aprilia

Service and repair manual

Pegaso 650

942V

FOREWORD

- This manual supplies the main information for normal servicing procedures.
- The information and illustrations contained in this manual are updated to the moment of its publication.
- This publication is meant for professional mechanics, therefore many notions have been intentionally omitted, as they were regarded as superfluous.
  For any further information, contact **aprilia s.p.a.** SERVICE DEPARTMENT.
- For any further information see the ENGINE SERVICE MANUAL, No 933 (D-UK) / No 934 (I-E-F), the ENGINE SPARE PARTS CATALOGUE and the "CHASSIS PARTS" SPARE PARTS CATALOGUE, No 261V

aprilia s.p.a. reserves the right to modify its models at any time, without prejudice to the main characteristics here described.

The mention to products or services supplied by third parties is made only for information purposes and is not binding in any case.

aprilia s.p.a. takes no responsibility as to the performance or the use of said products.

HOW TO USE YOUR SERVICE AND REPAIR MANUAL

- ADVICE FOR CONSULTATION
  - If not expressly described otherwise, the reassembly of the groups is to be carried out repeating the disassembly phases in the reverse order.
  - For each single operation on the engine, consult the specific manual.
  - For ordinary maintenance, consult the "USE AND MAINTENANCE" manual.

Remember: 1 mile = 1.6 km
1 km = 0.625 miles

- SYMBOLS
  Carefully observe the instructions preceded by the following warning signs:

Safety norms and regulations to protect the pilot, the mechanic and other people from severe injuries or grave risks.

Indications to make the operations easier. Technical information.

★ **The operations preceded by this symbol must be repeated on the opposite side of the vehicle.**

In this manual the various versions are indicated by the following symbols:

OPT optional
catalytic version
UK United Kingdom version
A Austria version
CH Switzerland version

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1 GENERAL INFORMATION

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GENERAL INFORMATION

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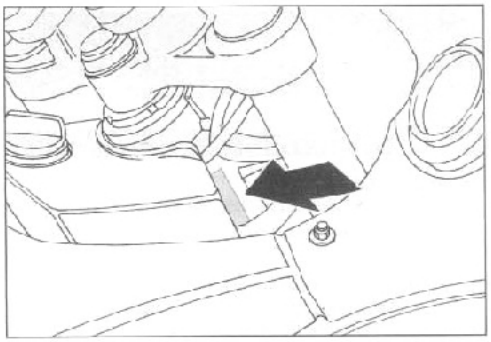
1.1 POSITION OF SERIAL NUMBERS

These numbers are necessary in order to register the vehicle.

Do not alter the identification numbers if you do not want to incur severe penal and administrative sanctions and to cause the immediate invalidation of the guarantee.

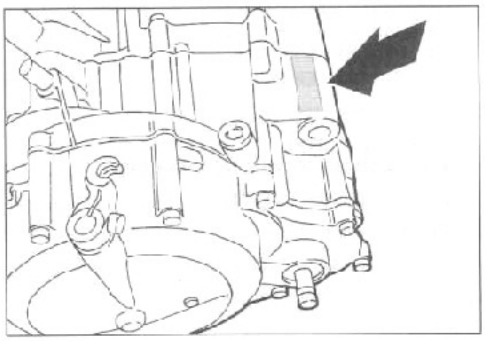
1.1.1 FRAME NUMBER

The frame number is printed on the vehicle right side of the steering tube.



1.1.2 ENGINE NUMBER

The engine number is printed high up on the rear part of the vehicle.



1.2 INSTRUCTIONS FOR USE OF FUEL, LUBRICANTS AND COOLANT

1.2.1 FUEL

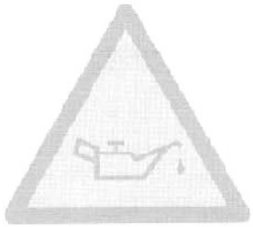
The fuel used for internal combustion engines is extremely inflammable and in certain conditions can become explosive.
It is advisable to perform the operations of refuelling and maintenance in a well-ventilated area with the engine switched off. Do not smoke while refuelling or when near fuel vapours and, in any case, avoid contact with naked flames, sparks and any other source of heat that might cause the fuel to catch fire or to explode. Avoid escape of fuel from the fuel filler as it could ignite on contact with the red-hot surfaces of the engine. In case fuel has accidentally been spilt, make sure that the area is completely dry before starting the vehicle.
Never fill the tank to the brim as fuel expands under the heat of the sun and reacts to the effects of sun radiation.
Close the cap securely after refuelling.
Avoid contact of the fuel with the skin and inhalation of the fumes; do not swallow fuel or pour it from one container into another by means of a tube.
Do not dispose of fuel in the environment.
KEEP FUEL AWAY FROM CHILDREN.

Normal version:
premium grade petrol (4 Stars ★★★★) according to the DIN 51 600 standard, min. O.N. 98 (N.O.R.M.) and 88 (N.O.M.M.).

Catalytic version Ⓒ:
unleaded petrol according to the DIN 51 607 standard, min. O.N. 95 (N.O.R.M.) and 85 (N.O.M.M.).

1.2.2 ENGINE OIL

Engine oil may cause serious damage to the skin if handled daily and for long periods.
It is advisable to wash your hands thoroughly after using.
Do not dispose of oil in the environment.
Deliver it to or have it collected by the nearest used oil recovery firm or by the supplier.



Check engine oil level every 500 km; see 2.12 (CHECKING THE ENGINE OIL LEVEL AND TOPPING UP).
Change engine oil after the first 1000 km and successively every 6000 km; see 2.13 (CHANGING ENGINE OIL AND OIL FILTER).

Recommended engine oil:
IP SUPERBIKE 4, SAE 5W - 40.
As an alternative to the recommended oil, high quality oils with performance conforming or superior to CCMC G-4, A.P.I.SG. specifications may be used.

1.2.3 FORK OIL

Fork oil may cause serious damage to the skin if handled daily and for long periods.
It is advisable to wash your hands thoroughly after using.
Do not dispose of oil in the environment.
Deliver it to or have it collected by the nearest used oil recovery firm or by the supplier.

Recommended fork oil: IP F.A. 5W or IP F.A. 20W fork oil.
If an intermediate performance is desired (between those of IP F.A. 5W and IP F.A. 20W) the products can be mixed as follows:

67% of volume SAE 10W IP F.A. 5W +
33% of volume IP F.A. 20W

33% of volume SAE 15W IP F.A. 5W +
67% of volume IP F.A. 20W

1.2.4 BRAKE FLUID

This vehicle is provided with front and rear disc brakes, with separate hydraulic circuits.
The following information refers to a single braking system, but is valid for both.

Brake fluid may cause irritation if it comes into contact with the skin or eyes.
Carefully wash the part of the body that has come into contact with the fluid.
Consult an oculist or a physician if the fluid comes into contact with your eyes.
Do not dispose of brake fluid in the environment.

KEEP BRAKE FLUID AWAY FROM CHILDREN

Use the brake fluid; it may chemically alter painted surfaces and the parts in plastic, rubber, etc.

Recommended brake fluid:
IP F.F. DOT 5 (DOT 4 compatible)

To avoid serious damage to the braking system, do not use fluids other than the recommended ones nor mix different fluids for topping up.
Do not use brake fluid taken from old or already opened containers. Do not use brake fluid left from previous repairs if they were done some time ago.
Sudden variations in clearance or an elastic resistance in the brake levers may be due to trouble in the hydraulic circuits.
Make sure that the brake discs and the friction pads are completely free of grease or oil, especially after maintenance or checking operations.
Check that the brake cables are not twisted or worn.
Make sure that neither water nor dust accidentally enter the circuit.

In case maintenance operations are to be performed on the hydraulic circuit, it is advisable to use latex gloves.

1.2.5 COOLANT

The coolant can be harmful if swallowed or if it touches the skin or eyes.
If it comes in contact with the skin or eyes, rinse thoroughly with large quantities of water.
If the coolant is swallowed, induce vomiting and immediately consult a doctor.

Do not remove the radiator cap when the engine is hot as the coolant is under pressure and at a very high temperature.

KEEP COOLANT AWAY FROM CHILDREN.

Do not use vehicle if the coolant level is below the minimum prescribed.

Check coolant level every 1000 km and after long runs, see 2.14 (CHECKING AND TOPPING UP COOLANT); change it every 12000 km or every 2 years (whichever occurs first), see 2.15 (CHANGING THE COOLANT).

The coolant is composed of 50% water and 50% antifreeze. This mixture is ideal for most running temperatures and ensures good protection against corrosion.

It is advisable to keep the same mixture in the hot season as well, since in this way losses due to evaporation are reduced and it is not necessary to top up so frequently. The mineral salt deposits left in the radiator by evaporated water are thus lessened and the efficiency of the cooling system remains unaltered.

If the outdoor temperature is below 0°, check th cooling circuit frequently and inf necessary increase the antifreeze concentration (up to maximum 60%).

Use distilled water for the cooling solution so as not to damage the engine.

Recommended coolant: IP ECOBLU - 40°

On the basis of the desired freezing temperature of the coolant mixture, add to the water the percentage of coolant indicated in the following table:

Freezing point °C	Coolant of the volume %
-20°	35
-30°	45
-40°	55

The characteristics of the various antifreeze liquids are different. Be sure to read the label on the product to learn the degree of protection it guarantees.

Use only antifreeze and anticorrosive without nitrite in order to ensure protection at at least -35°C.

1.3 RUNNING-IN RULES

The running-in of the engine is essential to ensure its duration and correct functioning.
If possible, drive on hilly roads or roads with many curves where the engine, the suspensions and the brakes are submitted to a more efficacious running-in.

Only after the first 1500 km of running-in is it possible to obtain the best performance.

Keep in mind these important indications:

- Do not open the throttle completely if the speed is low, both during and after the running-in.
- During the first 100 km put on the brakes with caution, avoiding sharp and prolonged brakings. This ensures a correct bedding-in of the pads on the brake disc
- Do not open the throttle at low speeds, both during and after running-in.
- Brake cautiously during the first 100 km, avoiding abrupt and prolonged braking to ensure a correct adaptation of the brake disc pads.
- Do not exceed 4000 rpm during the first 500 km (see table).
- Do not exceed 5000 rpm between the first 500 and 1000 km (see table).

After the first 1000 km perform the checking operations indicated in the "after running-in" column, see 2.1.1 (PERIODIC SERVICE CHART FOR THE COMPONENTS) in order to avoid injuring yourself or others a/o damaging the vehicle.

- Between the first 1000 and 2000 km increase and vary your speed, using the maximum acceleration only briefly to ensure better coupling of the components subject to wear.
  NEVER exceed 5500 rpm (see table).
- After the first 2000 km you may expect better performance from the engine without, however, exceeding a maximum 6250 rpm.

Engine maximum rpm for the running-in	
Mileage km	Max. rpm
0 - 500	4000
500 - 1000	5000
1000 - 2000	5500
over 2000	6250

1.4 PRECAUTIONS AND GENERAL INFORMATION

Follow with care these recommendations when repairing, disassembling and reassembling the vehicle.

The use of naked flames is forbidden for any type of operation.
Before commencing any service or inspection operation on the vehicle, switch off the engine and remove the key, wait until the engine and the exhaust system have cooled down and, if possible, raise the vehicle with the suitable equipment onto firm flat ground.
In order to avoid burns, be careful not to touch any parts of engine or exhaust system which have not cooled down completely.
The vehicle is constructed of inedible parts.
Do not bite, suck, chew or swallow any part of the vehicle for any reason whatever.
If not expressly described, the reassembly of the units is carried out by reversing the order of operations. Do not run the engine in closed or badly ventilated places.

Handle fuel with the greatest caution.

Never use fuel as a solvent for cleaning the vehicle.

Disconnect the negative cable (–) from the battery when electric welding.

When two or more persons are working together, make sure that each is working in safe conditions.

- Use only original **aprilia** SPARE PARTS.
- Use the recommended lubricants.
- Use, when necessary, the special tools designed for this vehicle.
- Always use the centre stand, if the vehicle is provided with it.
- In order to carry out certain interventions we recommend using a stand to hold the vehicle in a vertical position.
- When tightening screws and nuts, begin with those having greater diameters or with inner ones, proceeding diagonally.
  Tighten screws or nuts in successive passages before applying driving torque.
- Clean and wash carefully any disassembled parts with low inflammability detergents.
- Whenever possible, lubricate the parts before reassembly.
- Make sure that each component has been reassembled correctly.
- Always replace gaskets, grommets, circlips, O-rings and split pins with new ones.
- Before disconnecting the joints (pipes, cables, etc.), mark the positions on all of them and mark them with different distinguishing signs.
  Each piece must be marked clearly, in order not to have problems during installation.

The bearings must rotate freely, without halting a/o noise otherwise they must be replaced.

Never re-use a circlip.
When a circlip is disassembled from a shaft it must be replaced with a new one.
When assembling a new circlip be careful not to stretch its ends more than strictly necessary to put it on the shaft.
After installing a circlip, make sure that it is completely and firmly inserted in its seat.

1.5 SPARE PARTS

For any replacement, use **aprilia** Genuine Spare Parts only. **aprilia** Genuine Spare Parts are high-quality parts, expressly designed and manufactured for **aprilia** vehicles.

Failure to use aprilia Genuine Spare Parts may result in incorrect performance and damages.

1.6 TECHNICAL SPECIFICATIONS

DIMENSIONI / *DIMENSIONES* / DIMENSIONS	
Max. length	2218 mm
Max. width	880 mm
Max. height (height of instruments)	1265 mm
Saddle height	840 mm
Distance between centres	1480 mm
Min. ground clearance	200 mm
Weight without driver (ready for starting)	200 kg

MOTORE / *MOTOR* / ENGINE	
Type	ROTAX 655- single-cylinder, 4-stroke with 5 valves, dry-sump lubrication
Number of cylinders	1
Displacement	651,88 cm³
Bore and stroke	100 mm / 83 mm
Compression ratio	9 ± 0,5 : 1
Starting	electric
Idling engine	1400 ± 100 rpm
Clutch	Multiple disc in oil bath with control lever on left side of handlebar
Change gear	Mechanical gearshift, 5 gears with foot lever on left side of engine
Cooling	liquid-cooled

CAPACITY	
Fuel (reserve included)	22 ℓ
Fuel reserve	4 ℓ
Engine oil	2200 cm³ (2150 cm³ oil change - 2200 cm³ oil and filter change)
Fork oil (right fork tubo and left fork tubo)	430 cm³
Coolant	1,4 ℓ
Seats	2
VEHICLE MAX. LOAD (driver + passenger + luggage)	182 kg

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TRANSMISSION					
GEAR RATIOS	Gear	Primary transmission	Secondary transmission	Final gear ratio	Total gear ratio
	1ª	37/72 = 1 : 1,946	12/33 = 1 : 2,750	16/47 = 1 : 2,937	15,720
	2ª		16/28 = 1 : 1,750		10,003
	3ª		16/21 = 1 : 1,312		7,502
	4ª		22/33 = 1 : 1,045		5,976
	5ª		24/21 = 1 : 0,875		5,001

CARBURETTORS	
Modello / *Modelo* / Model	Mikuni BST 33
	Ø 31.5mm

FUEL SUPPLY	
Type	gravity feed
Fuel normal version	premium grade petrol (4 Stars) DIN 51 600, O.N. 98 (N.O.R.M.) and 88 premium grade unleaded petrol DIN 51 607 min, O.N. 95 (N.O.R.M.) and 85

FRAME	
Type	Composite structure made of steel and light alloy, with removable cradle and saddle pillar.
Steering inclination angle	28°
Fore stroke	109 mm

SUSPENSIONS	
Front	hydraulically operated telescopic fork
Stroke	180 mm
Rear	hydraulic shock absorber
Stroke	49 mm

BRAKES	
Front	disc brake, 300 mm with hydraulic transmission
Rear	disc brake, 220 mm with hydraulic transmission

WHEELS	
Type	Aluminium tangent spoke wheels
RIMS	
Front	2,15 x 19"
Rear	3,00 x 17"
TYRES	
Front	100/90 - 19 57H
Rear	130/80 - R17 65H
STANDARD INFLATION PRESSURE	
Front	180 kPa (1,8 bar)
Rear	190 kPa (1,9 bar)
INFLATION PRES. WITH PASSENGER	
Front	180 kPa (1,8 bar)
Rear	220 kPa (2,2 bar)

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IGNITION	
Type	C.D.I. (capacitive discharge) / NIPPONDENSO
Standard spark plug	NGK DR 8 EA - NGK DR 8 ES
Spark plug gap	0,6 ÷ 0,7 mm

ELECTRIC SYSTEM	
Battery	12 V - 12 Ah
Fuses	20 - 15 - 7,5 A
Generator (with permanent magnet)	12 V - 280 W

BULBS	
Low/high beam	12 V - 55 / 60 W
High beam	12 V - 3 W
Parking light	12 V - 5 W
Direction indicators	12 V - 10 W
Rear parking and stop light	12 V - 5/21 W
Plate light	12 V 3 W
Speedometer	12 V - 3 W
Revolution counter	12 V - 2 W
Coolant temperature indicator	12 V - 1,2 W

WARNING LIGHTS	
Direction indicators	12 V - 3 W
Low fuel	12 V - 3 W
Engine oil pressure	12 V - 2 W
Gear in neutral	12 V - 3 W
High beam	12 V - 2 W
Low beam	12 V - 3 W

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1.7 LUBRICANT CHART

Engine oil (recommended): IP SUPERBIKE 4, SAE 5W-40.
As an alternative to the recommended oil, it is possible to use high-quality oils with characteristics in compliance with or superior to the CCMC G-4, A.P.I. SG specifications.

Fork oil (recommended): fork oil IP F.A. 5W or IP F.A. 20 W.
If you need an oil with intermediate characteristics in comparison with the two recommended products, these can be mixed as indicated below:
SAE 10W IP F.A. 5W 67% of the volume, + IP F.A. 20W 33% of the volume.
SAE 15W IP F.A. 5W 33% of the volume, + IP F.A. 20W 67% of the volume.

Bearings and other lubrication points (recommended): IP AUTOGREASE MP.
As an alternative to the recommended product, use high-quality grease for rolling bearings, working temperature range -30°C...+140°C, dripping point 150°C...230°C, high protection against corrosion, good resistance to water and oxidation.

Protection of the battery poles: neutral grease or Vaseline.

Spray grease for chains (recommended): IP CHAIN SPRAY.

Brake fluid (recommended): IP F.F., DOT 5 (compatible with DOT 4).

Use new brake fluid only.

Engine coolant (recommended): IP ECOBLU -40°C.

Use only antifreeze and anticorrosive without nitrite, ensuring protection at -35°C at least.

Engine oil (recommended): IP SUPERBIKE 4, SAE 5W-40.
As an alternative to the recommended oil, it is possible to use high-quality oils with characteristics in compliance with or superior to the CCMC G-4, A.P.I. SG specifications.

Fork oil (recommended): fork oil IP F.A. 5W or IP F.A. 20 W.
If you need an oil with intermediate characteristics in comparisn with the two recommended products, these can be mixed as indicated below:
SAE 10W IP F.A. 5W 67% of the volume, + IP F.A. 20W 33% of the volume.
SAE 15W IP F.A. 5W 33% of the volume, + IP F.A. 20W 67% of the volume.

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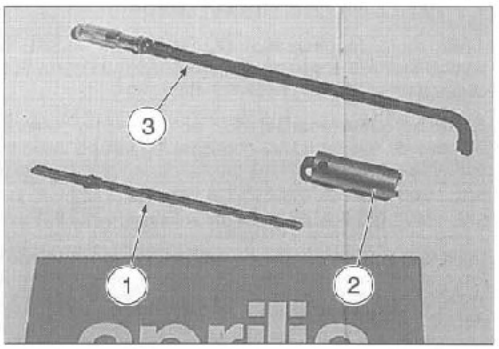
1.8 SPECIAL TOOLS

- Rod iron (1) for the withdrawing of the rear fork pin (it makes it possible to withdraw the pin partially during the removal of the engine from the frame).
- Socket spanner (2) for the rear fork pin locking ring.
- 90° screwdriver (3) for the adjustment of the air screw on the carburettors.



NOTES

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PERIODIC SERVICE AND SETTING UP OPERATIONS

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PERIODIC SERVICE AND SETTING UP OPERATIONS

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This section describes the procedures for periodic service on the principal components of the vehicle.

Before beginning any service operations or inspection of the vehicle, switch off the engine and remove the key, wait until the engine and the exhaust system have cooled down and, if possible, lift the vehicles with the proper equipment onto firm and flat ground.
In order to avoid burns, be careful not to touch any parts of the engine or exhaust system which have not cooled down completely.
The vehicle is constructed of non-edible parts.
Do not bite, suck, chew or low any part of the vehicle for any reason whatever.

If not expressly described otherwise, reassembly of the units is carried out repeating the disassembly operations in the reverse order.

Remember:
1 mile = 1.6 km
1 km = 0.625 miles

2.1 PERIODIC SERVICE PLAN

aprilia recommends respecting the intervals indicated for the periodic service on the various components in order to ensure the best operating conditions of the vehicle.

2.1.1 PERIODIC SERVICE CHART FOR THE COMPONENTS

SERVICE	After running-in (1000 km or 4 months)	Every 6000 km or 8 months	Every 12000 km or 16 months
Battery - liquid level	C	C	
Spark plug		C	S
Carburettors	C	P	
Driving chain	500 km: C		
Timing chain		C	
Suspension linkage bearings	every 30000 km: C		
Wheel tuning		C	
Steering bearings and steering	C	C	
Wheel bearings		C	
Air cleaner		C	S(*)
Engine oil filter (on the frame)	S	S	
Engine oil filter	S	S	
Clutch clearance	R	R	
Tappet clearance	C	R	
Braking system	C	C	
Cooling system	C	C	
Lighting system	C	C	
Brake fluid	C	every year: S	
Coolant	every 1000 km: C		every 2 year: S
Fork oil			S
Engine oil	S	500 km: C / 6000 km: S	
Tyre pressure	R	every month: R	
Engine idling rpm	R	R	
Fuel cock	C	C	
Tightening bolts and nuts	C	C	
Suspensions and position	C		C
Brake fluid bleeding	C		
Spoke tension	C	C	
Tubi carburante / *Tubos del combustible* / Fuel pipes		C	every 4 year: S

C = check and clean, adjust, lubricate or change, if necessary.

P = clean S = change R = adjust

Carry out service operations more frequently if the vehicle is used in rainy, dusty areas or on uneven roads.

2.2 POINTS TO LUBRICATE

Correct lubrication is important for a good performance and long life of the vehicle.

Before lubricating, completely clean all parts, removing rust, grease, dirt and dust. The exposed parts subject to rust are to be lubricated with engine oil or grease. See 1.7 (LUBRICANT CHART).

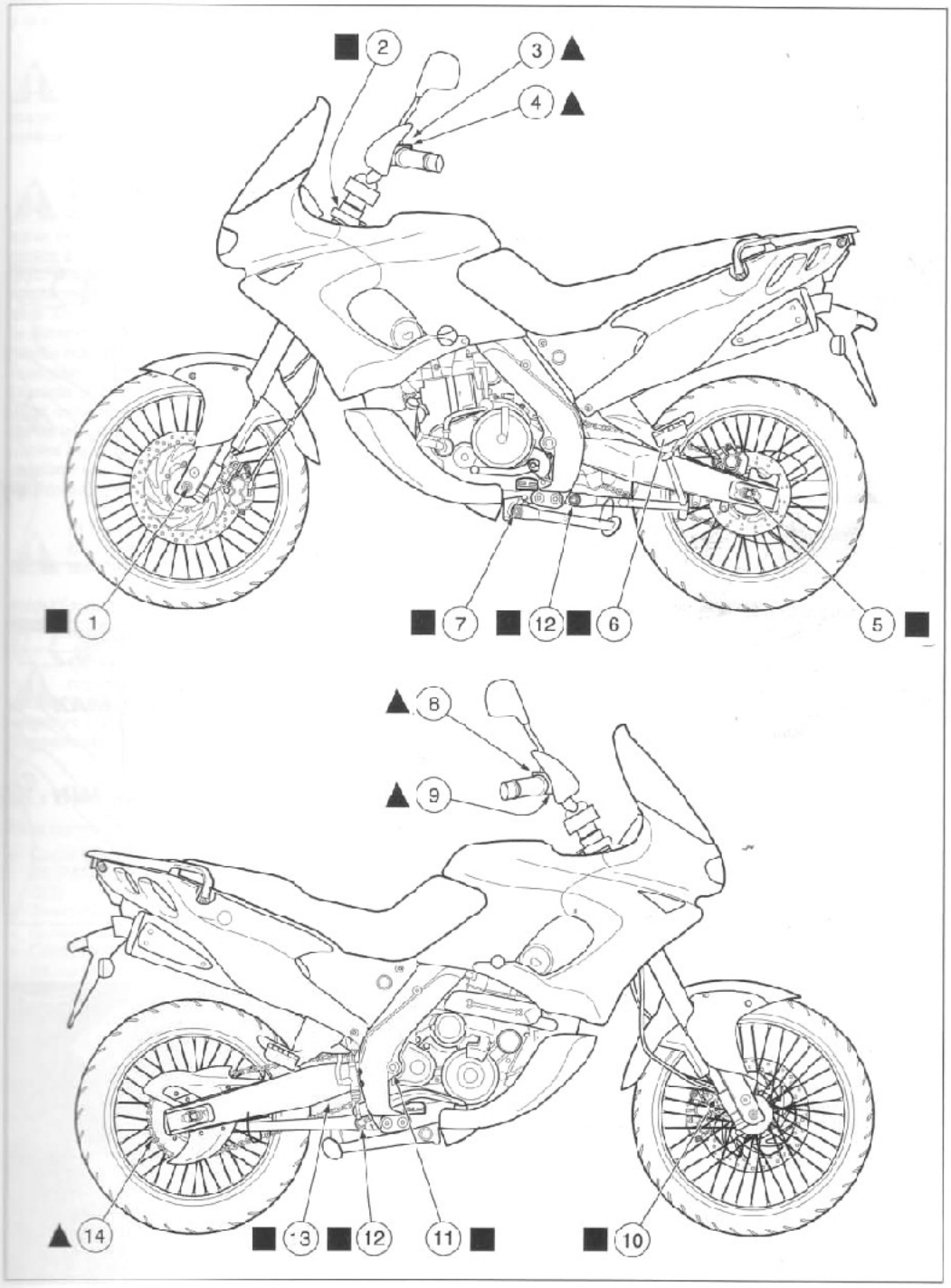
The points to be lubricated are indicated in the "LUBRICATION CHART"

LUBRICATRION CHART KEY

1) Front wheel pin and bearings
2) Steering bearings
3) Clutch lever pin /clutch cable
4) Lever cable for cold starting
5) Rear wheel pin and bearings
6) Passenger footrest pin
7) Side stand pin
8) Accelerator control handgrip
9) Accelerator cables
10) Speedometer/total kilometres odemeter transmission
11) Rear fork pin
12) Centre stand fulcrum screws OPT (n. 2 lubricators)
13) Rear suspension leverage
14) Driving chain

LUBRICATION CHART

■ = Grease
▲ = Oil



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2.3 BATTERY

Carefully read 1.4 (PRECAUTIONS AND GENERAL INFORMATION).

Check the electrolyte level and the tightening of the terminals after the first 1000 km (or 4 months) and then every 6000 km (or 8 months).

The electrolyte in the battery is toxic and caustic and may cause burns on contact with the skin as it contains sulphuric acid. Wear protective clothing, a face mask and/or goggles during service operations.

If electrolyte liquid comes in contact with the skin, wash with large quantities of running water. In case of contact with the eyes, wash with large quantities of water for fifteen minutes and consult an oculist without delay.
If the liquid is accidentally swallowed, drink large amounts of water or milk, then continue drinking milk of magnesia or vegetable oil and promptly call a doctor. The battery gives off explosive gases, particularly during the phase of starting and/or recharging; keep it away from flames, sparks, cigarettes and any other source of heat.
During recharging or using, make sure the room is properly ventilated and avoid inhaling the gases released during recharging. Never invert the connection of the battery cables.

The battery fluid which is very corrosive. Do not pour or spill it, especially on the plastic parts.

KEEP AWAY FROM CHILDREN.

Connect and disconnect the battery with the ignition switch in position "☼".
Connect first the positive cable (+) and then the negative cable (–).
Disconnect following the reverse order.

2.3.1 CHECKING THE ELECTROLYTE LEVEL

To check the electrolyte level:

- Remove the left side, see 7.1.4 (REMOVING THE RIGHT AND LEFT SIDES).
- Unscrew and remove the screw (1).
- Remove the battery cover (2).
- Make sure that the fluid level is included between the two **"MIN"** and **"MAX"** notches stamped on the battery side.

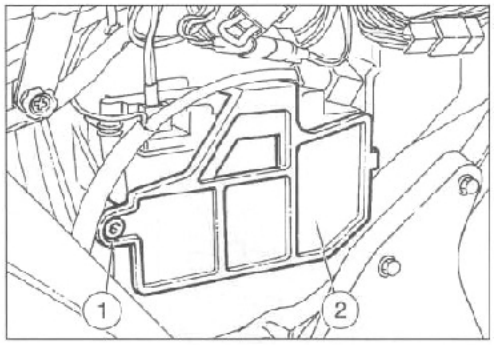
Otherwise:

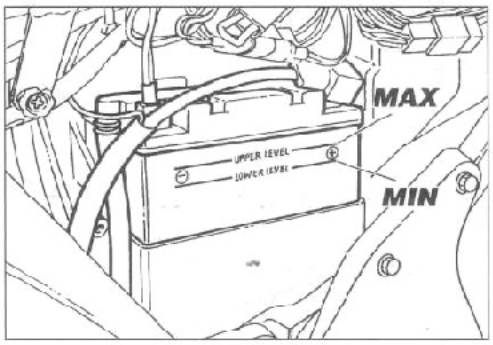
- Remove the element plugs.

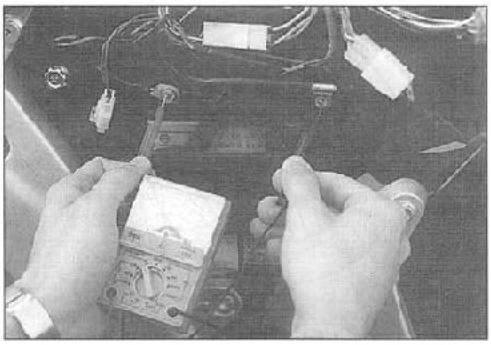
Never exceed the "MAX" notch, since the level increases during the recharge.

- Top up by adding distilled water only.

Check battery voltage with a portable tester. If voltage is less than 12V, the battery must be recharged.







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2.3.2 RECHARGING THE BATTERY

Check the electrolyte level, if necessary top up, then:

- Make sure that the ignition switch is in position "⊘".
- Disconnect, in order, the negative (–) and positive (+) cable.

Upon reassembly, connect first the positive cable (+) and then the negative cable (–).

- Remove the battery breather pipe.

Upon reassembly, always connect the battery breather pipe, to prevent the sulphuric acid vapours from corroding the electric system, painted parts, rubber elements or gaskets when they exit the breather pipe itself.

- Extract the battery from its container and put it in a cool and dry place.
- Remove the element plugs.
- Connect the battery with a battery charger.
- A recharge with an amperage equal to 1/10th of the battery capacity is recommended.
- After the recharging operation, check the electrolyte level again and if necessary top up with distilled water.

2.3.3 LONG INACTIVITY OF THE BATTERY

If the vehicle remains unused for long periods, remove the battery and recharge it completely, using a trickle charge.
Keep the battery in a cool, dry place. If the battery remains on the vehicle, disconnect the cables from the terminals.

During the winter months or whenever the vehicle is not in use, it is important to check the charge (about once a month) in order to prevent deterioration of the battery.

For maintenance of the battery refer to chapter 6.9.2 (MAINTENANCE).

2.4 EXHAUST MANIFOLD NUTS

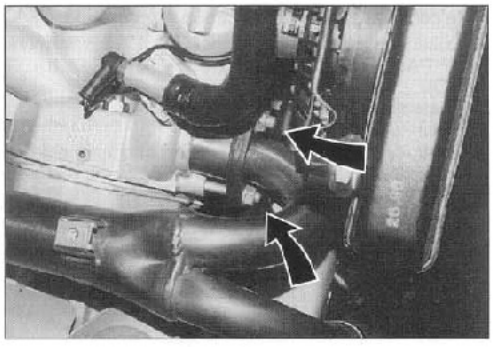
Read 1.4 carefully (PRECAUTIONS AND GENERAL INFORMATION).

Tighten nuts after the first 1000 km (or 4 months) and then after every 6000 km (or 8 months).

Allow the engine to cool down until it reaches room temperature.

- Remove the front fairing, see 7.1.14 (REMOVING THE FRONT FAIRING).
- ⋆ Tighten the exhaust manifold nuts (see figure) to the prescribed torque.

Driving torque: 25 Nm (2.5 kgm)

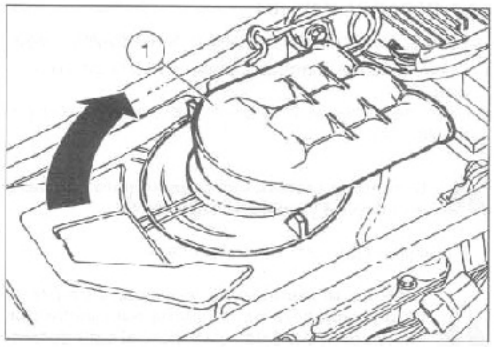


2.5 AIR CLEANER

Read 1.4 carefully (PRECAUTIONS AND GENERAL INFORMATION).

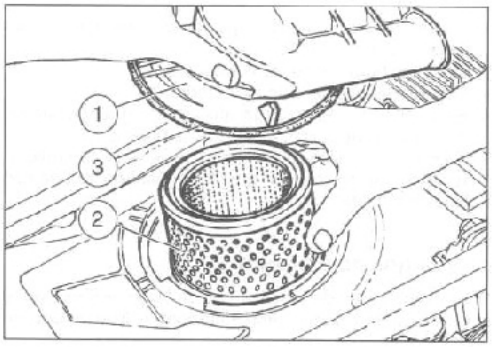
Clean every 6000 km. Replace every 12000 km.

The partial cleaning of the filter does not exclude or postpone the replacement of the filter itself. Do not start the engine if the air cleaner has been removed.
Do not use petrol or solvents to clean the filtering element; they may cause a fire in the fuel system, with serious risks for people and for the vehicle itself.



REMOVAL

- Remove the saddle, see 7.1.3 (REMOVING THE SADDLE).
- Rotate the air conveyor (1) clockwise, raise and remove it.
- Extract the air cleaner (2).



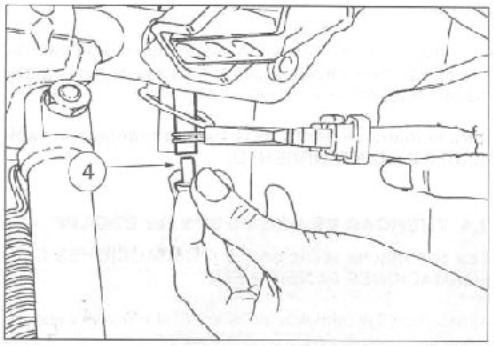
Partial cleaning

Do not press or strike the metal net of the air cleaner.
Do not use screwdrivers or alike.

- Seize the air cleaner vertically and strike it more than once on a clean surface.
- If necessary, clean the filter with a compressed air jet (directing it from the inside towards the outside of the filter).
- Clean the outer part of the air cleaner with a cloth.

Changing

- Replace the air cleaner with a new one of the same type.
- Make sure that the gasket (3) is intact: if it is damaged, change it.
- Every 6000 km, remove the plug (4), so that any impurity that may have accumulated inside the filter case can be discharged.



During above cleaning operations, check to see that there are no tears or rips in the filtering element. Otherwise replace it.
Make sure that the filtering element is correctly positioned so as not to allow passage of non-filtered air.
Remember that premature wear and tear on the segments of the piston or the cylinder is often caused by a defective and badly positioned filtering element.

If the vehicle is used in dusty areas, clean the filtering element more frequently.
Using the vehicle without the filtering element, or with the element damaged, considerably increases wear and tear on the engine.
Make sure the filtering element is always in perfect condition. the life of the engine depends, for the most part, on this component.

2.6 SPARK PLUG

Read 1.4 carefully (PRECAUTIONS AND GENERAL INFORMATION).

Check every 6000 km and replace every 12000 km.

For removing and cleaning:

Allow the engine to cool down until it reaches room temperature.

- Remuove the fuel tank, see 7.1.1 (REMOVING THE FUEL TANK).

Never disconnect the spark plug cap with the engine running, since you may get an electric shock from the ignition system.

- Take off the spark plug cap (1).
- Remove every trace of dirt from the base of the spark plug.
- Unscrew the spark plug (spanner to be found in tool kit) and extract it from its seat, taking care that no dust or other substances enter the cylinder.
- Make sure there are no carbon deposits or corrosion marks on the electrode or the central porcelain part. If necessary, clean them with the special spark plug cleaner, with an iron wire and/or metal brush. Blow a jet of air into the spark plug to prevent any residual material from entering the engine. The spark plug must be replaced if it shows cracks on the insulating material, corroded electrodes or excessive deposits.
- Check the spark plug gap with a thickness gauge; it should be **0.6 ÷ 0.7 mm** (see figure). Adjust it, if necessary, carefully bending the earth electrode. Make sure the washer is in good condition.
- With the washer in place, screw the spark plug completely by hand so as not to damage the thread.
- Tighten the spark plug with the special spanner, giving it half a turn to compress the washer.

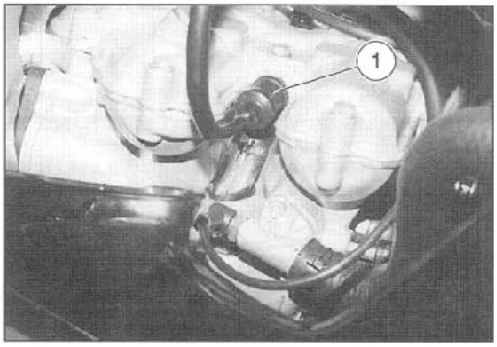
  Spark plug driving torque: 20 Nm (2 kgm).
- Put back the spark plug cap.

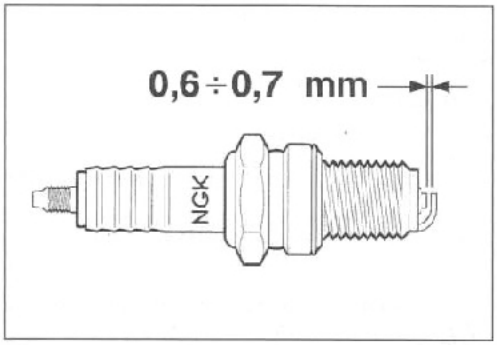
The spark plug must be tightened well otherwise the engine could overheat and be seriously damaged. Use the recommended type of spark plug only so as not to endanger the performance and life of the engine.

When changing the spark plug we recommend using the standard type, see 1.6 (TECHNICAL SPECIFICATIONS).
Remove the spark plug and check the insulator.
The heat rating is correct if both the insulators are coloured light brown. If the insulators are seen to be blackened from carbon deposits, use spark plugs with a hotter heat rating.

If the insulator is white, replace the spark plug with one with a colder heat rating.
Spark plugs with a cold heat rating are used for high speed driving.
They are designed to cool sufficiently and to prevent overheating and are called "cold" spark plugs.

When replacing a spark plug, check the pitch and length of the thread. If the threaded part is too short, carbon deposits will settle on the thread seat and may result in damage to the engine when the correct one is positioned back in place.





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2.7 CARBURETTORS

Check the carburettor after the first 1000 km (or 4 months) and then after every 6000 km (or 8 months).

For further information, see 4.5 (CARBURETTORS).

2.8 FUEL TUBING

Check every 6000 km (or 8 months).
Replace every 4 years.

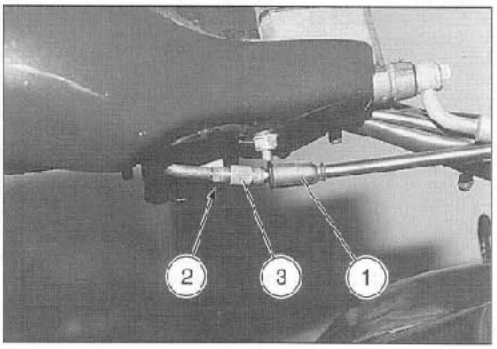
For further information see 4.0 (FUEL SUPPLY SYSTEM).

2.9 ACCELERATOR CABLE

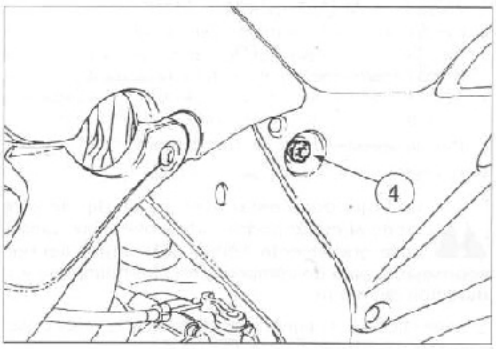
2.9.1 ADJUSTING THE ACCELERATOR CONTROL

The idle stroke of the accelerator control handgrip should be **2 to 3 mm**, measured on the edge of the handgrip itself. If this is not confirmed, proceed as follows:

- Position the vehicle on stand.
- Remove the protection guard (1)
- Loosen the lock nut (2)
- Rotate the adjuster (3) so as to return to the prescribed value.
- After this adjustment, tighten the lock nut (2) and check the idle stroke again.
- Put the protection guard in place again (1)



After completing the adjustment, check that the rotation of the handlebar does not modify the idling rpm of the engine and that the accelerator handgrip returns smoothly and automatically into a rest position when released.

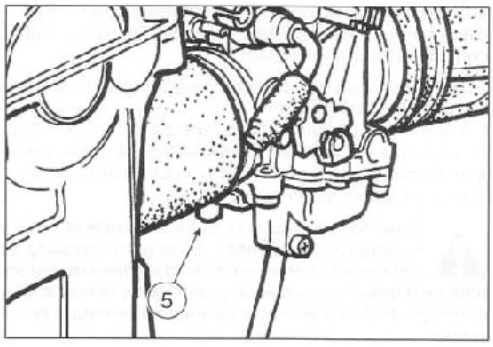


2.9.2 ADJUSTMENT OF IDLING RPM

Adjust the idling every time it is irregular.

To carry out this operation, proceed as follows:

- Ride for a few miles until reaching the normal running temperature.
- Keep the vehicle in vertical position.
- Check the engine idling rpm on the revolution counter. The engine idling speed must be about 1400 ± 100 rpm.



If necessary:

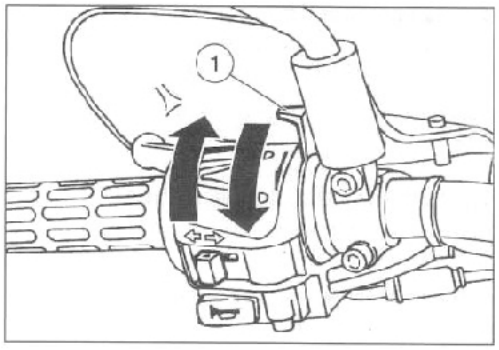
- Adjust the knob (1) positioned on the left side of the vehicle.
  By SCREWING IT (clockwise), you increase the engine rpm.
  By UNSCREWING IT (anticlockwise), you decrease the engine rpm.
- Twist the throttle grip, accelerating and decelerating a few times to make sure that it functions correctly and to check if the idling speed is constant.
- ★ If necessary, adjust the air screw (5) by means of the apposite 90° screwdriver, see 1.8 (SPECIAL TOOLS).

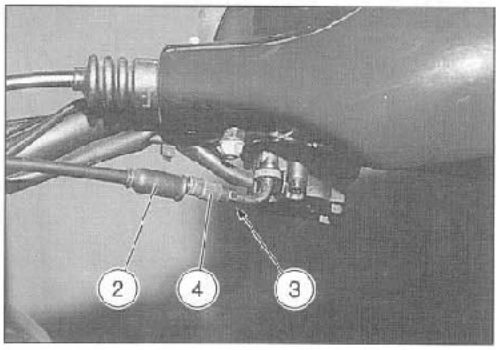
2.10 COLD START CABLE

The cold start cable must be adjusted so that the hand lever (1) has an idle stroke of **2-3 mm.** If adjustment is necessary, proceed as follows:

- Position vehicle on stand.
- Remove the protection guard (2).
- Loosen the lock nut (3).
- Rotate the adjuster (4) in one of the two directions to obtain the prescribed idle stroke.
- After this adjustment, tighten the lock nut (3) and check the hand lever play once more.
- Put the protection guard (2) in place again.

On completion of adjustment check that the rotation of the handlebar does not influence the engine rpm.





2.11 CLUTCH CABLE

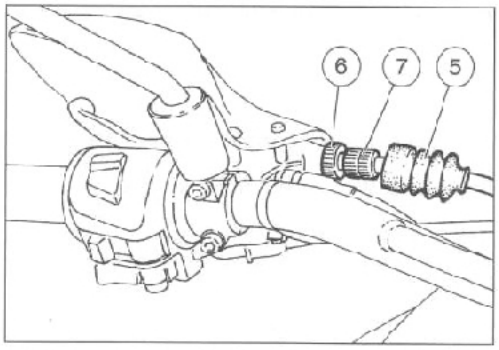
Adjust after first 1000 km and then after every 6000 km.

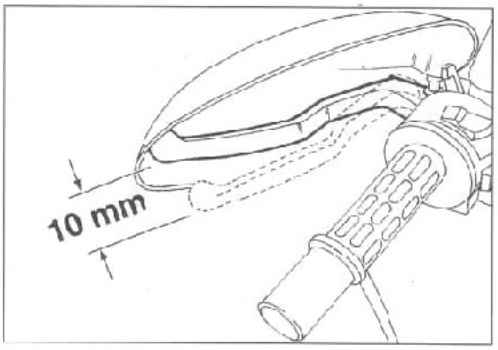
Adjustment of the clutch should be done when the engine stops or the vehicle tends to move ahead (with the clutch lever pulled and gear engaged) or else the clutch slips, causing a delay in acceleration in respect of the engine rpm.

To adjust the clutch, proceed as follows:

- Position the vehicle on stand.
- Remove the protection guard (5).
- Loosen the lock nut (6).
- Rotate the adjuster (7) until the idle stroke of the clutch lever is ca. **10 mm.**
- Tighten the lock nut (6) and check the adjustment again.
- Put the protection guard in place again (5)
- Switch on the engine and engage the 1st gear, making sure that the engine does not stop or that the vehicle does not tend to move ahead or the clutch slip during the phase of acceleration or during a run.

Make sure the clutch cable is sound: it should not have flattened parts and the sheath should not be worn at any place along the entire length.





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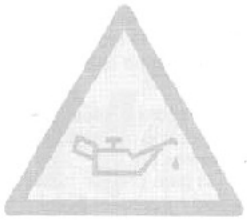
2.12 CHECKING THE ENGINE OIL LEVEL AND TOPPING UP

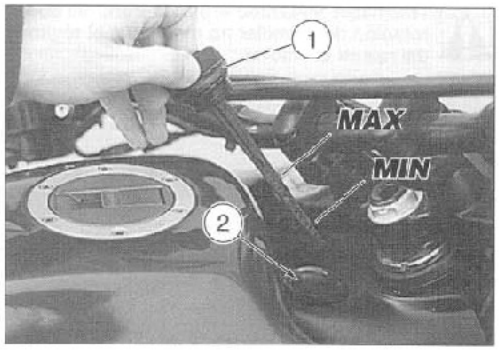
Read carefully 1.2.2 (ENGINE OIL) and 1.4 (PRECAUTIONS AND GENERAL INFORMATION).



Check oil every 500 km.

- Switch off engine and let it to cool down for at least ten minutes, thus allowing the oil to flow back into the oil pan and cool down.
- Switch on engine again and let it idle for at least one minute in order to fill the oil tank.
- Switch off the engine.
- Keep vehicle in a vertical position, with both wheels resting on the ground.

If you fail to carry out the above operations you will risk making an incorrect measurement of the oil level.



- Unscrew and take out the plug/dipstick (1)
- Clean the part in contact with the oil with a clean cloth.
- Insert plug/dipstick completely into inlet hole (2) without screwing it.
- Take out plug/dipstick again (1) and read the oil level:
  MAX = maximum level.
  MIN = minimum level.
  The difference between "**MAX**" and "**MIN**" is circa 300 cm³.
- The level is correct if oil approximately reaches the "**MAX**" mark on the dipstick.

Do not exceed the "MAX" mark nor allow oil to go below the "MIN" mark in order to avoid serious damage to the engine.

- If necessary, top up the engine oil tank through the inlet hole (2) after removing the plug/dipstick (1).

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2.13 CHANGING ENGINE OIL AND OIL FILTER

Read carefully 1.2.2 (ENGINE OIL) and 1.4 (PRECAUTIONS AND GENERAL INFORMATION).

Change it after the first 1000 km (or 4 months) and successively every 6000 km (or 12 months).

We recommend changing the oil more frequently if vehicle is used in dusty areas.

After a long period of use, engine oil deteriorates and hastens the wear of sliding or connecting surfaces. Change engine oil periodically, proceeding as follows:

- Switch off engine and let it cool down for at least 10 minutes, thus allowing the oil to flow back into the oil pan and cool down.
- Start the engine and let it idle for a few minutes to facilitate the flow of oil into the oil pan during the successive phase of draining.

Position the vehicle on firm and flat ground.

- Keep vehicle in a vertical position with the two wheels resting on the ground.

When warmed up, the engine contains very hot oil; pay particular attention not to be burnt during the course of the following operations.

- Unscrew and extract the plug/dipstick (1).
- Remove the oil pan, see 7.1.9 (REMOVING THE OIL PAN GUARD).
- Put a container (2) with at least 2500 cm³ capacity in correspondence with the drain plug (3) on the frame.
- Unscrew and remove the drain plug (3) positioned on the frame.
- Drain the oil and let it drip into the container (2) for a few minutes.
- Check and if necessary change the sealing washer of the drain plug (3) positioned on the frame.
- Screw and tighten the drain plug (3) positioned on the frame.

Driving torque of the drain plug (3) positioned on the frame: 27 Nm (2.7 kgm).

- Move the container (2) and position it under the engine base, in correspondence with the drain plug positioned on the engine (4).
- Unscrew and remove the drain plug positioned on the engine (4).
- Drain the oil and let it drip inside the container (4) for a few minutes.

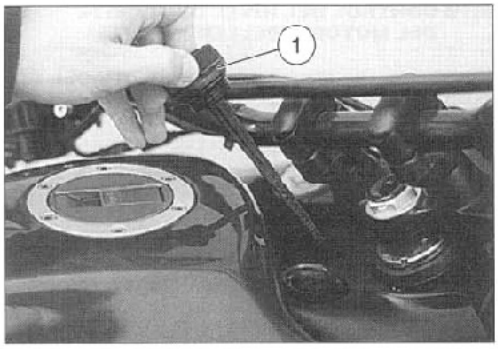
DO NOT DISPOSE OF ENGINE OIL IN THE ENVIRONMENT.

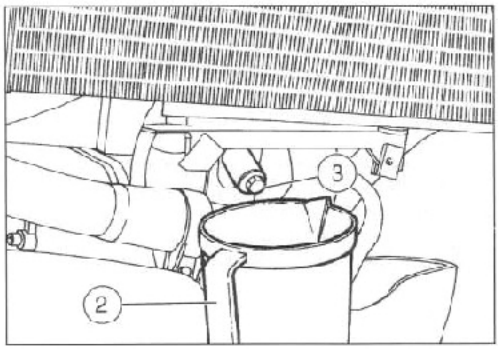
- Remove the metal residues from the drain plug (4) magnet.
- Check and if necessary replace the sealing washer of the drain plug (4).

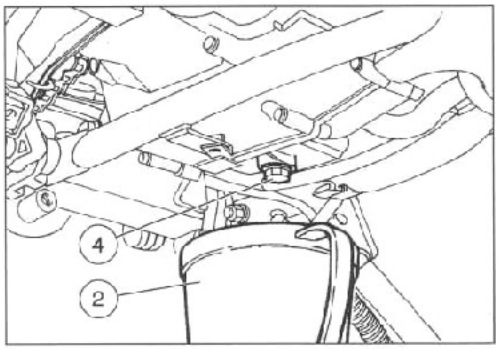
Change the sealing washer of the drain plug (4) every 12000 km (or every second engine oil change).

- Screw and tighten the drain plug (4).

Driving torque of the drain plug (4) positioned on the engine: 40 Nm (4 kgm).







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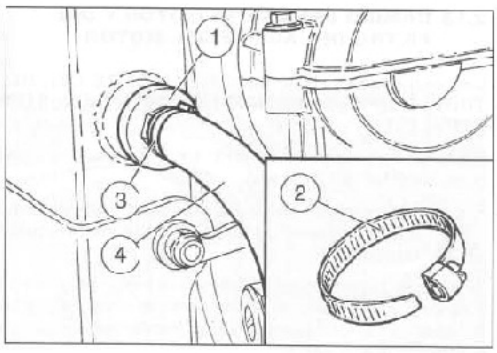
Clean the engine oil filter positioned on the frame (1) every 12000 km (or every second engine oil change).

Prepare a pipe clamp (2) to replace the original one (special type).

- Loosen the clamp (3) and disconnect the pipe (4).
- Unscrew and remove the engine oil filter positioned on the frame (1) and clean it with a compressed air jet.
- Check the seal of the engine oil filter positioned on the frame (1), screw and tighten it.

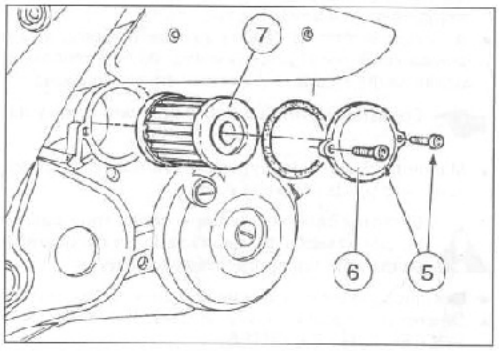
Driving torque of the engine oil filter (1) positioned on the frame: 35 Nm (3.5 kgm).

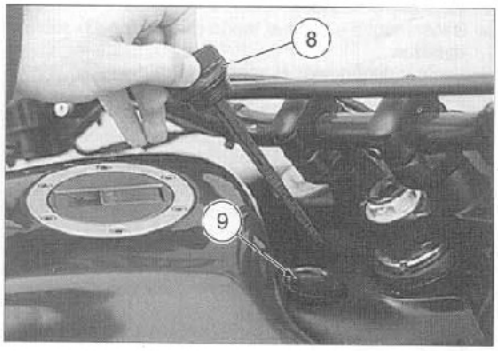
- Connect the pipe (4) and tighten the new clamp (2).



Change the engine oil filter (7) after the first 1000 km and successively every 6000 km (or every time you change the oil).

- Unscrew the two screws (5) and remove the cover (6).
- Remove the engine oil filter (7).
- Spread an oil film on the sealing ring of the new engine oil filter.
- Fit the new engine oil filter.
- Put back the cover (6), screw and tighten the two screws (5).
- Pour about 1600 cm³ of engine oil through the filling opening (9), see 1.7 (LUBRICANT CHART).
- Tighten the plug/dipstick (8).
- Start the engine and let it idle for about one minute, in order to ensure the filling up of the engine oil circuit.
- Unscrew and extract the plug/dipstick (8).
- Pour other 600 cm³ of oil through the filling opening (9).
- Check the oil level, see 2.12 (CHECKING THE ENGINE OIL LEVEL AND TOPPING UP).



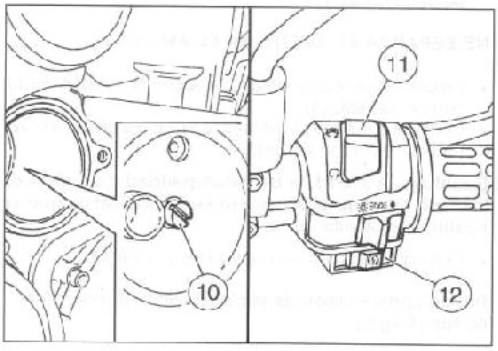


2.13.1 AIR BLEEDING FROM OIL DELIVERY PUMP

The bleeding of air must always be carried out when the oil has been completely discharged from both tank and engine (engine overhaul).

The following operations are to be performed during the phases of changing oil after removing the oil filter on the engine and before attaching the new one.

- Unscrew and remove the small valve (10) located on the bottom of the engine oil filter housing.
- Position the ignition switch on "O".
- Position the engine stop switch on "⊛" (11).
- Press the starter button "Ⓓ" (12) and run the starter until oil begins to escape from the seat of the small valve (10) (a few seconds are sufficient).
- Insert and completely screw the valve (10).



2.14 CHECKING AND TOPPING UP COOLANT

Read carefully 1.2.5 (COOLANT) and 1.4 (PRECAUTIONS AND GENERAL INFORMATION).

Check every 1000 km.

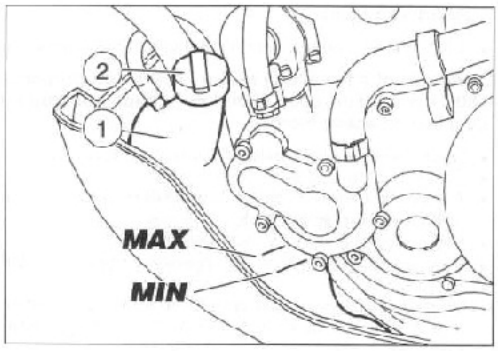
Do not remove the expansion tank cap when the engine is hot, since the coolant is under pressure and its temperature is high.

Check the coolant level and top up the expansion tank with cold engine.

- Stop the engine and wait until it has cooled down.

Position the vehicle on firm and flat ground.

- Keep the vehicle in vertical position, with the two wheels resting on the ground.
- Make sure that the level of the fluid contained in the expansion tank (1) is included between the "**MIN**" and "**MAX**" marks (see figure).
- If not, unscrew and remove the filling plug (2).
- Top up until the fluid reaches approx. the "**MAX**" mark. Do not exceed this level, otherwise the fluid will flow out of the tank when the engine is running.
- Put back the filling plug (2).



In case of excessive consumption of coolant and in case the tank (1) remains empty, make sure that there are no leaks in the circuit.

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2.15 CHANGING THE COOLANT

Read carefully 1.2.5 (COOLANT) and 1.4 (PRECAUTIONS AND GENERAL INFORMATION).

Replace the coolant every 2 years.

Allow the engine to cool down to room temperature.

- Remove the oil pan, see 7.1.9 (REMOVING THE OIL PAN GUARD).
- Remove the front fairing, see 7.1.14 (REMOVING THE FRONT FAIRING).
- Place a container under the drain plug (3) to collect the liquid (ca. 1,4 ℓ).
- Unscrew and remove the drain plug (3) recovering the copper washer.

Do not remove the radiator plug when the engine is hot as the coolant is under pressure and is very hot.

- To facilitate the liquid outflow, rotate the radiator plug (4) anticlockwise of one step.
- Wait a few seconds, in order to allow any residual pressure present in the system to be eliminated.
- Rotate the radiator plug (4) anticlockwise again and remove it.
- Rinse out the radiator with clean water.

DO NOT DISPOSE OF ENGINE OIL IN THE ENVIRONMENT.

In reassembling, apply LOCTITE® 574 on the thread of the drain plug (3).

- Reassemble the drain plug (3) with a new copper washer.

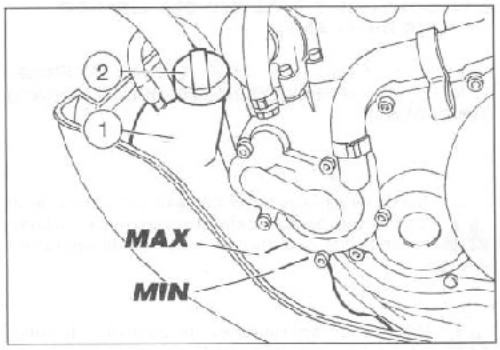
Driving torque of drain plug (4): 12 Nm (1,2 kgm)

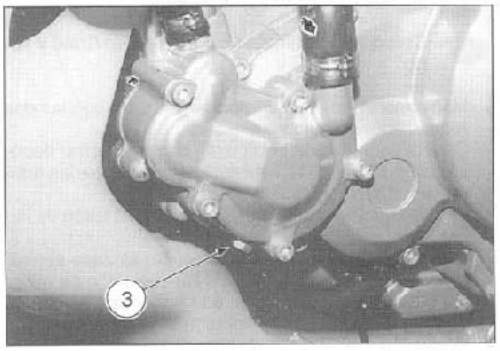
- Top up the radiator until filling it completely.
- Repeatedly press the two couplings (5-6) with your hand and release them, in such a way as to create a slight pressure and to allow the liquid to flow into the pipes.
- Top up the radiator again until filling it completely.
- Put the plug back on radiator (4).
- Remove the cap (2) from expansion tank (1).
- Top up until the liquid reached the "**MAX**" level, see 1.7 (LUBRICANT CHART). Do not exceed this level otherwise there will be an escape of the coolant during running of the engine.
- Reinsert the cap (2) of the expansion tank (1).
- Start the engine and let it run for a few minutes, then let it cool down and check the level of coolant in the expansion tank again.
- If necessary, top up.

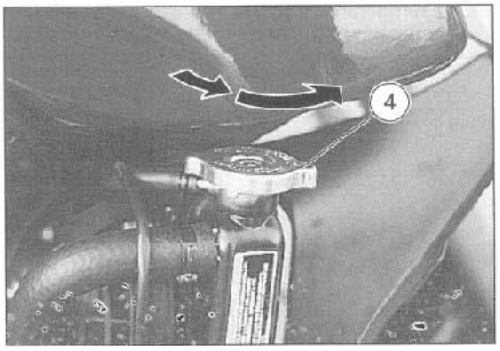
Total quantity: 1,4 ℓ (including the expansion tank).

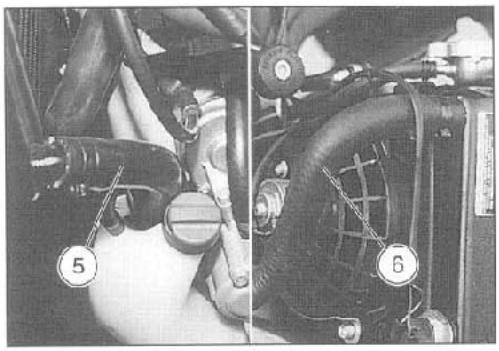
The bleeding of the system is not required for this vehicle.

For further information see 5.0 (COOLING SYSTEM).









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2.16 DRIVING CHAIN

Read 1.4 carefully (PRECAUTIONS AND GENERAL INFORMATION).

Check every 500 km. Lubricate every 1000 km.

The vehicle is fitted with an endless chain, which does not utilise the connecting link.

Chain type: DID mod. 520 V6

The driving chain is equipped with O rings between the links designed to keep the grease on the inside.
Use the maximum caution in adjusting, lubricating, washing and replacing the chain.

Position the vehicle on the special stand and slowly rotate, manually, the rear wheel with the gear in neutral.

Visually check that the chain presents none of the defects listed below:

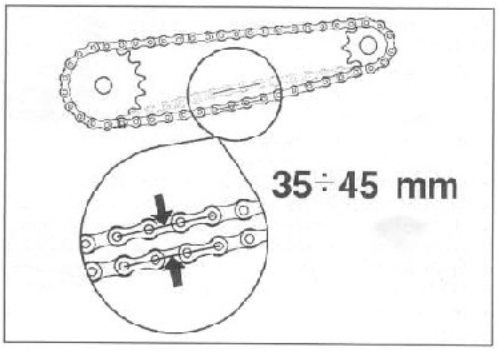
- Pins loosened
- Rollers damaged
- Links rusted or seized
- Links deformed or with rims
- Excessive wear
- Chain not adjustable correctly
- Leak of O rings

If the chain presents even one of the listed defects, it must be replaced, see 7.1.23 (REMOVING THE GEARING CHAIN).

2.16.1 CLEARANCE CONTROL

To check the clearance:

- Check that the vertical oscillation - in an intermediate point between pinion and crown gear in the lower branch of the chain - is approx. **35 to 45 mm**.
- Check the vertical oscillation of the chain, also when the wheel is turning; the clearance should remain constant in all the phases of the wheel rotation.
  If there is a larger clearance in certain positions, it means that there are crushed or seized links. Lubricate the chain frequently to avoid the risk of seizing, see 2.16.4 (CLEANING AND LUBRICATION).
  If the clearance is uniform but higher than **35 to 45 mm**, make the adjustment, see 2.16.3 (ADJUSTMENT).



An excessive slackening of the chain may cause it to come away from the pinion, causing an accident or serious damage to the vehicle and people.

Incorrect maintenance may cause the untimely wear of the chain and/or damages to the pinion and/or the crown.
Carry out the maintenance operations more frequently if you use the vehicle in difficult conditions or on dusty and/or muddy roads.

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