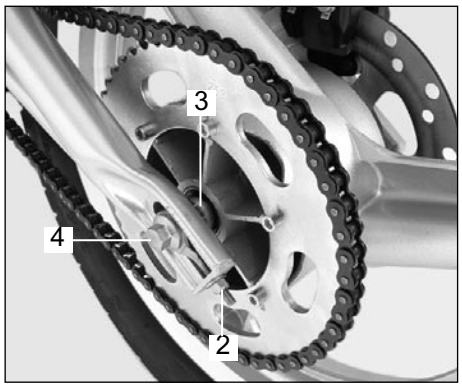
CAUTION
Do not damage brake disc and linings during installation!

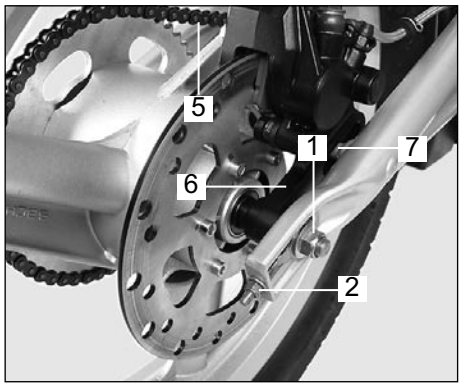
- Clean and grease the axle (4).
- Assemble axle (4), chain tensioner (2), brake caliper (6) into the swing arm.

NOTE
Insert the brake counter bracket into the receptacle (7) of the rear suspension.

- Assemble the drive chain (5).
- Assemble the rear wheel with spacer sleeve (3) and axle (4).
- Attach the right hand chain tensioner (2) and preassemble with axle nut (1).
- Tension the drive chain.
- Tighten axle nut (1).

Torque
Axle nut (1): 50-60 Nm





MAINTENANCE

FRONT WHEEL / REAR WHEEL BEARINGS

Removing/installing the front-wheel bearing

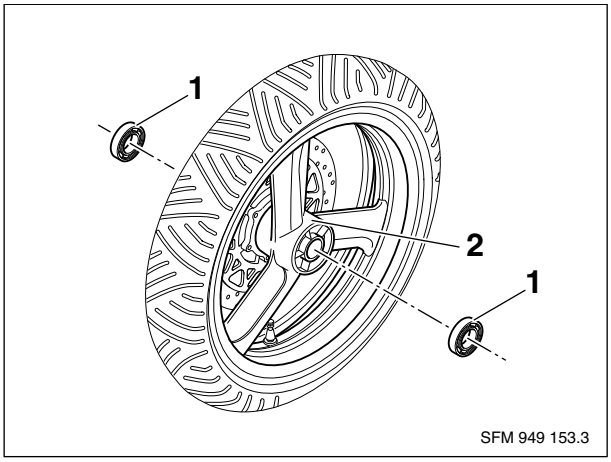
NOTE
Heat the bearing seat to approx. 100 °C in order to facilitate removal/installation.

Removing the wheel bearing:

- Remove the front wheel.
- Use an internal extractor to pull the wheel bearing (1) out of the bearing seat of the wheel hub (2).

Installing the wheel bearing:

- Press the wheel bearing (1) into the bearing seat of the wheel hub (2).
- Install the front wheel.



SFM 949 153.3

Removing/installing the rear-wheel bearing

NOTE

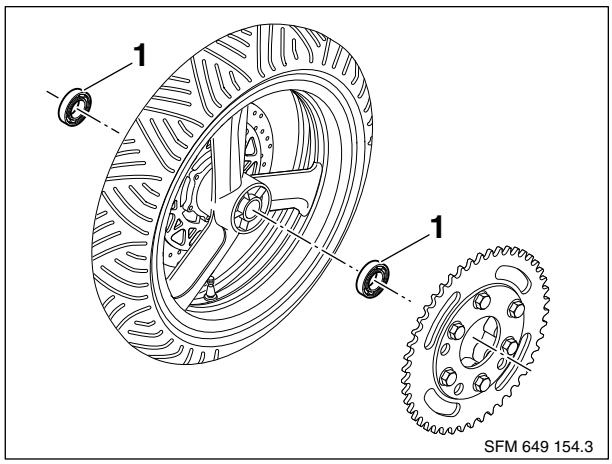
Heat the bearing seat to approx. 100 °C in order to facilitate its removal and installation.

Removing the wheel bearing:

- Remove the rear wheel.
- Remove the brake shoe support.
- Use an internal extractor to pull the wheel bearing (1) out of the bearing seat of the wheel hub (2).

Installing the wheel bearing:

- Press the wheel bearing (1) into the bearing seat of the wheel hub (2).
- Install the front wheel.

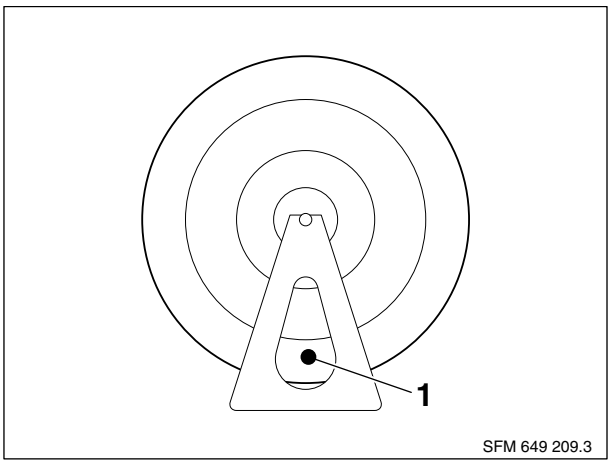


SFM 649 154.3

Statically aligning the wheels

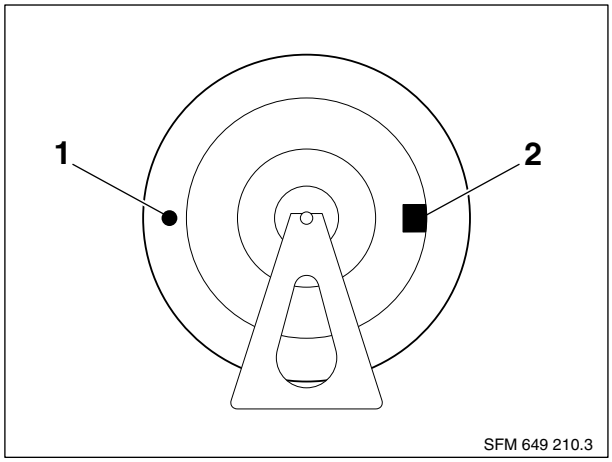
- Clamp the relevant wheel in the aligning device.
- Rotate the wheel gently and wait until it comes to a standstill. Make a mark (1) at the low point of the tire.

NOTE
Always start with the smallest alignment weight.



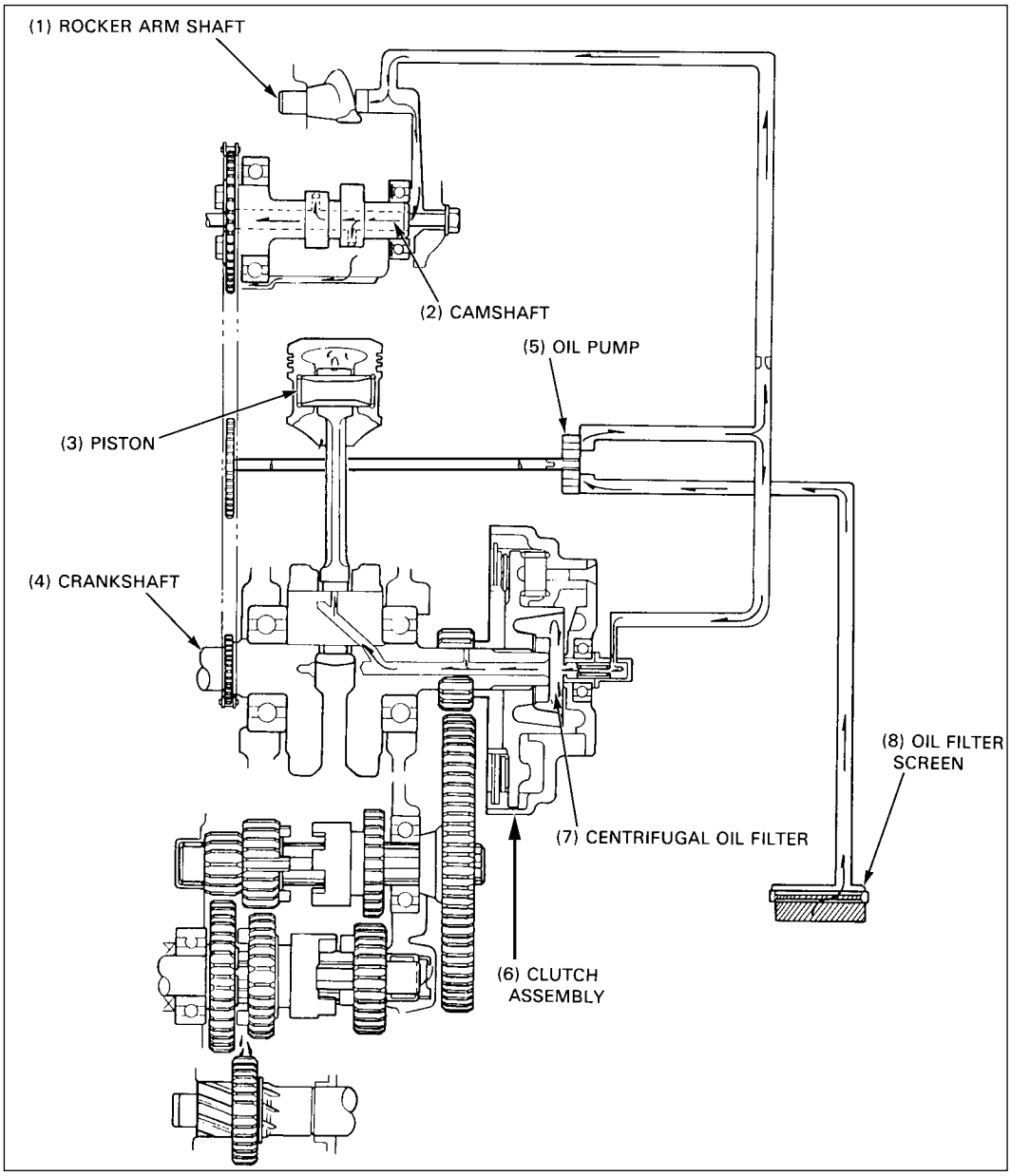
SFM 649 209.3

- Turn the wheel through 90°, stop it and let it find its own position. If the mark (1) again stops at the low point of the tire, this is the heavy point and an alignment weight (2) must be installed opposite it.
- Each time turn the wheel through 90° and stop it; the wheel must remain in position, otherwise repeat the alignment procedure.



SFM 649 210.3

LUBRICATION SYSTEM



LUBRICATION SYSTEM

SERVICE INFORMATION

GENERAL

WARNING

If the engine must be running to do some work, make sure the area is well-ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and lead to death.

CAUTION

Used motor oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil.

- The oil filter screen and oil filter rotor cleaning and oil pump servicing can be done with the engine in the frame.
- Perform these maintenance procedures with the engine oil drained after removing the right crankcase cover.
- When cleaning the oil filter rotor, do not use compressed air.

SPECIFICATION

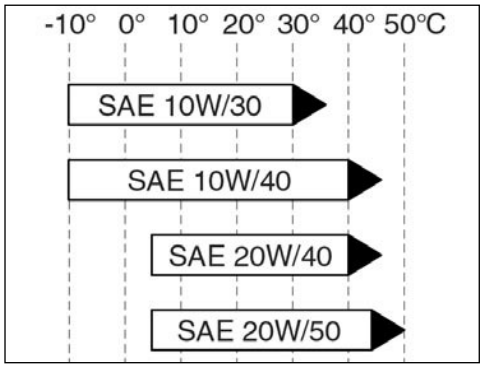
Engine oil capacity 1.0 litres at disassembly
0.8 litres at oil change

Engine oil:

Recommended grade:
Per API: SG or higher or also with additional release status: ACEA A3/96 (CCMC G5).

Recommended viscosity:
Viscosity depends on the outside temperature. For short while, the temperature may exceed or fall short of the limits of the SAE grades.

The recommended viscosity grade SAE 10W/40 covers the ambient temperature range –10 °C to +40 °C and therefore represents the optimum for our latitudes.



SERVICE DATA Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Oil pump	Rotor tip clearance	0.15 (0.006)	0.20 (0.008)
	Rotor-to-body clearance	0.03-0.08 (0.001-0.003)	0.12 (0.005)
	Pump end clearance	0.10-0.21 (0.004-0.008)	0.27 (0.011)

TORQUE VALUES

Oil drain bolt 25 Nm

TROUBLESHOOTING

Oil level too low

- External oil leak
- Worn valve guide or oil seal
- Worn piston ring
- High oil consumption

Oil contamination

- Oil not changed often
- Blown cylinder head gasket

Low oil pressure

- Oil level too low
- Plugged oil filter, screen, oil passage or orifice
- Faulty oil pump
- Incorrect oil used
- Damaged oil pump drive sprocket (cam chain guide sprocket)
- Misaligned oil pump/cam chain guide sprocket

LUBRICATION SYSTEM

ENGINE OIL

OIL LEVEL CHECK
Support the motorcycle upright on level ground.
Check the oil level with the filler cap/ dipstick (1).

CAUTION
For checking the oil level only insert the oil filler cap and don't screw in!
Otherwise there will be a wrong measurement.

If the level is below the lower level mark (4) on the dipstick, add the recommended oil to the upper level mark (3).

OIL CHANGE

NOTE
Change the engine oil with the engine warm to ensure complete and rapid draining.
Remove the oil filler cap/ dipstick.
Place an oil drain pan under the engine, and remove the drain bolt (2) and drain the engine oil.
Make sure that the sealing washer is in good condition and install the drain bolt.

TORQUE: 25 Nm

Fill the crankcase with the recommended oil.

CAPACITY: 0.8 litres at oil change

Install the oil filler cap/ dipstick. Start the engine and let it idle for 2-3 minutes.

WARNING
If the engine must be running to do some work, make sure the area is well-ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and lead to death.

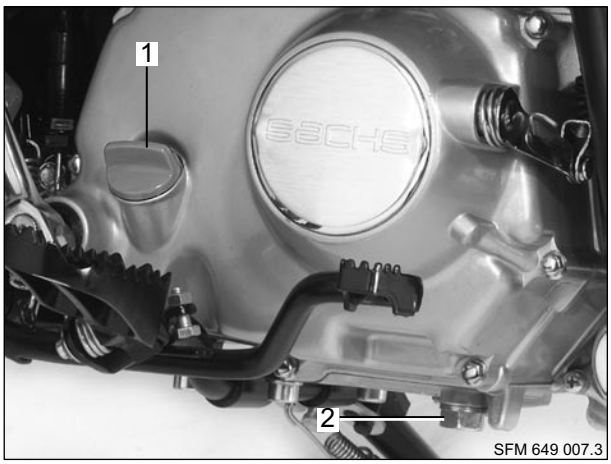
Stop the engine and check that the oil level is at the upper level mark on the dipstick with the motorcycle upright. Make sure there are no oil leaks.

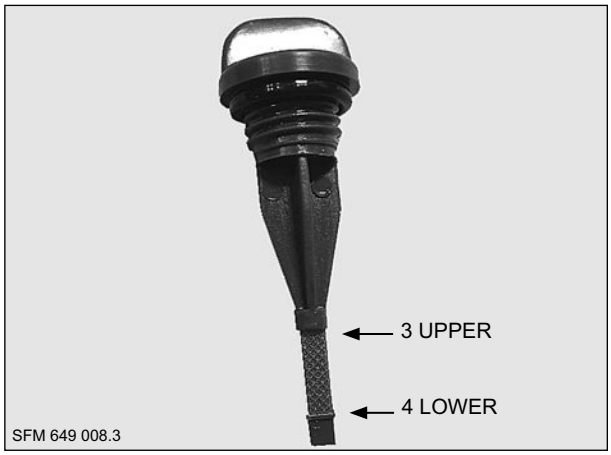
ENGINE OIL FILTER CLEANING

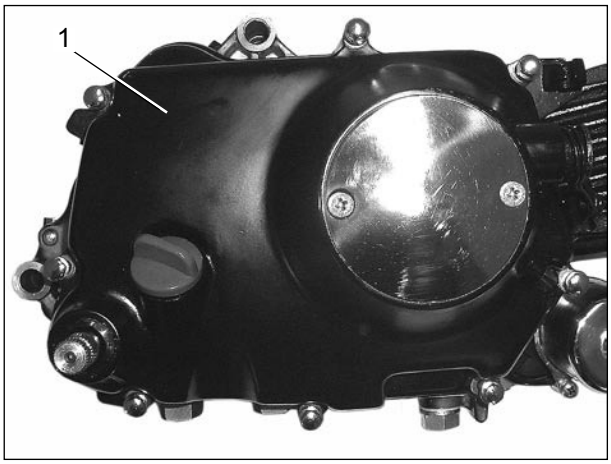
NOTE
Drain the engine oil before cleaning the filter.

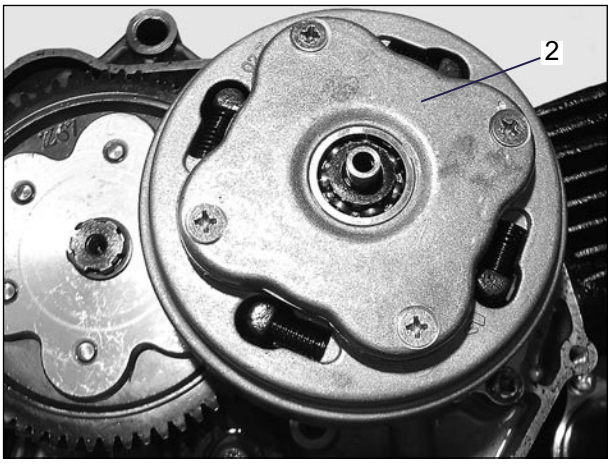
Remove the right crankcase cover (1).
Remove the clutch outer cover (2).
Clean the clutch outer cover and inside of the clutch outer using a clean lint-free cloth.

NOTE
Do not allow dust and or dirt to enter the crankshaft oil passage.
Do not use compressed air.









LUBRICATION SYSTEM

Install a new gasket and the clutch outer cover.

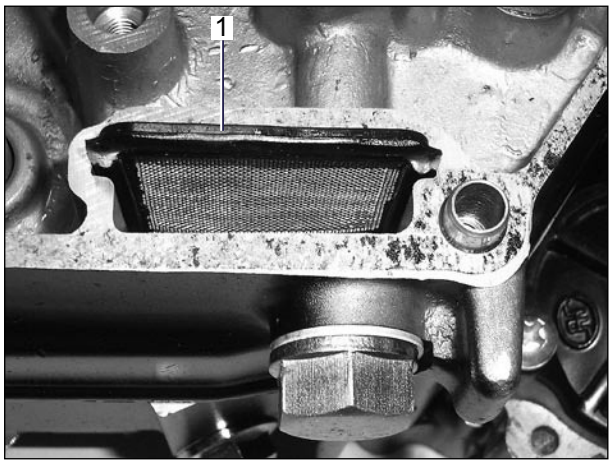
Remove the oil filter screen (1).

Clean the oil filter screen with solvent and blow it dry with compressed air.

Reinstall the oil filter screen into the right crankcase.

Install the removed parts in the reverse order of removal.

Fill the engine with recommended oil.

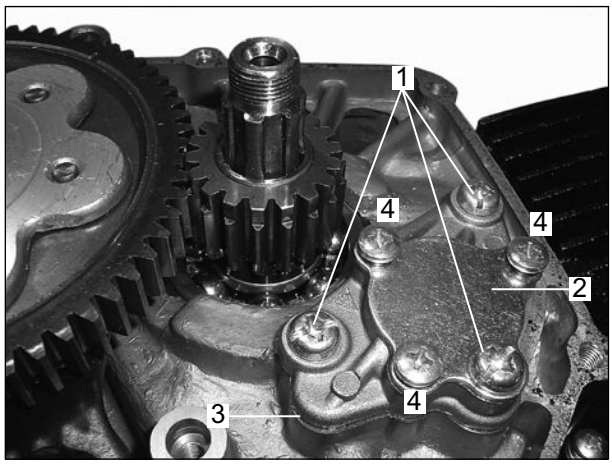


OIL PUMP REMOVAL

NOTE
The oil pump can be removed with the engine in the frame.

Drain the engine oil and remove the right crankcase cover.

Remove the clutch assembly.
Remove the three mounting screws (1), the oil pump (2), and the pump gasket (3).



DISASSEMBLY

Remove the three cover screws (4), cover and gasket.

Remove the rotor shaft (5), inner rotor (6) and outer rotor (7).