

Product: Beta RR 4T-250-400-450-525 Motorcycle Service Repair Workshop Manual
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Beta

WORKSHOP MANUAL

RR 4T - 250 - 400 - 450 - 525



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INTRODUCTION

This publication has been designed to assist authorized service personnel of **Betamotor** Workshops in maintaining and repairing the vehicle referred to in the manual. Familiarity with the specifications contained herein is a key factor in the technical training of operators. In order to make the manual easy to read and understand, the different paragraphs are marked with icons that point out the subject dealt with.

USEFUL ADVICE

To avoid problems and ensure best results, **Betamotor** recommends observing the following guidelines:

- Whenever a repair is needed, analyse the customer's account of the malfunction and ask any questions that can help to clarify the symptoms.
- Clearly diagnose the causes of the malfunction. This manual provides basic operating principles which the operator will have to supplement with their personal experience.
- Carefully plan the repair so as to avoid wasting time in obtaining spare parts, preparing tools, etc.
- Gain access to the parts to be repaired by performing only the operations that are strictly necessary. For best results, always follow the removal procedures described in this manual.

Note

Betamotor is committed to constantly improving its products. For this reason, there can be slight differences between the content of this manual and the vehicle to be repaired or serviced. **Betamotor** products are exported to many countries characterized by different Highway Codes and type-approval procedures. In view of this, **Betamotor** reserves the right to modify its products and technical documentation at any time and without notice.

Let us help protect the environment

Everything we do affects the entire planet and its resources.

To protect the common interest, **Betamotor** urges its customers and service operators to use the vehicles and dispose of their components in compliance with applicable regulations on environmental pollution control, waste disposal and recycling.

GENERAL CONTENTS

- 1 General information**
- 2 Specific tools**
- 3 Tightening torques - Specifications - Recommended products**
- 4 Maintenance**
- 5 Bodywork and fittings**
- 6 Engine**
- 7 Carburettor**
- 8 Front suspension/wheel**
- 9 Rear suspension/wheel**
- 10 Braking system**
- 11 Electrical system**

CONTENTS

HOW TO CONSULT THE MANUAL	Chap. 1 - 7
GENERAL CONTENTS	Chap. 1 - 7
Arrangement of subjects	Chap. 1 - 7
Description of operations	Chap. 1 - 7
PURPOSE OF THE MANUAL	Chap. 1 - 7
Updates	Chap. 1 - 7
TERMS AND SYMBOLS	Chap. 1 - 8
CONVENTION	Chap. 1 - 9
SAFETY	Chap. 1 - 10
Carbon monoxide	Chap. 1 - 10
Petrol	Chap. 1 - 10
Engine oil	Chap. 1 - 10
Coolant	Chap. 1 - 10
Brake fluid	Chap. 1 - 11
Threadlocking fluid	Chap. 1 - 11
Shock absorber nitrogen	Chap. 1 - 11
Battery	Chap. 1 - 11
Hot parts	Chap. 1 - 11
NOTES	Chap. 1 - 12
TABLES OF CONTENTS	
TABLE OF CONTENTS OF EACH CHAPTER	Chap. 1 - 12
CONTENTS OF EACH CHAPTER	Chap. 1 - 12
OPERATING SPECIFICATIONS	Chap. 1 - 13
VEHICLE IDENTIFICATION	Chap. 1 - 13

HOW TO CONSULT THE MANUAL

Arrangement of subjects

The manual is divided into chapters that cover the main sub-assemblies of the vehicle. To make the different chapters easy to find, the pages of each chapter bear a reference mark that is aligned with the related title in the general contents.

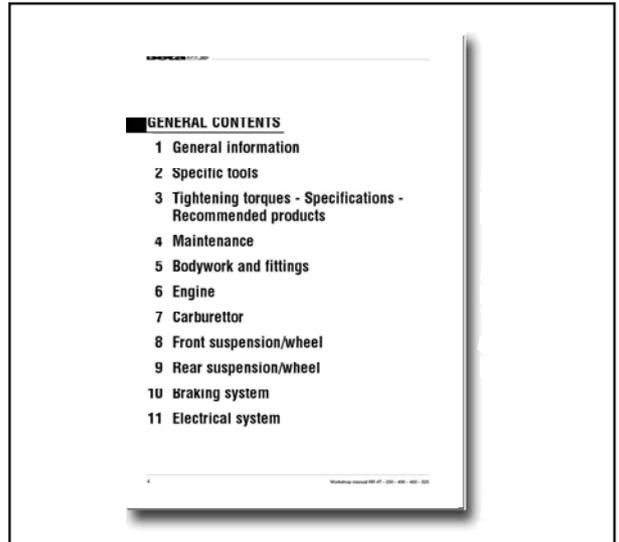
Description of operations

The removing, fitting and checking operations described in the manual are accompanied by pictures (drawings or photographs).

The pictures contain symbols referring to procedures, special tools and other information. Refer to the key to the symbols for a description of their meanings.

The procedures are arranged sequentially, step by step.

GENERAL CONTENTS



PURPOSE OF THE MANUAL

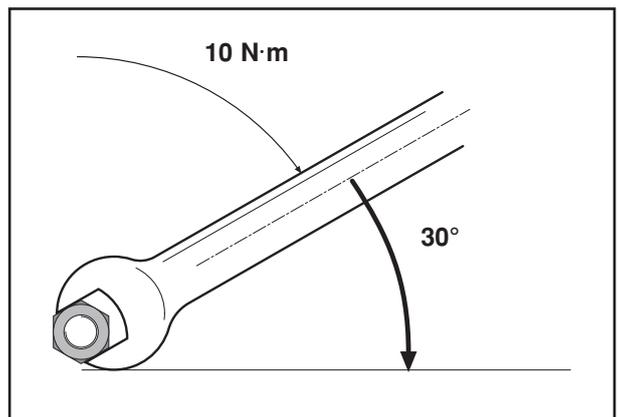
This manual is chiefly intended for qualified **Betamotor** dealers and mechanics. A mechanic should not expect to find all the information he requires in a manual. Anybody who uses this manual should have a working knowledge of the principles of mechanics and of motorcycle repairing techniques. Performing repairs or maintenance operations without this knowledge may render the vehicle unusable and even dangerous.

Updates

Betamotor is committed to continually improving its products. Any significant changes made to the specifications and procedures contained in this manual will be made known to official dealers and will be included in future editions of the manual. All the information, instructions and technical data provided in this manual were up-to-date when the manual was approved for print. **Betamotor** reserves the right to make changes to the manual at any time, without notice and without incurring any obligations.

EXAMPLE

Whenever a specific tightening torque is needed, begin by applying a standard tightening torque (e.g. 10 N·m), then proceed with the tightening by rotating the part by a predetermined angle (e.g. 30°).



TERMS AND SYMBOLS



IMPORTANT

When performing these operations, flammable vapours can be released and metal parts can be ejected at high speed. It is therefore necessary to:

- Avoid working near sparks or open flames.
- Wear protective clothing.
- Wear protective goggles.

NOTE

Whenever the words left, right, upper, lower, front and rear are used, reference is made to the vehicle in its normal direction of travel.



NOTE

Whenever a worn cylinder part needs to be replaced, we recommend checking and if necessary replacing all the parts that are related to it. In particular, the following parts should always be replaced at the same time:

- Piston, piston rings and piston pins.
- Valves, valve springs, valve cotters, caps and thrust washers.
- Valve guides with related valves, springs, caps, valve cotters and thrust washers.
- Crankshaft bearings.
- Any part subject to even wear.

To keep the engine in perfect running order, ensure that all fits are within the prescribed tolerances. A close fit can lead to seizure as soon as the moving parts heat up; on the other hand, a loose fit causes vibrations that accelerate the wear and tear of moving parts.



Avoid disposing of the parts in the environment.

CONVENTION

In order to clarify the left/right convention used in this manual, a diagram of the vehicle and engine are provided below with an indication of how the two sides are referred to in the manual.



SAFETY



The information contained in this paragraph is designed to minimize the risks the operator runs when working on the vehicle.

Carbon monoxide

- Exhaust gases contain carbon monoxide (CO), a poisonous gas that can cause loss of consciousness and even death.
- Before starting the engine, ensure that the area is well ventilated. Never run the engine indoors.
- The engine can be run indoors only if the area is equipped with specially designed exhausters.

Petrol

- Petrol is highly flammable and, under certain circumstances, explosive.
- Keep all heat sources, sparks and open flames away from the working area.
- Always work in a well ventilated area.
- Never use petrol as a cleaning solvent. Avoid handling it unless absolutely necessary.
- Do not use petrol for cleaning components that need to be blown with compressed air.
- Keep out of the reach of children.

Engine oil

- Repeated and prolonged contact of engine oil with the skin can cause skin diseases.
- In case of contact, wash the contaminated parts with soap and water as soon as possible.
- In case of eye contact, rinse abundantly with water and seek medical attention.
- In case of ingestion, immediately seek medical attention without causing vomit as this could result in the oil being breathed into the lungs. If the product is believed to have been breathed into the lungs, immediately transport the affected person to the nearest hospital.
- Spent oil contains substances that are dangerous to the environment. Oil can be renewed only by operators that are equipped for the disposal of spent oils in compliance with applicable laws.
- Avoid disposing of spent oil in the environment.
- Keep out of the reach of children.

Coolant

- Under certain circumstances the ethylene glycol contained in the coolant is flammable and its flame is invisible. Should the ethylene glycol ignite, its flame, though invisible, could cause serious burns.
- Avoid bringing the coolant into contact with hot parts as these could ignite it.
- The coolant (ethylene glycol) can irritate the skin and is poisonous if ingested.
- In case of skin contact, immediately take off any contaminated clothes or footwear and wash abundantly with soap and water. In case of eye contact rinse abundantly with clean water and immediately seek medical attention. If the coolant is ingested, avoid causing vomit as this could cause the product to be breathed into the lungs. Administer clean water and immediately transport the affected person to the nearest hospital and show the product to health personnel.
- If anybody is exposed to a high concentration of coolant vapours, transport them to an area where they can breath unpolluted air. If necessary seek medical assistance.
- Do not remove the radiator cap when the engine is hot. Since the coolant in the radiator is subjected to high pressures, it could spurt out and cause burns.
- The coolant contains substances that are harmful to the environment. The coolant can only be renewed by operators equipped for the disposal of spent oils/coolant in compliance with the regulations in force.
- Avoid disposing of the coolant in the environment.
- Keep out of the reach of children.

Brake fluid

- The brake fluid is highly corrosive.
- Avoid contact with the eyes, the skin and the mucous membranes.
- In case of skin contact, immediately take off any contaminated clothes or footwear and wash abundantly with soap and water.
- In case of eye contact, rinse abundantly with water and seek medical attention.
- In case of ingestion, immediately seek medical attention without causing vomit as this could cause the oil to be breathed into the lungs.
- If the product is believed to have been breathed into the lungs, immediately transport the affected person to the nearest hospital.
- If anybody is exposed to a high concentration of coolant vapours, transport them to an area where they can breath unpolluted air. If necessary seek medical assistance.
- In case of accidental contact, rinse abundantly with water and seek medical attention.
- Keep out of the reach of children.

Threadlocking fluid

- Although threadlocking fluid is not classified as dangerous, prolonged contact with the skin, especially if bruised, can lead to sensitization or dermatitis. In case of skin contact, rinse with running water.
- In case of sickness due to inhalation of the product, take the affected person into the open air and seek medical assistance.
- In case of eye contact, rinse abundantly with water for at least 15 minutes.
- In case of ingestion, drink large quantities of water or milk. Seek medical attention without causing vomit as this could cause the oil to be breathed into the lungs.
- Keep out of the reach of children.

Shock absorber nitrogen

- The rear shock absorber contains pressurized nitrogen.
- Before disposing of used shock absorbers, release the nitrogen through the inflating valve.
- Only use nitrogen to pressurize the shock absorber. Unstable gases can explode and cause burns.
- To prevent the risk of explosions and burns, avoid keeping the shock absorber close to flames or heat sources.
- Keep out of the reach of children.

Battery

- The battery produces explosive gases. Keep it away from sparks, flames and cigarettes. Only recharge it in well ventilated places.
- The battery contains a solution of sulphuric acid (electrolyte).
- Sulphuric acid is corrosive to many materials and clothes. When it comes into contact with small quantities of water it produces a violent reaction which releases intense heat and spurts of hot acid. Sulphuric acid attacks many metals and in the process releases hydrogen, a flammable gas that combines with air to produce an explosive mixture.
- Contact with sulphuric acid can cause burns. In case of contact immediately take off any contaminated garments and rinse the skin with large quantities of water. If necessary, take the affected person to the nearest hospital.
- In case of eye contact immediately rinse abundantly with water, seek medical assistance and continue the treatment until the doctor arrives.
- Should the electrolyte be ingested, rinse the mouth with water without swallowing, immediately transport the affected person to the nearest hospital and show the product to health personnel.
- The battery contains dangerous substances that are harmful to the environment. Batteries can only be replaced by operators equipped for their disposal in compliance with the regulations in force.
- Avoid disposing of spent batteries in the environment.
- Keep out of the reach of children.

Hot parts

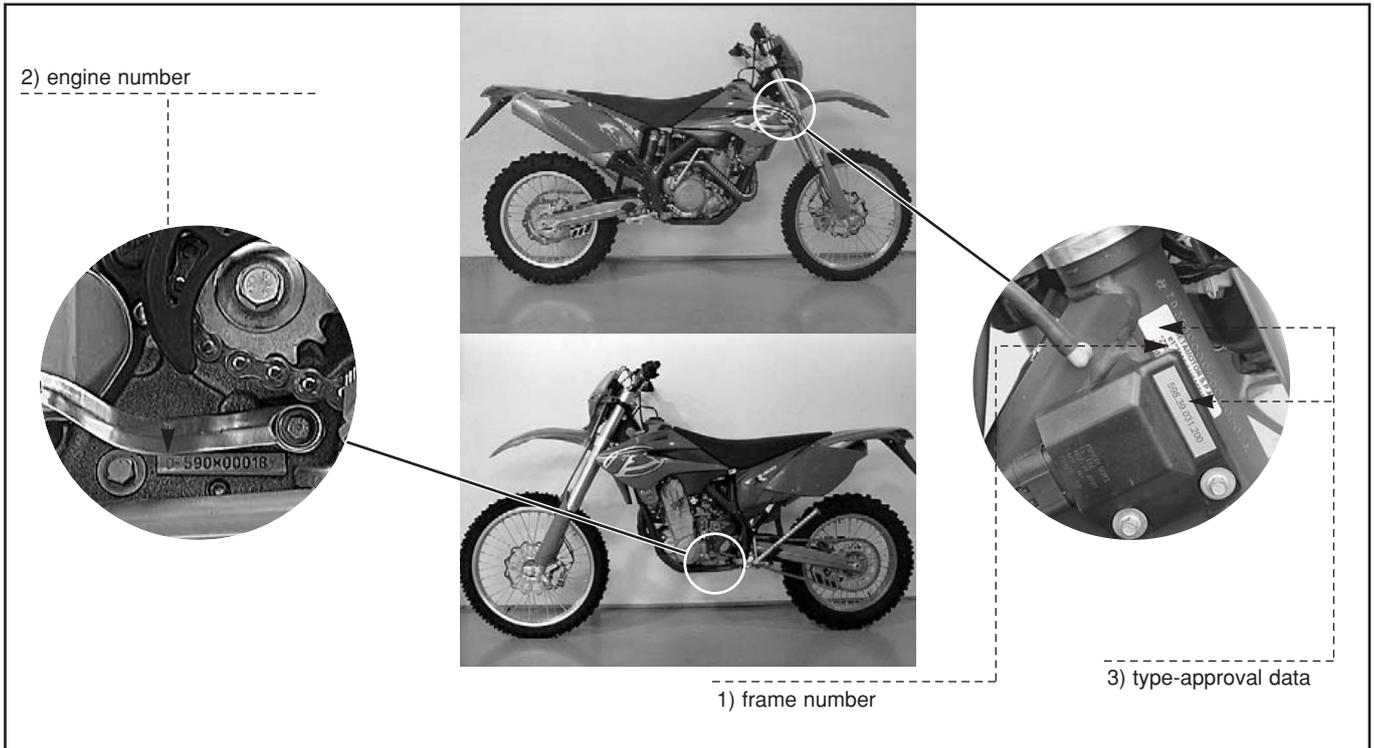
- The engine and the exhaust system become and remain very hot for some time, even after the engine has been stopped. Allow them to cool down and put on insulating gloves before handling these parts or working near them.

OPERATING SPECIFICATIONS

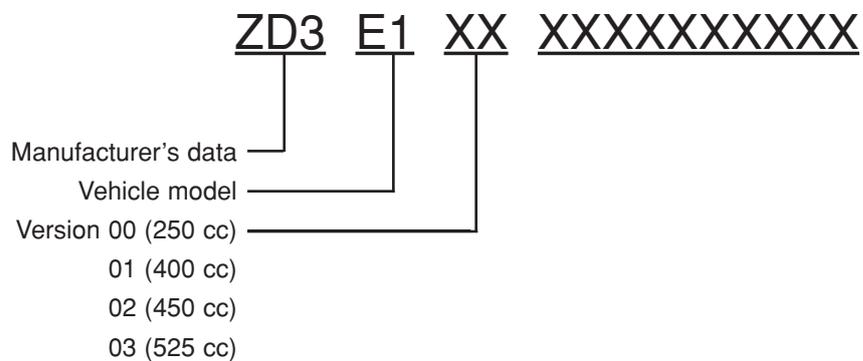
VEHICLE IDENTIFICATION

The frame number is stamped on the right side of the head tube.

The engine number is stamped on the upper crankcase half, next to the swingarm.



The following is an example of frame number format:





SPECIFICATIONS - ENGINE

SPECIFICATIONS

Engine	250	400	450	525
Type	single-cylinder, 4-stroke, liquid-cooled, with countershaft and electric start			
Displacement	250 cc	398 cc	448 cc	510 cc
Bore/stroke	75 / 56,5 mm	89 / 64 mm	89 / 72 mm	95 / 72 mm
Compression ratio	12 : 1	11 : 1	11 : 1	11 : 1
Fuel	unleaded premium fuel with a minimum of 95 RON			
Valve gear	4 rocker-operated valves and 1 overhead camshaft driven by single chain			
Camshaft		5532 590/5521	590/5521	590/5521
Diameter of intake valves	28 mm	35 mm	35 mm	35 mm
Diameter of exhaust valves	24 mm	30 mm	30 mm	30 mm
Valve cold clearance	intake: 0,12 mm			
Valve cold clearance	exhaust: 0,12 mm			
Crankshaft bearings	2 cylindrical roller bearings			
Small end bearing	needle roller cage			
Small end bearing	bronze bearing			
Piston	cast alloy		forged alloy	
Piston rings	1 compression ring, 1 scraper ring			
Lubrication	2 oil pumps			
Engine oil	completely synthetic oil of known brands (Motorex Cobra 15W40)			
Oil quantity	1,25 litres			
Primary drive	cylindrical gears with straight teeth, 33:76 teeth			
Clutch	wet multiplate			
Transmission (with front coupling)	6 speed	6 speed	6 speed	6 speed
Gear ratios	1st 14:38	1st 14:34	1st 14:34	1st 14:34
	2nd 16:36	2nd 17:31	2nd 17:31	2nd 17:31
	3rd 19:34	3rd 19:28	3rd 19:28	3rd 19:28
	4th 21:32	4th 22:26	4th 22:26	4th 22:26
	5th 23:30	5th 24:23	5th 24:23	5th 24:23
	6th 22:25	6th 26:21	6th 26:21	6th 26:21
Ignition system	DC-CDI digital ignition system without breaker, with variable spark advance, KOKUSAN type			
Dynamo	12V 150W	12V 150W	12V 150W	12V 150W
Spark plug	NGK DCPR 8 E			
Spark gap	0,6 - 0,7 mm			
Cooling	liquid cooling, forced liquid circulation by pump			
Coolant	1.3 litres, 40% antifreeze, 60% water, at least -25°C			
Starting	electric start / kickstart			

SPECIFICATIONS - ENGINE
CARBURETTOR TUNING

	250	400/450	525
Carburettor type	Keihin FCR-MX 37	Keihin FCR-MX 39	Keihin FCR-MX 39
Carburettor code	3700A	3900A	3900B
Main jet	160	178	178
Jet needle	OBEKT	OBDVR	OBDVT
Idling jet	42	42	42
Main air jet	200	200	200
Idling air jet	100	100	100
Needle valve position	3.	3.	3.
Starting jet	85	85	85
Fuel mixture adj. screw open by	0,75 turns	1,25 turns	1,25 turns
Throttle valve	15	15	15
Power reduction	throttle valve stop	throttle valve stop	throttle valve stop
Pump diaphragm stop	858 / 2,15 mm	858 / 2,15 mm	858 / 2,15 mm



SPECIFICATIONS - ENGINE

TIGHTENING TORQUES

Description	Type	Tightening
Crankcase, clutch cover, ignition cover flange screws	M6	10 N·m
Oil drain screw	M12x1.5	20 N·m
Short oil unit socket-head screw	M16x1.5	10 N·m
Long oil unit hexagonal-head screw	M20x1.5	15 N·m
Oil filter cover flange screw	M5	6 N·m
Bypass valve screw	M12x1.5	20 N·m
Oilway screw and oil line hollow grub screw	M8	10 N·m
Oil pump cover screws	M5	Loctite 222 + 6 N·m
Cylinder head flange screws - upper section	M6	10 N·m
Cylinder head flange screws - upper section, water pump cover	M6	8 N·m
Exhaust flange screws	M6	Loctite 243 + 8 N·m
Cylinder head screws	M10	40/50 N·m
Camshaft gear socket-head screws	M8	Loctite 243 + 28 N·m
Automatic decompressor lever set screw	M5	Loctite 222 + 8 N·m
Rocker arm pin socket-head end screw	M5	5 N·m
Valve adjusting screw counternuts	M6x0.75	11 N·m
Primary drive gear and free wheel socket-head screw	M6	Loctite 646 + 16 N·m
Primary drive gear hexagonal nut	M20x1.5	Loctite 243 + 150 N·m
Countershaft gear socket-head screws	M6	Loctite 243 + 8 N·m
Clutch hub hexagonal nut	M18x1.5	Loctite 243 + 150 N·m
Clutch spring flange screws	M6	8 N·m
Gear selector socket-head screw	M6	Loctite 243 + 10 N·m
Selector lever flange screw	M5	Loctite 243 + 6 N·m
Timing chain stretcher, chain guide, chain guard flange screws	M6	Loctite 243 + 8 N·m
Gearbox desmodromic mechanism flange screw	M5	Loctite 243 + 6 N·m
Chain stretcher flange screws	M6	8 N·m
Chain guard flange screws	M5	Loctite 243 + 6 N·m
Stator flange screws	M6	Loctite 243 + 8 N·m
Pick-up flange screws	M5	Loctite 243 + 6 N·m
Rotor flange nut	M12x1	60 N·m
Kickstart stop plate flange screw	M6	Loctite 243 + 8 N·m
Kickstart spring link flange screw	M6	Loctite 243 + 10 N·m
Starter motor cover flange screw, LH only	M6	Loctite 243 + 8 N·m
Breather pipe bracket flange screw	M6	Loctite 243 + 8 N·m
Kickstart screw	M8	Loctite 243 + 25 N·m
Gearshift lever flange screw	M6	Loctite 243 + 10 N·m
Hexagonal-head chain front sprocket screw	M10	Loctite 243 + 60 N·m
Spark plug	M10	10-12 N·m
Spark plug	M12x1.25	20 N·m

SPECIFICATIONS - ENGINE
FITS, WEAR LIMITS

Crankshaft	axial play . . . . .	.0,1 - 0,2 mm
	offset between shaft sections	max. 0,12 mm
Small end bearing	radial play	max. 0,05 mm
	axial play	max. 1,10 mm
Cylinder 250	size I diameter . . . . .	.75,000 - 75,012 mm
	size II diameter . . . . .	.75,013 - 75,025mm
Cylinder 450/450	size I diameter . . . . .	.89,000 - 89,012 mm
	size II diameter . . . . .	.89,013 - 89,025mm
Cylinder 525	size I diameter . . . . .	.95,000 - 95,012 mm
	size II diameter . . . . .	.95,013 - 95,025 mm
Piston 250	size I diameter . . . . .	.74,960 - 74,970 mm
	size II diameter . . . . .	.74,971 - 74,980 mm
	size I fit . . . . .	.0,030 - 0,052 mm
	size II fit . . . . .	.0,032 - 0,055 mm
	wear limit . . . . .	.0,12 mm
Piston 400	size I diameter . . . . .	.88,930 - 88,940 mm
	size II diameter . . . . .	.88,941 - 88,950 mm
	size I fit . . . . .	.0,060 - 0,082 mm
	size II fit . . . . .	.0,062 - 0,085 mm
	wear limit . . . . .	.0,12 mm
Piston 450	size I diameter . . . . .	.88,916 - 88,946 mm
	size II diameter . . . . .	.88,926 - 88,956 mm
	size I fit . . . . .	.0,054 - 0,096 mm
	size II fit . . . . .	.0,056 - 0,099 mm
	wear limit . . . . .	.0,12 mm
Piston 525	size I diameter . . . . .	.94,932 - 94,960 mm
	size II diameter . . . . .	.94,940 - 94,968 mm
	size I fit . . . . .	.0,050 - 0,070 mm
	size II fit . . . . .	.0,044 - 0,085 mm
	wear limit . . . . .	.0,12 mm
Luce segmento	compression ring	max. 0,80 mm
	scraper ring	max. 1,00 mm
Valves	width of sealing surface, intake	max. 1,50 mm
	width of sealing surface, exhaust	max. 2,00 mm
	head floating	max. 0,05 mm
	valve guide diameter	max. 6,2 mm
	spring cup	min. 0,4 mm (mm when new 0,5 mm)
Valve springs 450 / 525 / 400	minimum outer spring length . . . . .	.39,20 mm
	minimum inner spring length . . . . .	.36,45 mm
Conical valve springs 250	minimum length . . . . .	.37,70 mm
Oil pump	play btw outer rotor and pump casing	max. 0,20 mm
	play btw outer and inner rotors	max. 0,20 mm
	axial play . . . . .	.0,15 mm
By-bass valve	minimum spring length . . . . .	.23,5 mm
Clutch plates	minimum spring length	min. 41,5 mm (mm when new 43 mm)
	wear limit . . . . .	.1,7 mm
Gear shafts	axial play . . . . .	.0,1 - 0,4 mm
Rocker arm shafts	axial play . . . . .	.0,02 - 0,10 mm
Countershafts	support pin offset . . . . .	.0,06 mm



SPECIFICATIONS - CYCLE PARTS

250/400/450/525

Frame	Single-beam, molybdenum steel frame with double cradle split over exhaust port		
Fork	"MARZOCCHI" hydraulic upside-down fork (leg Ø 45)		
Front/rear suspension travel	290/300 mm		
Rear suspension	SACHS monoshocks with progressive leverage		
Front brake	Floating steel disc Ø 255 mm with floating caliper		
Rear brake	Steel disc Ø 240 mm with floating caliper		
Brake discs	Wear limit 0.4 mm		
Front tyre	90/90 - 21"		
Tyre pressure, off road	1,0 bar		
Tyre pressure, road use	1,5 bar		
Rear tyre	140/80 - 18"		
Tyre pressure, off road	1,0 bar		
Tyre pressure, road use	1,8 bar		
Fuel tank capacity	8,5 litres (including 1 litre reserve)		
Chain	135 ZRDK / 007		
Bulbs	Headlight	12V 25/25W	
	Parking light	12V 3W	
	Brake/Rear light	12V 21/5W	
	Indicators	12V 10W	
	Number plate light	12V 5W	
Battery	12V 5Ah		
Caster angle	26,5°		

DIMENSIONS - RR 250

Maximum length	2270 mm
Maximum width	813 mm
Maximum height above ground	1255 mm
Wheelbase	1490 mm
Saddle height	940 mm
Ground clearance	320 mm
Footrest height	405 mm

DIMENSIONS - RR 400 - 450 - 525

Maximum length	2270 mm
Maximum width	813 mm
Maximum height above ground	1255 mm
Wheelbase	1500 mm
Saddle height	940 mm
Ground clearance	320 mm
Footrest height	405 mm

STANDARD ADJUSTMENTS - FORK

MARZOCCHI

Compression adjust range	18 clicks
Rebound adjust range	10 clicks
Oil type	EB-H16 SAE 7,5

STANDARD ADJUSTMENTS - SHOCK ABSORBER

SACHS

Compression adjust range	clicks	21/21 (low speed)
	clicks	24/24 (high speed)
Rebound adjust range	24	
Spring preload	260 mm	

SPECIFICATIONS - FRAME
TIGHTENING TORQUES

4 fork foot screws	M6	10 N·m
Front brake caliper	M8 CH10	Loctite 243 + 30 N·m
Front brake disc	M6	Loctite 243 + 15 N·m
Rear brake disc	M8 CH10	Loctite 243 + 20 N·m
Upper fork plate clamping screws	M8 CH10	20 N·m
Lower fork plate clamping screws	M8 CH10	20 N·m
Rear wheel spindle flange nut	M20x1.5 CH27	90 N·m
Swingarm pin hexagonal nut	M16x1.5 CH19	100 N·m
Handlebar clamp screws	M8 CH10	20 N·m
Handlebar support screws	M10 TCEI	Loctite 243 + 40 N·m
Upper shock absorber screw	M10x1.25	Loctite 243 + 80 N·m
Lower shock absorber screw	M12	Loctite 243 + 80 N·m
Chain sprocket screws, special screw	M8 10.9	Loctite 243 + 25-30 N·m
Brake pedal screw	M8 CH10	
Brake pedal ball joint screw	M6	Loctite 243 + 10 N·m
Engine fixing screws	M10x1.25 CH14	45 N·m
Other frame screws	M6	10 N·m
	M8	25 N·m
	M10	45 N·m
Other frame flange nuts	M6	15 N·m
	M8	30 N·m
	M10	50 N·m

PLANNED MAINTENANCE

Item	Interval	hours (h) fuel (litres)	3 20	after/every 15 100
Air filter (after each off-road ride)			C	C
Valves			K	K
Spark plug (replace every 30 hours)			-	K
Idle speed			K	K
Throttle cable play			K	K
Clutch			K	K
Engine oil			R	R
Engine oil filter			R	R
Engine oil gauze strainer			C	C
Exhaust pipe bolts			-	T
Brakes			K	K
Brake lines (replace every 4 years)			K	K
Brake fluid (renew every 2 years)			K	K
Tyres			-	K
Steering			K	K
Fork			-	K
Rear suspension			-	K
Frame bolts / nuts and oil line			T	T
Chain tensioning			K	K

K = Check and adjust, clean, lubricate or replace as necessary.
 C = Clean
 R = Replace/renew
 T = Tighten

RECOMMENDED LUBRICANTS

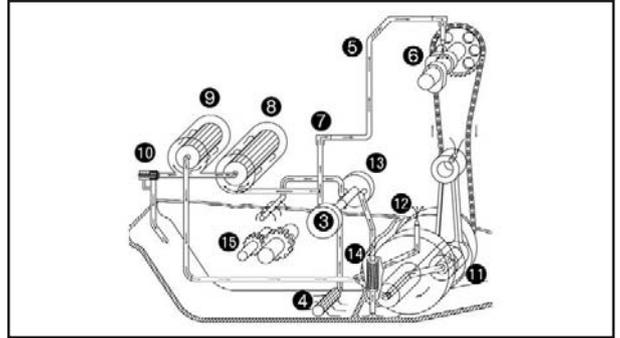
To keep the vehicle in perfect running order and prolong its life, we recommend using the products listed in the table below:

PRODUCT TYPE	SPECIFICATIONS
ENGINE OIL	MOTOREX COBRA 15W40 alternatively (SHELL ADVANCE ULTRA 4 SAE 10W40)
BRAKE FLUID	IP DOT 4 alternatively (SHELL ADVANCE BRAKE DOT 5.1)
FORK OIL	EB-H16 SAE 7,5
LINKAGE GREASE	IP AUTOGREASE MP
CLUTCH OIL	ARAL VITAM LS (olio minerale)

Note: When renewing the lubricants, be sure to use the products specified in the above table.

Oil circuit

Oil pump **3** sucks the engine oil from the gearbox oil sump through long oil unit **4**. The oil flows through oil line **5** into the cylinder head to camshaft lubrication point **6**. The oil quantity is adjusted by means of oilway screw **7**. A pipe branches off to long oil unit **8**, where the coarser particles are filtered from the oil. The oil then comes to short oil unit **9**, which filters off the finer particles. Once it has been so cleaned, the engine oil is pumped through bypass valve **10** to connecting rod bearing **11** and then sprayed from below onto the piston through jet **12**. The second oil pump **13** sucks the oil from the crankcase through short oil unit **14**, lubricating gears **15**.



Checking the engine oil level

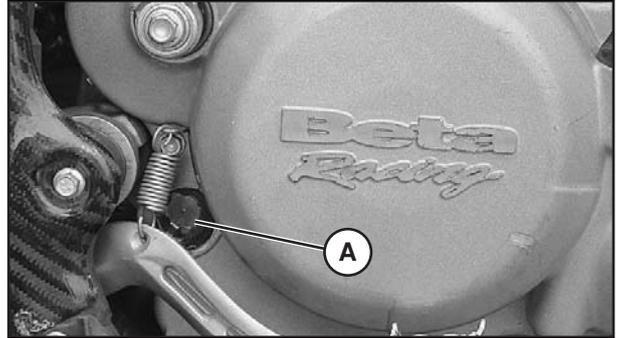
The engine oil level can be checked indifferently when the engine is cold or hot.

Place the vehicle in an upright position on level ground (do not use the side stand).

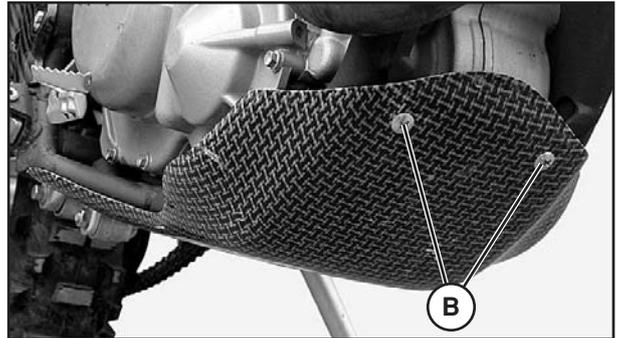
When the engine is cold, the oil should reach the lower edge of sight **A**.

When the engine is hot, the oil should reach the upper edge of the sight.

If necessary top up with engine oil.



WARNING: An insufficient quantity of engine oil or the use of low quality oil lead to early engine wear.



Changing the engine oil and the oil filter

Before performing this operation, remove (if present) lower bumper **A** after unscrewing the three screws **B** as shown in the figure.

Whenever the oil is changed, be sure to clean the short and long oil units and replace both oil filters.

Renew the oil while the engine is at operating temperature.



WARNING: An engine at operating temperature and the oil it contains are very hot and can cause burns.

Park the vehicle on level ground, remove screw **C** and drain the oil into a container.

Thoroughly clean the screw (with the magnet). When the oil has drained out completely, clean the sealing surface, refit screw **C** with the seal and tighten to 20 N·m.



ENVIRONMENT: Dispose of spent oils in compliance with applicable laws.

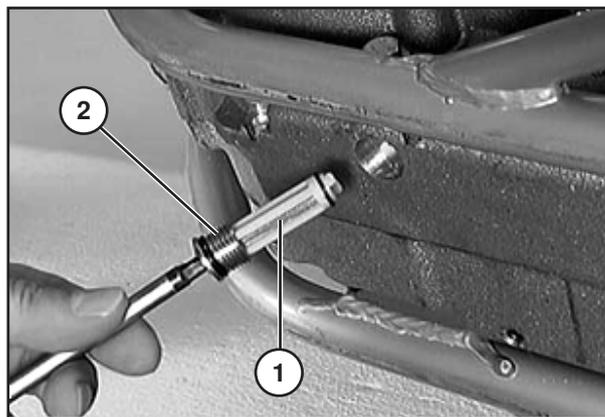


Cleaning the short oil unit

Short oil unit **1** is fitted into socket-head screw **2** on the lower side of the engine. Insert an Allen key into the socket and unscrew the oil drain screw.

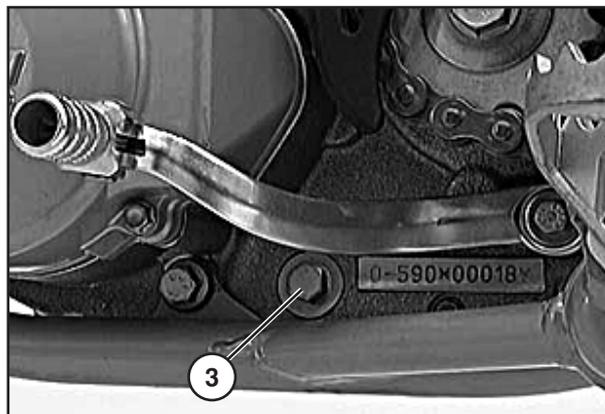
Remove the oil unit, thoroughly clean its components and blow them with low-pressure compressed air. Check the O-rings for damage and if necessary replace them.

Replace the oil unit with the screw and tighten the latter to 10 N·m.

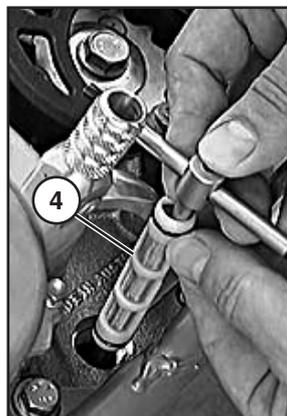


Cleaning the long oil unit

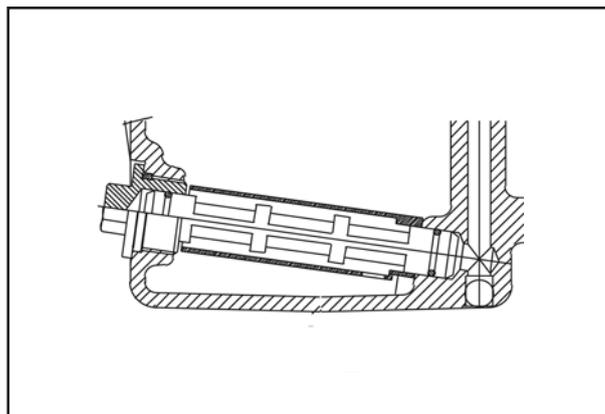
The long oil unit is fitted into hexagonal-head screw **3** next to the engine number. Remove the screw with the oil unit, thoroughly clean the components and blow them with low-pressure compressed air. Check the O-rings for damage and if necessary replace them.



Fit long oil unit **4** using a 300 mm spanner as shown in the figure, then insert the spanner through the opening in the hole on the opposite side of the crankcase. Push the oil unit into the crankcase until it stops and remove the spanner. Refit screw **3** and tighten to 15 N·m.



The oil unit is fitted at an angle (see figure). To avoid malfunctions, be sure to observe this position.

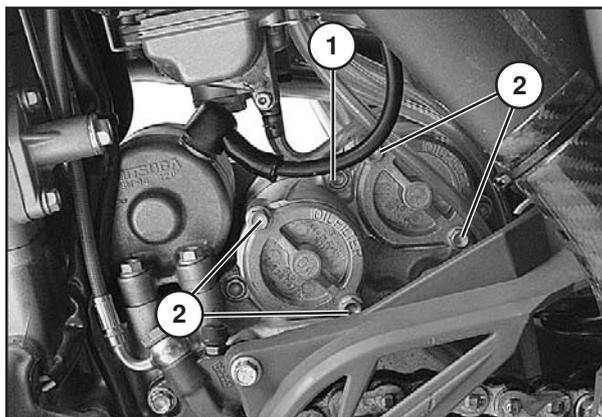


Replacing the oil filter

Remove screw **1** and place a container under the engine to collect the drained oil. Remove the four screws **2** and take off the two oil filter covers.



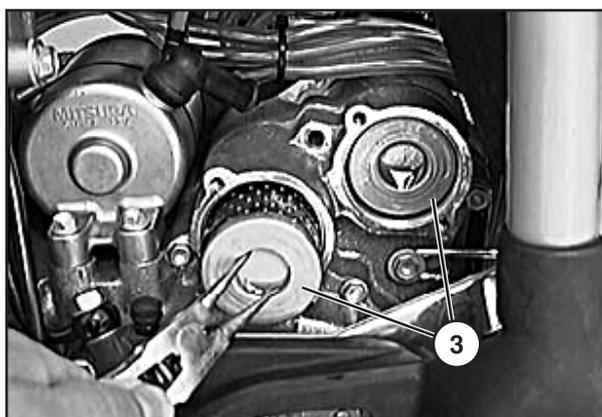
ENVIRONMENT: Dispose of spent oils in compliance with applicable laws.



Using a pair of Seeger ring pliers, pull out the two filter elements **3** from the crankcase.

Clean the oil filter covers, the O-ring sealing surfaces and the crankcase. Check the O-rings and the oil filter covers for damage and replace as necessary.

Turn the vehicle upside down and half fill the two oil filter casings with engine oil.



Fit the long filter unit in the front and the short filter unit in the back of the crankcase.

Grease the oil filter cover O-rings and fit covers **4**.

Fit screws **2** and tighten them to 6 N·m.

Tighten screw **1** to 8 N·m.

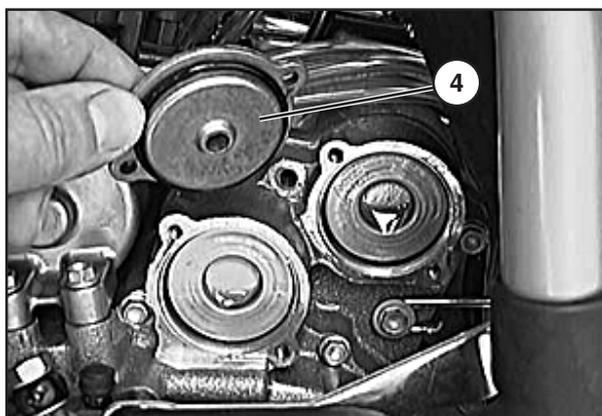
Lift up the vehicle.

Remove screw fastening **5** from the clutch cover and pour in 1.25 litres of the recommended engine oil (see table in Chapter 3).



WARNING: Before actually starting the engine, actuate the kickstart several times to allow the oil to spread throughout the system.

Subsequently start the engine and check all screw fastenings and oil filter covers for signs of leakage. Finally check the engine oil level and top up as necessary.



Checking the front brake fluid level

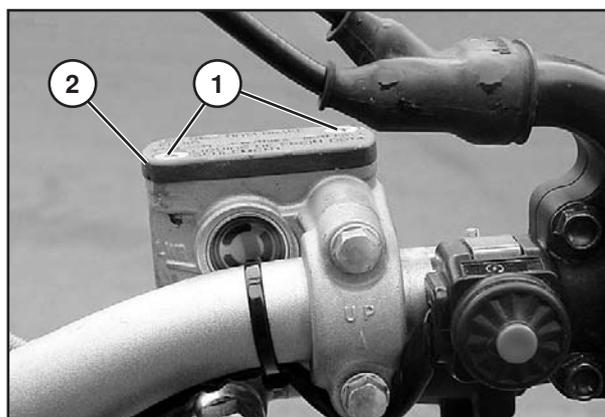
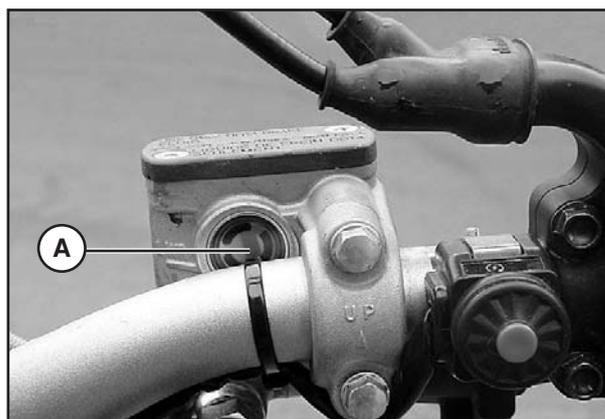
Check the brake fluid level by looking through sight **A**. The level should never fall below the mark in the sight.

Restoring the front brake fluid level

To restore the brake fluid level, unscrew the two screws **1**, lift cap **2** and pour in fresh fluid (IP DOT 4) until the level is 5 mm below the upper rim of the reservoir.

IMPORTANT: We recommend using DOT 4 brake fluid. Should this fluid be unavailable, use DOT 5.1 instead. Do not on any account use DOT 5 brake fluid, a purple liquid with a base of silicone requiring special seals and tubes.

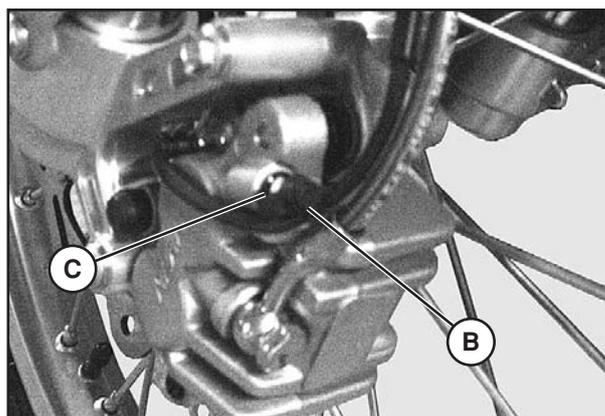
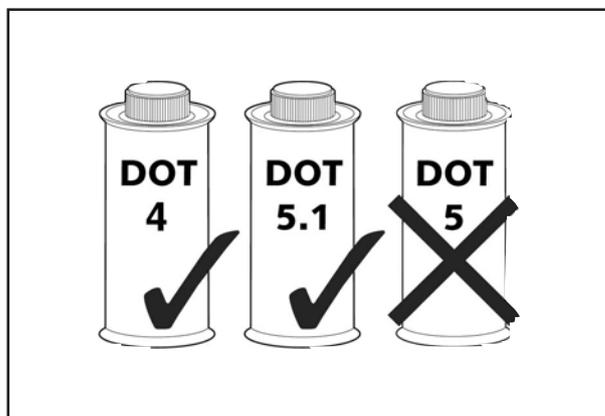
WARNING: Brake fluid is highly corrosive. Take care not to drip it onto the paintwork.



Bleeding the front brake

To bleed air from the front brake circuit, follow these steps:

- Remove rubber cap **B** from valve **C**.
- Open the brake fluid reservoir cap.
- Insert one end of a small tube into valve **C** and place the other end in a container.
- Unscrew valve **C** (while pulling the lever) and repeatedly pull the brake lever until the oil comes out in an uninterrupted flow with no air bubbles. During this operation it is important that the brake lever should never be released completely. Keep pouring brake fluid into the brake pump reservoir to compensate for the fluid that is flowing out.
- Tighten the valve and remove the tube.
- Replace the cap.
- Fit the reservoir cap on the brake pump.



Checking the rear brake fluid level

Ensure the brake fluid level by looking through sight **D**. The level should never fall below the mark in the sight.

Restoring the rear brake fluid level

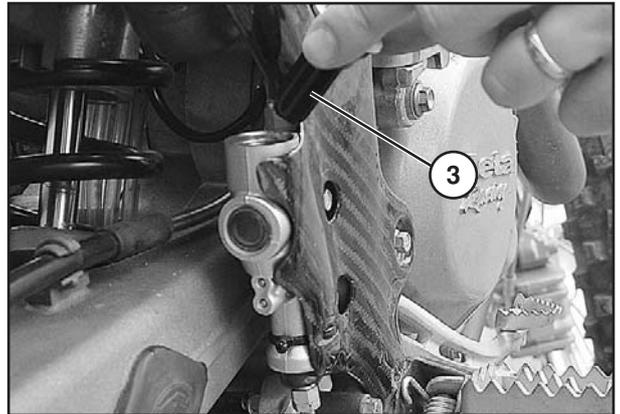
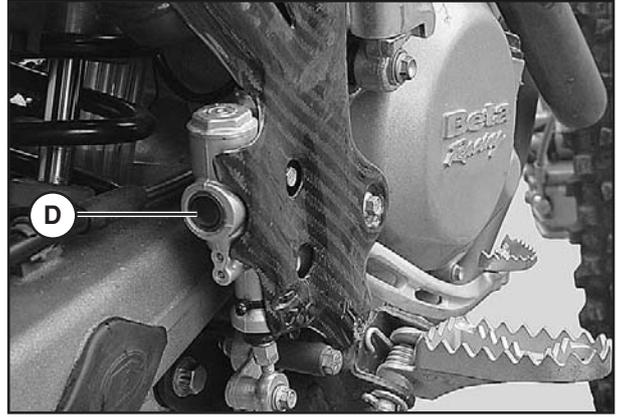
To restore the brake fluid level, unscrew cap **3** and pour in fresh fluid (IP DOT 4) until the level reaches the mark in sight **D**.



IMPORTANT: We recommend using DOT 4 brake fluid. Should this fluid be unavailable, use DOT 5.1 instead. Do not on any account use DOT 5 brake fluid, a purple liquid with a base of silicone, as it requires special seals and tubes.



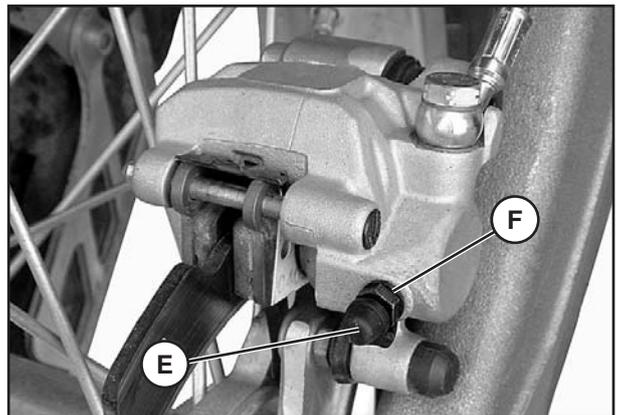
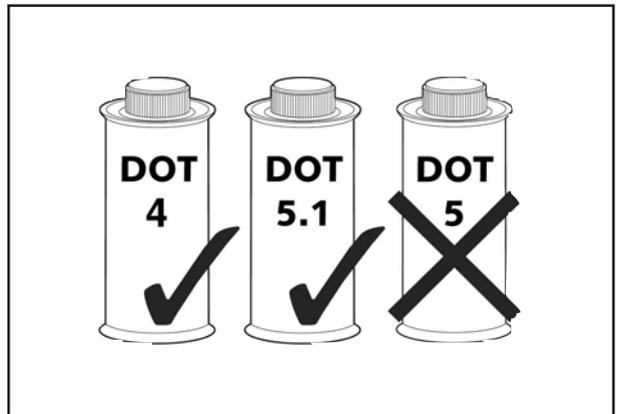
WARNING: Brake fluid is highly corrosive. Take care not to drip onto the paintwork.



Bleeding the rear brake

To bleed air from the rear brake circuit, follow these steps:

- Remove rubber cap **E** from valve **F**.
- Unscrew the brake fluid reservoir cap.
- Insert one end of a small tube into valve **F** and place the other end in a container.
- Unscrew valve **F** (while operating the pedal) and repeatedly actuate the brake pedal until the oil comes out in an uninterrupted flow with no air bubbles. During this operation it is important that the brake pedal should never be released completely. Keep pouring brake fluid into the brake pump reservoir to compensate for the fluid that is flowing out.
- Tighten the valve and remove the tube.
- Replace the cap.
- Fit the reservoir cap on the brake pump.



Checking the front brake pads

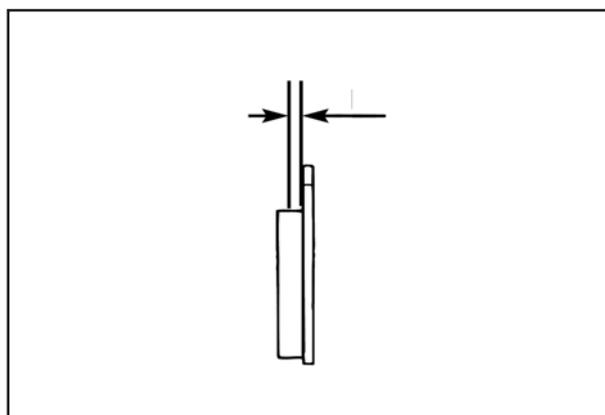
To check the wear of the front brake pads, visually inspect the caliper from below. The lining on the visible ends of the two brake pads should be at least 2 mm thick. Should the lining be thinner, immediately replace the brake pads.



NOTE: Perform the check at the intervals specified in the *Maintenance* table in Chapter 3.

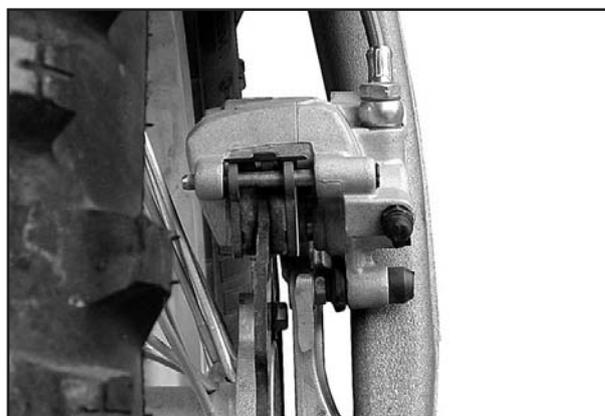


WARNING: Any delay in the replacement of the brake pads can result in poor braking and lead to brake disc damage.



Checking the rear brake pads

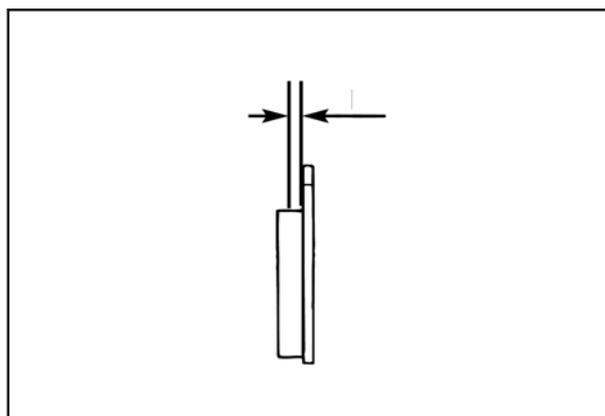
To check the wear of the rear brake pads, visually inspect the caliper from behind. The lining on the visible ends of the two brake pads should be at least 2 mm thick. Should the lining be thinner, immediately replace the brake pads.



NOTE: Perform the check at the intervals specified in the *Maintenance* table in Chapter 3.



WARNING: Any delay in the replacement of the brake pads can result in poor braking and lead to brake disc damage.



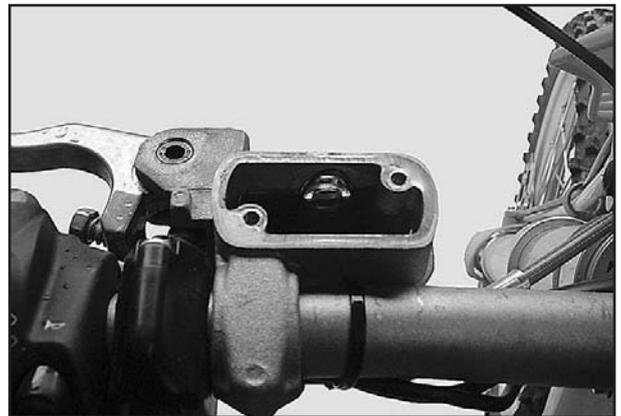
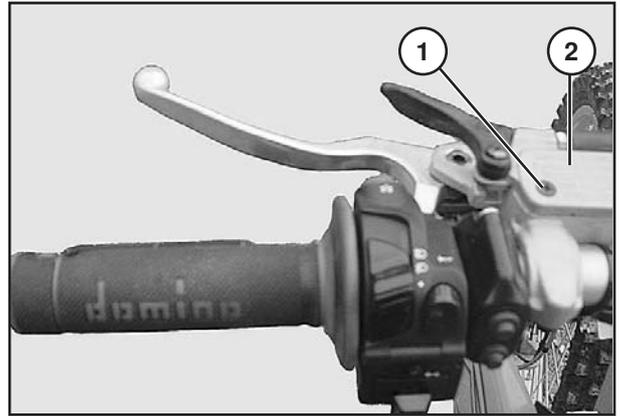
Checking the level of the hydraulic clutch fluid

To check the level of the fluid in the clutch pump, it is first necessary to remove cover **2**.

Remove the two screws **1** and take off cover **2** together with the rubber bellows.

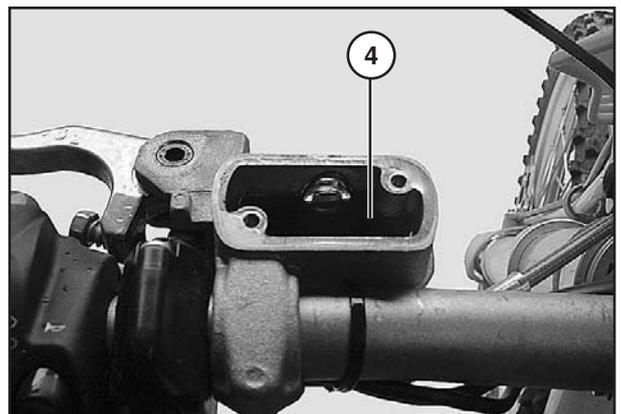
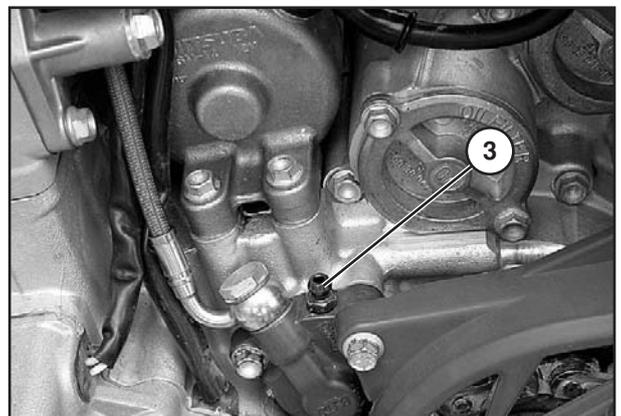
When the clutch pump is in a horizontal position, the fluid should be 4 mm below the upper rim.

If necessary, top up with hydraulic fluid of the recommended type (see Chapter 3).



Bleeding the hydraulic clutch

Before bleeding the clutch, it is first necessary to remove the clutch pump cover. Remove the two screws **1** and take off cover **2** together with the rubber bellows. Remove the breather valve from clutch pump cylinder **3** and replace it with the bleeding syringe filled with SAE 10 hydraulic fluid. Inject fluid until it comes out with no air bubbles from clutch pump hole **4**. Ensure that no fluid flows over. After completing the bleeding, check the level of the fluid in the clutch cylinder and if necessary top up with hydraulic fluid of the recommended type (see Chapter 3). It is essential that only mineral oil should be used.

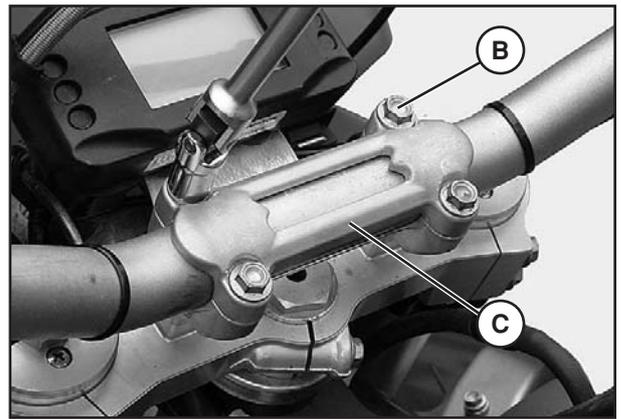


Fork oil

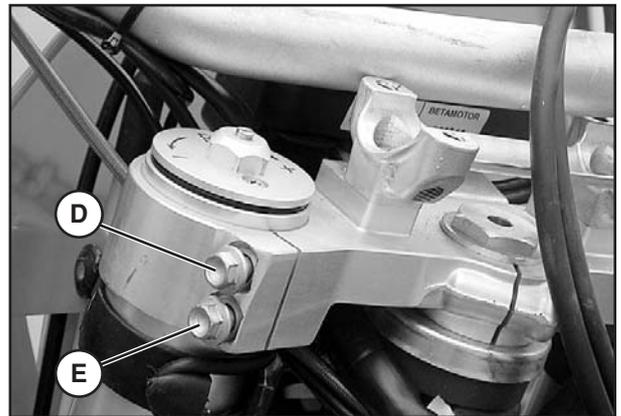
Left/right fork leg

To renew the oil, follow these steps:

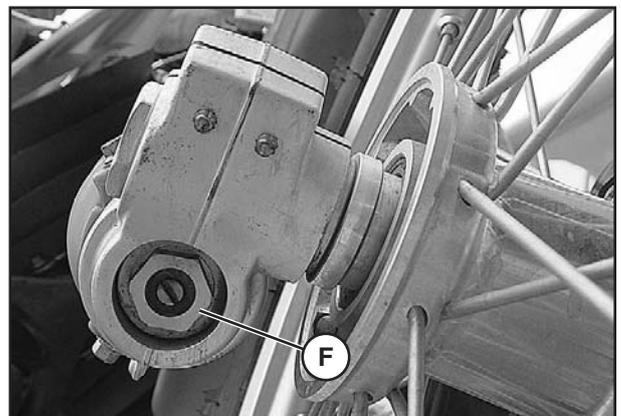
- Unscrew the four screws **B** fastening handlebar clamp **C** and remove the handlebars.



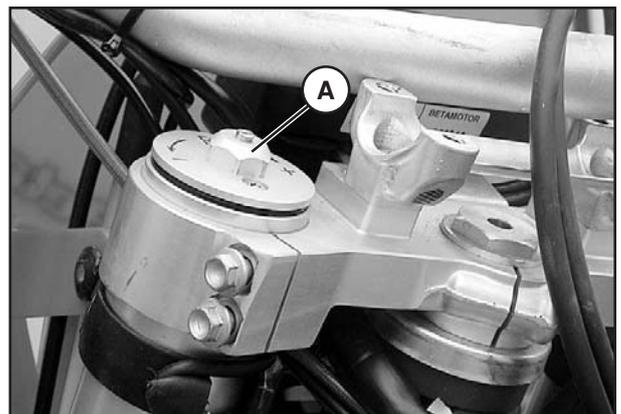
- Loosen leg clamping screws **D** and **E**.



- Remove lower plug **F** and upper plug **A** (pay attention to the spring).
- Allow the oil to drain completely from the fork leg.
- Screw on lower plug **F** again.



- Pour in fresh oil of the type specified in the table in Chapter 3.
- Screw on upper plug **A** again.
- Tighten screw **D**, then screw **E** and then screw **D** again.



Air filter

A dirty air filter blocks the passage of air, reduces engine power and increases fuel consumption. For these reasons, it is essential to maintain the oil filter on a regular basis.

To gain access to the filter, follow these steps:

- Remove the saddle.
- Lift and rotate battery **1**.
- Release filter fastener **2**.
- Pull out air filter **3**.
- Carefully wash the filter in soap and cold water or using a suitable detergent.
- Dry the filter.
- Wet the filter with filter oil, taking care to remove any excess oil so as to prevent dripping.



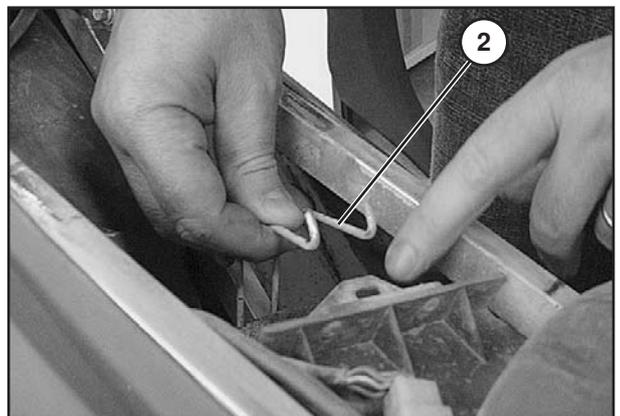
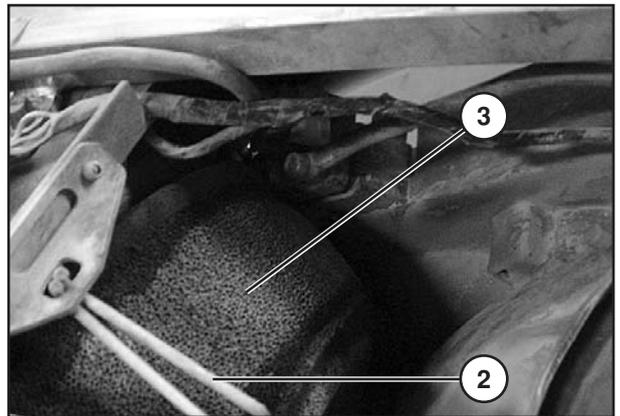
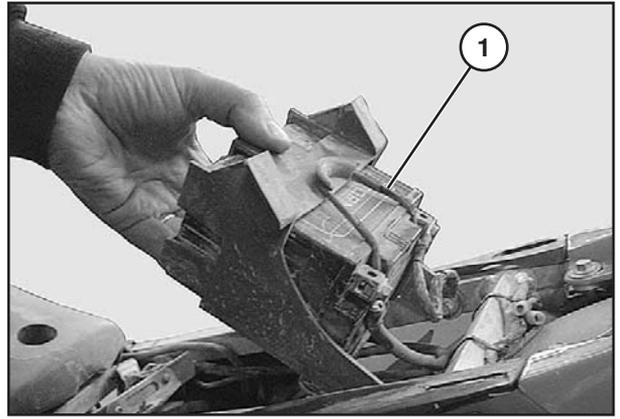
WARNING: Do not clean the filter in foam containing petrol or petroleum as these substances may corrode it. Do not clean the filter with hot water.

Do not start the engine if the air filter is not in place: dust and dirt getting into the engine could cause damage and excessive wear.

- If necessary, also clean the inside of the filter casing.
- When refitting, make sure of the seal of the rubber gasket.
- Reattach filter fastener **2**.



WARNING: After working on the filter, ensure that no object is left inside the filter casing. Clean the filter every time the vehicle is used off road.



Spark plug

Maintaining the spark plug in good condition makes for reduced fuel consumption and optimum engine performance. It is preferable to remove the spark plug when the engine is hot (obviously after switching it off) as the carbon formation and the colour of the insulator provide important information on carburation, lubrication and the general condition of the engine.

NOTE:

spark plug is black: mixture is "rich"
spark plug is light brown: mixture is correct
spark plug is white: mixture is "lean"



To avoid serious hand burns, wear protective gloves and perform the operation with great caution.

To perform the check, simply remove the spark plug cap and unscrew the spark plug using the spanner provided. Carefully clean the electrodes using a wire brush. Blow the spark plug with compressed air to prevent any residues from getting into the engine.

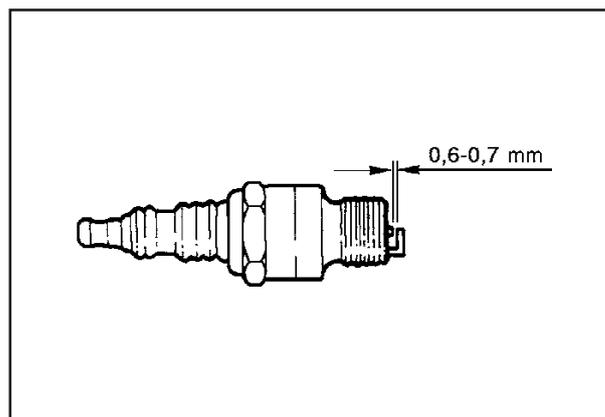
Using a thickness gauge, check that the spark gap is 0.6-0.7 mm. If necessary, correct the distance by bending the earth electrode.

Also check that the insulator is not cracked and the electrodes are not corroded. If that is the case, immediately replace the spark plug.

Perform the check by referring to the indications provided in the table Maintenance in Chapter 3.

Lubricate the spark plug thread and, when the engine is cold, screw in the spark plug by hand until it stops and then tighten it with the spanner.

NOTE: Always use NGK DCPR 8 E spark plugs.



Carburettor - Idle speed adjustment

The adjustment of the idle speed strongly affects engine starting, i.e. an engine whose idle speed is properly adjusted is easier to start than an improperly tuned engine.

The idle speed is adjusted by means of adjusting roller **1** and mixture adjusting screw **2**. The adjusting roller alters the base position of the throttle valve; the mixture adjusting screw adjusts the idle speed mixture, which comes to the engine through the idle speed system. Turning the screw clockwise decreases the quantity of fuel (lean mixture); turning it anticlockwise increases the quantity of fuel (rich mixture).

To properly adjust the idle speed, follow these steps:

- Turn in mixture adjusting screw **2** until it stops, then turn it to obtain the basic adjustment prescribed by BETAMOTOR (see engine specifications in Chapter 3).
- Warm up the engine.
- Using adjusting roller **1**, adjust the standard idle speed (1400 - 1500 rpm).
- Slowly turn mixture adjusting screw **2** clockwise until the idle speed begins to decrease. Memorize this position. Now slowly turn the mixture adjusting screw anticlockwise until the engine speed starts to decrease again. Choose the point between these two positions where the idle speed is higher. Should the engine speed increase considerably, reduce it to the standard level and repeat the above procedure.

NOTE: Failure to successfully complete the above procedure may be due to an idling jet of unsuitable size.

- a) If the mixture adjusting screw is turned until it stops and the idle speed does not change, fit a smaller idling jet.
- b) If the engine stalls while the mixture adjusting screw is still two turns open, fit a larger idling jet.

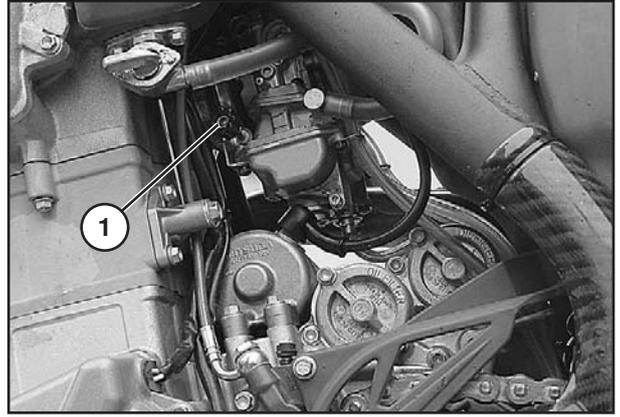
Obviously, once the jet has been replaced, the adjusting procedure will have to be restarted from the beginning.

- Now use the adjusting roller to obtain the desired idle speed.
- The idle speed needs to be adjusted again in case of marked changes in the outside temperature and the riding altitude.

Basic information about carburettor wear

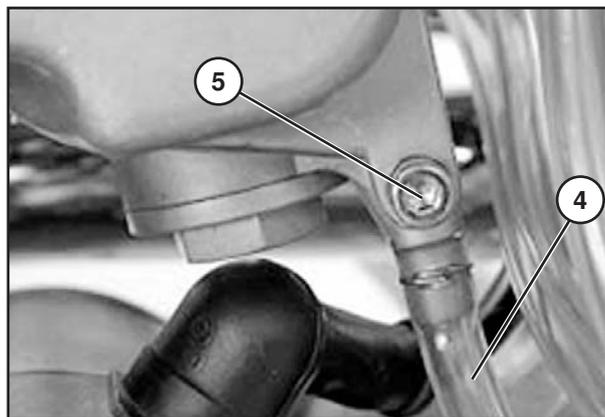
The throttle valve, the jet needle and the needle jet are subject to heavy wear and tear due to engine vibrations.

This could result in carburettor malfunctions (e.g. a richer mixture).



Emptying the float chamber

Should the float chamber need to be emptied, use the following procedure when the engine is cold. Close the fuel cock and place pipe **4** in a container to collect the fuel that will flow out. Open drain screw **5** and drain the fuel. Close the drain screw again, open the fuel cock and check the seal of the system.



 **WARNING:** Fuel is toxic and highly flammable. Handle it with the utmost care. Never work on the fuel system near heat sources or open flames. Always allow the engine to cool down. Clean any excess fuel with a rag. Materials soaked in fuel are also highly flammable. In case of ingestion or contact with sensitive body parts, immediately seek medical attention.

 Dispose of fuel in accordance with the law.

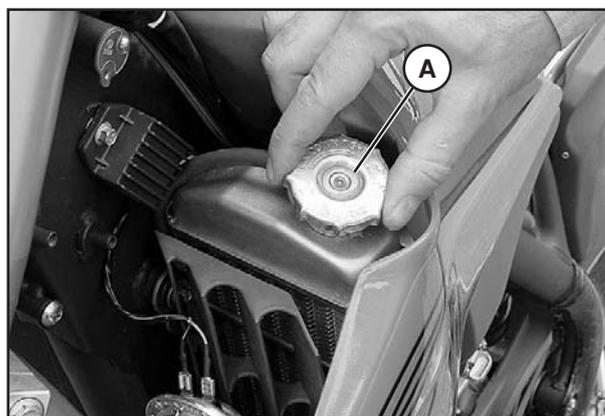
Coolant

 Check the coolant level when the engine is cold. Follow these steps:

- Unscrew cap **A** and visually check the level of the coolant. When the engine is cold, the liquid should be about 10 mm above the radiator fins.
- If the coolant does not cover the radiator fins, add coolant until the level is restored.

The capacity of the circuit is shown in the table in Chapter 3.

 **WARNING:** To avoid burns, never unscrew the radiator filler cap when the engine is hot.



Chain maintenance

The life of the chain mainly depends on its maintenance. Chain without X-rings should be regularly cleaned in petroleum and then immersed in hot chain oil or treated with chain spray.

The maintenance of X-ring chains is reduced to a minimum. The best way to clean them is to use plenty of water. Never attempt to clean an X-ring chain with brushes or solvents. Once the chain has dried, it is possible to use a spray for X-ring chains.



Take special care in ensuring that the lubricant does not come into contact with the rear tyre or the brake disc, otherwise the grip of the tyre or the braking action would be considerably reduced, making the vehicle difficult to control.

Chain wear

Carefully follow the procedure described below to check the wear of the chain.

Change into neutral, pull up the upper chain stretch with a force of 10-15 kg (see figure). Now measure the length of 18 links on the lower chain stretch. If the measurement is equal to or greater than 272 mm, replace the chain. Chains do not always wear out evenly. For this reason the measurement should be taken at different points along the chain.



When fitting a new chain, it is advisable to change the front and rear sprockets as well. New chains wear out faster when fitted on old and worn-out front sprockets.

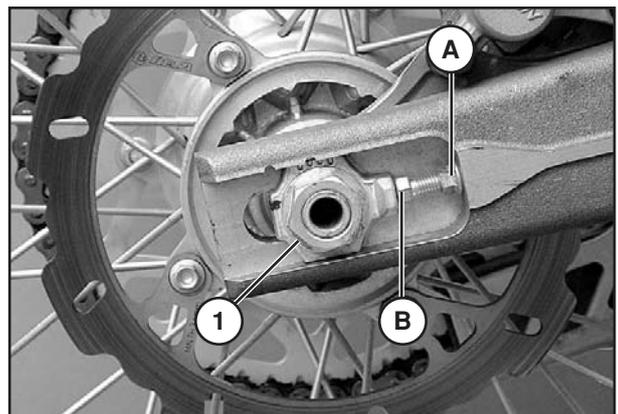
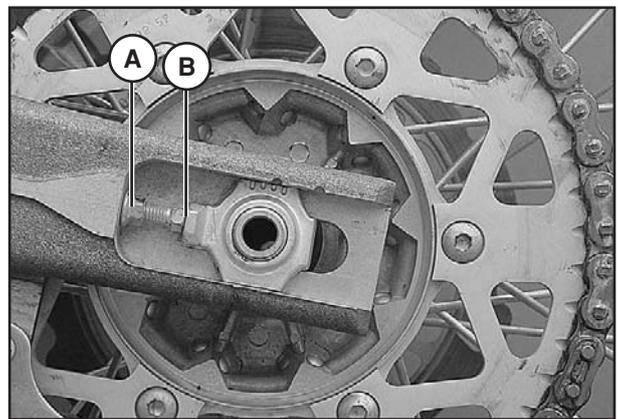
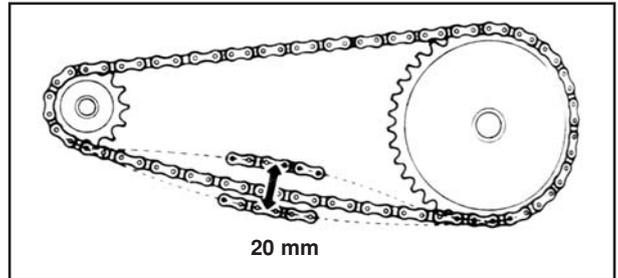
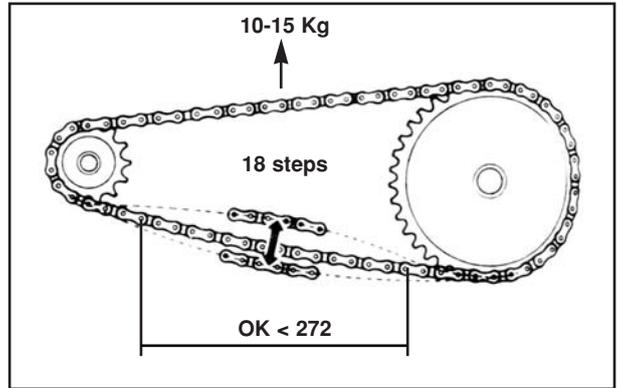
In case of replacement, adjust the chain tension.

Chain tensioning

To prolong the life of the drive chain, it is advisable to periodically check its tensioning.

Always keep the chain clean and lubricated. Whenever the chain play exceeds 20 mm, adjust the chain tension by following these steps:

- Loosen wheel spindle nut **1**.
- Loosen counternuts **A** on both fork arms.
- Turn adjusting screw **B** on either side to obtain the desired tension.
- Tighten counternuts **A** on both fork arms.
- Tighten nut **1**.



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