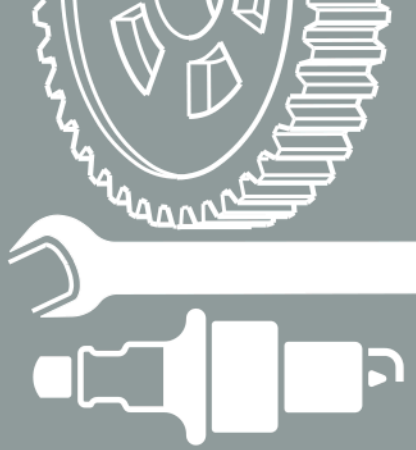
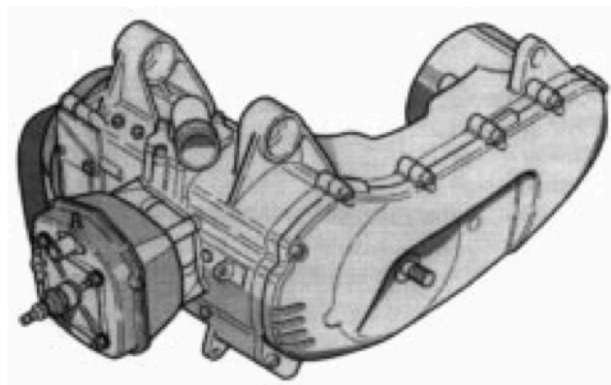


**aprilia**

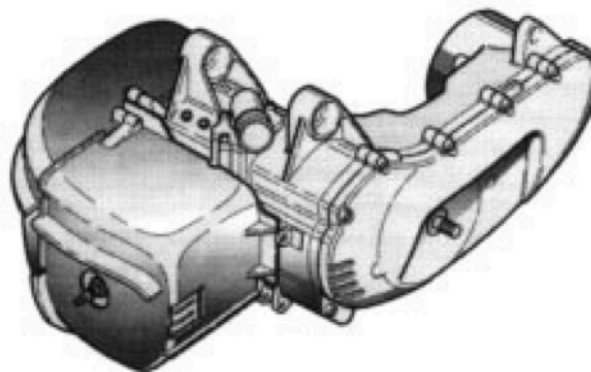


# Workshop manual

**MA 50**



**MY 50**



**977 X**

# LIST OF SECTIONS

## Introduction

The entire Introduction needs to be rewritten as follows:

This manual contains information covering normal servicing procedures.

The information and illustrations contained in this manual are current as of the manual's publication. Since **aprilia** s.p.a. strives to always improve the quality and usefulness of its vehicles, changes may be made to the vehicles at any time. Thus, it is imperative that users of this manual understand that some information may be out of date for some vehicles. Be sure that the information in this manual applies to the vehicle that you are servicing before you begin any service operations.

This publication is intended for **aprilia** dealers and their trained and qualified mechanics. The description of many service and repair operations is intentionally omitted, as it is assumed that the users of this manual have basic mechanical training, basic knowledge of the procedures regarding motor vehicle repair, and have available to them all current information published by **aprilia** concerning the vehicle. Without these things, the repair or servicing of the vehicle could be affected and could lead to a dangerous condition or accident for the servicing mechanic or the operator.

This manual does not describe all of the procedures necessary to repair and service the vehicle in detail. Therefore, it is important to be particularly careful in order to avoid any damage to the vehicle, its parts, or to cause injury to the mechanic or the rider.

Changes in the technical specifications and servicing procedures that become necessary as a result of changes to **aprilia** vehicles will be documented and distributed to all **aprilia** dealers. Therefore, it is necessary that the latest **aprilia** information be kept available to the servicing mechanics.

If you have questions regarding repair and servicing procedures, contact the **aprilia** Consumer Service (A.C.S.). A.C.S. technical counselors will be able to assist you with any problems that you might face.

For further information refer to:

- MOTORCYCLE VEHICLE WORKSHOP MANUAL
- ENGINE SPARE PARTS CATALOGUE
- CHASSIS PARTS SPARE PARTS CATALOGUE

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**aprilia** is not responsible for the performance or use of any product not specifically recommended or endorsed by **aprilia**.

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Tel. +39 (0)587 - 42280  
Fax +39 (0)587 - 422801  
www.cld.it  
E-mail: cld@cld.it

on behalf of:

**aprilia s.p.a.**

Via G. Galilei, 1 - 30033 Noale (VE) - Italy

Tel. +39 (0)41 - 5829111

Fax +39 (0)41 - 441054

www.aprilia.com

www.serviceaprilia.com

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## SAFETY WARNINGS

Throughout this manual, you will see the following symbols:

**▲ WARNING** : When you find this symbol on the vehicle or in the manual, it indicates that a potential for serious personal injury or death exists. Failure to follow this warning may result in serious risk of personal injury or death, of the mechanic working on the vehicle, the operator of the vehicle, or the general public. It also indicates that serious and permanent damage to the vehicle is possible.

**▲ CAUTION** : This statement indicates a potential hazard which may result in some personal injury, or damage to the vehicle.

**NOTE**: The word “NOTE” in this manual precedes important information or instructions to which special attention must be given.



: liquid-cooled version only.

## MAINTENANCE WORK SAFETY PRECAUTIONS

**NOTE**: always take the following precautions when repairing, fitting or refitting engine components.

**▲ CAUTION** : all maintenance and inspection work must be done with the engine turned off. Make sure that none of the parts are still hot (e.g. exhaust pipe, brakes or other parts subject to heating) after being removed from the motorcycle; if necessary, wait until they cool down. Place the engine on a suitable stand, making sure it is positioned on a solid, level work surface.

**▲ WARNING** : never use your mouth to hold engine parts, etc.: none of these items are edible and some of them are harmful, or even toxic.

**▲ WARNING** : do not start the engine in closed, poorly ventilated areas.

**▲ WARNING** : keep well away from heat sources. Do not use naked flames.

**NOTE**: all persons carrying out servicing or repair work on the engine must be in possession of all the instructions and observe the safety specifications in all procedures (e.g. torque wrench settings). If two or more persons are working on an engine at the same time, make sure they observe the rules for their own safety and the safety of others.

### Use only GENUINE APRILIA SPARE PARTS

Use only recommended lubricants (see Recommended Lubricants Table, p. 2-2).

When a special tool is called for by this manual, you must use only the appropriate special tool. Do not attempt to perform operations which require special tools using any tool other than that specified in this manual.

**▲ WARNING** : Failure to obey the above instructions can result in serious personal injury, such as might occur when an improper wrench slips from a fastener, and your hand slams into the workbench.

When tightening fasteners, start with the largest diameter fasteners. First apply enough torque to snug each of the largest diameter fasteners, working from the innermost fastener. Then, snug up other fasteners, working again from the innermost, and proceed diagonally. Tighten the fasteners to the required torque in the same order, then, check the torque on each of the fasteners, proceeding in the same order as above.

**▲ WARNING** : Do not use flammable solvents to clean parts. Use only fireproof solvents and detergents. Failure to obey this warning can lead to a fire with serious injury or even death.

Always lubricate metallic parts and seals before reassembling.

**▲ CAUTION** : Failure to follow this instruction can lead to seizure and premature part failure.

When reassembling parts, be sure that they are fitted correctly. Some parts will physically fit in reversed or inverted position, and you will not know that they are incorrectly fit until after assembly is complete.

**▲ CAUTION** : Fitting parts incorrectly can lead to irreparable damage to the engine, as well as possible seizure or other engine malfunction.

Never reuse gaskets, circlips, snap rings, O rings (OR) or split (cotter) pins.

When installing a new snap ring, spread the ends apart no farther than necessary to slip it over the shaft. After the new snap ring is installed, make sure that it is firmly and fully seated in its groove. Note that there is a right way and a wrong way to fit the snap rings, the rounded edge of the snap ring must always bear the thrust load. (Sharp edge “outward”.)

Lubricate bearings abundantly before installing.

**NOTE:** Bearings must run freely with no chatter, unevenness or noise. If these conditions are not met, replace the bearings with new ones.

Mark the positions on all connections (hoses, wires, etc.) clearly before disassembling them. Each part must be clearly identified for reassembly.

Carefully clean all gasket surfaces before reassembling. Remove all traces of old gaskets and gasket cement.

**NOTE:** Failure to obey this instruction will lead to a leaky motor.

Never reuse oil seals nor gaskets. Apply a thin layer of grease to the edges of oil seals, and either grease or gasket cement, as appropriate, to gaskets before reassembling. Unless otherwise instructed by this manual, install oil seals and bearings so that the identifying marks or part numbers are visible when the seal or bearing is installed.

**NOTE:** Unless otherwise specified, follow the disassembly procedures in reverse order to reassemble.

**▲ WARNING** : Failure to follow the above instructions can lead to many engine difficulties, including such serious and dangerous conditions as engine seizure or total failure. Such failure, if it occurs while the vehicle is being ridden, can lead to an upset, with subsequent serious injury or even death. If there is any doubt about your ability to properly carry out the operations described in this manual, seek assistance from your local Aprilia dealer or Aprilia Customer Service, or your factory service representative, as appropriate. Never attempt to perform any of the operations described in this manual unless you have the appropriate special tools, a clean well-lighted, well-ventilated work area, and knowledge necessary to carry these procedures out properly.

## GENERAL SAFETY RULES

### CARBON MONOXIDE

Any maintenance jobs that have to be done with the engine running **MUST** be performed in a well-ventilated environment.

**▲ WARNING** : do not work in enclosed spaces without an exhaust gas extraction system. Exhaust gases contain carbon monoxide, a poisonous gas that may cause loss of consciousness and even death.

## FUEL

See the use and maintenance handbook supplied with the motorcycle for information on the type of fuel to use.

**▲ WARNING** : the fuel is highly inflammable and can be explosive in certain conditions. Always take great care when handling it.

**▲ WARNING** : fuel vapors can damage your health. Avoid inhaling them. Always make sure there is a suitable air exchange in rooms where exposed fuel is present.



**▲ WARNING** : do not smoke, create sparks, use naked flames or any other heat source that may cause fires or explosions in the vicinity of fuel stores or places where there are likely to be fuel vapors.

**▲ CAUTION** : do not let the fuel come into contact with the skin. Use protective gloves. Do not use your mouth on the tube when siphoning fuel, as you may inhale the vapors or fuel itself.

**▲ CAUTION** : use authorized waste disposal methods when disposing of fuel.

**KEEP OUT OF REACH OF CHILDREN**

## GEARBOX OIL

Use  F.C. SAE 75W - 90 oil or  Agip GEAR SYNTH oil. As an alternative to the recommended oil, you can use brand-named oils with performance specifications equivalent to or better than A.P.I. GL-4.

**▲ CAUTION** : insufficient lubrication or the use of unsuitable oils will cause increased wear on the moving parts and may lead to irreparable breakdowns.

**▲ CAUTION** : do not over-tighten the oil drain plug, as this may damage the engine crankcase.

**▲ CAUTION** : used oil contains environmentally harmful substances and must be disposed of in accordance with legal regulations.

**▲ CAUTION** : continuous and prolonged contact with oil can cause serious skin disorders. Always wash your hands thoroughly after handling oil.

**KEEP OUT OF REACH OF CHILDREN**

## COOLANT

The coolant is made up of 50% distilled water and 50% anti-freeze, this being the ideal mixture for most running temperatures, with effective anti-corrosion properties. Keep to the same mixture in the warmer seasons as well, as it evaporates more slowly and thus requires less topping up. This, in turn, will reduce the build-up of mineral salt deposits, thus helping to keep the cooling system working efficiently.

Check the coolant circuit frequently at temperatures below 0°C (32°F). If necessary, increase the concentration of anti-freeze to no more than 60%.

Use only anti-freeze and anti-corrosion fluids without nitrites, as this guarantees protection down to -35°C (-31°F).

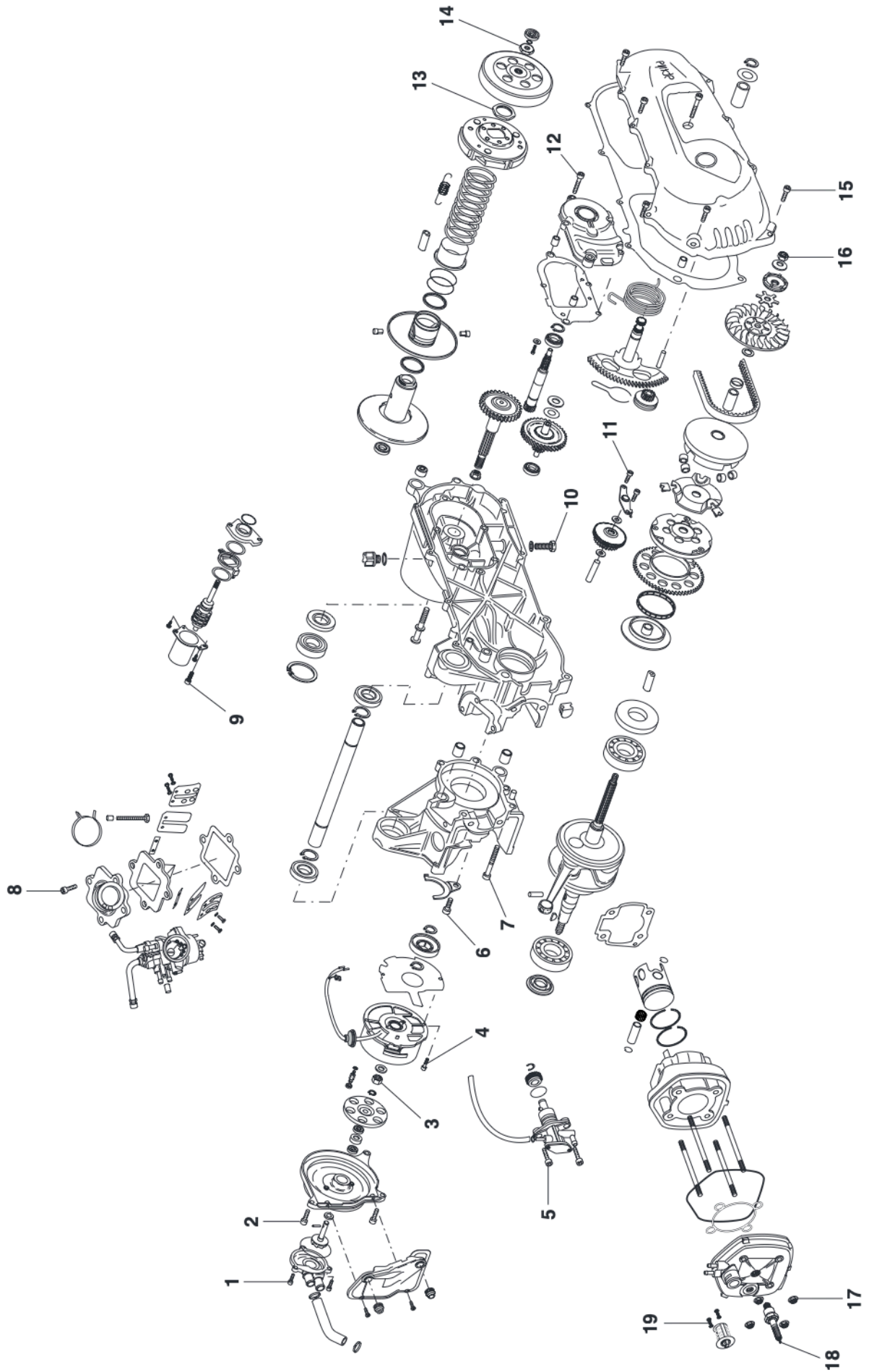
**▲ CAUTION** : do not remove the filler cap when the engine is hot, as the coolant may squirt out under pressure and cause burns/scalds.

**▲ CAUTION** : some of the coolant components are inflammable and burn with an invisible flame, thus increasing the burns hazard.

**▲ CAUTION** : contact with the coolant can cause burns or skin irritations. If the coolant gets into your eyes, wash copiously with clean water and call a doctor immediately.

**▲ WARNING** : if swallowed, stimulate vomiting and call a doctor immediately. Even though it is highly toxic, coolant is particularly attractive to animals. Always keep coolant containers hermetically sealed to stop animals from drinking it.

**KEEP OUT OF REACH OF CHILDREN**


















Torque wrench settings

Pos.	Description	Qty.	Type	Torque wrench setting	
				Nm	ft-lb
1	Water pump cover bolt	3	M5 x 0.8	7	5.163
2	rh crankcase cover bolt	5	M6 x 1	7	5.163
3	Stator nut	1	M10 x 1.25	38	28.029
4	Stator bolt	3	M6 x 1	9	6.638
5	Oil pump bolt	2	M5 x 0.8	4	2.950
6	Oil seal support bolt	1	M6 x 1	10	7.376
7	Crankcase bolt, flywheel side	6	M6 x 1	9	6.638
8	Carburetor flange bolt	4	M6 x 1	8	5.901
9	Starter motor bolt	2	M6 x 1	13	9.589
10	Oil drain plug	1	M8 x 1.25	18	13.277
11	Starting gear bolt	2	M6 x 1	9	6.638
12	Gearbox cover screw	6	M6 x 1	12	8.851
13	Clutch holder nut	1	M28 x 1	50	36.88
14	Secondary pulley nut	1	M10 x 1	50	36.88
15	Gearbox case cover screw	12	M6 x 1	12	8.851
16	Primary drive pulley nut	1	M10 x 1.25	33	24.341
17	Cylinder head nut	4	M7 x 1	10	7.376
18	Spark plug	1	M14 x 1.25	20	14.752
19	Thermostat bolt	2	M4 x 0.7	35	25.816

LUBRICANTS TABLE

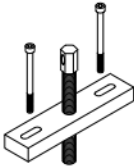
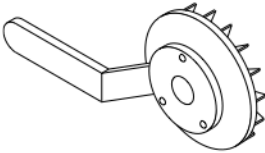
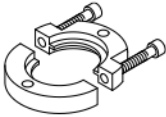
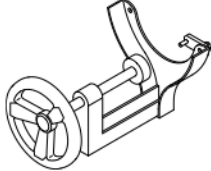
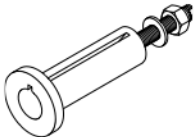

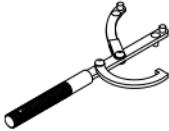

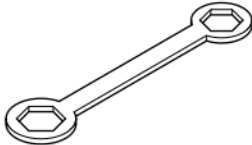
USE	SPECIFICATIONS	BRANDS	SYMBOL
Mixer oil	* ISO-L-ETC++, A.P.I. TC++	 GREEN HIT 2  Agip CITY 2T	
Gearbox oil	* A.P.I. GL-4	 F.C. SAE 75W – 90  Agip GEAR SYNTH	
Grease for joints, pins and bearings	**	 AUTOGREASE MP  Agip GREASE 30	
Coolant	***	 ECOBLU –40°C  Agip COOL	
Loctite thread sealant		LOCTITE 243	
Loctite liquid sealant		LOCTITE 580	

\* As an alternative to the recommended oil, you can use brand-named oils with performance specifications equivalent to or better than those stated in the table.

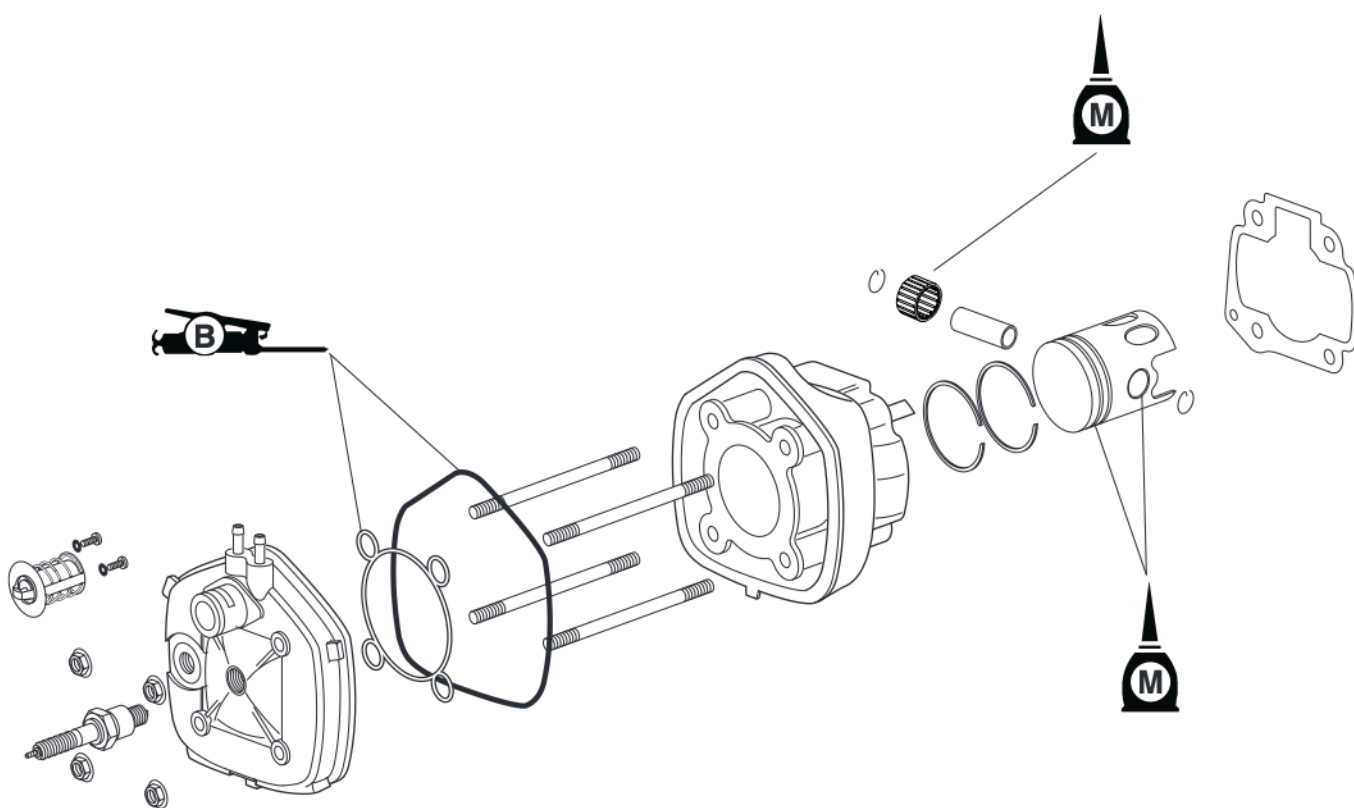
\*\* As an alternative to the recommended product, you can use a brand-named grease for rolling-contact bearings with a useful temperature range of -30°C to +140°C (86°F to +140°F), dropping point 150°C to 230°C (302°F to 446°F), high anti-corrosion protection and good water and rust resistance properties.

\*\*\* Use only anti-freeze and anti-corrosion fluids without nitrites, as this guarantees protection down to -35°C (-31°F).

Service tools - Kit part N° 8201821


 <p>8106698</p>	<p>Connecting rod extractor</p>	 <p>8106707</p>	<p>Pulley locking tool</p>
 <p>8140152</p>	<p>Crankshaft bearing extractor</p>	 <p>8140259</p>	<p>Clutch spring tool</p>
 <p>8140234</p>	<p>Complete crankshaft installation tool</p>	 <p>8140207</p>	<p>Moryama flywheel extractor</p>
 <p>8106702</p>	<p>Flywheel spanner wrench</p>	 <p>8140208</p>	<p>Ducati flywheel extractor</p>
 <p>8106703</p>	<p>Clutch removal wrench</p>		






## Cylinder head - remove

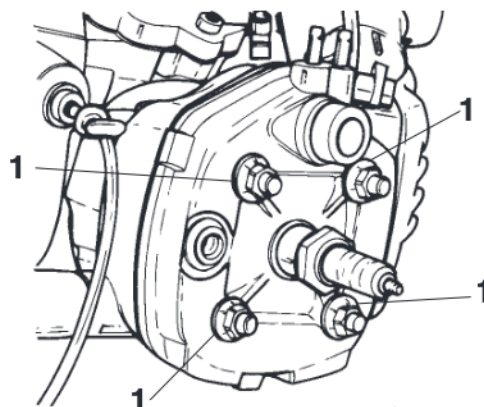
**▲ CAUTION** : Never attempt to work on the engine or any of its parts with tools not specifically designed for the task. Always use close fitting wrenches and drivers that are in good condition. If a special Aprilia tool is called for, do not attempt the operation without that special tool. Obviously, damage caused by the use of improper or poorly fitting tools is not covered by warranty. Before removing the motor, you can gain access to the cylinder head, cylinder, piston and reed valve by removing the exhaust pipe, air box and carburetor.

 Drain all the coolant.  
(This must be done only if the engine has not been removed from the motorcycle frame; if the engine has already been removed, it should have been done before the removal).

**▲ CAUTION** : Do not pollute drains or water courses when disposing of coolant. Use authorized waste disposal methods.

Remove the spark plug and the two carburetor heating circuit tubes with their 4 clamps. Unscrew the 4 flanged cylinder head nuts (1), slackening them half a turn each time. Remove the cylinder head.

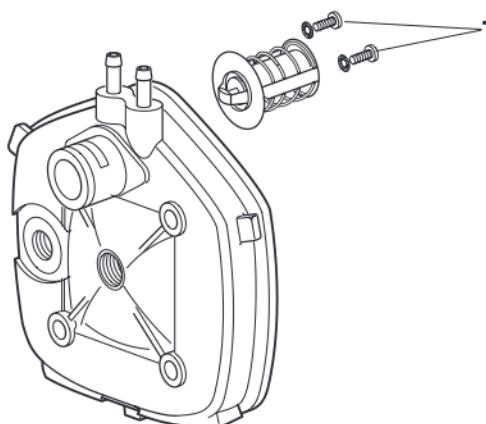
 **NOTE:** Remove the cylinder head with its two ring seals (internal and external). Make a careful note of how the two carburetor heating circuit tubes are connected before removing them, in order to be able to refit them correctly.




## Thermostat - remove

Unscrew the two screws (1) shown in the figure and remove the thermostat. Check the mechanical condition of the thermostat.

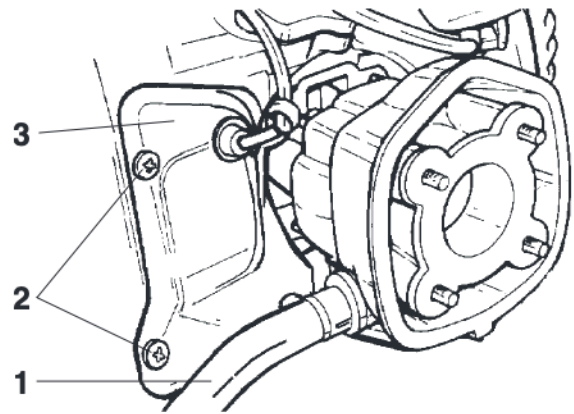
**NOTE:** Check the two thermostat screws for corrosion and coolant fluid deposits before removing them. The screws are small, and will easily break if too much torque is applied. If corrosion or deposits are evident, use penetrating oil, and wait for the penetrating oil to work before attempting removal.



## Cylinder - remove

 Remove the cylinder water union (1).

Unscrew the two cover retaining screws (2) and remove the cover (3) from its seat.  
Remove the cylinder, holding the piston in position.  
Remove the cylinder bottom gasket.

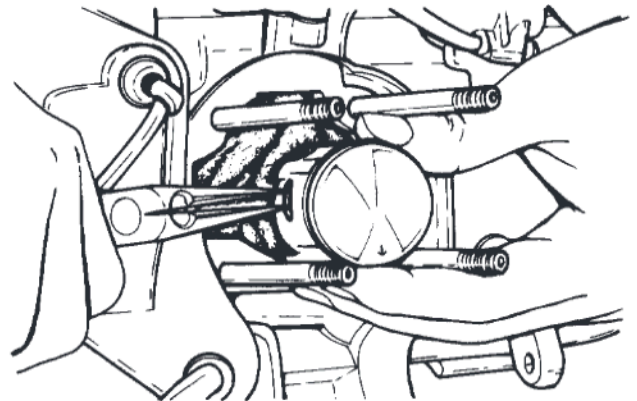


## Piston - remove

**⚠ CAUTION :** Close the opening in the crankcase with a clean rag before removing the piston pin circlip to stop the circlip from dropping inside the engine. Thoroughly deburr the circlip housing and the piston pin insertion hole area before removing the piston pin.


**Do not use a hammer for removing the piston pin.**

Remove the 2 circlips using circlip pliers. Gently push out the piston pin, and remove the piston. Remove the needle bearing from the connecting rod's small end.

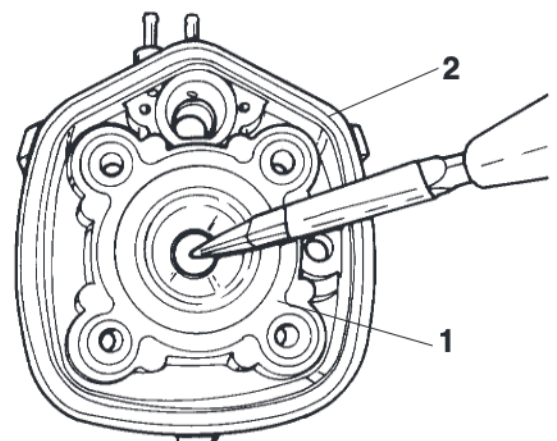


3

## Cylinder head - check

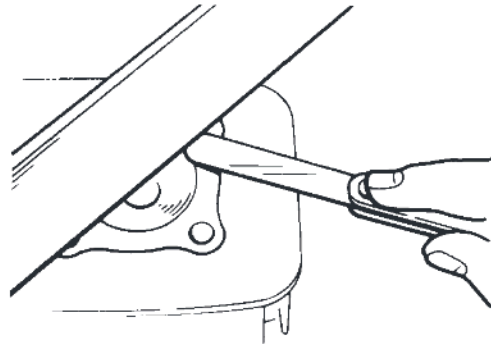
 Check the condition of internal (1) and external (2) O-rings on the cylinder head.

Remove the carbon deposits from the cylinder head using a rounded scraper. Use great care not to damage the spark plug threads. Also, be very careful not to damage the cylinder head itself. Ensure that all deposits have been removed from the combustion chamber, but do not get carried away. Traces of hard carbon in the combustion chamber itself will not cause any problems.

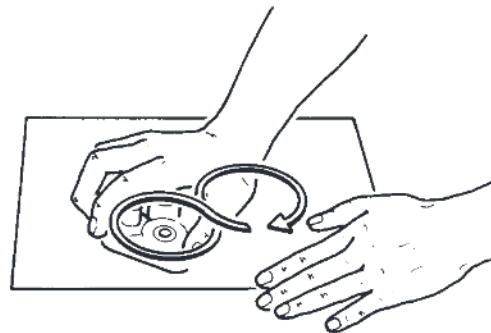


We have already inspected the cylinder head combustion chamber , so we do not need to discuss this.

Inspect the cylinder head for warping, using a surface plate or rigid straight edge and feeler gauge. The cylinder head must be flat within 0.03 mm (0.0012 in).

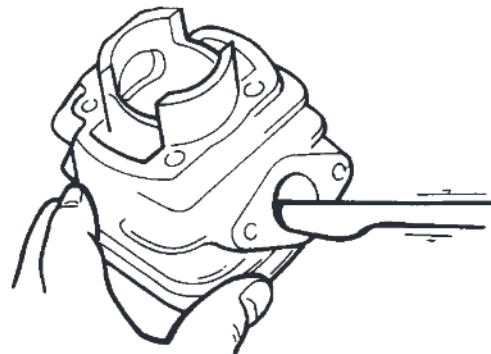


If the cylinder head is out of level more than 0.03 mm (0.0012 in), lap it in, using 400-600 abrasive paper placed on a perfectly flat surface plate, until the entire gasket surface shows an even frosted looking surface. Work the cylinder head in a figure 8, as shown in the illustration, turning the head regularly in your hand to ensure a perfectly flat surface.

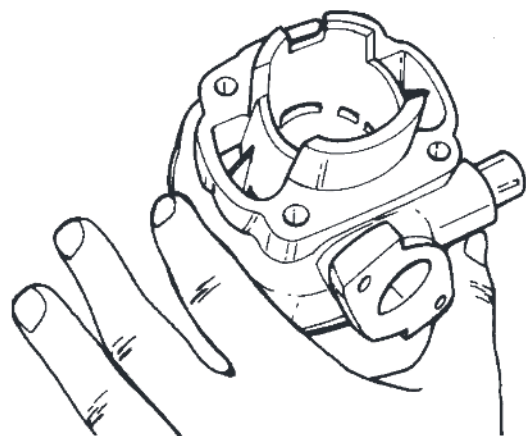


### Cylinder - check

Carefully remove all carbon deposits from the inlet manifold, but, again, do not go overboard and remove any aluminum. A rounded scraper , or a fine abrasive flap wheel, is helpful in this operation.



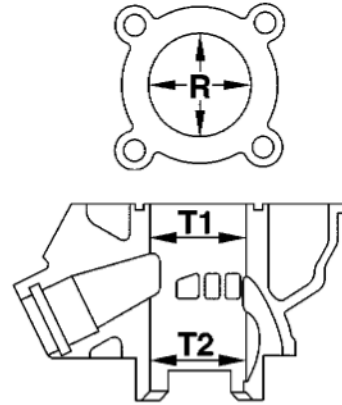
Inspect the cylinder liner , and the condition of the cylinder bore. Slight longitudinal scoring is acceptable, but any scores deeper than 0.01 mm (0.0004 in), and any sign of seizure whatsoever , calls for reconditioning or replacement of the cylinder . Carefully remove any carbon deposits which remain in the transfer , inlet, or exhaust ports.



Using a bore gauge, check the diameter of the cylinder. Compare your measurements with the table below. If the measurements establish that the cylinder is out of tolerance, you must replace the cylinder along with the piston and rings (see Clearances Table).

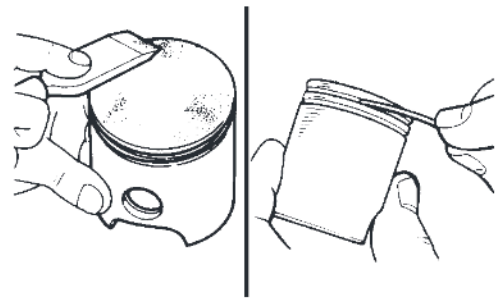
	Standard	Wear limit
Cylinder diameter "C"	39.99 to 40.01 mm (1.574 to 1.575 in)	40.1 mm (1.579 in)
Taper "T" *	--	0.05 mm (0.0019 in)
Ovalization "R" **	--	0.01 mm (0.0004 in)

\* where "T" is the result of the difference between T1 and T2.  
 \*\* where "R" is the result of the difference between the two right-angle measurements.



### Piston - check

Remove the piston rings, being careful not to widen them more than necessary. To remove carbon deposits from the piston crown, use a slightly rounded scraper. To clean the piston ring lands, use a discarded piston ring, as shown in the illustration. Do not use silicon carbide abrasive paper on the piston crown or the lands. This will remove too much metal, and cause pieces of silicon carbide to be embedded in the piston which will quickly destroy the cylinder bore and cause corrosion of the piston.



Inspect the piston skirt carefully. If you see hard carbon deposits, it is best to eliminate them by dipping the entire piston in a proprietary cleaner such as carburetor cleaner.

**▲ WARNING :** Cleaners capable of removing hard carbon are inevitably extremely hazardous to use. Their vapors can cause serious illness, and contact with the skin or eyes will cause immediate serious injury. Always use appropriate protective equipment, such as goggles, and gloves, and follow scrupulously the instructions and warnings on the container and package of the cleaner.



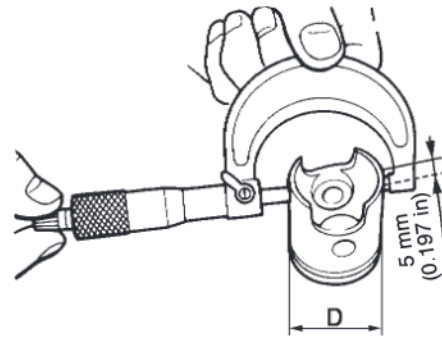
If, after cleaning, the piston shows slight scoring on the skirts, this may be used by very light rubbing with a very fine flat stone.

**▲ CAUTION :** Do not get carried away. You can quickly ruin a perfectly serviceable piston by removing scores on the piston skirt. The very lightest rubbing is always sufficient. Never use a file, silicon carbide abrasives, or any abrasive coarser than 800 grit on a piston skirt.



Renew the piston if the scoring is too deep (see clearances table).

Measure the piston diameter (D) with a micrometer, taking the reading at 5 mm (0.197 in) from the bottom edge of the piston, as shown in the figure.

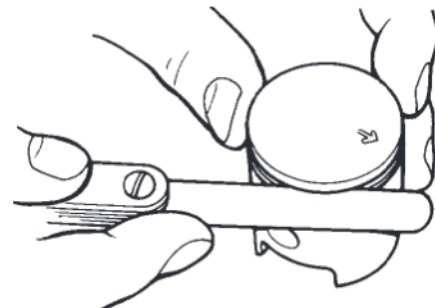


Check the piston-cylinder clearances against the values in the table.

CLEARANCES TABLE mm (in)	
ENGINE TYPE	MIN/MAX CLEARANCE
MA SCOOTER (CAST IRON CYLINDER)	0.29 (0.0116) / 0.042 (0.0017)

Measure the piston ring side clearance with a thickness gauge.

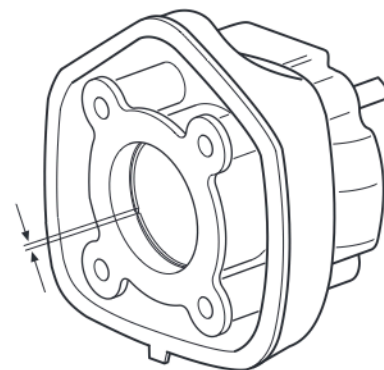
Side clearance: 0.03 to 0.056 mm (0.0012 to 0.002 in)



Inspect the piston rings. Ensure that they are not damaged and are seating against the cylinder. Inspect the ring gap by placing the ring within the top of the cylinder as shown in the illustration, and using a feeler gauge. Use the piston skirt to squarely position the ring about 1/2 inch below the top of the cylinder.

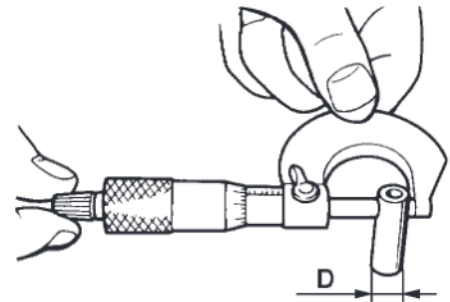
La misura rilevata deve essere compresa tra:

0.15 to 0.35 mm (0.006 to 0.014 in)



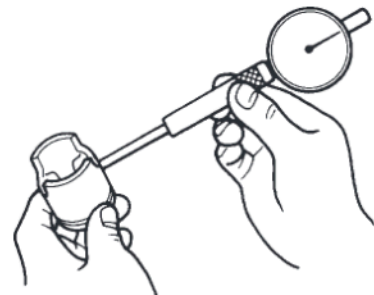
Inspect the piston pin for evidence of scoring, scratches or heat discoloration. If you can feel scoring or scratches, or if the piston pin has areas that have turned blue/grey, the piston pin must be replaced. This type of damage could indicate a fault in the lubrication system, so inspect the lubrication system before returning the engine to service. Slight brownish discoloration of the piston pin does not indicate that it must be replaced.

Measure the external diameter (D) of the piston pin.  
Replace if out of tolerance range.  
Piston pin external diameter: 9.996 to 10.000 mm  
(0.393 to 0.394 in)



Check the diameter of the piston pin seat. Replace if out of tolerance range.  
Diametro sede spinotto:  
10.004 to 10.015 mm (0.3938 to 0.3943 in)

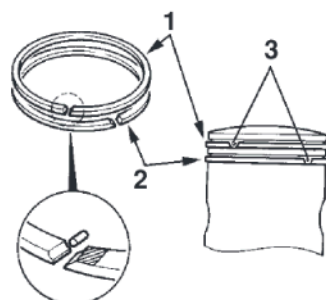
Also, check the roller case for damage. Replace if damaged.



### Cylinder head-piston unit - refit

Fit the new bottom ring (2), and top ring (1) on the piston. The beveled side goes up. Take extreme care to ensure that the piston rings are properly aligned on the pins, as shown in the illustration.

**▲ CAUTION** : Failure to observe this procedure will make it nearly impossible to install the cylinder on the piston upon reassembly, and will ensure that you do at least break the piston rings when you attempt to reassemble the motor, if not do more serious damage as well.

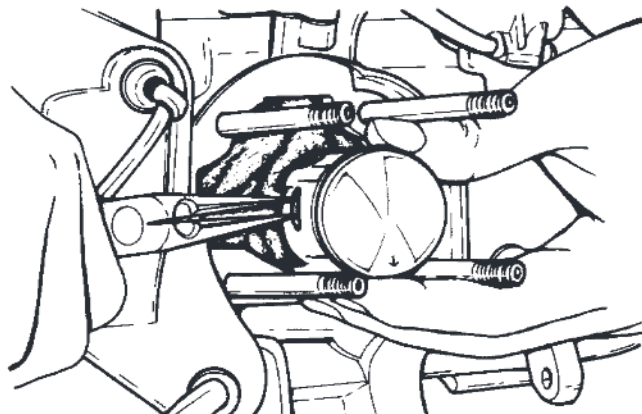


Oil the roller case, piston pin, piston pin circlip seats and cylinder surface with 2-stroke engine oil (see Lubricants table).

**▲ CAUTION** : Use new circlips.

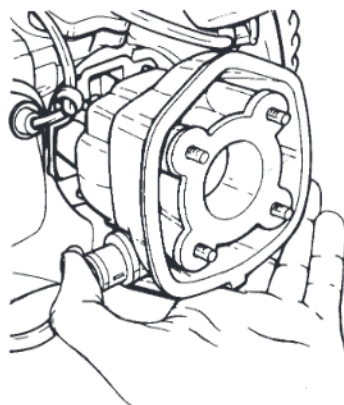
**NOTE**: Remember there is a right way and a wrong way to install the circlips. The rounded edge of the circlip must face the piston pin.


**▲ CAUTION** : The arrow on the piston must point to the lower of the engine. Cover the crankcase with a clean rag before fitting the piston pin circlip, to stop foreign bodies falling inside the crankcase.




**▲ CAUTION** : Oil the piston rings with 2-stroke oil before fitting the cylinder.

Fit a new cylinder bottom gasket.  
Fit the cylinder .



 Renew the two cylinder head O-rings.

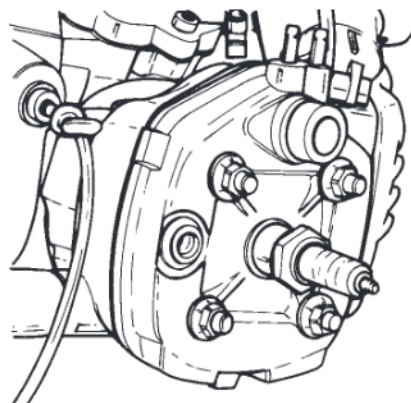
Refit, tightening up the 4 nuts in numerical order and in a diagonal tightening sequence, then fit the spark plug.

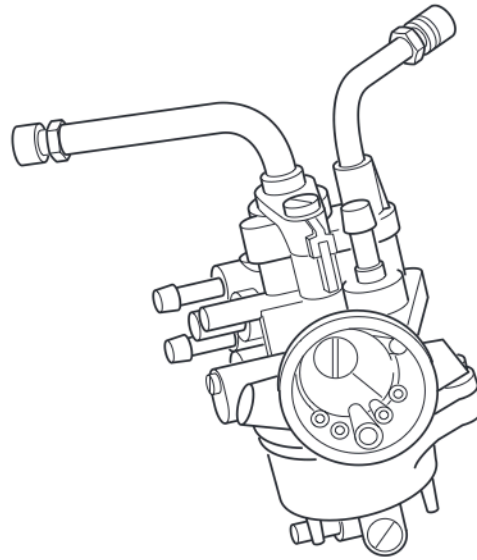
 Reconnect the inlet tube from the water pump to the union. Reconnect the carburetor heating system tubes, connecting the cylinder head left hand connector to the carburetor upper connector and the cylinder head right hand connector to the carburetor lower connector (as seen from above the scooter, looking in the forward travel direction).  
Secure the tubes with new clamps.

Refit the cover.

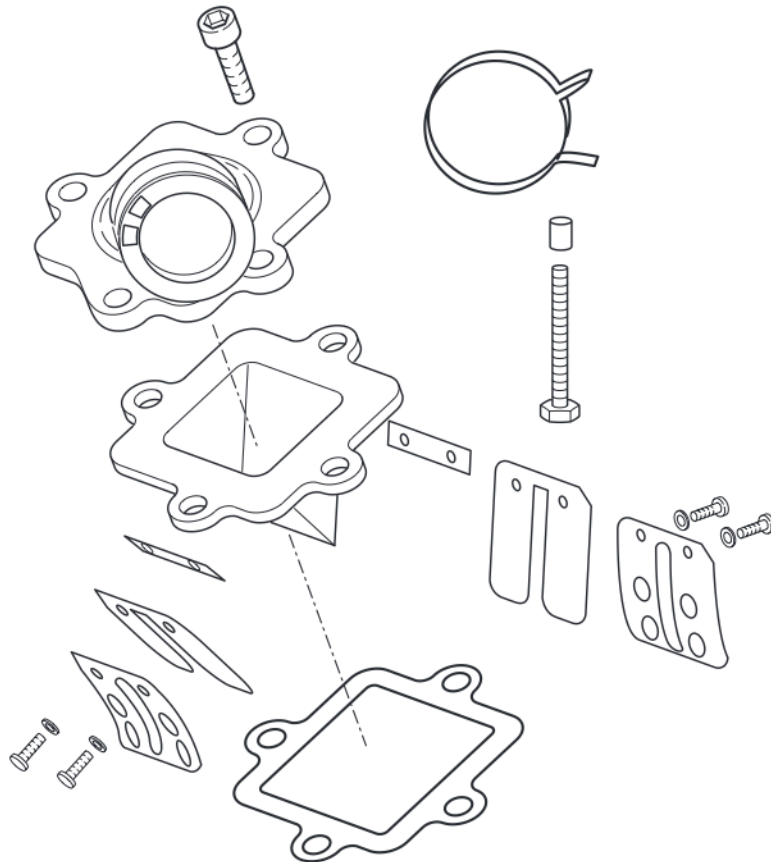
Cylinder head nuts torque setting: **10 Nm (7.376 ft-lb)**

Spark plug torque setting : **20 Nm (14.752 ft-lb)**







4

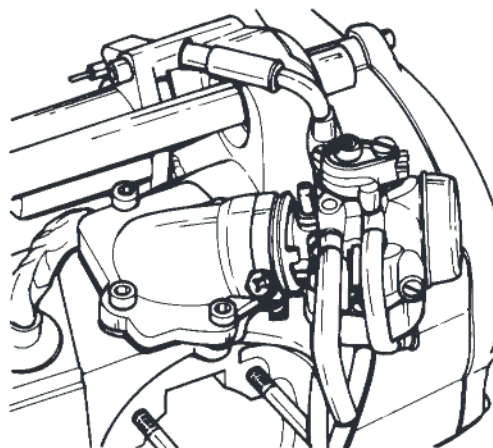


## Carburetor - remove

Disconnect all of the tubes leading to the carburetor (oil flow and petrol flow).

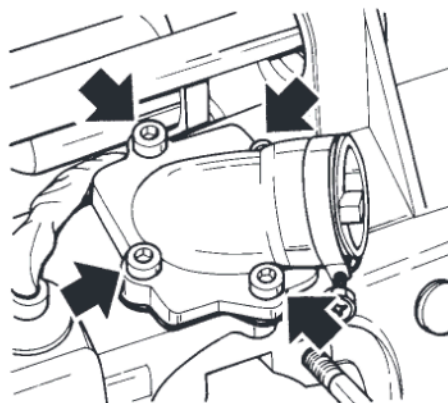
 Disconnect the water heating device tubes. Loosen the screw on the reed valve set clamp, and remove the carburetor.

 **NOTE: Make careful note of how the carburetor hot water lines are connected before removing them in order to be able to replace them correctly.**

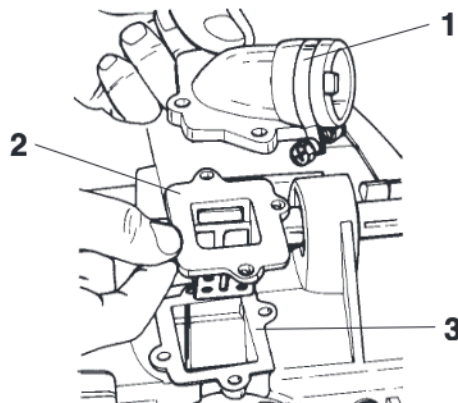


## Reed valve set - remove

Remove the 4 screws shown in the figure.



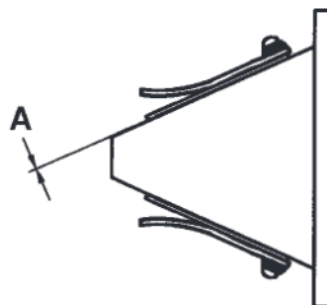
Remove the inlet manifold (1), and then the reed valve (2) and the gasket (3). Place a clean rag in the inlet port to prevent foreign material from falling in and damaging the engine.



## Reed valve set - check

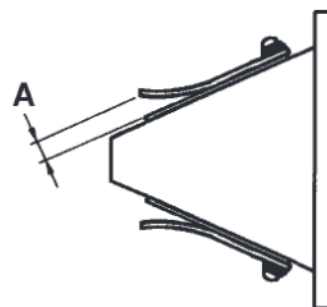
Inspect the reed valve for damage or cracks in the reed valve holders. Any damage necessitates replacement.

Measure the clearance (A) between the reed valve and the seat. If the reed valve is away from the seat more than 0.2 mm (0.0008 in), then the reed valves must be replaced.



Measure the reed valve holder height (A). If it is not in the range of 4.0 to 4.4 mm (0.157 to 0.173 in), it must be replaced.

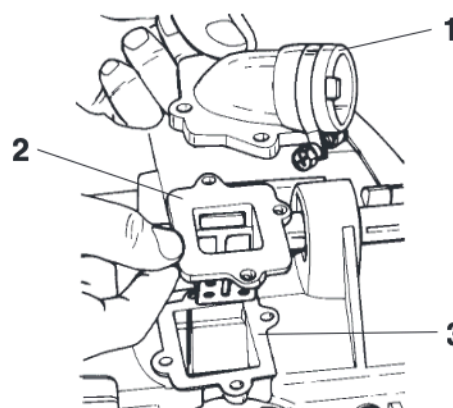
**▲ CAUTION** : Do not attempt to repair either the reed valve or the reed valve holder.



### Reed valve set - refit

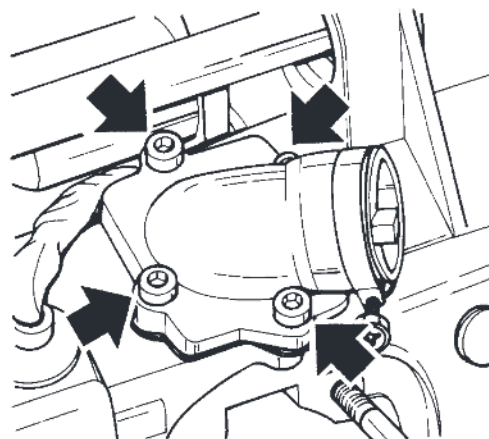
Remove the rag that was in the inlet port to stop dirt from getting in.

Fit a new gasket (3), the reed valve set (2) and the inlet manifold (1) in order .



4


Tighten up the four screws to secure the unit.



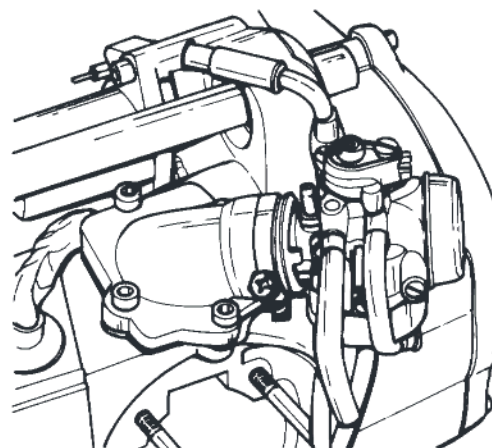
Torque setting: **8 Nm (5.9 ft-lb)**

### Carburetor - refit

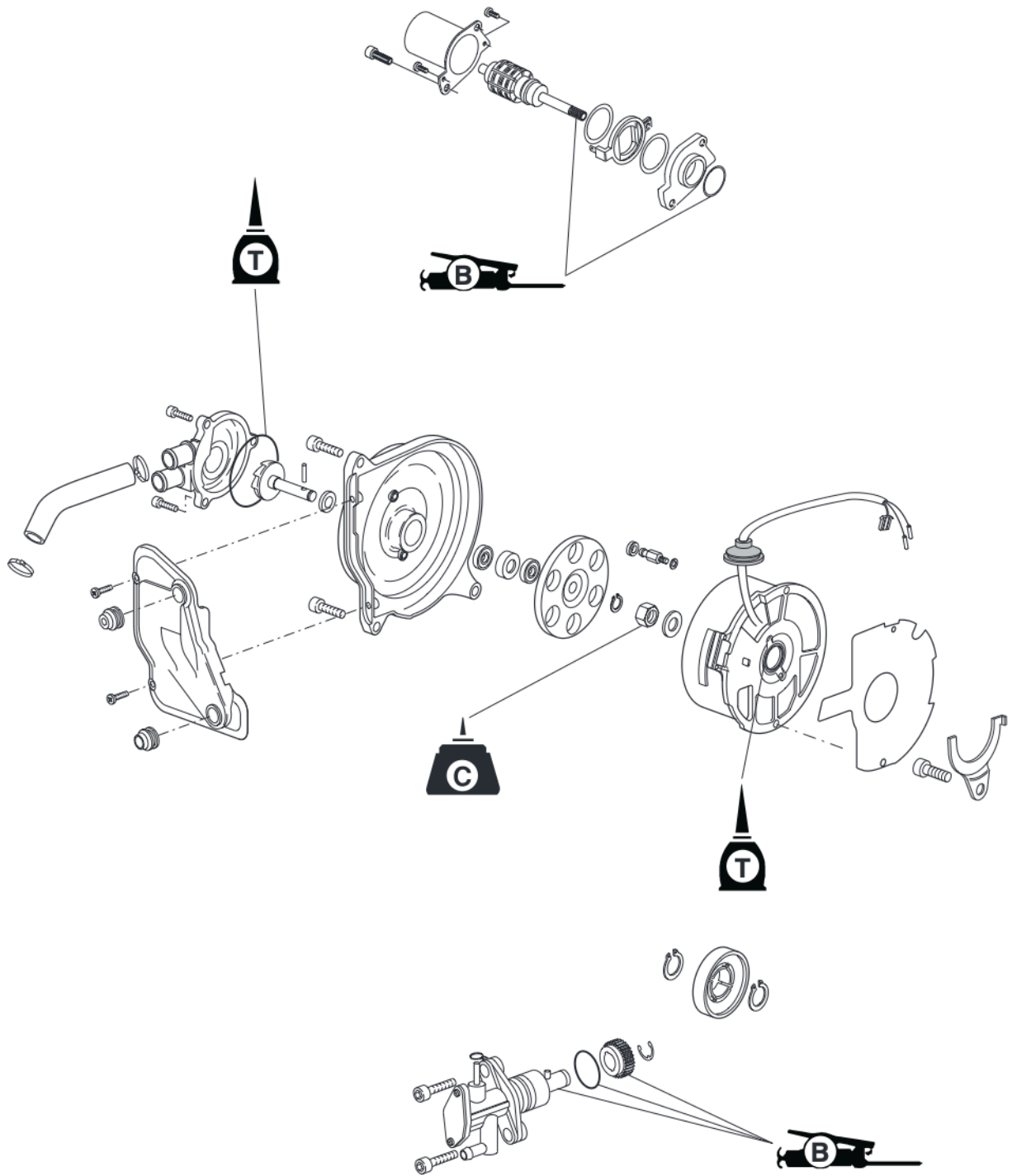
Place the carburetor on the inlet manifold, fitting the tabs on the carburetor into the two slots on the manifold, thus ensuring that the carburetor is replaced in the correct position. Reconnect all tubes (oil flow and petrol flow).

 Reconnect the carburetor heating system tubes, connecting the cylinder head left hand connector to the carburetor upper connector and the cylinder head upper right hand connector to the carburetor lower connector (as seen from above the scooter, looking in the forward travel direction).

Secure the tubes with new clamps.



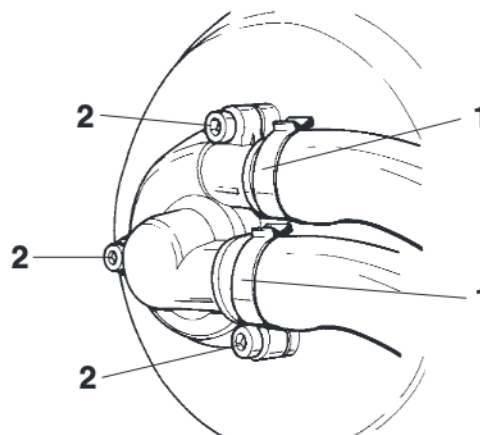






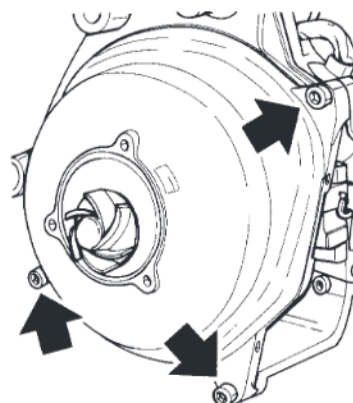
### Water pump - remove


Remove the tube clamps (1) and take off the pump water inlet tube and cylinder water delivery tube. Remove the 3 screws (2) and remove the water pump cover and O-ring.



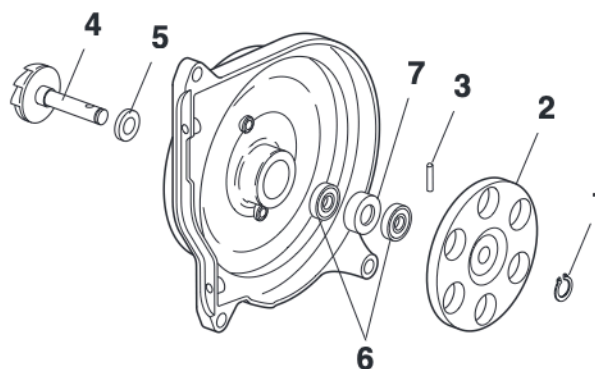
### Flywheel magnet cover - remove

Unscrew the 3 screws and remove the flywheel magnet cover .



 Remove the circlip (1) from the flywheel magnet cover , making it possible to remove the following parts In order: the drive device (2), the retainer pin (3) and the water pump impeller shaft (4) with its circlip (5).

The water pump bearings (6) can now be removed along with their spacer (7), using a drift of the correct size.



### Water pump - check

Inspect the general condition of the water pump inlet tubes and plastic drive devices. Any that show significant wear should be replaced.

Carefully inspect the water pump itself for cracks or erosion.

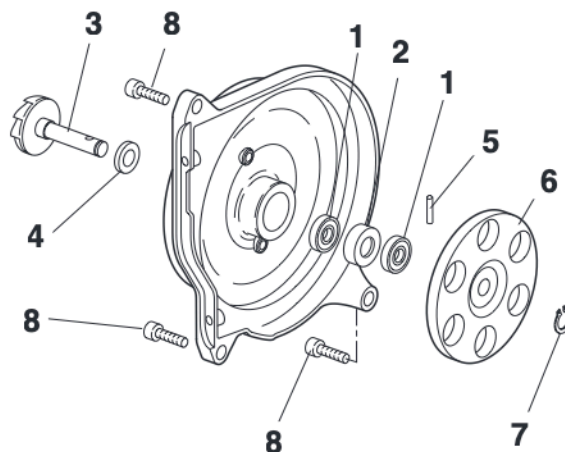
Check that the water pump bearings run smoothly without sticking. If necessary , renew the bearings.

### Water pump - refit

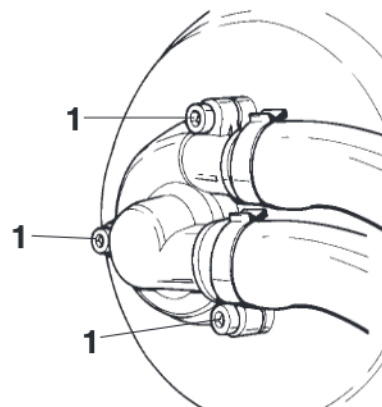
Use a jig of the correct size to refit the water pump bearings, inserting the spacer (2) between the bearings.

Refit the water pump impeller shaft (3) with a new circlip (4), the retainer pin (5) and the drive device (6) in order, securing the assembly with the circlip (7).

Fit the pump body on to the engine and secure it with the three screws (1).



Fit the water pump cover with the new O-ring and secure it to the flywheel magnet cover with the 3 screws (1). Reconnect the water inlet and delivery tubes, securing them with new tube clamps.



5

### Flywheel magnet - remove

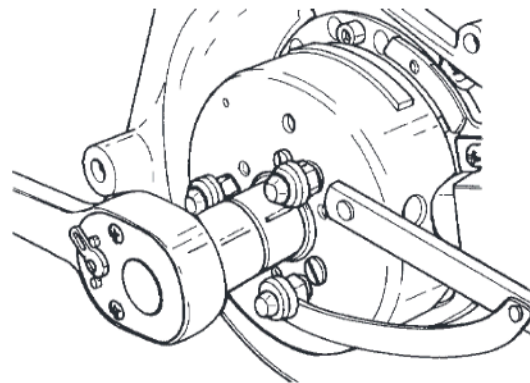
Remove the rotor nut with its washer, locking the flywheel with the special tool and removing the rotor with the specific extractor tool.

**CAUTION** : The flywheel nut is screwed on tightly. Proceed with care to avoid hurting yourself.

Flywheel retainer tool: 8106702

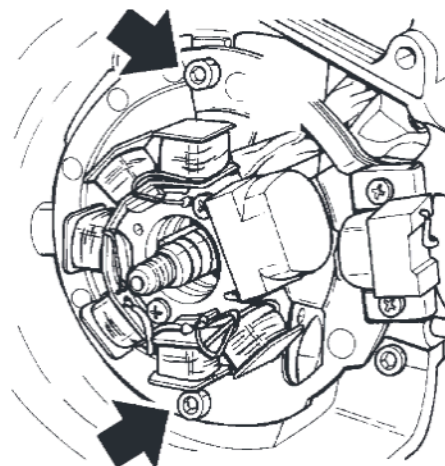
Moryama flywheel extractor: 8140207

Ducati flywheel extractor: 8140208



### Stator - remove

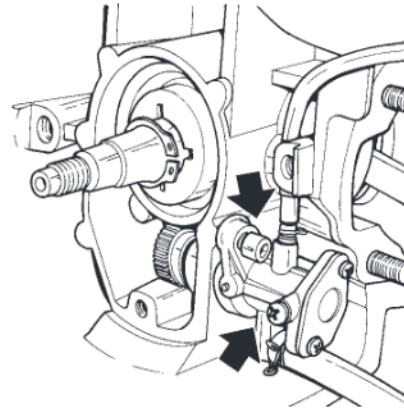
Unscrew the 2 screws and, remove the plate with the stator, the pick-up with its connection wires, the key and the gasket.



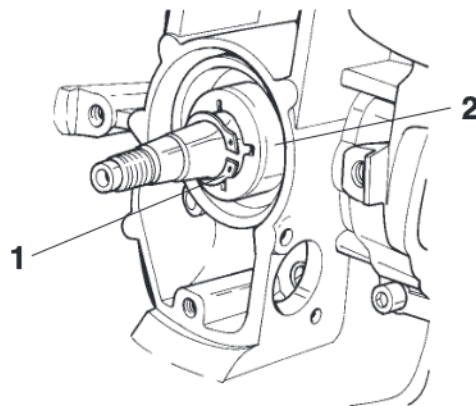
## Oil pump - remove

Remove the two screws and take off the oil pump with the pump oil inlet tube and carburetor oil deliver tube.

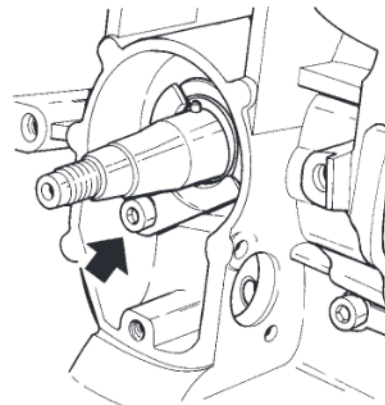
**▲ CAUTION** : Take careful note of the routing of the oil delivery tube so as to be able to refit it correctly.



Remove the circlip (1), the pump driving gear (2), the shaft and the other circlip.



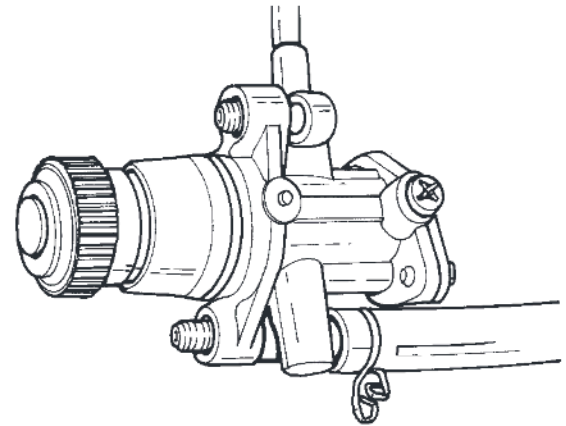
Unscrew the screw and take off the oil seal holder plate.



## Oil pump - check

Check the general condition of the oil pump. Any significant wear will affect the calibration settings of the pump.

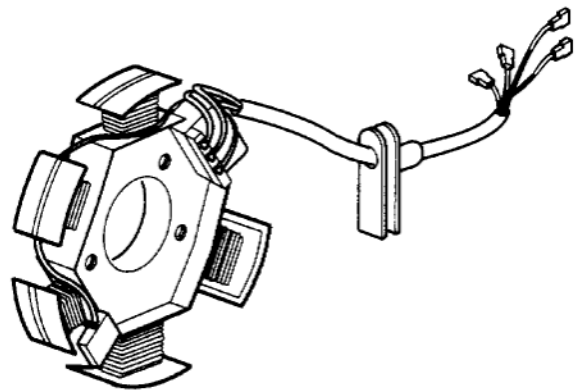
However, since it is completely lubricated at all times, it is extremely rare to see significant wear on the oil pump. If you suspect the pump is not working properly, check the inlet line and the condition of the ring seal. Replace it if it shows any sign of damage. Inspect the condition of the pump driving gear. Replace it if it shows significant wear.



**NOTE: It is very important that the oil inlet tube and oil delivery tube be completely purged of air. If there are bubbles of air in either of these lines, it is essential that the source of these bubbles be isolated and repaired before the engine is run.**

### Flywheel - check

Check the mechanical state of all the flywheel parts and check the state of wear of the key seat and the key slot in the crankshaft. Renew any parts showing signs of excessive wear.



### Stator - check

To check the electrical working order of the stator, take the following readings with a digital tester set to the resistance testing function. Connect the two probes of the digital tester to the wires listed in the table.

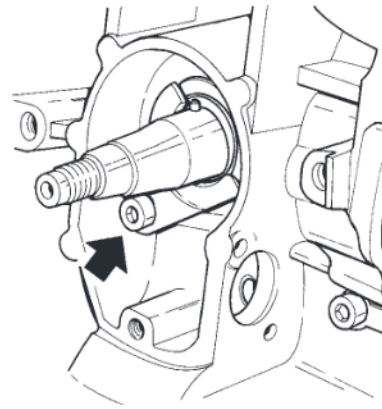
Type of ignition	Pick-up resistance (red-white and white wires)	Charge coil resistance (red-black and white wires)
MORYAMA	>500 Ω	>830 Ω
DUCATI	120 Ω	720 Ω

Check the continuity of the winding (0 Ohm), taking the reading between the yellow-red and white wires of the stator.

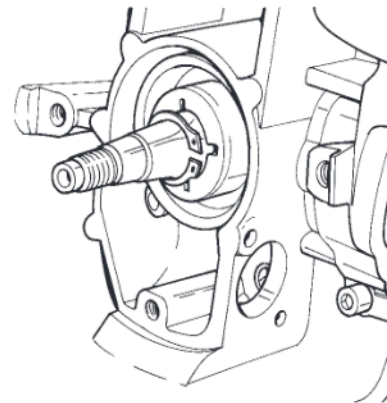
**NOTE: The readings in the table may oscillate by 10%, according to which tester is used. This check can be carried out without removing the flywheel cover.**

## Oil pump - refit

Fit the oil seal holder plate, securing it with the screws.



Fit the circlip, shaft, pump driving gear and the other circlip in order .



Refit the pump, being sure to route the oil delivery tube correctly and secure it with the two screws.

**NOTE:** air bubbles may remain in the tubes and pump after the servicing, and these will cause oil supply problems when the engine is running. It is therefore important to bleed the pump before using the engine.

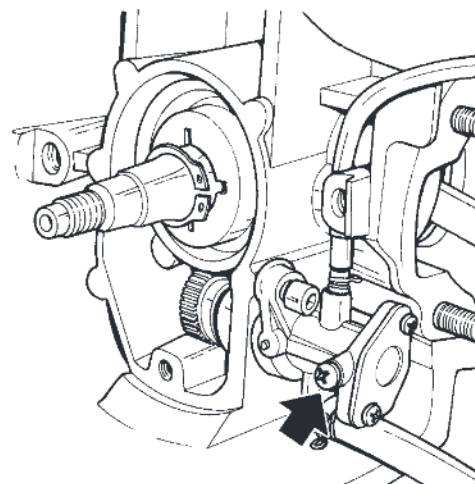
Unscrew the bleed screw from the pump and wait until the oil that comes out has no air bubbles in it. The pump has now been bled and the screw can be replaced.

**▲ CAUTION :** Put at least 1/2 a liter (0.132 gal USA) of fuel mixture (petrol with 2% oil) into the fuel tank, to give the pump time to expel the air.

**▲ CAUTION :** Continuous and prolonged contact with oil can cause serious skin disorders. Always wash your hands thoroughly after handling oil.

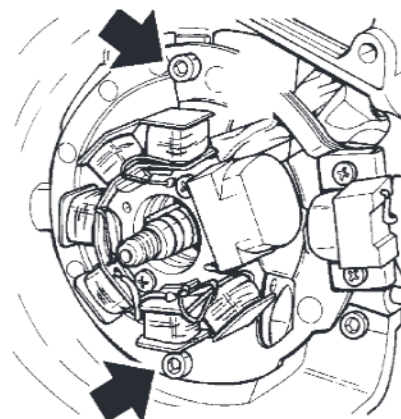
We strongly suggest that you wear latex or nitrile disposable gloves when handling petroleum products.

**KEEP OUT OF REACH OF CHILDREN**



### Stator - refit

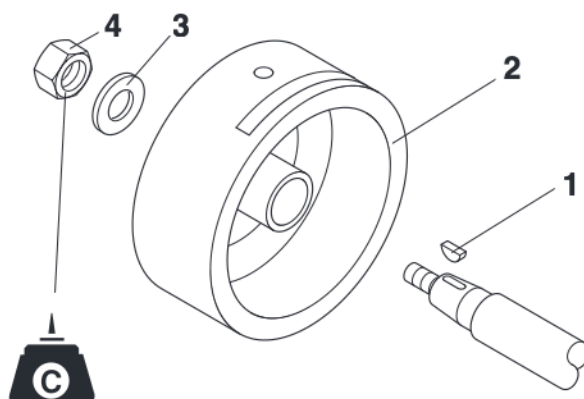
Fit a new right hand casing cover gasket and screw the stator unit on to the casing with the two screws, threading the wires through the hole in the casing and securing them with the rubber wire clamp.



Torque wrench setting: **9 Nm (6.638 ft-lb)**

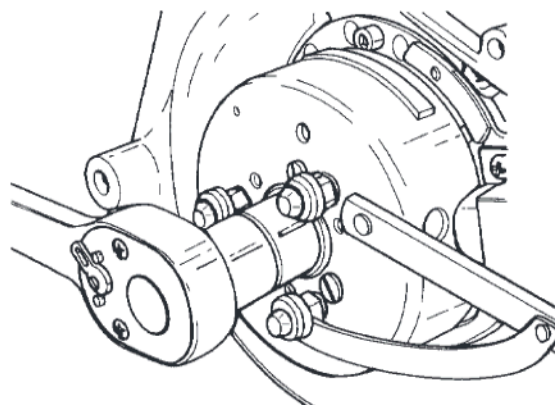
### Flywheel magnet - refit

Fit the key (1), the CDI magnet (2), the flat washer (3) and the nut (4) in order applying Loctite thread sealant (see Lubricants Table).


**5**

Hold the flywheel still with the special tool and refit by tightening up the nuts.

**CAUTION** : The flywheel nut is screwed on tightly. Proceed with care to avoid hurting yourself.

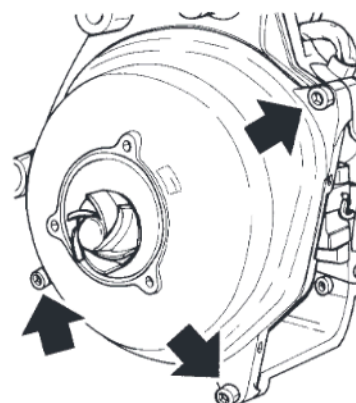


Torque wrench setting: **38 Nm (28.029 ft-lb)**

Flywheel spanner wrench: 8106702

### Flywheel magnet cover - refit

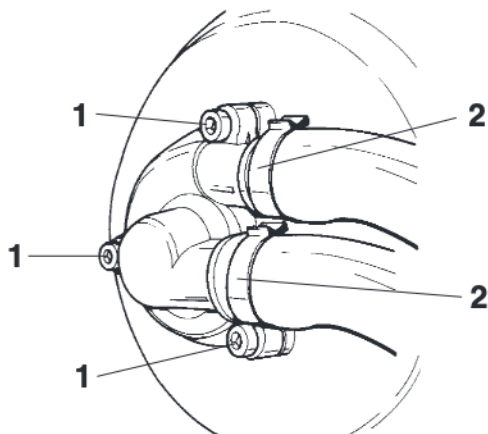
Refit the flywheel cover, tightening the screws shown in the figure.



Torque wrench setting: **7 Nm (5.163 ft-lb)**

### Water pump cover - refit

Fit the water pump cover with its O-ring and secure it with the three screws (1). Connect up the water inlet tube and the cylinder water delivery tube, securing them with the tube clamps (2).

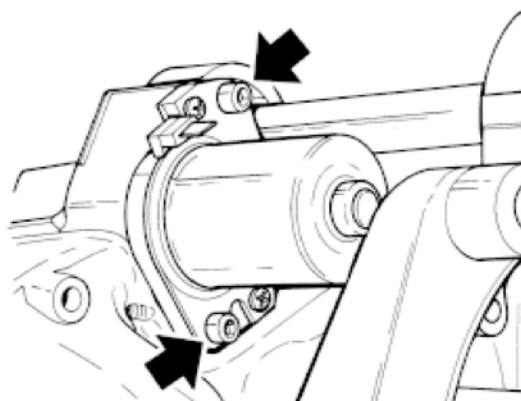


Torque wrench setting: 7 Nm (5.163 ft-lb)

### Starter motor - remove

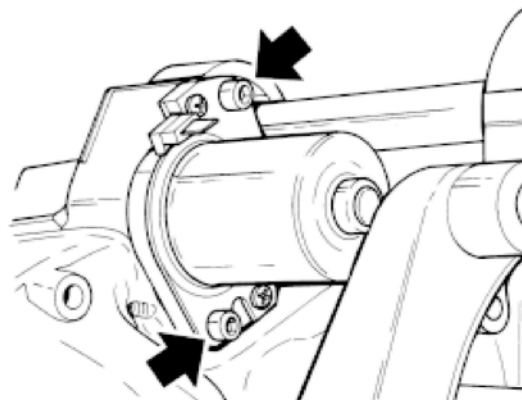
If there is a fault in the starter motor, check the electrical connections before removing it, repairing them if necessary.

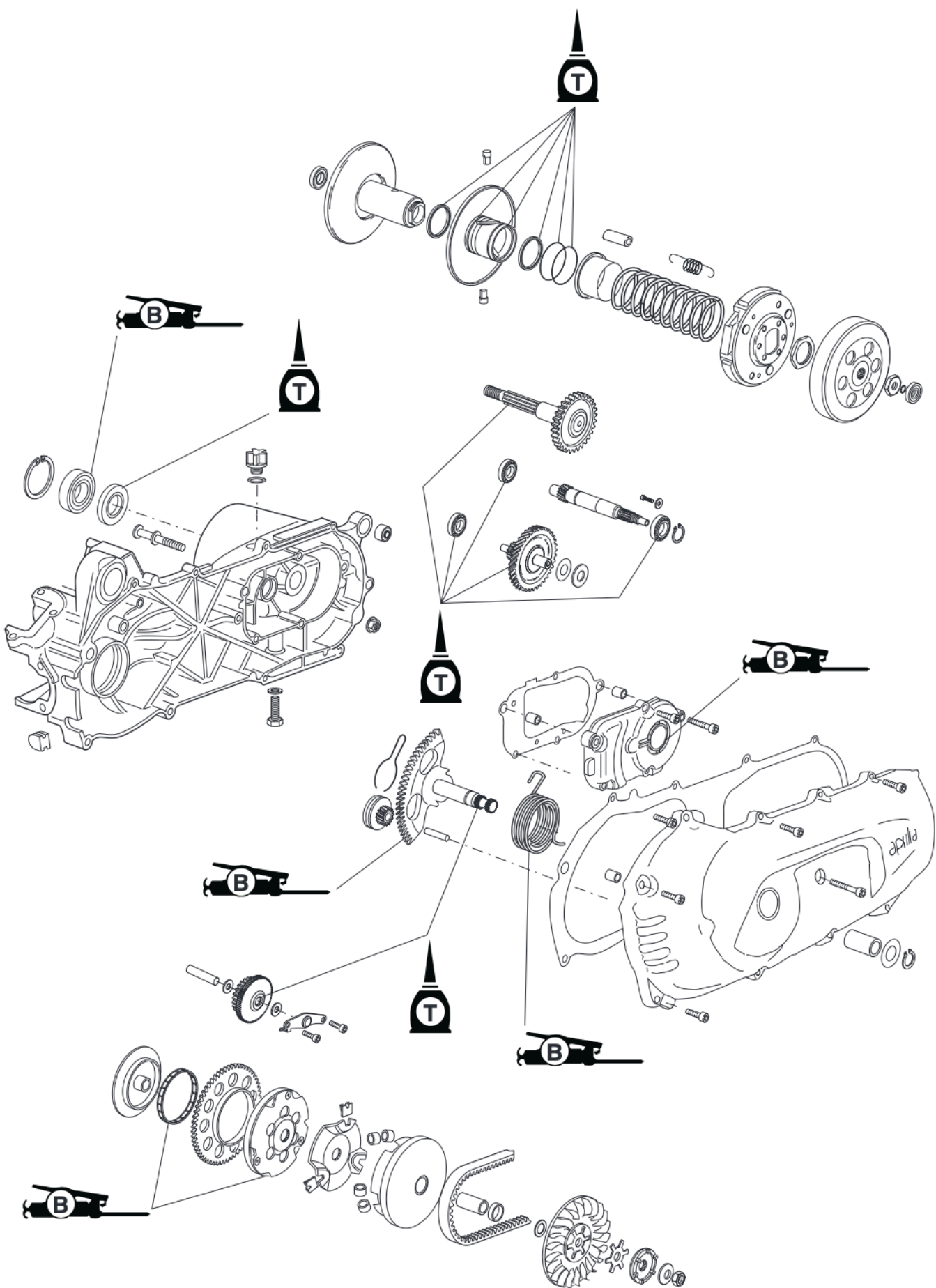
Remove the two screws that secure the starter motor to the casing and remove the starter motor.



### Starter motor - refit

Make sure that the O-ring is fitted properly into its slot, apply a thin layer of special oil seal grease (see Lubricants table) and then refit the starter motor, securing it to the casing with the two screws.

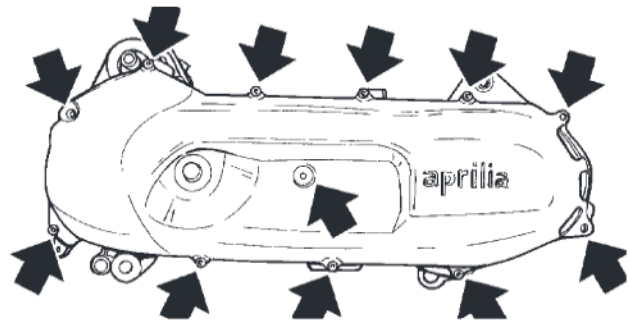




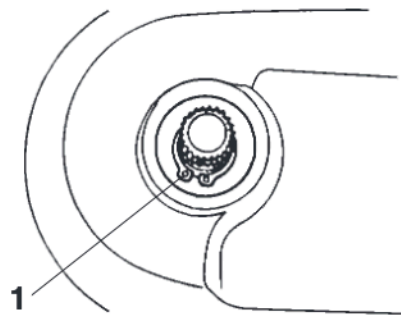


### Starter system - remove

Remove the starting lever retainer screw and take off the pedal. Take out the 12 casing cover screws and remove the cover along with its gasket, taking special care with the two locating pins.

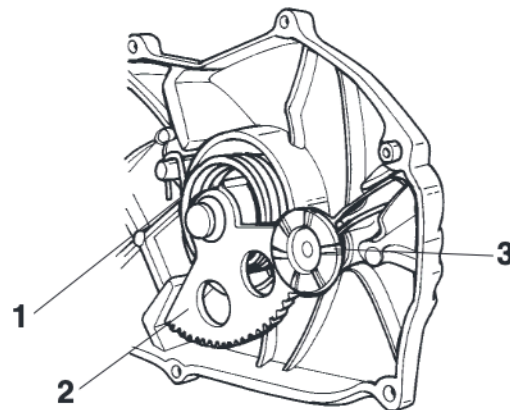


Remove the circlip (1).



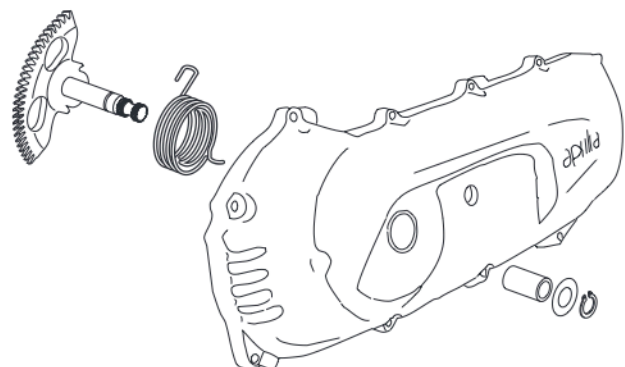
**▲ CAUTION : Preloaded spring.**

Release the pressure spring (1), using a hook or screwdriver. Remove the toothed plate (2) and the pinion (3).



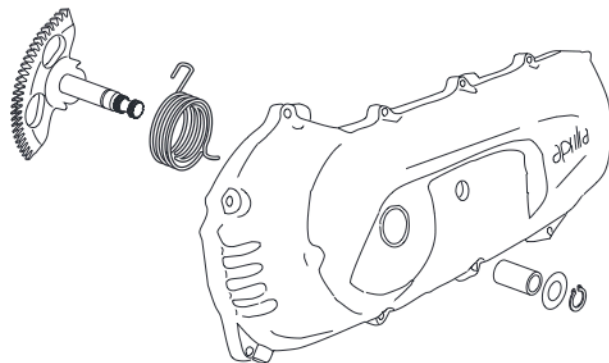
### Starter system - check

Check the starter system, renewing it if there are any signs of damage or wear. Check the return spring, renewing it if weakened. Measure the spring tension, which must be from 150 to 250 g (5 to 9 oz). Check the engagement teeth and pinion teeth on the retainer ring.



### Starter system - refit

Refit the return spring, pedal shaft, bushing, flat washer and spring clip in order .

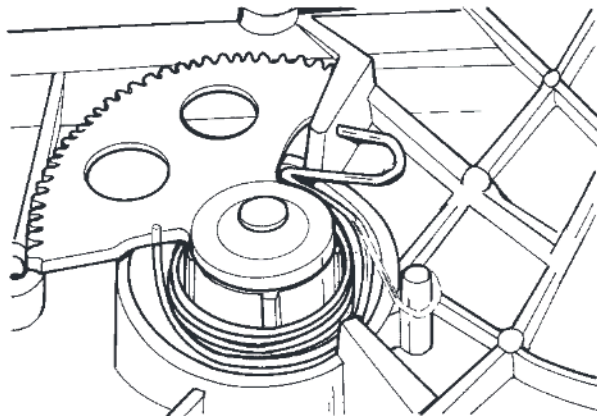


Attach the end of the return spring to the pedal shaft and, using a spring loading tool, attach the other end to the pin.

**IMPORTANT:** do not stretch the spring more than necessary when refitting it.

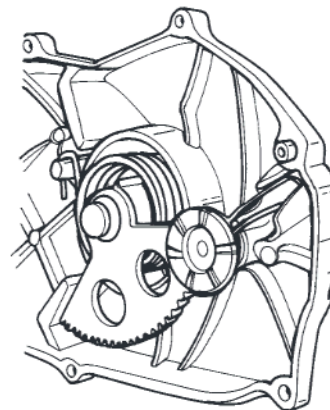
**⚠ CAUTION :** Excessive stretching could cause the spring to yield.

**⚠ WARNING :** Dangerous operation.



Refit the pinion and spring in that order . Move the pedal shaft slightly to facilitate the engagement of the teeth.

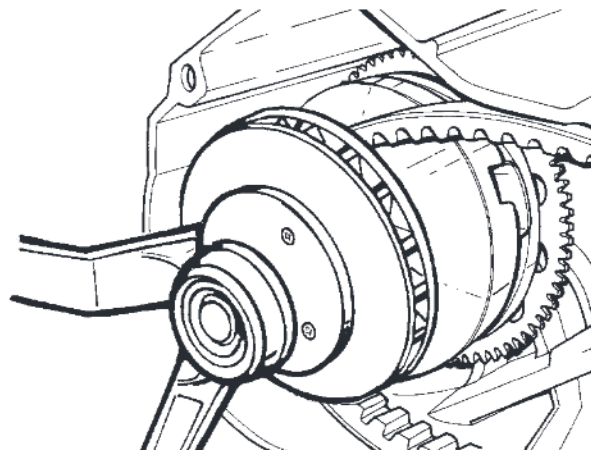
**NOTE:** Apply a little grease to the spring and to the kick starter quadrant (see lubrication table).



6

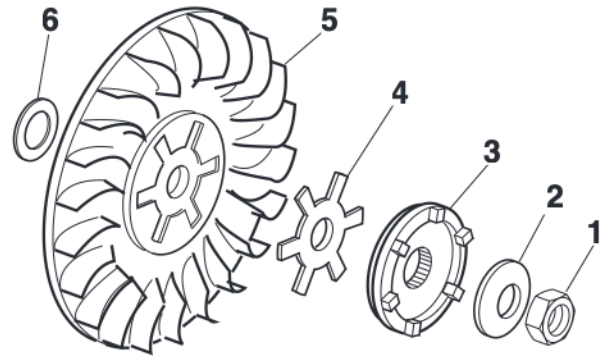
### Primary drive pulley - remove

Loosen the pulley retainer nut, using the special tool.



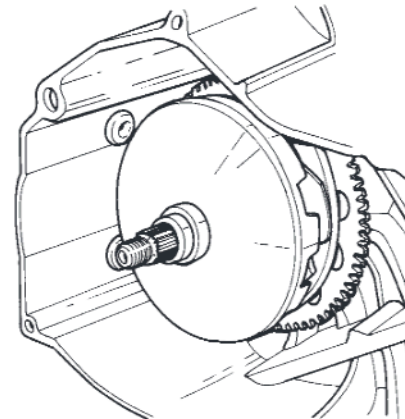
Pulley locking tool: 8106707

Remove the locknut (1), conical washer (2), starter coupling (3), spider (4), drive pulley (fixed) (5) and shim (6) in order .

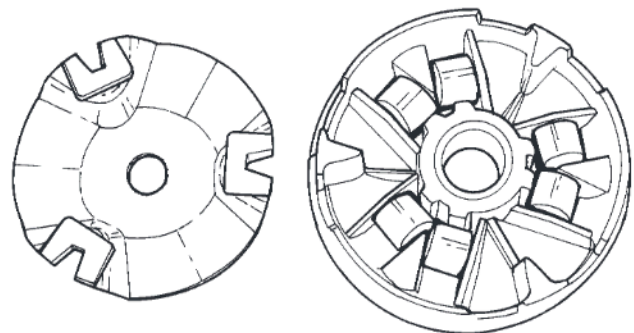


Remove the moving portion of the drive pulley , the cam, the weight casing, the bushing, and the washer simultaneously .

**CAUTION** : Do not separate the pulley from the weight casing before removal, as the 6 weights will fall out.



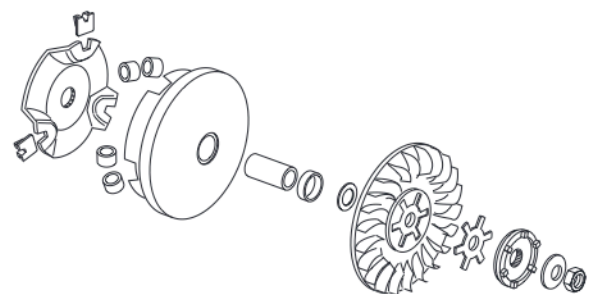
Separate the pulley from the weight casing and remove the 6 weights inside.



### Primary drive pulley - inspection

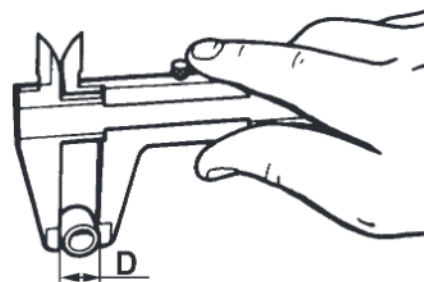
Examine all parts of the pulley assembly for cracks, scoring or other signs of damage on the moving and fixed parts of the drive pulley . Inspect the bushing for scoring or wear . Check that the bushing runs freely and smoothly inside the moving portion of the drive pulley . If it does not, or if there is excessive play or wear, replace both the pulley and the bushing as a unit.

Inspect the fan for broken or cracked blades, and all parts and fasteners for excessive wear . Replace any worn or defective parts.

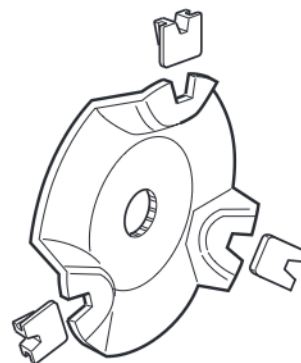


Check that the external diameter (D) of the weights is not less than the maximum wear limit. If it is, renew them.

Wear limit D: 14.5 mm (0.571 in)

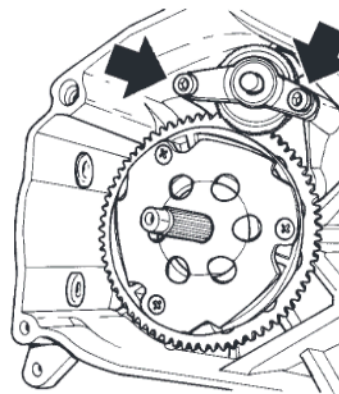


Check the condition of the moving portion of the weight casing and the three drive inserts. If they show excessive wear, replace them.



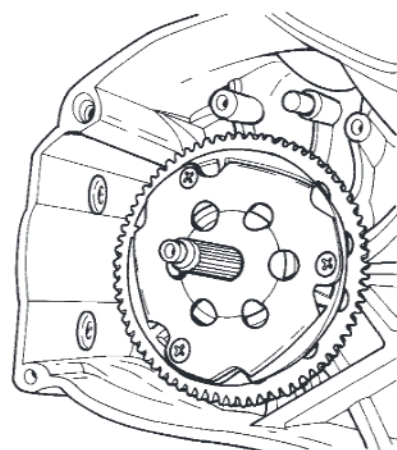
**Starting clutch - remove**

Take out the two screws and remove the intermediate gear locking plate, the gear and the outside and inside washers.



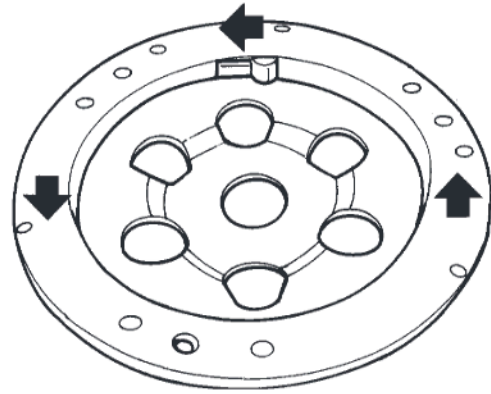
**6**

Remove the starting gear clutch, roller bearings and bushing simultaneously, being careful not to drop the locating pins from the inside of the starting clutch.

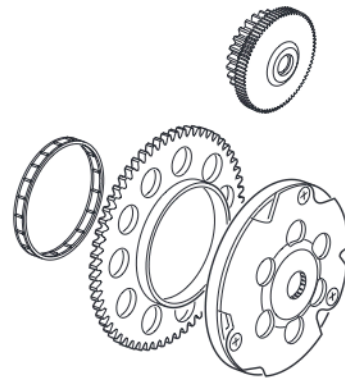


### Starting clutch - check

Check the general condition of the starting clutch. Push the rollers in the direction of the arrow and check that they run smoothly in the groove and return to their original position. Renew if necessary.



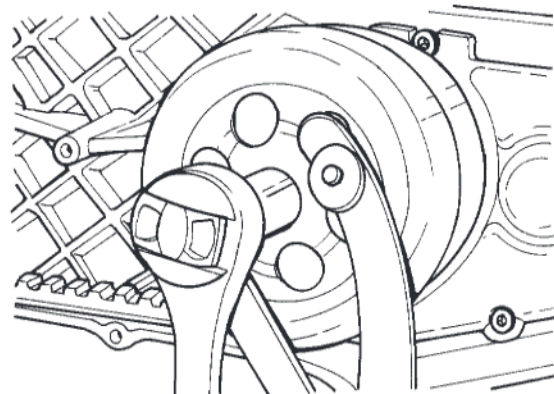
Check the condition of the gear teeth and the internal and external faces of the starter wheel. Inspect the roller bearings carefully. Replace any components which display excessive wear, scoring or distortion.



### Clutch and secondary pulley - remove

Remove the clutch housing locknut, keeping the clutch housing stationary using the special tool.

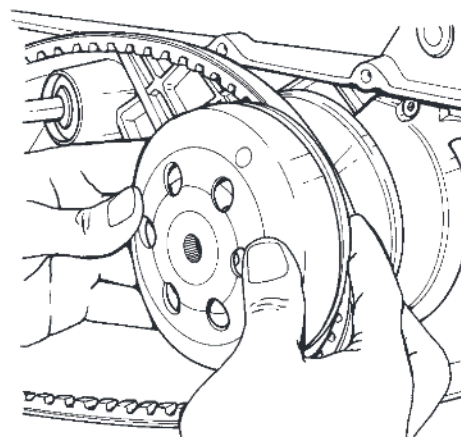
**CAUTION** : The clutch nut is screwed on tightly. Proceed with care to avoid hurting yourself.



Special tool: 8106702

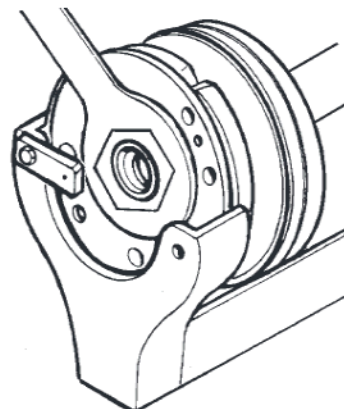
Simultaneously remove the clutch housing along with the secondary pulley unit and the belt.

**CAUTION** : Do not twist the belt.



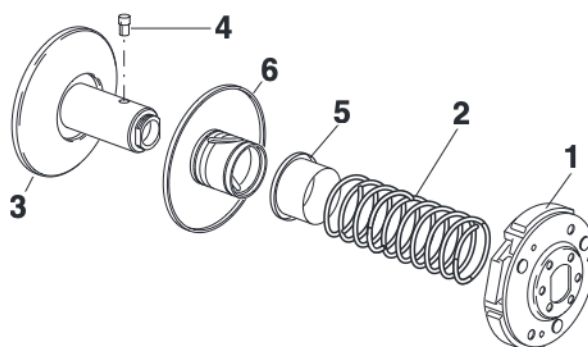
Remove the clutch retainer nut, after pressing the unit together with the clutch spring support.

**⚠ WARNING : Compressed spring.**



Clutch spring tool: 8140259  
Clutch removal wrench: 8106703

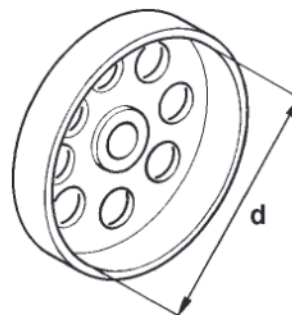
Remove the clutch block support (1), counterspring (2), fixed secondary pulley (3), pin (4), spring seat (5) (with the help of 2 screwdriver-type wedges) and moving secondary pulley (6) in order .



**Clutch - check**

Inspect the clutch housing internal surface. Remove light scoring or rust with emery cloth. Measure the internal diameter (d), 105.0 or 107.0 mm (4.134/4.213 in).

Wear limit (d): 105.4 or 107.4 mm (4.149/4.228 in)



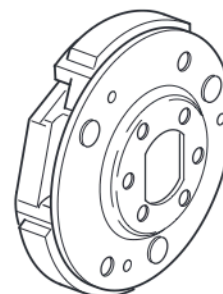
**6**

Inspect the clutch blocks. If they have been contaminated with oil or other fluid, clean thoroughly using a residue free solvent.

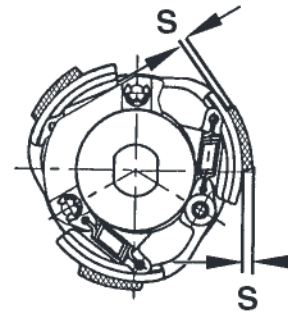
**⚠ WARNING : See Warnings under General Information, Section 1 of this manual.**

Blow the blocks completely dry . If the clutch blocks are glazed, remove the glaze with easy grit sandpaper .

**NOTE: Using compressed air, blow the blocks thoroughly after you have finished removing the glaze, to remove all traces of sanding residue.**



Measure the thickness of the blocks (S), which must not exceed the wear limit of 2.5 mm (0.98 in).

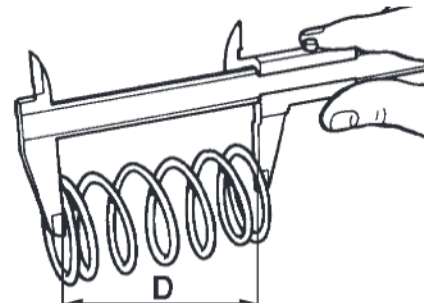


### Secondary pulley - check

Ensure that the secondary pulley is in good condition, and runs smoothly. If it does not, or if the faces are excessively scored, replace the pulley. Check that the groove, guide pin, and ring seal show no signs of damage or wear. If these components, especially the sealing surfaces, are in any way damaged, they should be replaced.



Measure the free length of the counterspring (secondary pulley). A new spring is 121.7 mm (4.791 in) long. The minimum permissible length is 106.7 mm (4.201 in). Replace the spring if its free length is less than this figure.

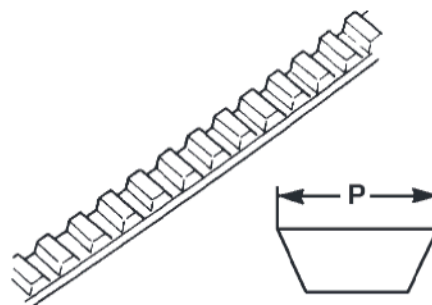


### Belt -check

Inspect the belt for cuts, cracks or excessive wear, or contamination with oil. Replace if any of these conditions are present. Measure the width of the widest part of the belt at several points along the belt.

A new belt measures (P) 16.6 mm (0.653 in), the wear limit is 15.2 mm (0.598 in).

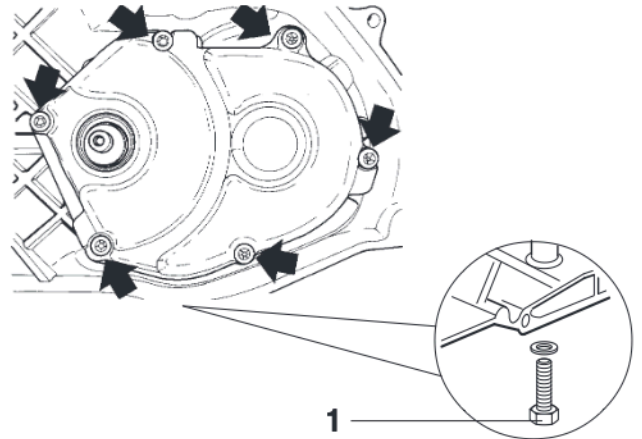
Replace the belt if it measures (P) less than 15.2 mm (0.598 in) at any point.



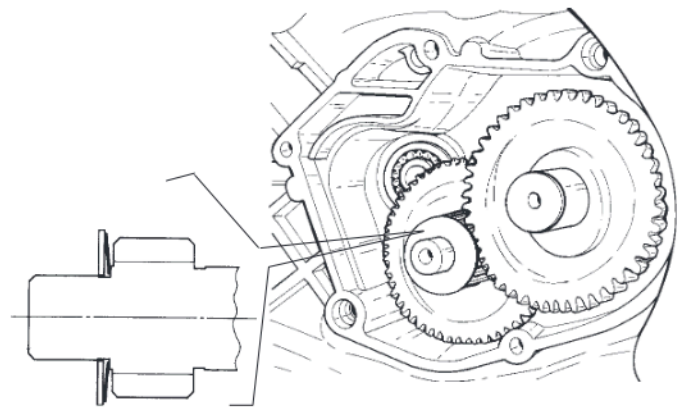
**Gearbox - remove**

**CAUTION** : Unscrew the drain plug (1) underneath the gearbox and drain off all the oil before removing the gearbox cover.

Take out the 6 screws and remove the gearbox cover with the driving gear, two locating pins and gasket.

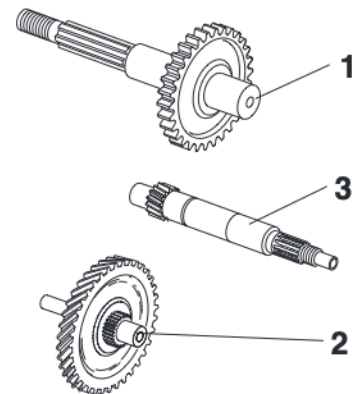


Withdraw the output shaft and the double intermediate gear, being careful about the thrust washers, as shown in the figure.



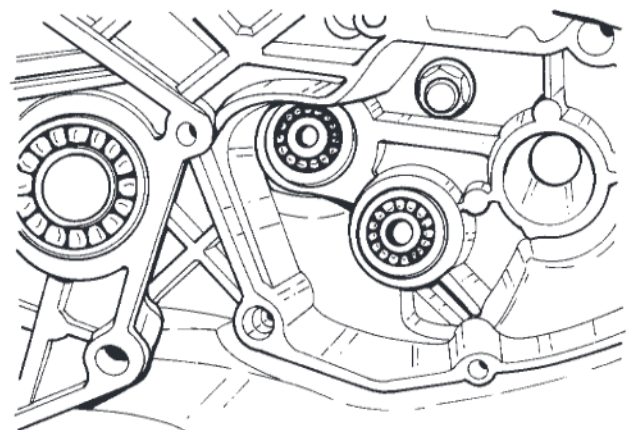
**Gearbox - check**

Check for excessive wear on the output shaft gears (1), double intermediate gear (2) and drive shaft (3), replacing them if necessary.



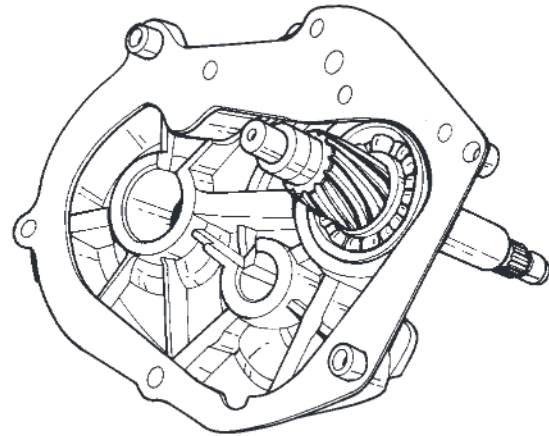
**6**

Check for signs of excessive wear, scoring and seizure on the gear bearings, replacing them if necessary.



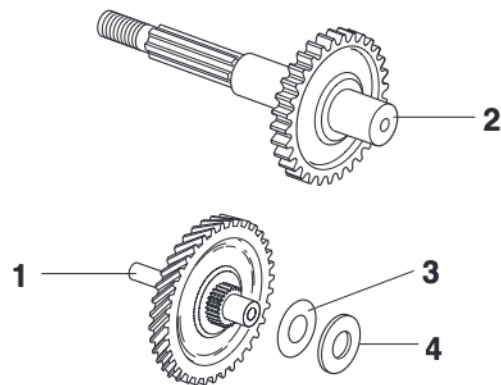


Check that the drive shaft runs smoothly , repairing or renewing it if necessary .

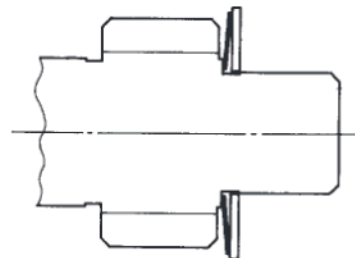


**Gearbox - refit**

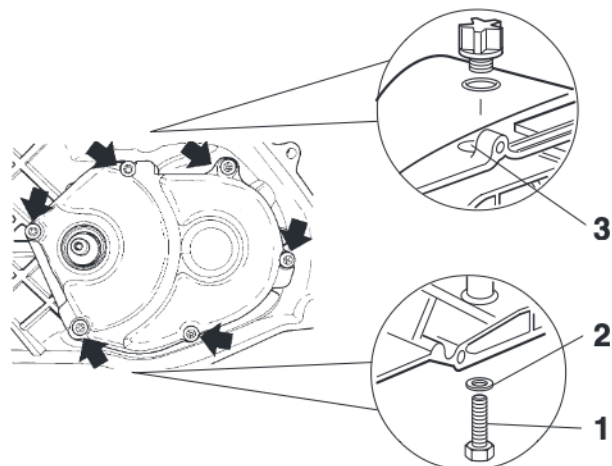
Fit the double intermediate gear (1), output shaft (2), conical washer (3) and flat washer (4) in order , after greasing the bearings and oil seal with lithium soap-based grease and the gears with engine oil.



Fit the conical spring washer correctly , as shown in the figure.



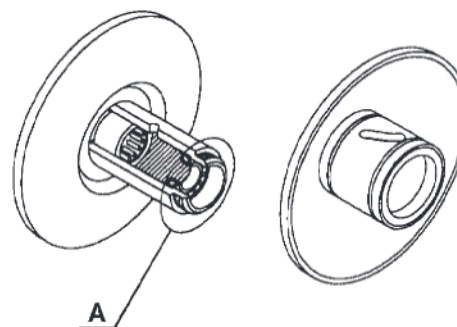
Before reassembling the gearbox, lubricate the output shaft bearing with engine oil (see Lubricants table). Also, grease the cover gasket with lithium soap-based grease (see Lubricants table). Fit the gasket, insert the locating pins into their housings, place the gearbox cover with the output shaft in position and secure with the 6 screws. Tighten up the drain plug (1) with a new washer (2). Finally , fill up with gearbox oil via the filler hole (3) on the top: quantity: 0.12 l (0.25 gal USA). Screws torque wrench setting: **12 Nm (8.851 ft-lb)**  
Oil drain plug torque wrench setting: **18 Nm (13.277 ft-lb)**



### Secondary pulley - installation

Before installing the pulley, clean the pulley slide face and grease the fixed half-pulley (see lubrication table).

**⚠ CAUTION** : Wrap a piece of vinyl electrical tape around the groove in the pulley shaft as shown at "A" in the illustration, before attempting to install the pulley. This will prevent the shaft from fouling the lips of the oil seals, and destroying the seals during installation. Be sure to remove the tape after installation.

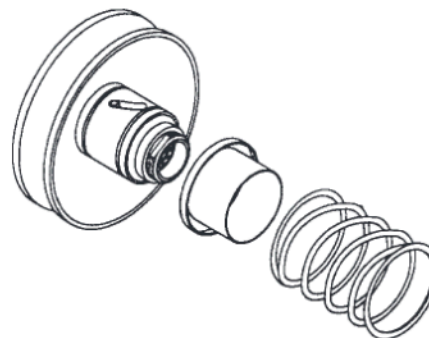


Install the pin and grease the moving pulley groove. Grease the mobile secondary pulley O-rings (1) before fitting.



Install the spring seat and check that the pulley and return spring work smoothly.

**⚠ CAUTION** : Remove any excess grease.



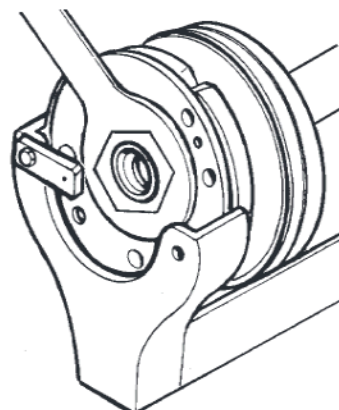
### Clutch - reinstallation

Clean the contact faces between the nut and the clutch holder.  
Install the clutch retainer nut, pressing the pulley and the clutch spring support together.

**⚠ WARNING** : Compressed spring.

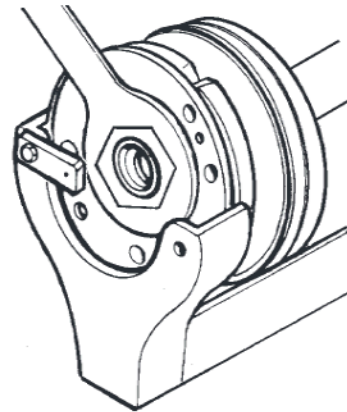
**⚠ CAUTION** : Do not attempt this operation if you do not have the appropriate special tools. (See Chapter 2 of this manual.)

Clutch spring tool: 8106704  
Clutch removal wrench: 8106703



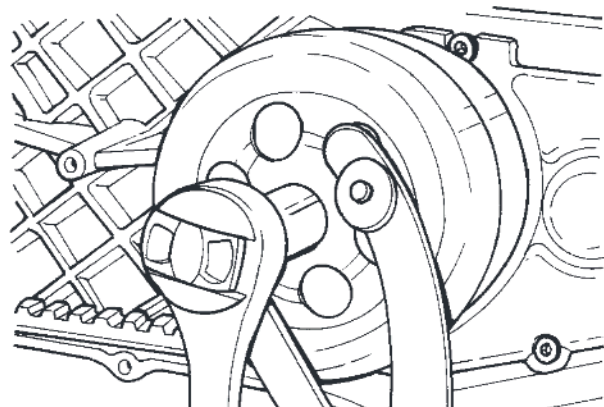
Tighten up the nut to complete the fitting of the clutch. Preload the counterspring and fit the belt between the pulleys so that the clutch unit can be inserted on the drive input axis.

**▲ CAUTION** : Proceed as described above: this will allow you to tighten the primary fixed pulley without the belt getting the way.  
Fit the belt with the arrow pointing in the direction of rotation.



Torque wrench setting: **50 Nm (36.88 ft-lb)**

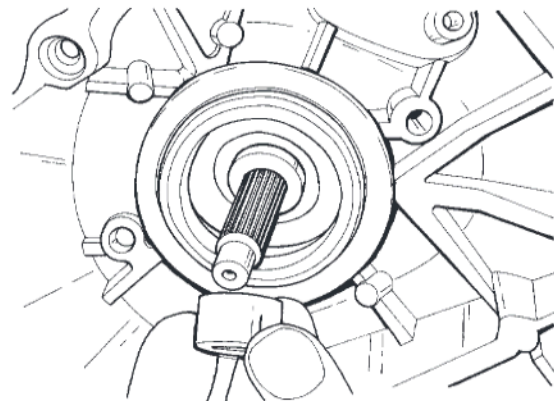
Fit the housing around the pulley and, holding it still with a suitable tool, tighten up the nut as shown in the figure.



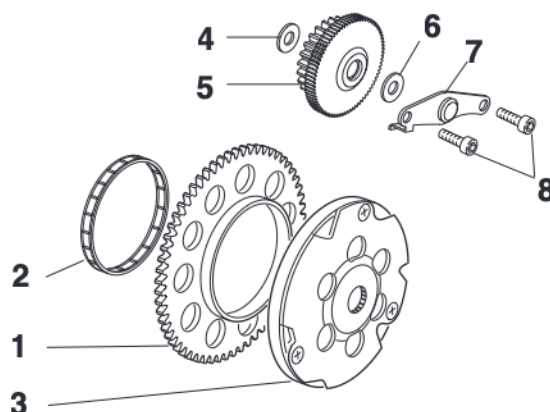
Torque wrench setting: **50 Nm (36.88 ft-lb)**

### Starting clutch - refit

Fit the bushing on the crankshaft.



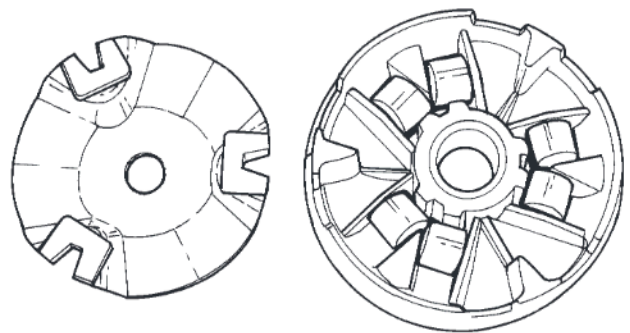
In order , fit the starting gear (1), oiling it with gearbox oil, the roller bearing (2), the starting clutch (3), the washer (4), the starting gear (oiled) (5) and the washer (6), and secure the plate (7) by tightening the two retainer screws (8).



Torque wrench setting: **9 Nm (6.638 ft-lb)**

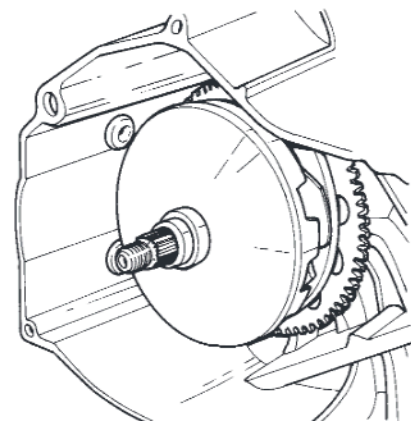
### Primary drive pulley - install

Thoroughly clean the slide surfaces of the centrifugal weights and fit them in their grooves. Fit the drive inserts into the weight casing and fit the weight casing to the pulley . Insert the bush.

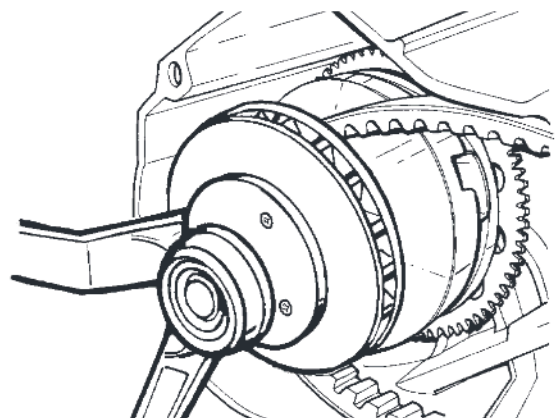


Install the drive pulley over its shaft, holding the weight casing together with your fingers to keep the weight from falling out.

**⚠ CAUTION :** Be careful not to squeeze your fingers between the pulley and the engine casing.



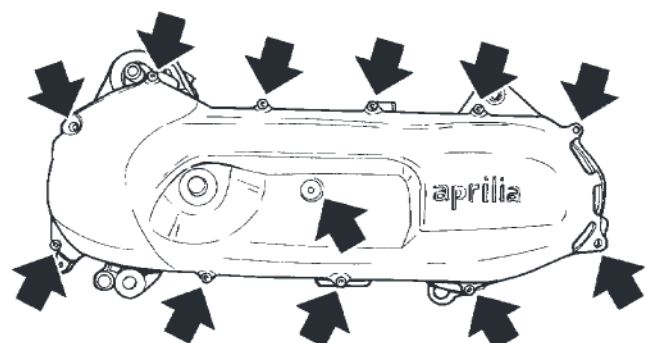
Install the shim, fixed drive pulley , spider , starter coupling, washer , and nut in that order . Lock the crankshaft movement with the pulley locking tool and tighten the nut.



Torque wrench setting: **33 Nm (24.341 ft-lb)**  
Pulley locking tool: 8106707

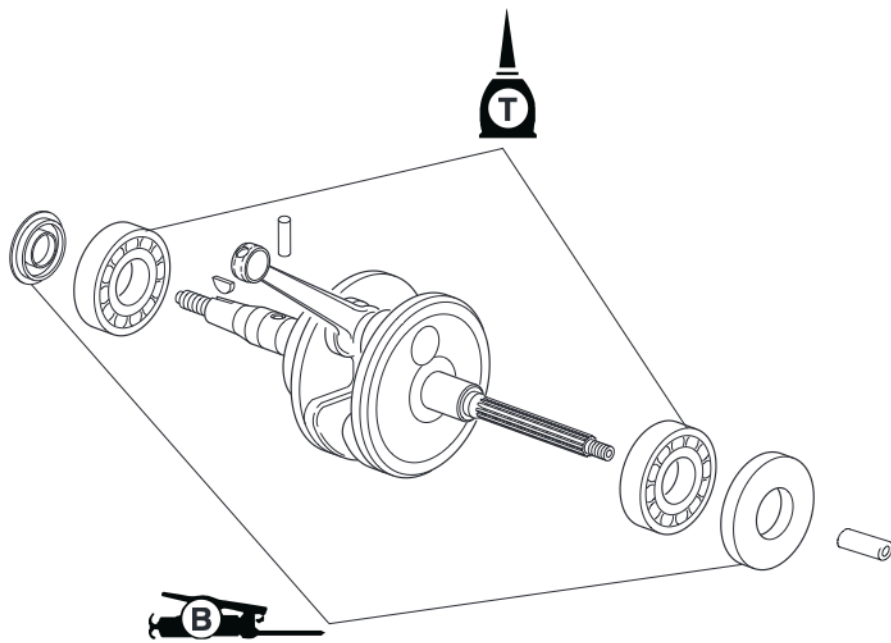
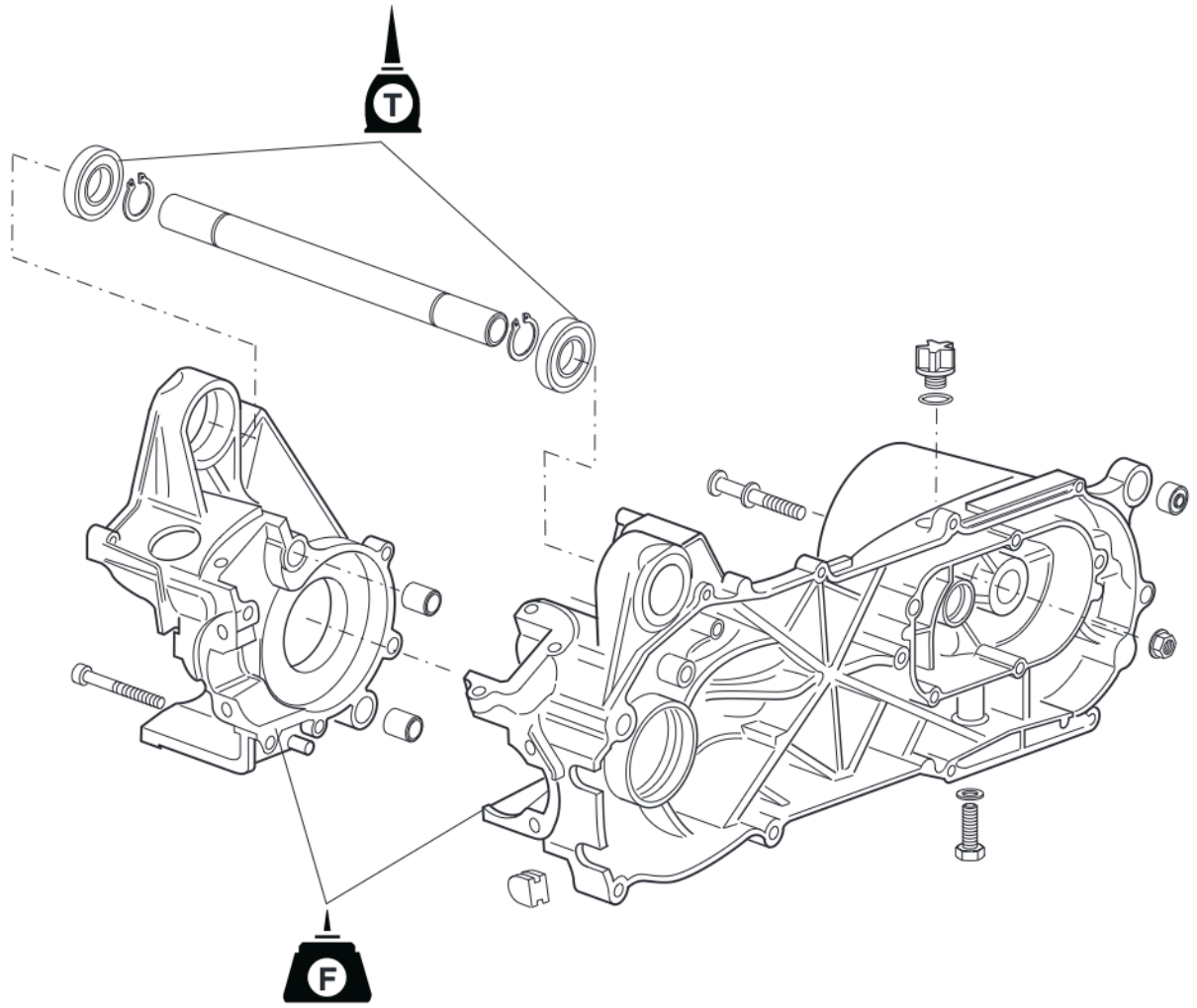
### Starter system - refit

Insert the locating pins into their holes, fit a new gasket and fit the casing, securing it with the 12 screws shown in the figure. Refit the starting pedal and secure it with the screw .



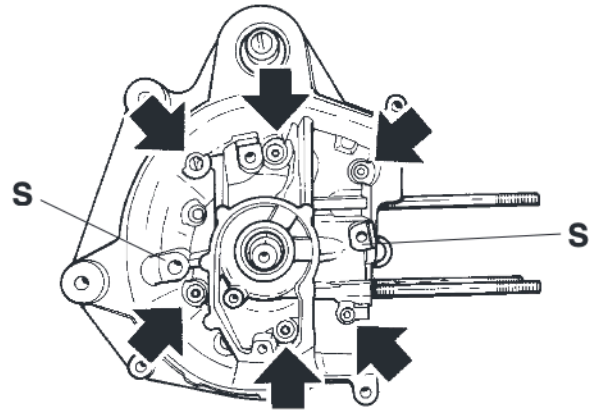
Screws torque wrench setting: **12 Nm**





## Right hand crankcase and crankshaft - remove

Unscrew the 6 bolts to remove the right hand crankcase.



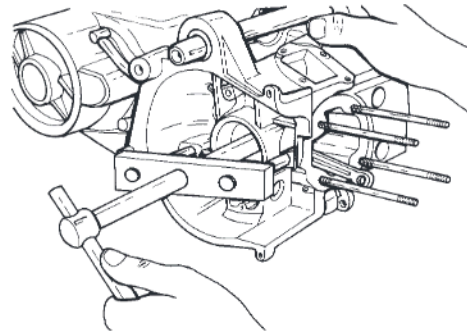
Tighten up the crankcase separator tool, fixing it to the two M8-threaded joining supports (S in the above figure).

**▲ CAUTION :** Make sure the tool is parallel to the crankcase when tightening up the bolts that support the tool.

**▲ CAUTION :** Lubricate between the spacer tube and the crankcase bearings; hammer on the axis as you turn the separator tool.

When tapping on the case, tap all around, only on parts of the case which are used for mounting the case to the vehicle's frame. Do not ever hammer, even with a soft mallet, on the gasket contact faces.

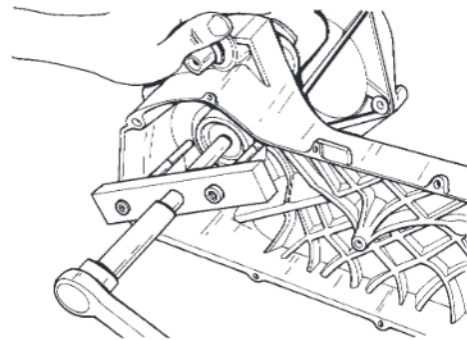
Crankcase separator tool: 8106698



## Crankshaft - Remove

Remove the crankshaft with the separator tool, fixing it to the two M8-threaded joining supports.

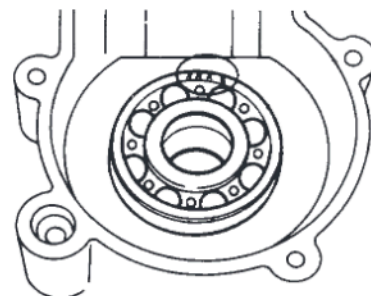
**▲ CAUTION :** Make sure the foot is parallel to the crankcase when tightening the tool support bolts.



Crankcase separator tool: 8106698

## Crankcase, crankshaft and connecting rod - check

Inspect the crankshaft bearings by rotating the inner race. Replace the bearing if it does not rotate completely smoothly, or if there is any radial play, or excessive lateral play. If you perceive roughness when you turn the inner race of the bearing, clean the bearing carefully, and blow it out with compressed air. Lubricate the bearing lightly, and then recheck. It is possible that what you were feeling is merely dirt or foreign matter in the bearing. Once thoroughly clean, you should feel no roughness, clicking or hesitation upon rotating the inner race with your fingers. If any discrepancies are felt, the bearing must be replaced.

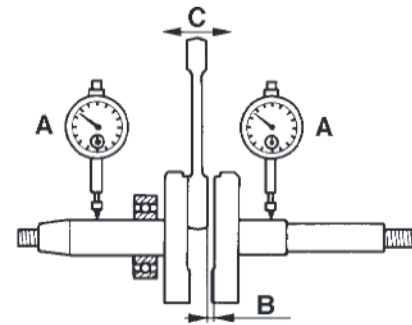


Check the condition of the connecting rod and flywheel. Inspect the flywheel crankpins for scoring or wear. Check the condition of the big end bearing by rotating it on its pin. Measure the axial clearance of the big end of the connecting rod (C). This should be between 0.4 and 0.8 mm (0.016/0.031 in). Measure the side clearance on the connecting rod (B). This should be between 0.20 and 0.50 mm (0.008/0.02 in). If, after thorough cleaning, you detect any roughness, unevenness, or slack, the big end bearing must be replaced.

**⚠ CAUTION :** Replacement of the big end bearing requires specialized knowledge, special fixtures, and a large hydraulic press. DO NOT ATTEMPT to replace the big end bearing unless you have the special tools and knowledge required. Contact Aprilia Service.

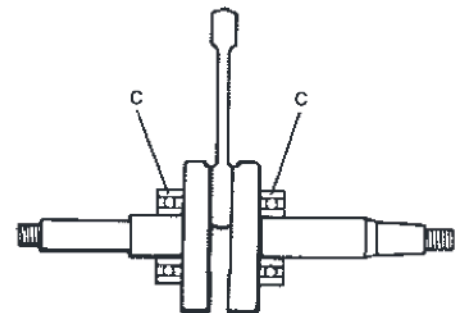
Also, check to insure that the connecting rod is not bent, and that it runs exactly perpendicular to the crank pins. Use a set of V blocks to measure the eccentricity of the two crankpins, at the points shown in the illustration. The limit on eccentric (A) run out is 0.03 mm (0.001 in). If this eccentricity is exceeded, the crankpins must be realigned. Again, contact Aprilia Service.

Connecting rod extractor : 8106698  
Crankshaft bearing extractor : 8140152

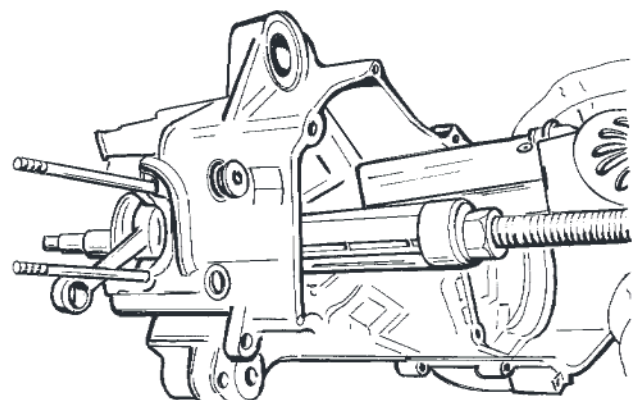


## Bearings - refit

Fit two new bearings (C) on to the crankshaft, using a piece of pipe of the correct diameter and resting the pipe on the bearing inner ring. Drive the bearings against their stop ledge, using a mallet or hydraulic press.



Using an automatic heater, heat the crankcase to a temperature of about 150 °C, 302 °F (~10 minutes heating time), and drive the connecting rod group into the lh crankcase, as described in the section "Crankcase - refit".

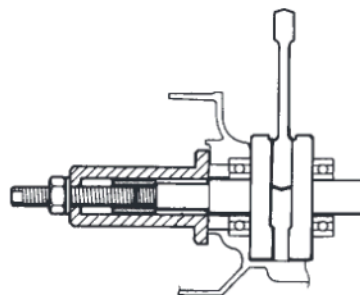




## Crankshaft - install

**▲ CAUTION** : Grease the oil seals and oil the bearings to protect the crankshaft from scoring and facilitate installation.

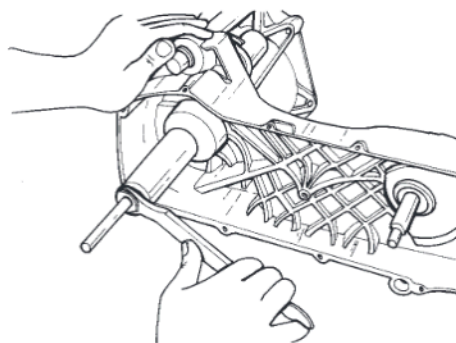
Install the crankshaft fitting tool and fit the adapter and spacer .



Complete crankshaft installation tool: 8140234

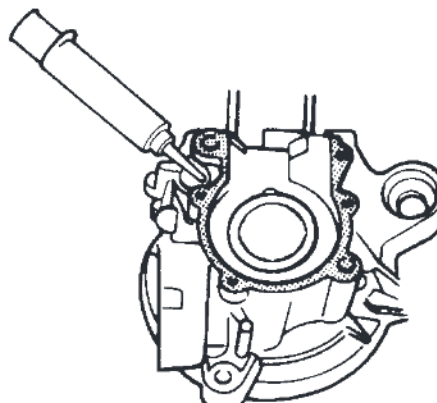
Install the crankshaft in the left hand crankcase.

**NOTE:** move the connecting rod to the top dead center and hold it still with one hand, then turn the installation tool with the other hand. Continue turning the installation tool until the crank pin is bottomed on the crankshaft bearing in the left hand crankcase.

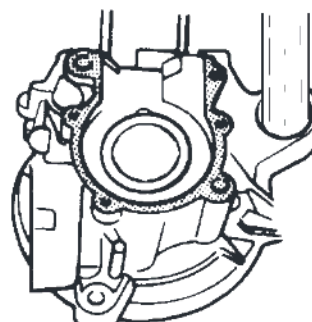


## Crankcase - install

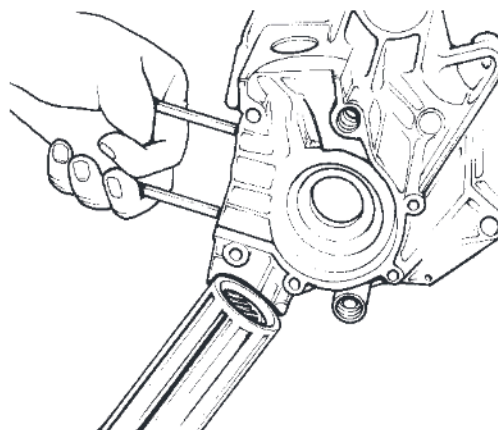
Apply sealant to the contact surface on both crankcase halves.



Fit the spacer tube and locating pins.

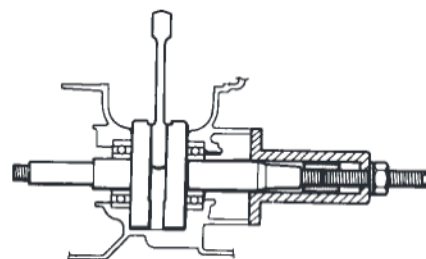


Using an automatic heater , heat the right hand crankcase to a temperature of about 150 °C, 302 °F (~10 minutes heating time), and complete the fitting of the connecting rod group in the rh crankcase, as described in the next section



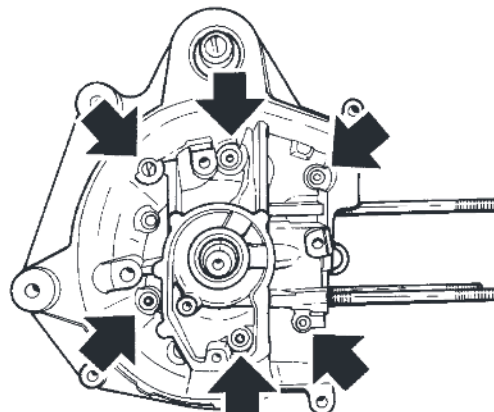
Position the right hand crankcase and install the crankshaft fitting tool, using the tool to bring the two crankcase halves together .

**NOTE:** While holding the connecting rod at top dead center with one hand, turn the nut on the tool with the other hand until the two crankcases are gently in contact.



Complete crankshaft installation tool: 8140234

Install and tighten the 6 bolts, snugging each slightly , in a "X" pattern tightening sequence.

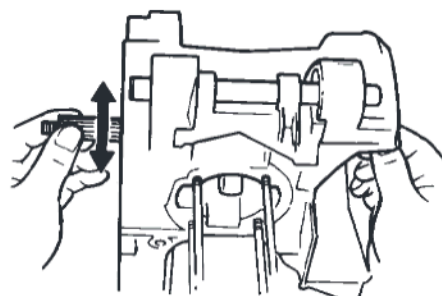


Torque wrench setting: **9 Nm (6.638 ft-lb)**

After installation, ensure that the crankshaft turns freely in the crankcases. Tap gently only upon reinforced parts of the crankcases to ensure proper seating of the bearings on the crank pins.

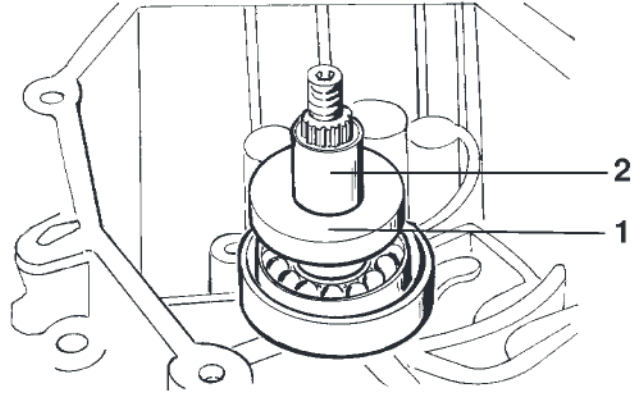
**NOTE:** If necessary, use a plastic mallet to restore the axial play.

**CAUTION :** Never use a metallic hammer for this job. Use only a plastic or rubber mallet. Never pound on the crankshaft.

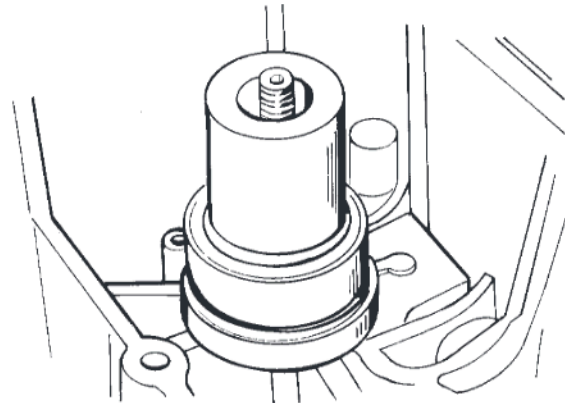


## Crankshaft oil seal - refit

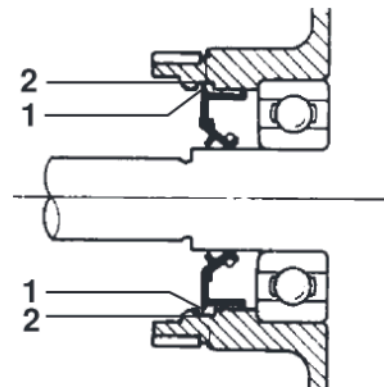
Fit the oil seal (1) and the center bush (2) in order, being sure to spread a layer of lithium soap-based grease (see Lubricants Table) on the rim of the oil seal.



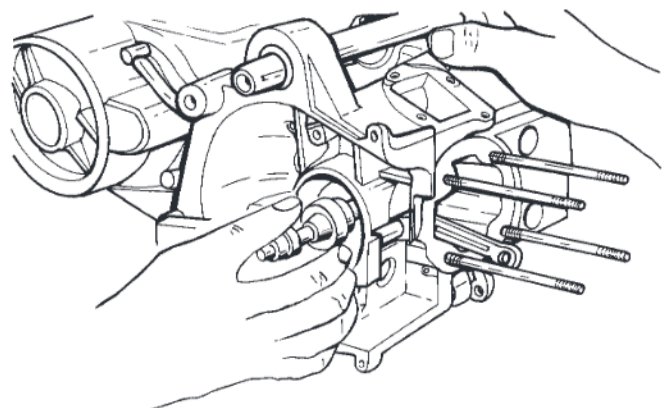
Use a pipe of the correct diameter to facilitate the fitting operation



After fitting, make sure that the rim of the oil seal (1) is properly housed in the seating on the crankcase (2), as shown in the figure.



Fit the oil seal in the rh side of the engine, being sure to spread a layer of lithium soap-based grease (see Lubricants Table) on the edges of the oil seal.







**aprilia s.p.a.**

Via G. Galilei, 1  
30033 Noale (VE)  
Tel. +39 (0) 41 - 5829111  
Fax +39 (0) 41 - 441054  
[www.aprilia.com](http://www.aprilia.com)  
[www.serviceaprilia.com](http://www.serviceaprilia.com)  
Italy

**8140247**



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