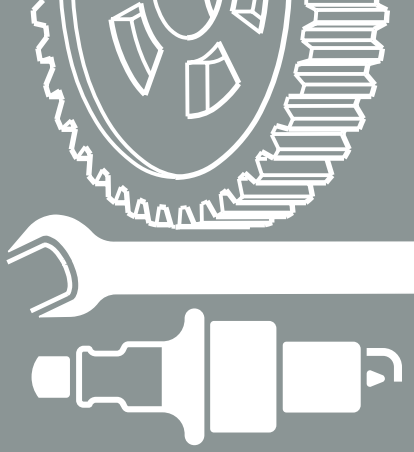
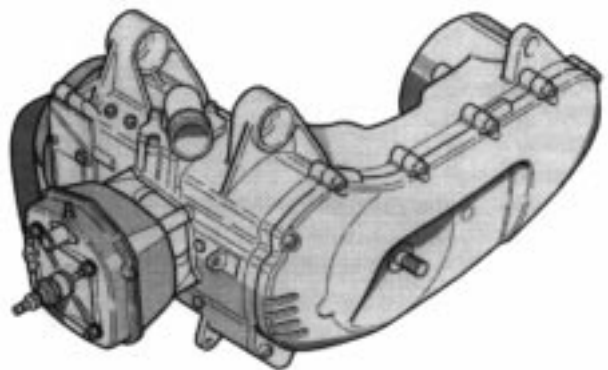


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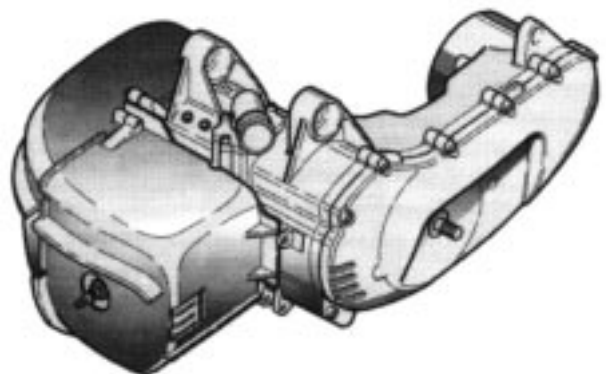


Workshop manual

MA 50



MY 50



976 X

LIST OF SECTIONS

Introduction

This manual provides basic information on standard servicing procedures. The data and illustrations contained in the manual were up to date at the moment of publication.

Owing to **aprilia's** constant commitment to improving the quality and performance of its products, vehicles are subject to change without notice. Users of this publication should consequently be aware that, for some models, the information provided may not be entirely up to date.

Updates of specifications and servicing procedures resulting from changes made to vehicles will be notified to all **aprilia** distributors, who will in turn make them available to after-sales mechanics.

Before performing any operation, ensure that the information contained in this manual is applicable to the vehicle to be serviced.

This publication is meant for **aprilia** dealers and their trained and qualified mechanics. The description of many service and repair operations has been deliberately omitted in that it is assumed that users of this manual have received a basic training in mechanics, that they are aware of vehicle repairing techniques, and that they have at their disposal all the information published by **aprilia** on the vehicle. Should any of these three conditions not be fulfilled, repairs and/or servicing may prove inadequate and thereby result in danger or injury.

This manual does not provide a detailed description of all the procedures required to perform repairs and servicing operations. It is therefore essential to exercise extreme caution in order to prevent damage to the vehicle and its components as well as personal injury to mechanics and the user.

In case of doubt as to the repairing or servicing procedures, please contact **aprilia's** AFTER-SALES DEPARTMENT: **aprilia's** technicians will be pleased to provide all necessary support.

For further information, please refer to:

- THE CYCLE PARTS WORKSHOP MANUAL
- THE ENGINE SPARE PARTS CATALOGUE
- THE CHASSIS SPARE PARTS CATALOGUE

aprilia reserves the right to make any changes at any moment to all its models.

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Power Plant

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Carburettor - Reed Valve Unit

4

Oil Pump - Starter Motor

5

Starting System - Clutch

6

Crankcase - Crankshaft

7

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SAFETY PRECAUTIONS

The following symbols are used in the manual to stress the importance of certain pieces of information:

▲ DANGER : This symbol is used when special precautions are needed in dangerous situations that can cause death or serious injury to the operator and other exposed people, or result in serious and permanent damage to the vehicle.

▲ CAUTION : This symbol denotes a potentially hazardous situation that may result in minor personal injury or damage to the vehicle.

IMPORTANT: This term precedes important information or instructions that deserve special attention.



: Liquid cooling version only

RECOMMENDATIONS ON MAINTENANCE

IMPORTANT: Always observe the following precautions when repairing, fitting or removing engine components.

▲ CAUTION : All engine inspections and maintenance operations must be carried out while the engine is switched off. Also ensure that no parts (such as the silencer, the brakes and other components that are subject to heating) are hot after removing the engine from the vehicle. If necessary, wait for all parts to cool down. Use suitable equipment to support the engine, taking care to place it on a level and solid working surface.

▲ DANGER : Do not hold mechanical parts or engine components in the mouth, as some of them are made of toxic materials.

▲ DANGER : Avoid starting the engine in closed or poorly ventilated rooms.

▲ DANGER : Keep away from heat sources. Do not use bright flames.

IMPORTANT: Operators servicing or repairing the engine must have all operating instructions to hand and follow them scrupulously while observing the safety precautions prescribed for each part (e.g. tightening torques). When two or more operators are required to work on the same engine at the same time, all of them must observe the rules that ensure their own safety and that of others.

Only use GENUINE aprilia spares.

Avoid using lubricants other than those shown in the table on page 2-2.

Always use the special tools that are prescribed in this manual. Never attempt to perform operations that require the use of special equipment with tools other than those specified in this manual.

▲ DANGER : Failure to comply with the above instructions can result in serious personal injury, as is the case when an unsuitable spanner slips off a fastening device, causing the operator's hand to strike against the workbench.

When clamping fastening devices, always begin with the largest ones. Apply sufficient torque to tighten each of the large-diameter fasteners, starting with the innermost device, and then proceeding diagonally. Following the same order, clamp the fastening devices with the prescribed torques, and then check the torque value for each of the fasteners.

▲ DANGER : Never use flammable solvents to clean the parts. Only use antifire detergents and solvents. Failure to observe this precaution may result in a fire breaking out and in serious or even fatal personal injury.

Before fitting or assembling any components, always lubricate the metallic parts and the gaskets.

⚠ CAUTION : Failure to observe the above prescription may result in seizure or early breakage of the parts.

⚠ CAUTION : When fitting or assembling parts, be sure to perform the operation properly. Some of the parts can be fitted upside down or in the opposite direction, and the error will become evident only at the end of the assembly.

⚠ CAUTION : Incorrect fitting or assembly can result in irreparable engine damage, seizure or malfunction.

Never reuse gaskets, seeger rings, snap rings, O-rings and cotter pins.

When fitting a new snap ring on a shaft, be sure not to part its ends more than necessary. Once it is in place, ensure that it is firmly seated in its groove. Remember that snap rings do have a fitting direction, as the rounded rim of the ring is designed to bear the thrust load (sharp edge “on the outside”).

Generously lubricate the bearings before fitting them.

IMPORTANT: Bearings must rotate freely, smoothly and noiselessly, otherwise they need to be replaced.

Apply distinctive marks to the positions of all connections (pipes, wires, etc.) before removing the components. Each part must be clearly identifiable to allow it to be properly reinstalled.

Before fitting new gaskets, thoroughly clean all their surfaces. Take care to remove any fragments of the old gaskets and any residues of the gasket adhesive.

IMPORTANT: Failure to observe this prescription will result in leakage from the engine.

Never reuse oil seals and gaskets. Before fitting oil seals and gaskets, apply a film of grease to the rims of the oil seals, and a film of grease or adhesive to the gaskets. Unless otherwise directed in this manual, install the oil seals and the bearings so that their marks or identification numbers are clearly visible when the parts have been fitted.

IMPORTANT: Unless otherwise directed, reassembling operations are to be performed in reverse order to the disassembly.

⚠ DANGER : Failure to observe the above directions may result in serious and dangerous engine malfunctions such as seizure and breakage. Should such breakdowns occur during driving, the vehicle may overturn and cause serious or even fatal personal injury. If you are unsure about your ability to properly perform the operations described in this manual, please contact your local Aprilia dealer, or Aprilia's Customer Care. Never attempt to perform any of the operations described in this manual if you do not have the specific knowledge and special equipment required, as well as a clean, well-lit and well-ventilated working area.

GENERAL SAFETY RULES

CARBON MONOXIDE

If any operations are to be performed while the engine is running, it is essential that they should be carried out in the open air or in a well-ventilated room.

⚠ DANGER : Avoid operating in indoor spaces that are not provided with an exhaust-gas venting system. Exhaust gases contain carbon monoxide, a toxic gas that may cause fainting or even death.

FUEL

For information on the type of fuel to be used, please refer to the operation and maintenance manual provided with the vehicle.

⚠ DANGER : Fuel is highly flammable, and in certain conditions can even become explosive. Always handle it with great care.

⚠ DANGER : Avoid inhaling fuel fumes as they are toxic. Fuel should be handled in a closed environment only if an adequate air change is ensured.



⚠ DANGER : Never smoke near fuel stores or where fuel fumes may be present. Also avoid sparks, open flames and whatever may cause the ignition or explosion of the fumes.

⚠ CAUTION : Avoid spilling fuel on the skin. Wear protective gloves when pouring it. To avoid ingesting fuel or inhaling its fumes, use a length of tube without sucking with the mouth.

⚠ CAUTION : Do not dispose of fuel in the environment.

KEEP OUT OF REACH OF CHILDREN

TRANSMISSION OIL

Use  FC SAE 75W-90 oil or  GEAR SYNTH. Alternatively, use brand name oil complying with or exceeding the API GL-4 specifications.

⚠ CAUTION : Insufficient lubrication or the use of unsuitable lubricants may result in irreparable damage due to increased wear and tear of the moving parts.

⚠ CAUTION : Do not overtighten the oil drain plug. Excessive tightening may damage the crankcase.

⚠ CAUTION : Used oil contains substances that are harmful to the environment. Even small quantities must be disposed of in compliance with the regulations in force.

⚠ CAUTION : To avoid serious skin damage due to prolonged contact with oil, accurately wash the hands after handling the lubricant.

KEEP OUT OF REACH OF CHILDREN

COOLANT

The coolant contains 50% of distilled water and 50% of antifreeze, and is ideal at all operating temperatures. It also provides adequate protection against corrosion.

Using the same mixture during the hot season will reduce evaporation and the necessity to top up. This will in turn slow the formation of deposits of mineral salts and keep the cooling system in working order.

At temperatures below 0° C, check the cooling circuit at short intervals and if necessary add antifreeze to a maximum concentration of 60%.

Only use nitrite-free antifreeze and anticorrosive products ensuring protection down to -35° C.

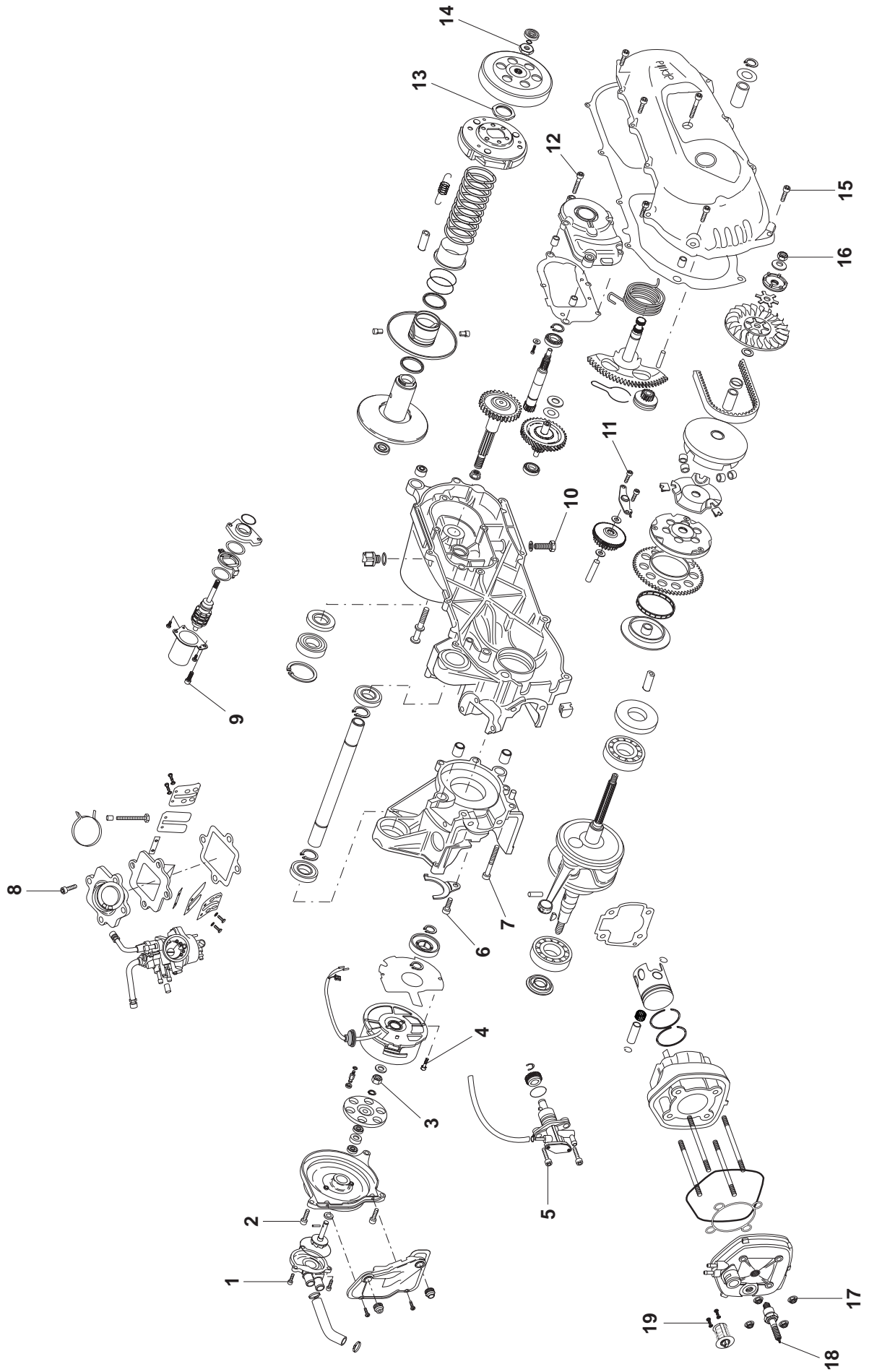
⚠ CAUTION : Never remove the filler cap while the engine is hot: the coolant is under pressure, and may spurt out and cause burns.

⚠ CAUTION : Some of the coolant components are flammable and burn with an invisible flame that may easily cause burns.

⚠ CAUTION : Contact with the coolant may cause skin burns or irritation. In case of contact with the eyes, rinse abundantly with clean water and immediately seek medical attention.

⚠ DANGER : Should the coolant be accidentally ingested, cause vomiting and immediately seek medical attention. Despite its toxicity, the coolant is particularly attractive to animals: be sure to seal the container to stop them from drinking it.














KEEP OUT OF REACH OF CHILDREN



Tightening torques

Pos.	Description	Qty	Type	Tightening torque Nm
1	Water pump cover screw	3	M5 x 0.8	7
2	Right-hand crankcase cover screw	5	M6 x 1	7
3	Stator nut	1	M10 x 1.25	38
4	Stator screw	3	M6 x 1	9
5	Oil pump screw	2	M5 x 0.8	4
6	Oil seal support screw	1	M6 x 1	10
7	Crankcase screw, flywheel side	6	M6 x 1	9
8	Carburettor sleeve screw	4	M6 x 1	8
9	Starter motor screw	2	M6 x 1	13
10	Oil drain screw	1	M8 x 1.25	18
11	Starting gear screw	2	M6 x 1	9
12	Transmission cover screw	6	M6 x 1	12
13	Clutch holding nut	1	M28 x 1	50
14	Secondary pulley nut	1	M10 x 1	50
15	Transmission casing cover screw	12	M6 x 1	12
16	Primary pulley nut	1	M10 x 1.25	33
17	Cylinder head nut	4	M7 x 1	10
18	Spark plug	1	M14 x 1.25	20
19	Thermostat screw	2	M4 x 0.7	35

TABLE OF LUBRICANTS

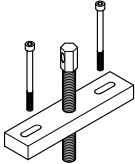
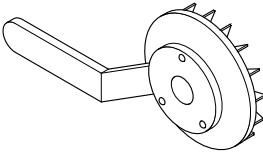
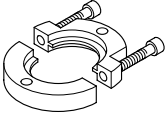
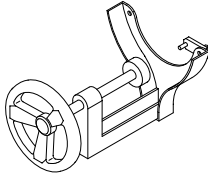
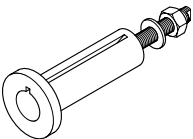

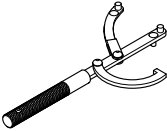

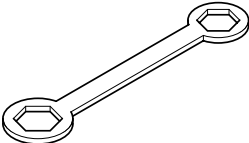
USE	SPECIFICATIONS	PRODUCTS	SYMBOLS
Mixer oil	* ISO-L-ETC++, A.P.I. TC++	 GREEN HIT 2  CITY 2T	
Transmission oil	* A.P.I. GL-4	 F.C. SAE 75W – 90  GEAR SYNTH	
Grease for joints, pins and bearings	**	 AUTOGREASE MP  GREASE 30	
Coolant	***	 ECOBLU –40°C  COOL	
Thread-braking Loctite		LOCTITE 243	
Liquid seal Loctite		LOCTITE 580	

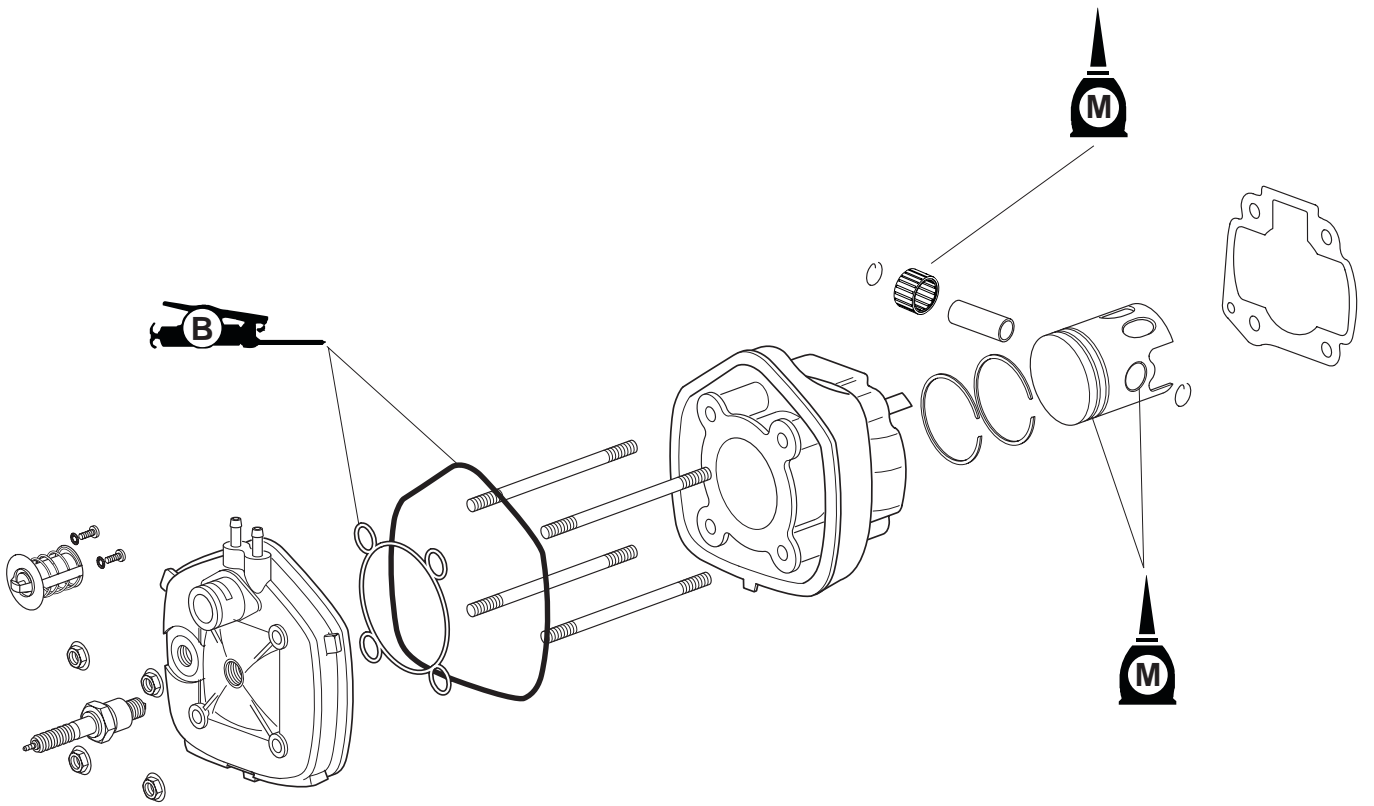
* Alternatively, use brand name oil complying with or exceeding the specifications shown in the table.

** Alternatively, use brand name grease for rolling-contact bearings having the following characteristics: useful temperature -30° C to +140° C, dropping point 150° C to 230° C, excellent anticorrosive protection, resistance to water and oxidation.

*** Only use nitrite-free antifreeze and anticorrosive products ensuring protection down to -35° C.

Tools - Tool kit no. 8201821


 <p>8106698</p>	<p>Crankcase separator</p>	 <p>8106707</p>	<p>Pulley spanner</p>
 <p>8140152</p>	<p>Crankshaft bearing extractor</p>	 <p>8140259</p>	<p>Tool for clutch springs</p>
 <p>8140234</p>	<p>Crankshaft assembly mounting tool</p>	 <p>8140207</p>	<p>Moryama flywheel extractor</p>
 <p>8106702</p>	<p>Flywheel retainer</p>	 <p>8140208</p>	<p>Ducati flywheel extractor</p>
 <p>8106703</p>	<p>Clutch removing spanner</p>		



Removing the cylinder head


⚠ CAUTION : The manufacturer assumes no responsibility for damage resulting from the use of unsuitable tools for the removal and refitting of the engine or any part of it.

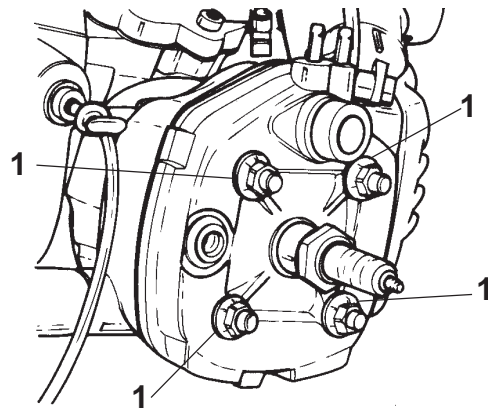
When the engine is in place, the cylinder head, the cylinder, the piston and the reed valve can be exposed by removing the following parts: exhaust pipe, air filter casing, carburettor.

 Drain all the coolant. (This operation must be performed before removing the engine from the chassis.)

⚠ CAUTION : The coolant must not be disposed of in the environment. The disposal must be carried out in compliance with the regulations in force.

Remove the spark plug and the two pipes of the carburettor heating system with the four clamps. Loosen the four cylinder-head flanged locknuts (1) by unscrewing them a half turn at a time. Remove the cylinder head.

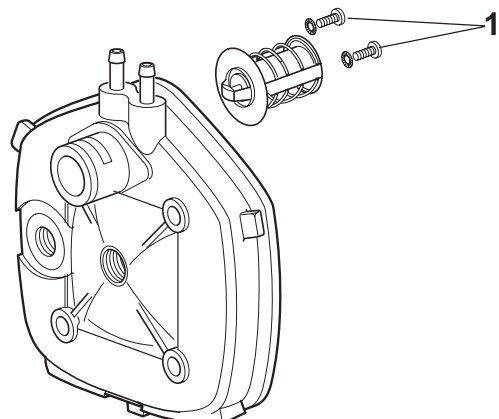
 **IMPORTANT:** Remove the cylinder head with the two sealing rings (inner and outer). Before removing the two pipes of the carburettor heating system, pay special attention to the way they are connected so as to ensure proper refitting.



Removing the thermostat

Loosen the two screws (1) shown in the figure, remove the thermostat and check its mechanical condition.

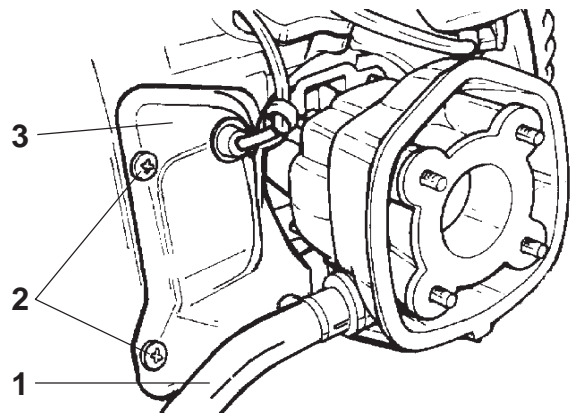
IMPORTANT: Before removing the two thermostat fixing screws, ensure that they are not excessively encrusted with coolant residues. On account of their small size, the screws may break if overstressed. If necessary use a release agent.



Removing the cylinder

 Remove the cylinder water connection (1).

Remove the cover (3) from its seat after loosening the two fixing screws (2).
Remove the cylinder while keeping the piston in place.
Remove the cylinder base gasket.

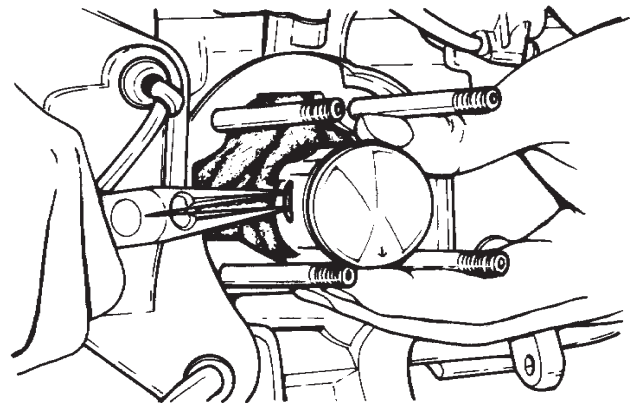


Removing the piston


▲ CAUTION : Before removing the piston pin retaining ring, cover the crankcase opening with a clean cloth so as to prevent the ring from falling into the crankcase. Before removing the piston pin, carefully deburr the retaining ring groove and the adjoining part of the pin insertion hole. If the pin is still difficult to extract, use the specially designed extractor.

Do not use a hammer to eject the piston pin.

Remove the two retaining rings and extract the piston pin. Remove the piston and the roller cage from its housing in the connecting rod.

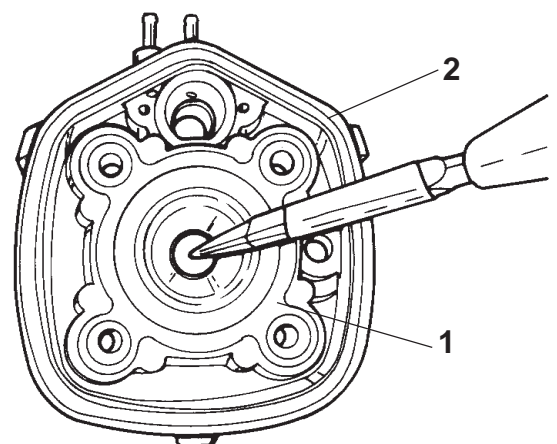


Checking the cylinder head

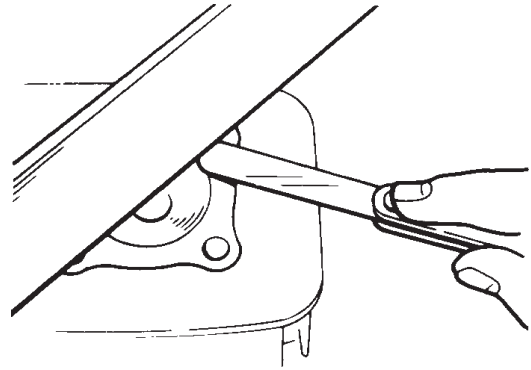
 Check the condition of the inner (1) and outer (2) O-rings fitted on the cylinder head.

Decoke the head using a rounded scraper, and taking care not to damage the spark plug thread or scrape the aluminium.

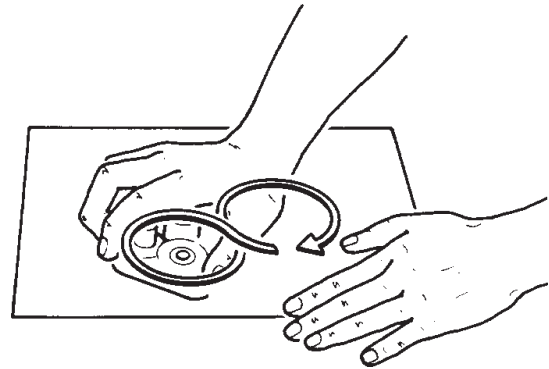
Inspect and decoke the cylinder head combustion chamber.



Check and if necessary restore the planarity of the head to the limit of 0.03 mm. To do so, rest a straight edge on the cylinder head and check its planarity using a thickness gauge.

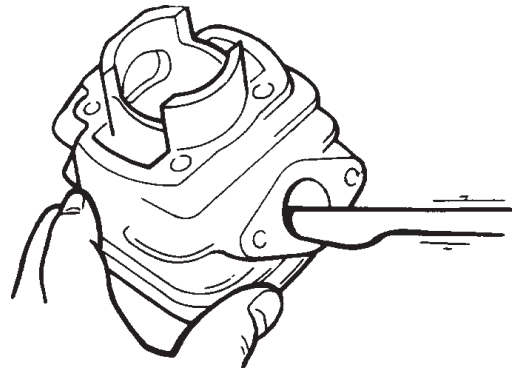


If the planarity is outside the tolerance range, restore it by rubbing the head with wetted 400-600 abrasive paper in a figure-of-eight pattern.

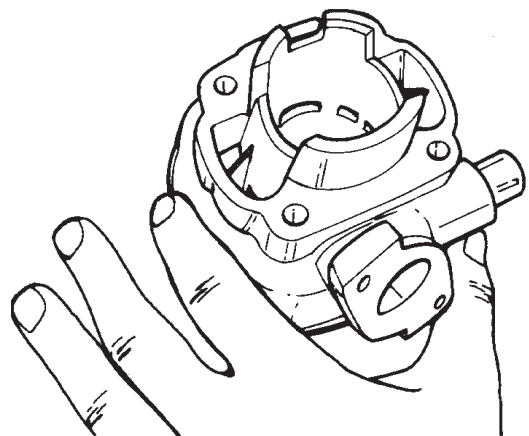


Checking the cylinder

Decoke the exhaust manifold using a rounded scraper.



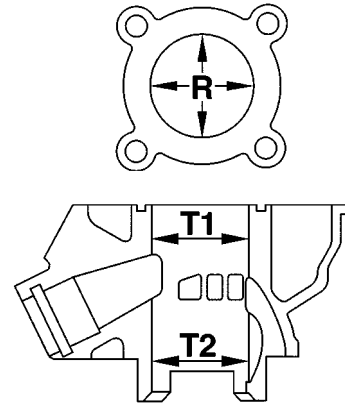
Check the cylinder sleeve and remove any carbon formation and residues.
Check that the cylinder barrel shows no signs of seizing, wear or scoring.



Using a bore meter, check the diameter of the cylinder against the values shown in the table. Should the measurement fall outside the tolerance range, replace the cylinder, the piston and the piston rings (refer to the mating chart).

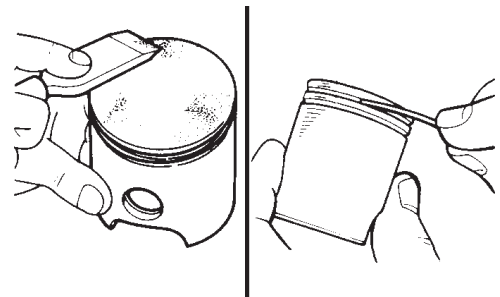
	Standard mm	Wear limit (mm)
Cylinder diameter "C"	39.99 ÷ 40.01	40.1
Taper "T" *	--	0.05
Ovalization "R" **	--	0.01

* "T" being the difference between T1 and T2.
 ** "R" being the difference between the two orthogonal measurements.



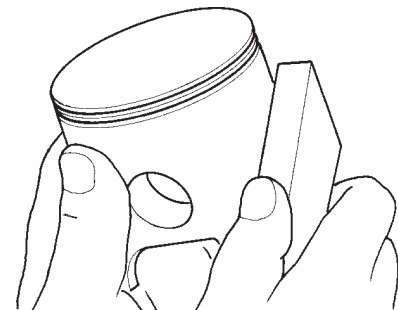
Checking the piston

Remove the piston rings taking care not to part their ends more than necessary. To decoke the piston top, use a scraper with a slightly rounded edge. Clean the piston grooves using a discarded piston ring as shown in the figure. Avoid using silicon-carbide abrasive paper to clean the piston top or grooves, as an excessive amount of metal would be removed and silicon carbide particles would settle in the piston and quickly damage the cylinder bore and corrode the piston itself.



Carefully check the piston skirt. Remove any hardened carbon formations by immersing the whole piston in a suitable liquid such as the type used for cleaning carburetors.

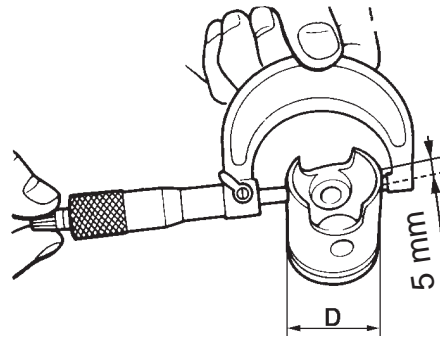
⚠ CAUTION : The use of detergents capable of removing hardened carbon formations is very dangerous. The fumes released by these chemicals can cause serious illnesses and any contact with the skin or the eyes immediately produces severe lesions. It is therefore essential to wear suitable protections such as goggles and gloves, and to scrupulously follow the instructions provided on the package and the container of the detergent.



After the cleaning, remove any superficial scoring from the piston skirt using an abrasive stone with a very fine grain.

⚠ DANGER : When removing the superficial scoring, take care not to overgrind the piston and make it unusable. Remember that a minimum rubbing force always ensures proper removal of superficial scratches. When working on the piston skirt, never use files, silicon-carbide abrasives, or any other abrasive having a grain in excess of 800.

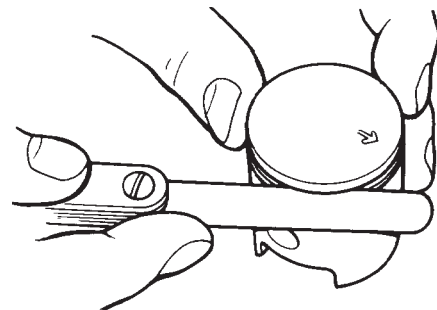
If the scoring is too deep, replace the piston (refer to the mating chart).
 Measure the diameter of the piston (D) using a micrometer. Take the measurement 5 mm from the lower rim of the piston as shown in the figure.



Check the piston-cylinder clearance against the values shown in the following table.

MATING CHART (mm)	
ENGINE TYPE	CLEARANCE MIN/MAX
SCOOTER MA (CAST-IRON CYLINDER)	0.29 / 0.042

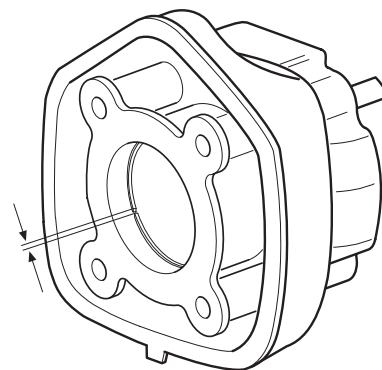
Measure the side clearance of the piston rings using a thickness gauge.
 Side clearance: 0.03 ÷ 0.05 mm



Check that the piston rings show no signs of anomaly, and that the gap between the ring ends is as shown in the table below. Take the measurement with a thickness gauge. Fit the segment into the cylinder, taking care to position it horizontally. To do so, position the piston rings in the cylinder using the lower part of the piston.

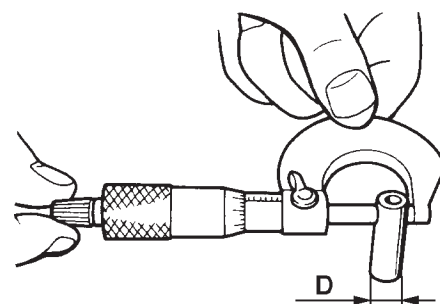
The measurement must be in the following range:

0.15 ÷ 0.35 mm



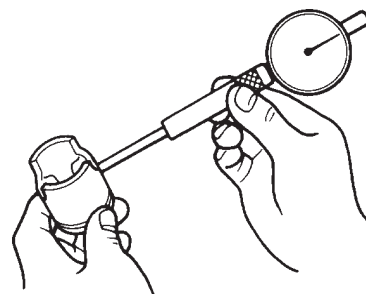
Check the piston pin for any scoring, scratches or altered colour resulting from high temperatures. The piston pin needs replacing whenever it feels scored or scratched to the touch, or if it shows any blue-grey areas. Since such damage can be due to a lubricating malfunction, be sure to check the operation of the lubrication system before restarting the engine. If, on the other hand, the piston pin has become slightly brownish, there is no need to replace it.

Measure the outside diameter (D) of the piston pin. If it falls outside the tolerance range, replace it.
Piston pin outside diameter: $9.996 \div 10.000$ mm.



Check the diameter of the piston pin seat. If it is outside the tolerance range, replace the piston.
Piston pin seat diameter: $10.004 \div 10.015$ mm

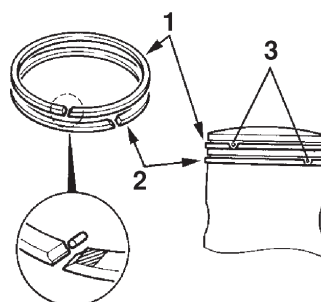
Also check that the roller cage is not damaged, and if necessary replace it.



Refitting the power plant

Fit the new upper ring (1) and lower ring (2) on the piston with the tapered side facing upwards. Refer to pins (3).

▲ CAUTION : Failure to observe this procedure will make it virtually impossible to fit the cylinder on the piston, and will result in breakage of the piston rings, and possibly more serious damage during engine assembly.

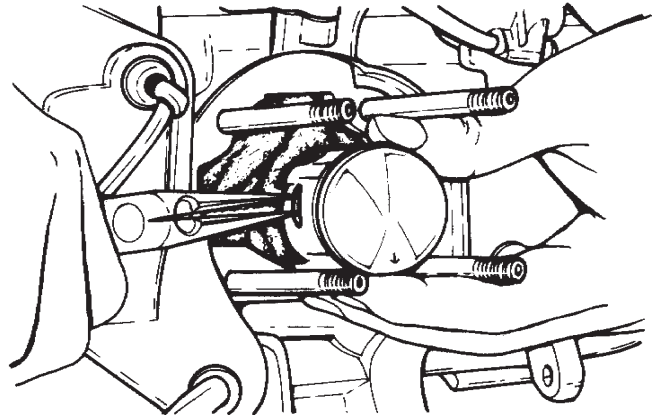


Lubricate the following parts with oil for two-stroke engines (see Table of Lubricants): roller cage, piston pin, piston pin retainer seats, cylinder surface.

▲ DANGER : Always use new retaining rings.

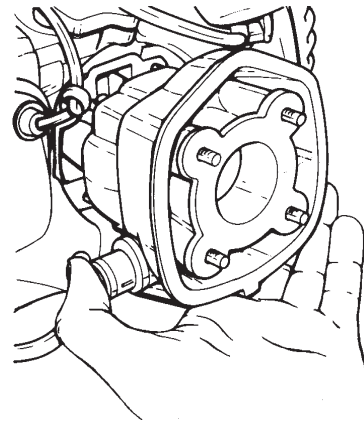
IMPORTANT: Remember that the piston rings must be fitted with the rounded edge facing the piston pin.


▲ CAUTION : The arrow on the piston must point to the lower part of the engine. Before fitting the piston pin ring, cover the crankcase with a clean cloth so as to prevent any object from falling into the crankcase.




▲ CAUTION : Before fitting the cylinder, apply oil for two-stroke engines to the piston rings.

Fit a new cylinder base gasket.
Fit the cylinder.



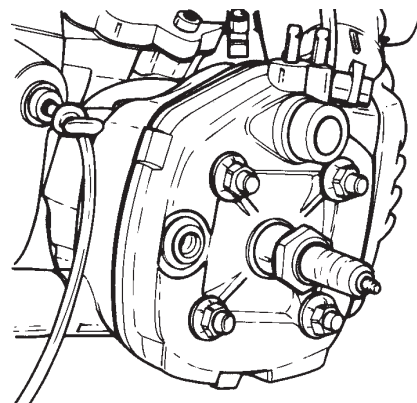
 Replace the two cylinder head O-rings, then refit the head and fix it by tightening the four nuts in a crosswise pattern in numerical order. Fit the spark plug.

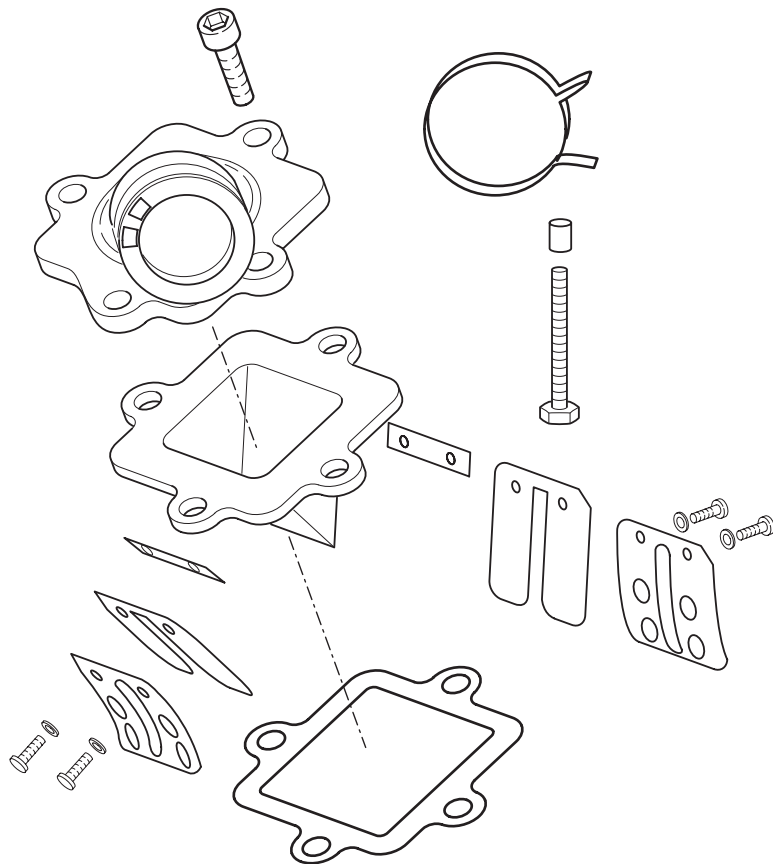
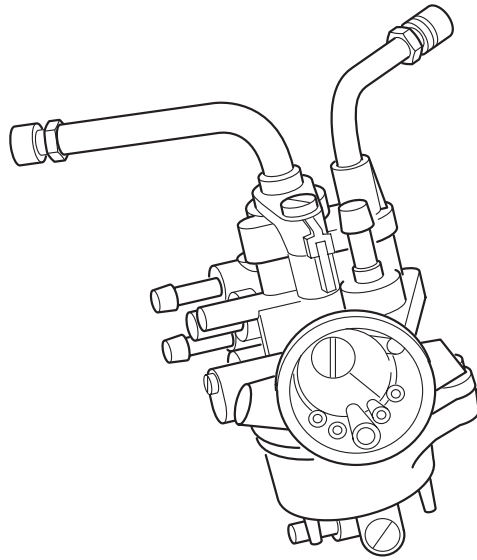
 Reconnect the pipe from the water pump to its fitting. Reconnect the pipes of the carburettor heating system by following these steps (as viewed from above the vehicle, in the direction of motion): join the left-hand head connection to the upper carburettor connection, and the right-hand head connection to the lower carburettor connection. Fasten the pipes with new clamps.

Refit the cover.

Cylinder head nut tightening torque: **10 Nm**


Spark plug tightening torque: **20 Nm**




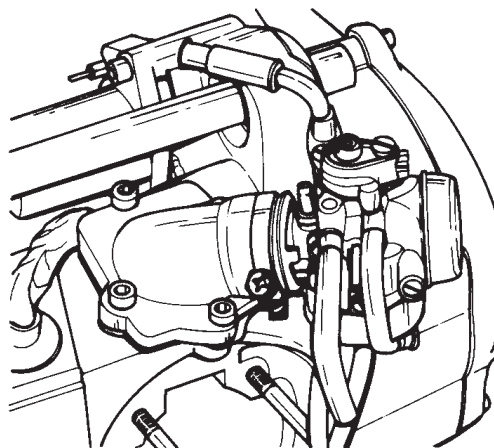


Removing the carburettor

Detach the connections on the carburettor, (oil delivery and petrol delivery).

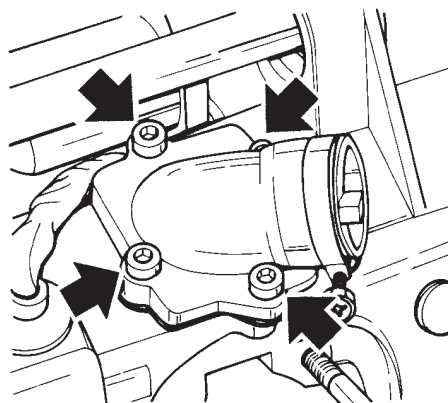
 Disconnect the pipes of the water heating device. Loosen the screw fixing the carburettor to the reed valve unit and remove the carburettor.

 **IMPORTANT:** Before removing the two pipes of the carburettor heating system, pay special attention to the way they are connected in order to ensure proper refitting.

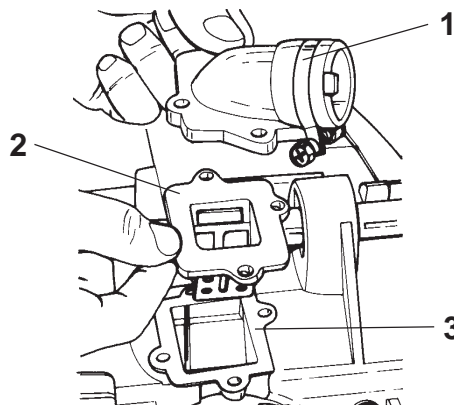


Removing the reed valve unit

Remove the four fixing screws shown in the figure.



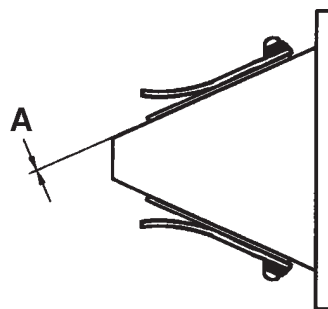
Remove, in the following order, the intake manifold (1), the reed valve (2) and the related gasket (3), taking care to insert a cloth in the intake slot so as to prevent dirt from entering and hindering the operation of the mechanisms.



Checking the reed valve unit

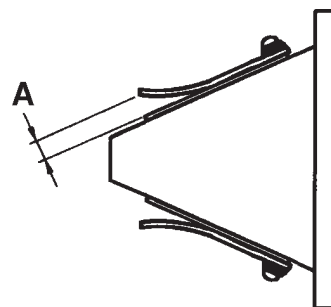
Check for any damage or breakage of the reed valve stops and if necessary replace them.

Measure the bending limit (A) of the reed valve. If it falls outside the tolerance range, replace the valve. Bending limit: 0.2 mm.



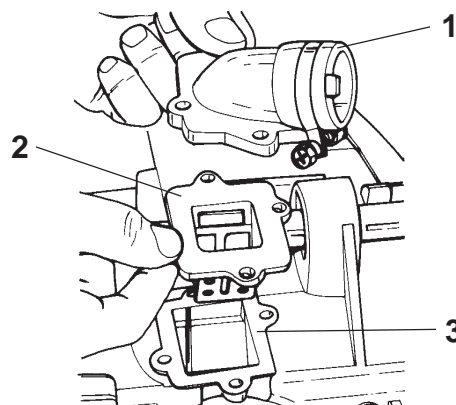
Measure the height of the reed valve stops (A). If it is outside the tolerance range, replace the stops.
Reed valve stop height: $4.0 \div 4.4$ mm.

⚠ CAUTION Never attempt to repair the reed valve or its support.



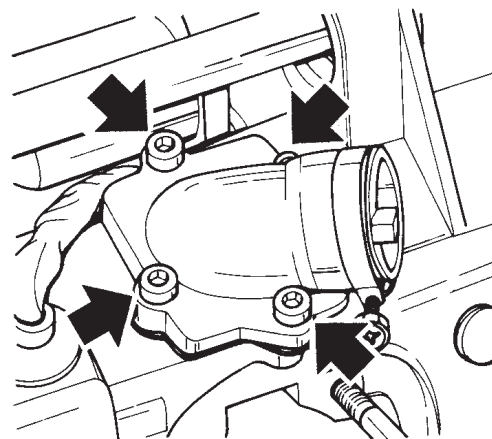
Fitting the reed valve unit

Remove the cloth that had previously been inserted into the intake slot to prevent dirt from getting in. Fit, in the following order, a new gasket (3), the reed valve (2) and the intake manifold (1).



4


Fasten the assembly by tightening the four screws.

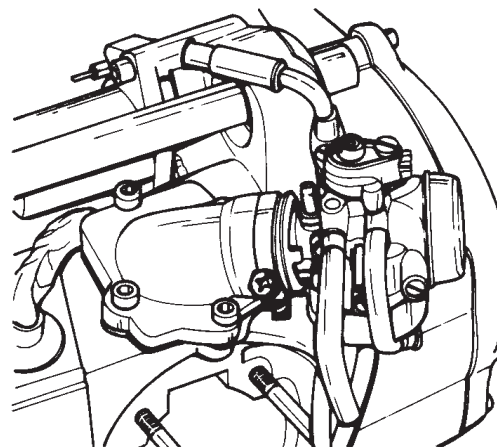


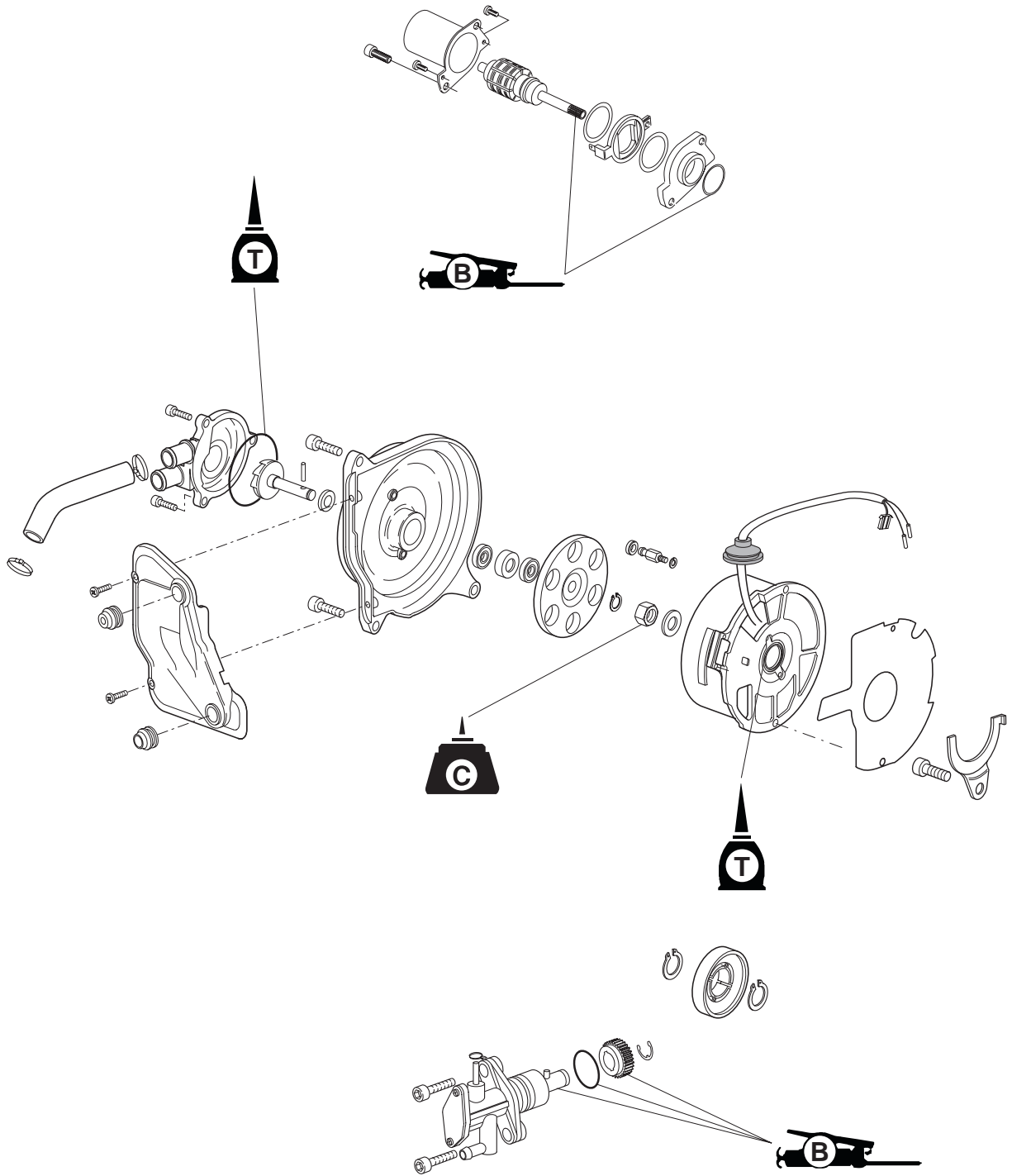
Tightening torque: **8 Nm**

Installing the carburettor

Place the carburettor in the intake manifold taking care to fit the carburettor tongue between the two tongues on the manifold. This will ensure proper positioning of the carburettor. Attach the connections (oil delivery and petrol delivery).

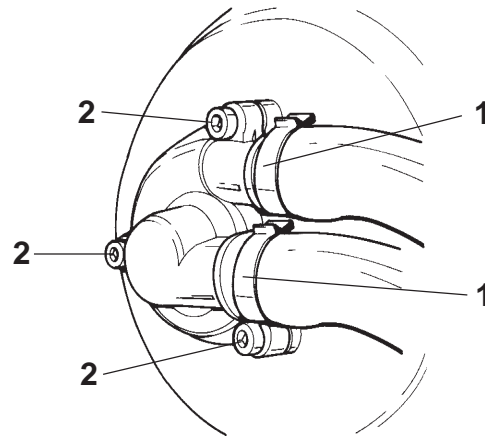
 Reconnect the pipes of the carburettor heating system by following these steps (as viewed from above the vehicle, in the direction of motion): join the left-hand head connection to the upper carburettor connection, and the right-hand head connection to the lower carburettor connection. Fasten the pipes with new clamps.





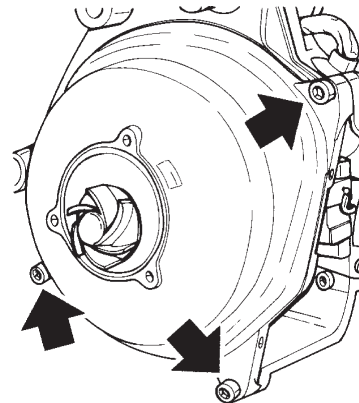
Disassembling the water pump


Remove the clamps (1) and detach the water feed pipe and the pipe that delivers water to the cylinder. Loosen the three fixing screws (2) and remove the water pump cover and the related O-ring.

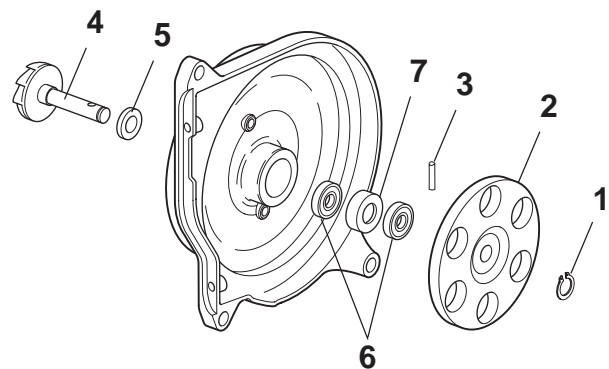


Removing the flywheel cover

Loosen the three fixing screws and remove the cover of the flywheel magneto.



 Remove the seeger ring (1) from the flywheel magneto cover, and then extract, in the following order, the driving device (2), the retaining pin (3), the impeller water pump pin (4) and the related elastic washer (5). Using a drift of suitable size, extract the water pump bearings (6) and the related spacer (7).



Checking the water pump

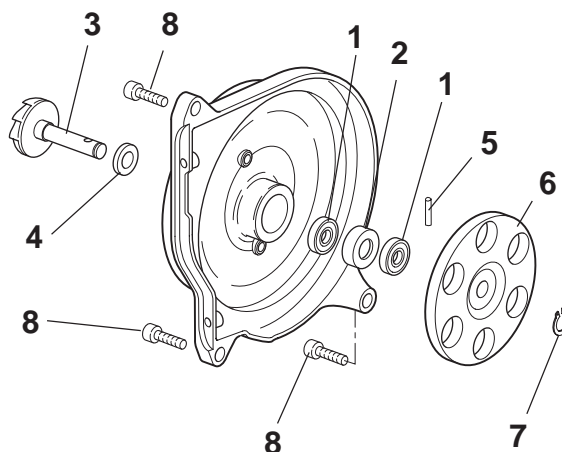
Check the general condition of the water pump, of the feed pipes and of the plastic driving devices. Check that the water pump bearings slide smoothly with no sticking. Replace any defective bearings.

Reassembling the water pump

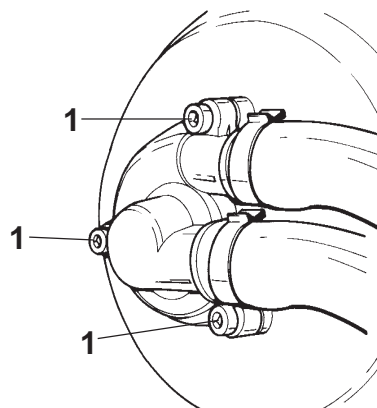
Fit the water pump bearings (1) using a drift of suitable size after interposing the spacer (2).

Fit, in the following order, the impeller water pump pin (3) with a new elastic washer (4), the fastening pin (5), the driving device (6), and then fix everything in place with the seeger ring (7).

Fit the pump body to the engine and fasten it with the three screws (8).



Fit the water pump cover with a new O-ring and fasten it to the flywheel cover by means of the three fixing screws (1). Reconnect the water feed and delivery pipes and fix them in place with new clamps.



5

Removing the flywheel magneto

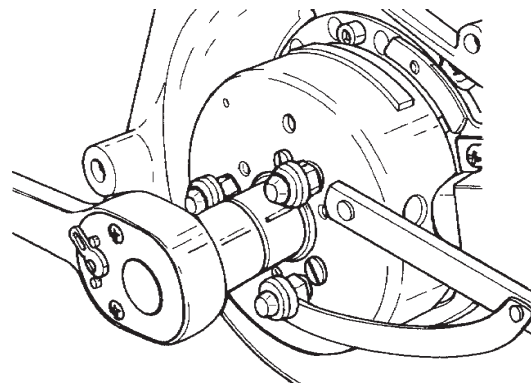
Remove the rotor nut and the related washer while holding the flywheel with the specially designed tool. Remove the rotor using the specific extractor.

▲ CAUTION : Since the flywheel locknut is tightened with a considerable torque, caution should be exercised in order to prevent injury.

Flywheel retaining tool: 8106702

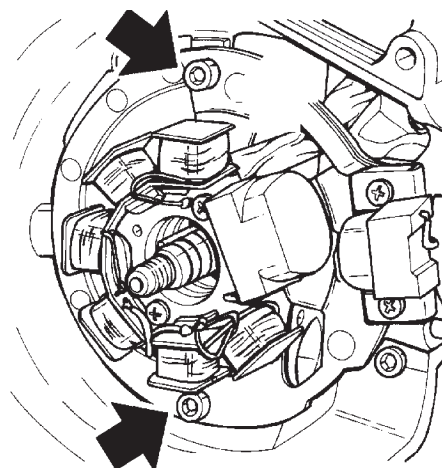
Moryama flywheel extractor: 8140207

Ducati flywheel extractor: 8140208



Removing the stator

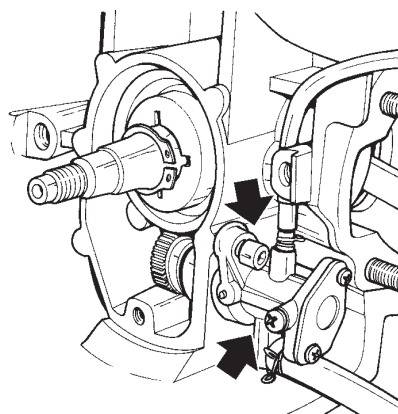
Loosen the two fixing screws and remove, in the following order, the plate with the stator, the pick-up and its wiring, the key and the gasket.



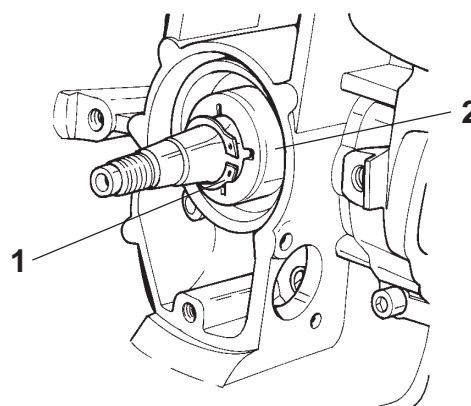
Removing the oil pump

Remove the two fixing screws and extract the pump with the oil feed pipe and the pipe that delivers oil to the carburettor.

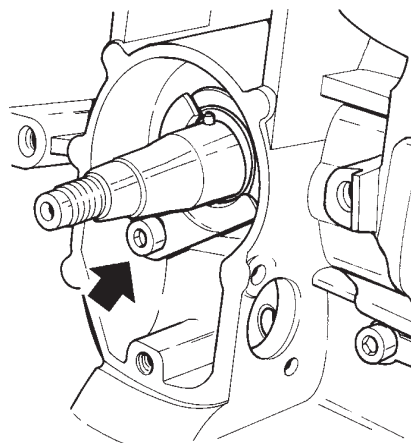
⚠ CAUTION : To ensure proper fitting, pay special attention to the passage of the oil delivery pipe.



Remove the seeger ring (1), the pump driving gear (2), the pin and the other seeger ring.



Loosen the fixing screw and remove the oil seal stop plate.

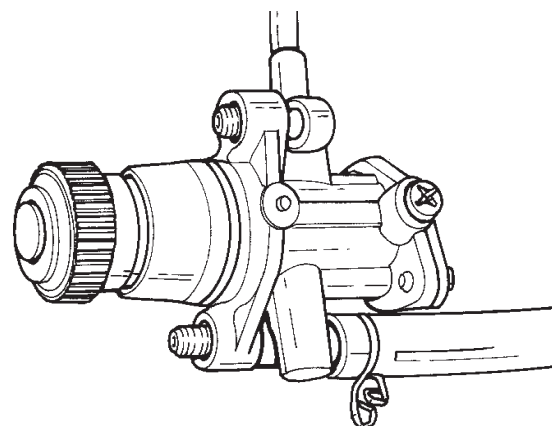


Checking the oil pump

Check the general condition of the oil pump. Remember that wear or malfunction can alter the settings of the pump.

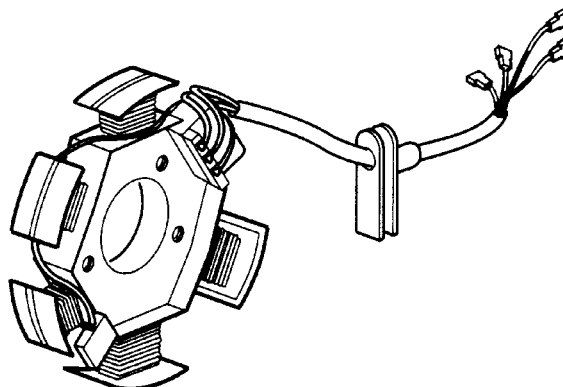
This, however, occurs very rarely. Should the pump appear to be malfunctioning, check the feed duct. Check the sealing ring and if necessary replace it. Also check the pump driving gear and replace it in case of excessive wear. Also check the condition of the pump oil feed and oil delivery pipes, making sure they contain no air bubbles.

IMPORTANT: It is very important for the oil feed and oil delivery pipes to contain no air. If air bubbles are found in either of the pipes, it is essential to identify and repair the part that let the air in before restarting the engine.



Checking the flywheel

Check the mechanical condition of all flywheel components. Check the wear condition of the woodruff key and of the woodruff key groove on the crankshaft. Replace any worn-out components.



Checking the stator

To verify the electrical operation of the stator, conduct the following checks with a digital multimeter set to measure resistance.

Connect the two multimeter probes as shown in the following table:

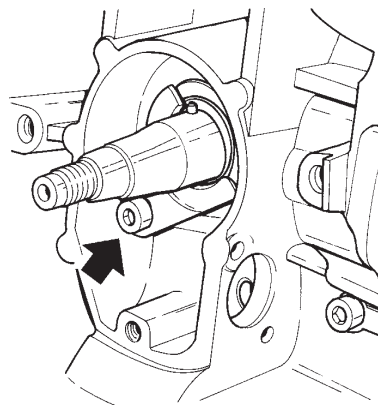
Ignition type	Pick-up resistance (red-white and white wires)	Charging coil resistance (red-black and white wires)
FACIND	110 Ω	600 Ω
MORYAMA	>500 Ω	>830 Ω
DUCATI	120 Ω	720 Ω

Check the continuity (0 Ohms) of the windings by measuring resistance between the yellow-red and white wires of the stator.

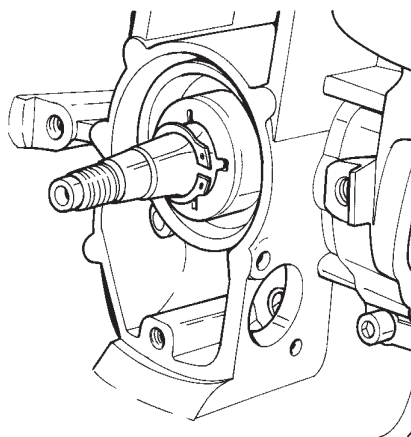
IMPORTANT: Depending on the instrument used, the measurements shown in the table can vary by as much as 10 percent. The check can be conducted without removing the flywheel cover.

Fitting the oil pump

Fit the oil seal stop plate and fasten it with the fixing screw.



Fit, in the following order, the seeger ring, the pin, the pump driving gear, and the other seeger ring.



Fit the pump paying special attention to the passage of the oil delivery pipe, and then fasten it with the two screws.

IMPORTANT: When working on the oil pump, air bubbles may enter and remain in the pipes and in the pump itself, and subsequently hinder lubrication while the engine is running. For this reason, be sure to bleed the pump before starting the engine.

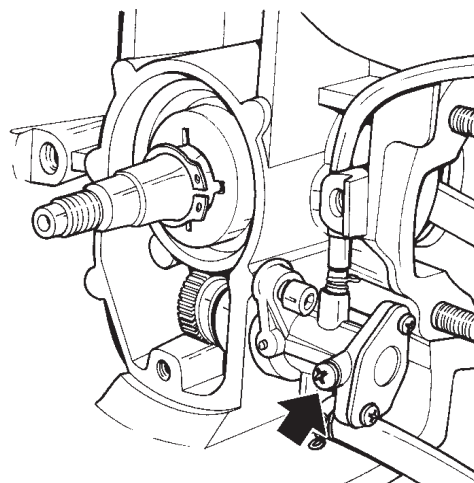
Remove the drain screw from the pump and allow the oil and any air bubbles to come out. When the oil starts flowing out with no bubbles, the bleeding is complete and the screw can be retightened.

CAUTION : To allow the oil pump to expel all the air, fill the fuel tank with at least 1/2 litre of 2% petrol-oil mixture.

CAUTION : To avoid serious skin damage due to prolonged contact with oil, accurately wash the hands after handling the lubricant.

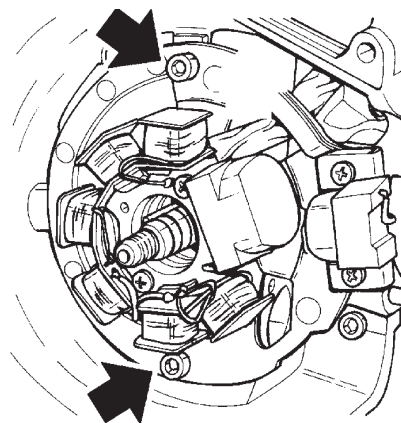
When handling products with a base of petroleum, it is strongly recommended to wear disposable latex or nitrile gloves.

KEEP OUT OF REACH OF CHILDREN



Fitting the stator

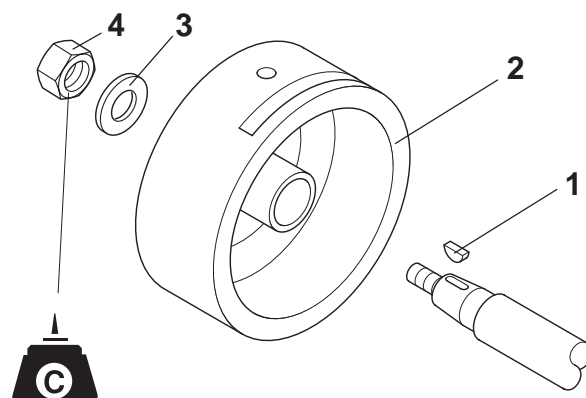
Fit a new gasket on the right-hand crankcase cover and fix the stator assembly to the crankcase with the two screws. Thread the wires through the hole in the crankcase and fasten them with the specially designed rubber.



Tightening torque: **9 Nm**

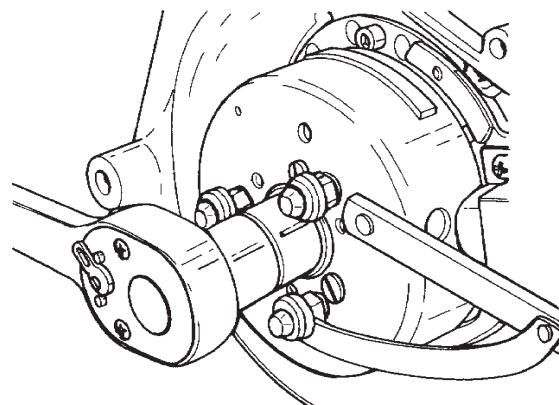
Fitting the flywheel magneto

Fit, in the following order, the key (1), the CDI magnet (2), the plain washer (3) and the nut (4). Apply thread-braking Loctite (see Table of Lubricants).


5

Hold the flywheel with the specially designed tool and fasten it by tightening the locknut.

▲ CAUTION : Since the flywheel locknut is tightened with a considerable torque, caution should be exercised in order to prevent injury.

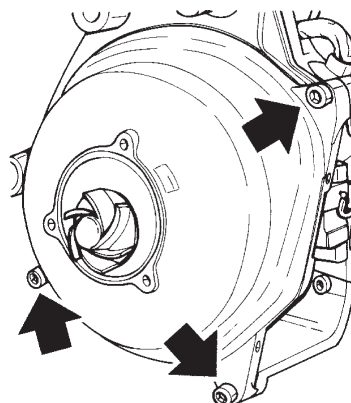


Tightening torque: **38 Nm**

Flywheel retaining tool: 8106702

Fitting the flywheel cover

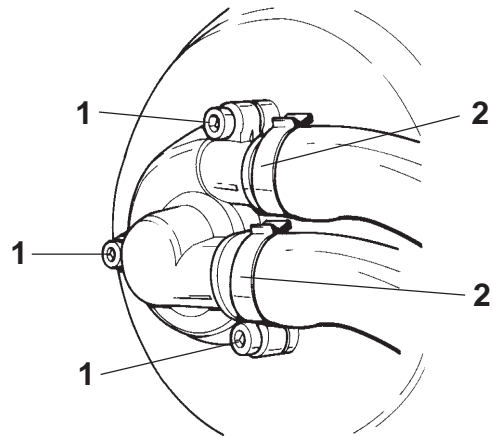
Fit the flywheel cover and fasten it with the three fixing screws shown in the figure.



Tightening torque: **7 Nm**

Fitting the water pump cover

Fit the water pump cover with the related O-ring and fasten it using the three fixing screws (1). Connect the water feed pipe and the pipe that delivers water to the cylinder. Fix the pipes with the related clips (2).

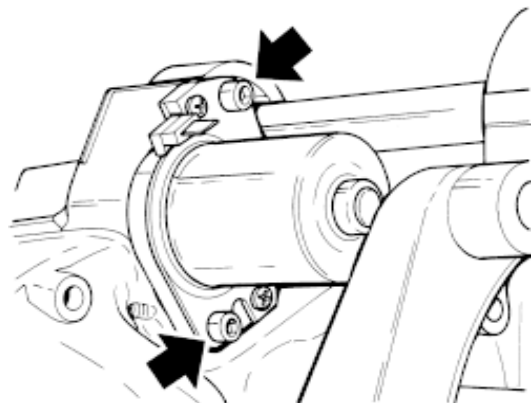


Tightening torque: **7 Nm**

Removing the starter motor

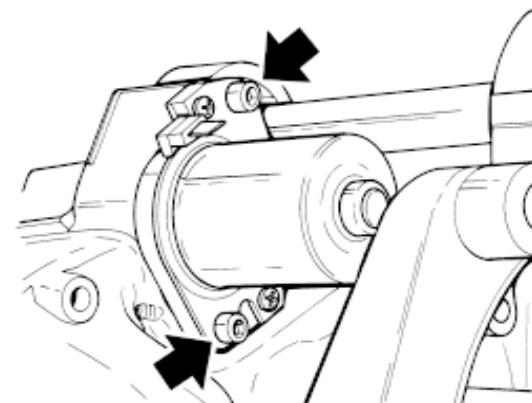
If the starter motor fails to operate, check and if necessary restore the electrical connections before removing the motor.

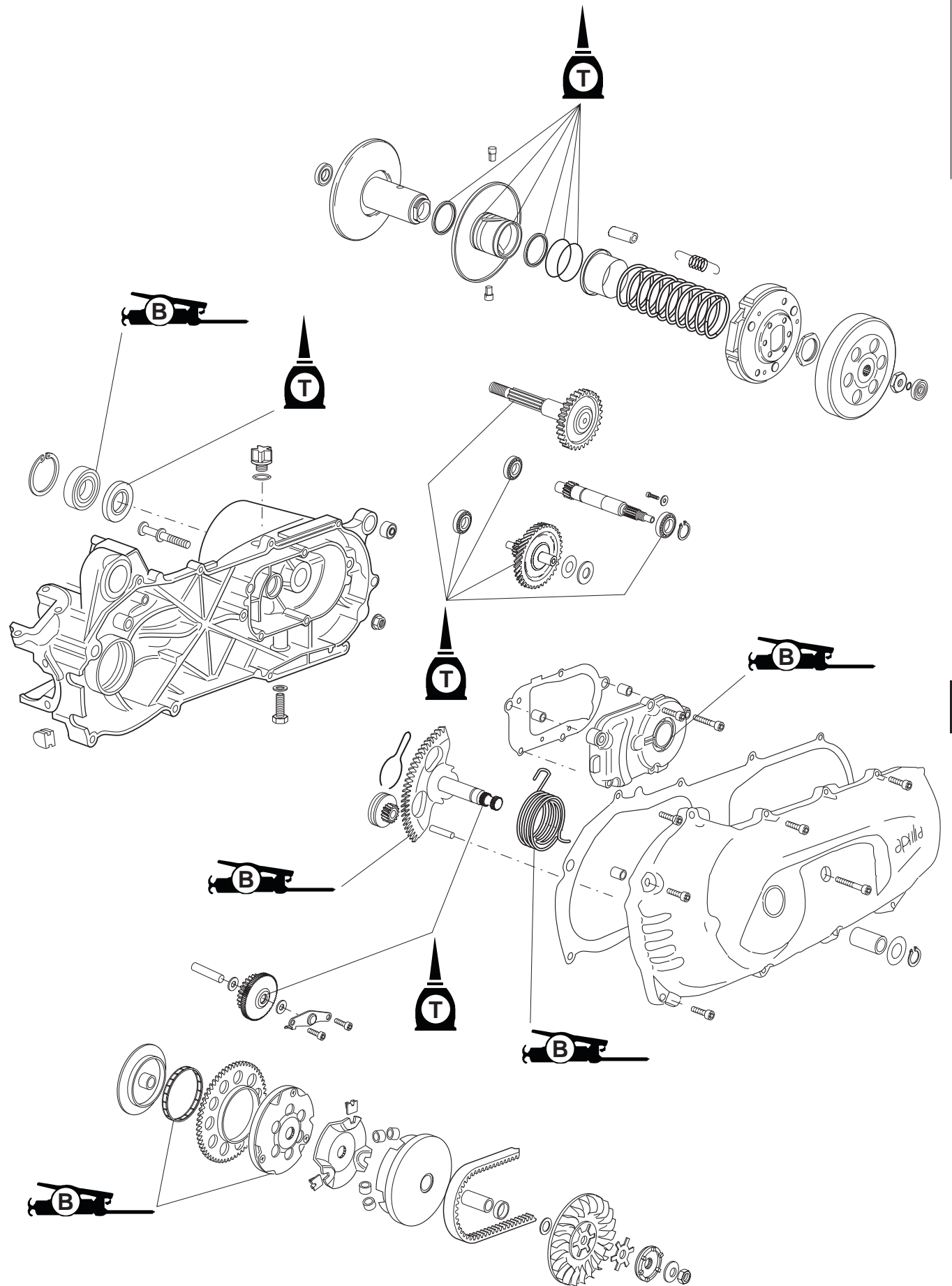
Remove the two screws that fix the motor to the crankcase, and then pull off the motor.



Fitting the starter motor

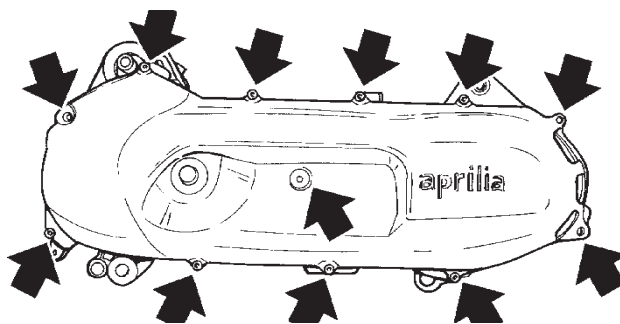
Ensure that the O-ring is properly seated in its groove, apply a thin film of special grease for oil seals (see Table of Lubricants), then fit the starter motor and fasten it to the crankcase using the two fixing screws.



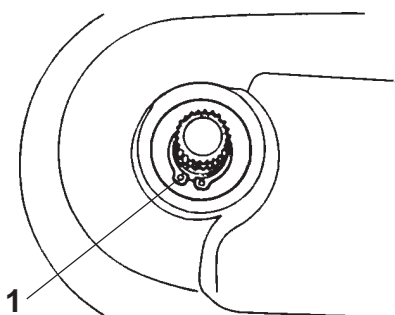


Disassembling the starting system

Remove the starter lever fixing screw and then the pedal. Remove the 12 crankcase cover fixing screws. Remove the cover and the related gasket paying special attention to the two reference pins.

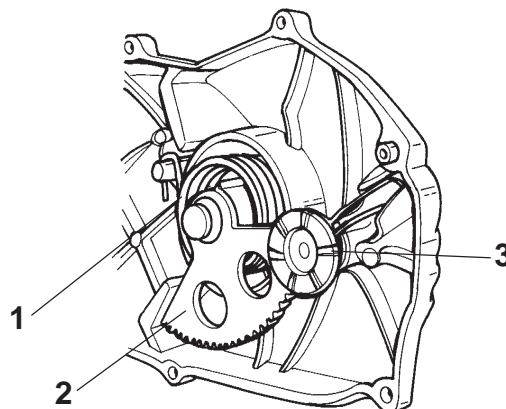


Remove the seeger ring (1).



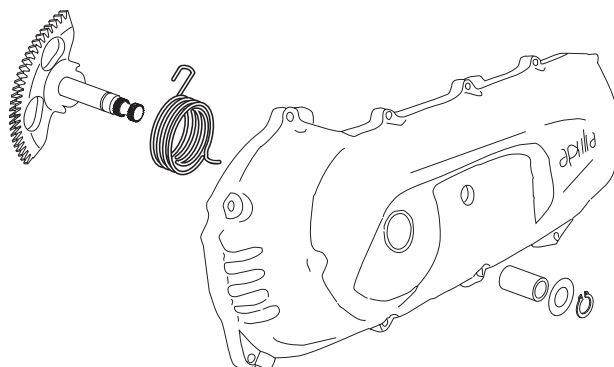
CAUTION : The spring is precharged.

Release the pressure spring (1) using a hook or a screwdriver. Extract the sector gear (2) and the pinion (3).



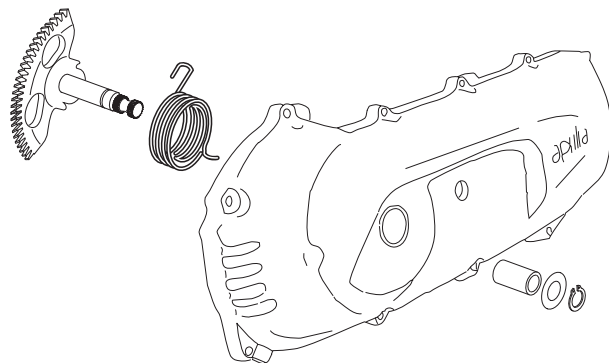
Checking the starting shaft

Check the starting system for signs of damage and wear, and if necessary replace it. Check the return spring and, if it shows signs of yielding, replace it. Also check that the spring tension is $150 \div 250$ g.



Reassembling the starting system

Refit, in the following order, the return spring, the pedal shaft, the bush, the plain washer and the circlip.

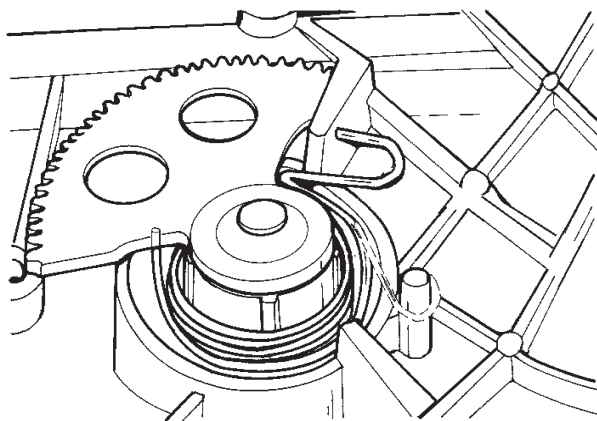


Attach the return spring to the pedal spindle and, using a spring pull hook, fix the other end to the pin.

IMPORTANT: When hooking the spring, avoid pulling it too hard.

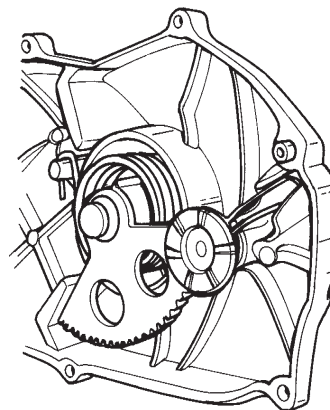
▲ CAUTION : Excessive pulling may cause the spring to yield.

▲ DANGER : This is a dangerous operation.



Fit, in the following order, the pinion gear and the spring. Slightly shift the pedal shaft to facilitate the insertion of the gear.

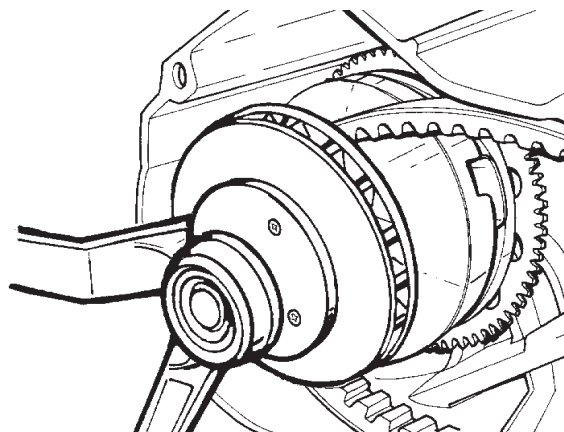
IMPORTANT: Lubricate the spring and the sector gear with the grease mentioned in the table of lubricants.



6

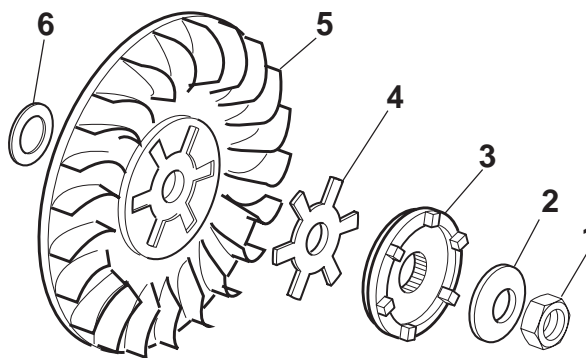
Removing the primary pulley

Loosen the pulley locknut using the specially designed tool.



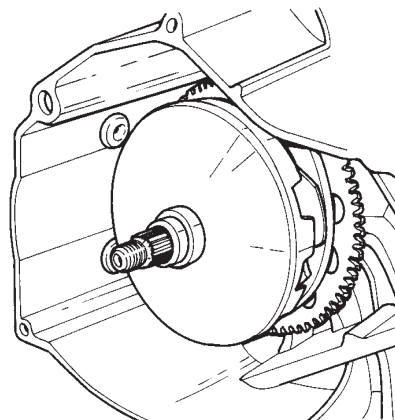
Pulley spanner: 8106707

Remove, in the following order, the locknut (1), the coned washer (2), the start coupling (3), the spider (4), the (fixed) primary pulley (5) and the shim (6).

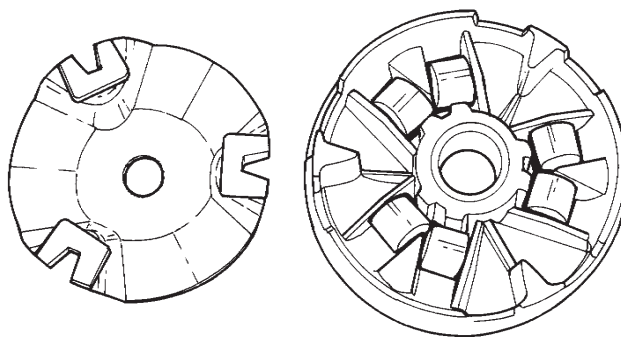


Simultaneously remove the (movable) primary pulley, the lug holder, the bush, and the related washer.

CAUTION : To prevent the six weights from falling inside, take care not to separate the pulley from the lug holder.



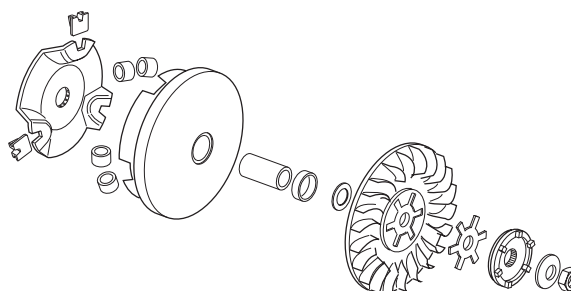
Separate the pulley from the lug holder and remove the six weights.



Checking the primary pulley

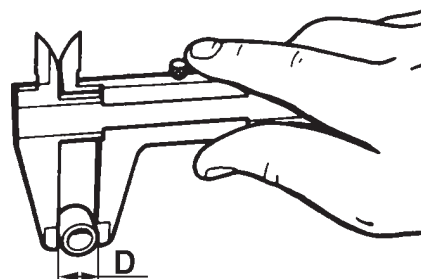
Check the (fixed and movable) primary pulley and the bush for signs of wear, breakage, scoring or other damage, and replace as necessary.

Check that the bush slides smoothly inside the (movable) primary pulley. If not, or if the play is excessive, replace the pulley and the bush.

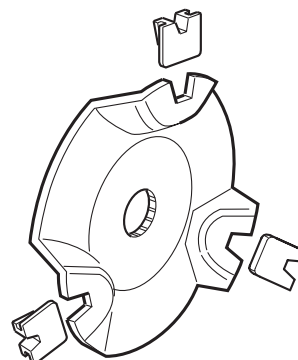


Check that the outside diameter (D) of the weights is not less than the wear limit, and if necessary replace them.

Wear limit D: 14.5 mm

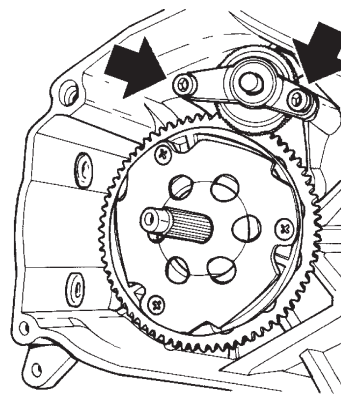


Check the condition of the lug holder and of the three driving lugs. Replace any worn lugs.

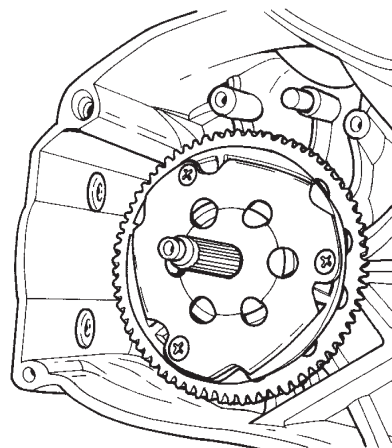


Removing the starting clutch

Remove the two fixing screws of the idler gear stop plate, the idler gear itself, and the front and rear washers.

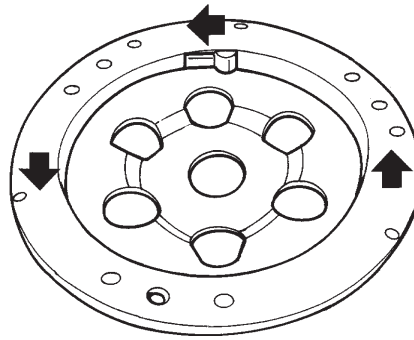
**6**

Simultaneously remove the starting clutch, the gear, the roller bearing and the bush, taking care not to drop the grub screws from inside the starting clutch.

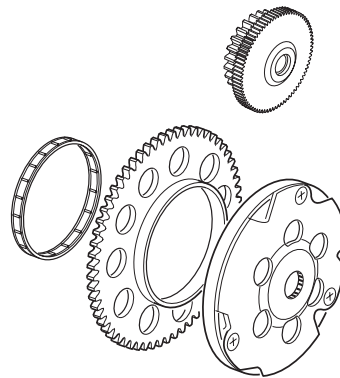


Checking the starting clutch

Check the general condition of the starting clutch. When pushed in the directions shown in the figure, the rollers should slide smoothly in their seats and return to their original positions when released. Replace as necessary.



Check the condition of the gear teeth, the inner and outer surface of the gear (starting wheel) and of the roller bearing. Replace any worn-out or damaged components.

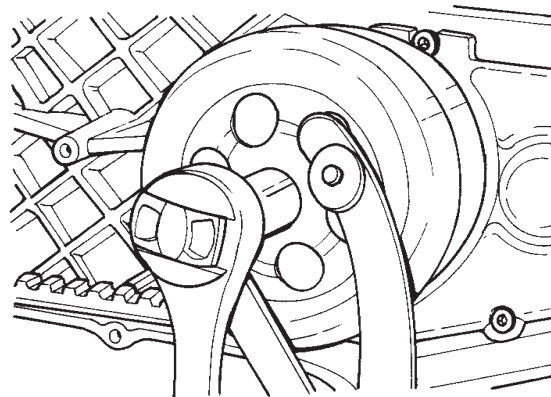


Removing the clutch and the secondary pulley

Remove the clutch bell housing locknut while holding the part with the specific tool.

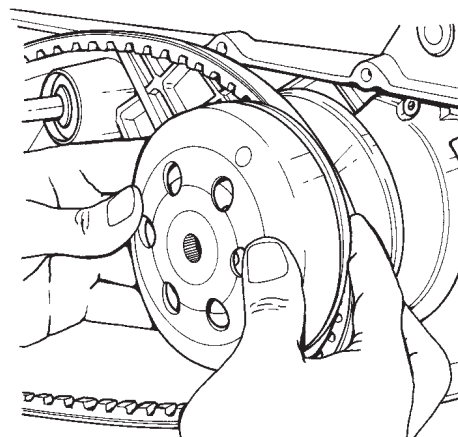
⚠ CAUTION : Since the clutch locknut is tightened with a considerable torque, caution should be exercised in order to prevent injury.

Specific tool: 8106702



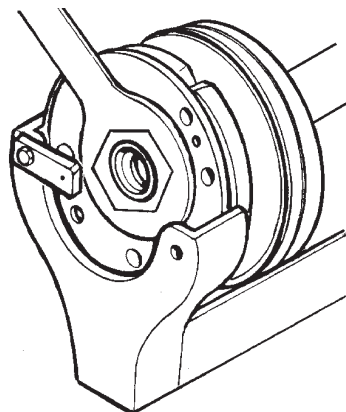
Simultaneously remove the clutch bell housing, the clutch, the secondary pulley assembly and the belt.

⚠ CAUTION : Take care not to twist the belt during the operation.



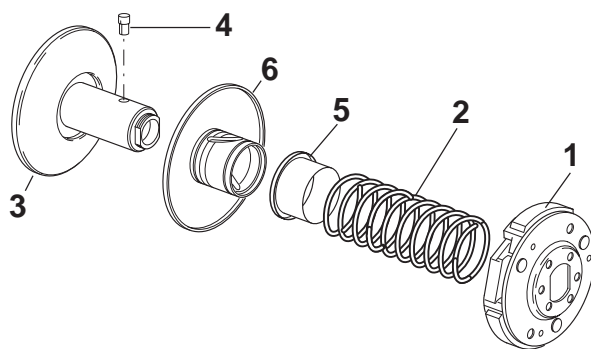
Compress the assembly with the clutch spring support and remove the clutch locknut.

▲ DANGER : The spring is compressed.



Clutch spring tool: 8140259
Clutch removing spanner: 8106703

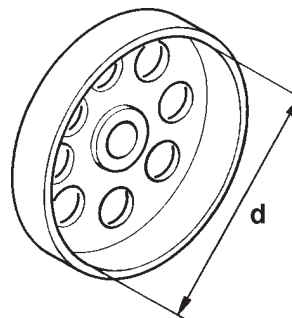
Remove, in the following order, the clutch block support (1), the counterspring (2), the fixed secondary pulley (3), the pin (4), the spring seat using two wedges (5) (for example, two screwdrivers) and the moveable secondary pulley (6).



Checking the clutch

Check the inside surface of the clutch housing. If it shows signs of rust or scoring, remove and clean with emery cloth. Also check that inside diameter (d) is $105.0 \div 107.0$ mm.

Wear limit (d): $105.4 \div 107.4$ mm



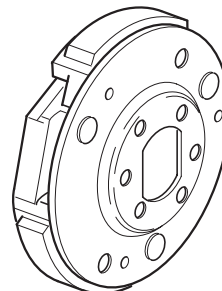
6

Check the clutch blocks and if necessary reface with coarse-grained abrasive paper. Thoroughly clean after completing the operation.

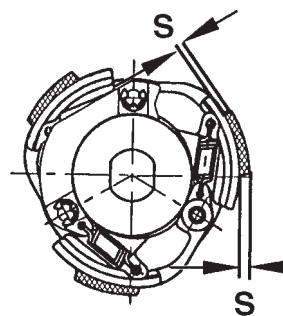
▲ DANGER : Refer to the notes contained in the **General Information chapter (Section 1)** of this manual.

Dry out the blocks with compressed air. If the clutch blocks have vitrified, the deposit can easily be removed with emery paper.

IMPORTANT: After removing the vitrified deposit, use compressed air to thoroughly clean the clutch blocks of the sanding residues.

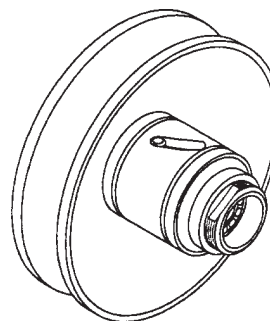


Check that the thickness of the shoes does not exceed the wear limit (S) of 2.5 mm.



Checking the secondary pulley

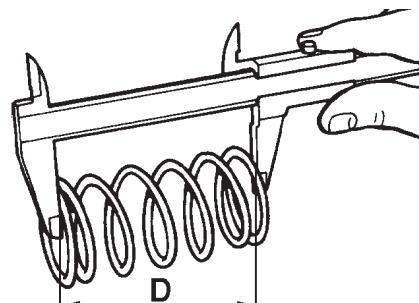
Check the condition and sliding of the secondary pulley, and if necessary replace it. Check that the race, the guide pin and the retaining ring show no signs of damage or wear, and if necessary replace them.



Measure the free length of the (secondary pulley) counterspring and, if it falls outside the allowable range, replace it.

Free length: 121.7 mm

Minimum allowable length: 106.7 mm

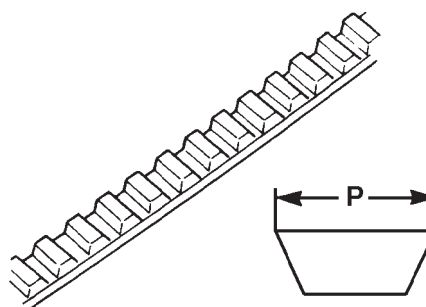


Checking the belt

Check that the belt shows no signs of cuts, cracks or excessive wear, and that it is not impregnated with oil. If any of the above defects is present, replace the belt. Measure the head width at several points along the belt and, if it falls outside the allowable range, replace the belt.

P = Standard depth: 16.6 mm

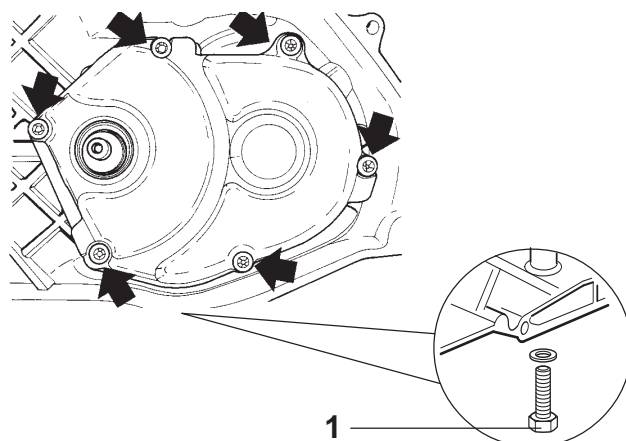
P = Wear limit: 15.2 mm



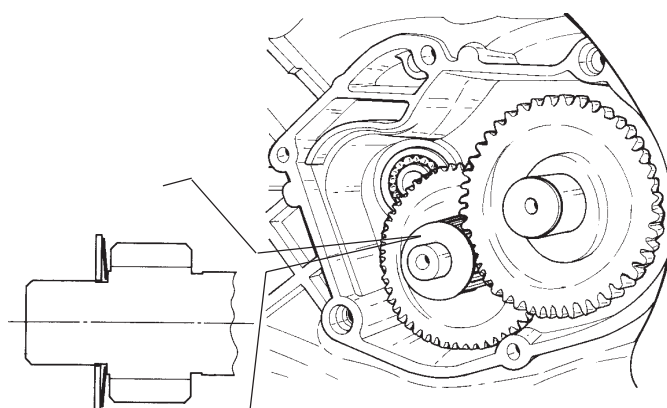
Disassembling the transmission

▲ CAUTION : Before removing the transmission cover, remove the drain screw (1) from the lower part of the gearbox and drain all the oil.

Then loosen the six fixing screws and remove the transmission cover together with the main gear, the two reference grub screws and the related gasket.

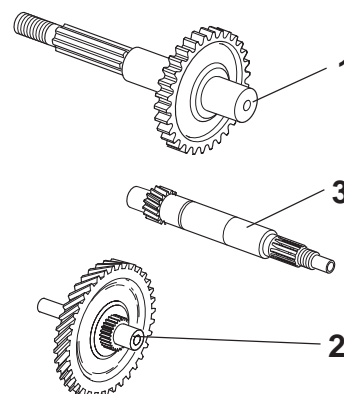


Remove the output shaft and the double idler gear.



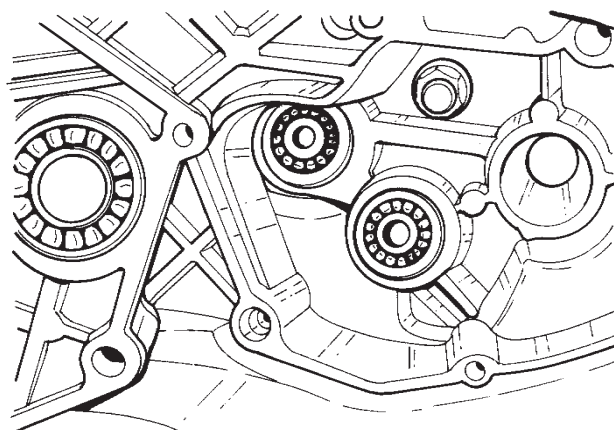
Checking the transmission

Check that the output shaft gears (1), the double idler gear (2) and the drive shaft (3) show no signs of wear. Replace any worn components.

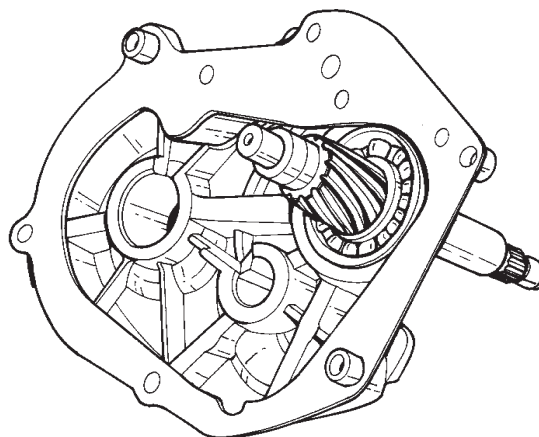


6

Check that the transmission bearings show no signs of scoring or seizing. Replace as necessary.

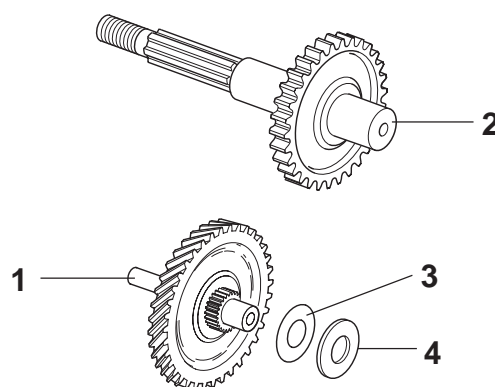


Check that the drive shaft slides smoothly. Repair or replace in case of malfunction.

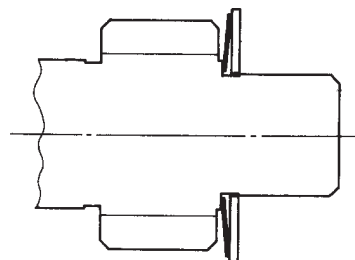


Reassembling the transmission

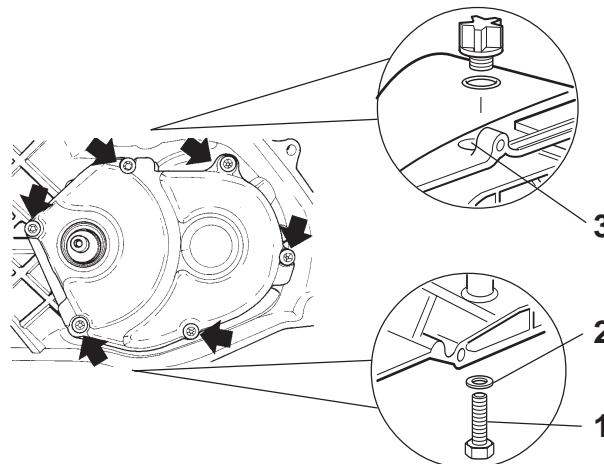
Fit, in the following order, the double idler gear (1), the output shaft (2), the coned washer (3) and the plain washer (4) after lubricating the bearings and the oil seals with lithium soap grease and the gears with engine oil.



Fit the coned spring washer as shown in the figure.



Before fitting the gearbox, lubricate the bearing of the output shaft with engine oil (see Table of Lubricants). Grease the cover gasket with lithium soap grease (see Table of Lubricants). Fit the gasket, insert the pegs in their housings, position the transmission cover with the output shaft, and then tighten the 6 fixing screws. Tighten the oil drain screw (1) after fitting it with a new washer (2). Pour in 0.12 l of transmission oil through the hole (3).

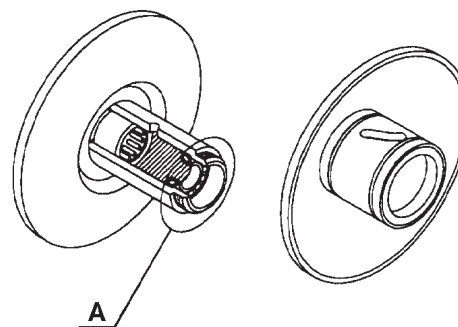


Tightening torque for fixing screws: **12 Nm**
Tightening torque for oil drain screw: **18 Nm**

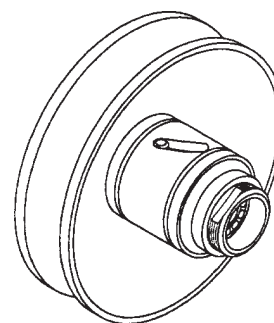
Fitting the secondary pulley

Before fitting the pulley, clean its sliding surface, and if necessary add grease in the fixed half pulley (see Table of Lubricants).

▲ CAUTION : Wrap adhesive tape around pulley end "A" in order to avoid overturning the lips of the oil seals while fitting the pulley.

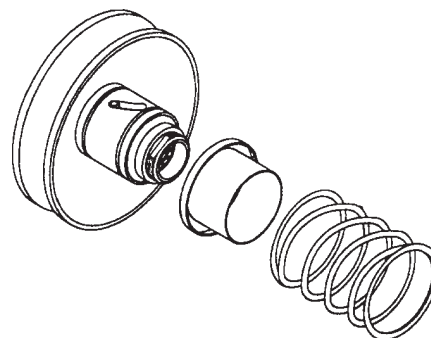


Fit the pin and apply grease in the groove of the movable pulley.
Grease the O-rings (1) of the movable secondary pulley before fitting them.



After fitting the spring seat, check the sliding of the pulley and then fit the return spring.

▲ CAUTION : Remove any excess grease.


6

Fitting the clutch

Clean the mating surfaces between the nut and the clutch holder.

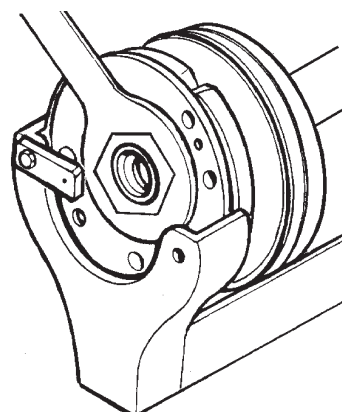
Fit the clutch locknut while compressing the pulley with the clutch spring support.

▲ DANGER : The spring is compressed.

▲ CAUTION : Do not attempt to perform this operation without the specially designed tools (refer to Chapter 2).

Clutch spring tool: 8106704

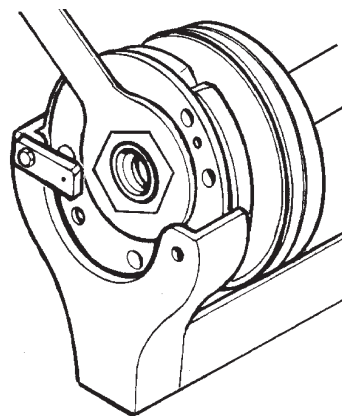
Clutch removing spanner: 8106703



To complete the installation of the clutch, tighten the locknut.

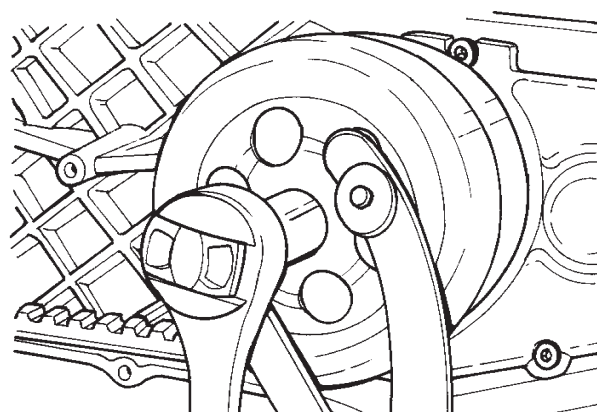
Preload the snerve spring and fit the belt between the pulleys to allow the insertion of the clutch unit in the input shaft.

▲ CAUTION : This operation allows for optimum tightening of the primary fixed pulley, and prevents the belt from getting jammed. The belt must be fitted with the arrow pointing in the direction of rotation.



Tightening torque: **50 Nm**

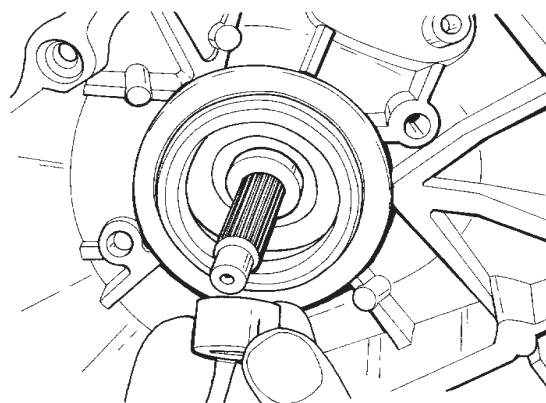
Fit the bell housing around the pulley and, while holding it with a suitable tool, tighten the nut as shown in the figure.



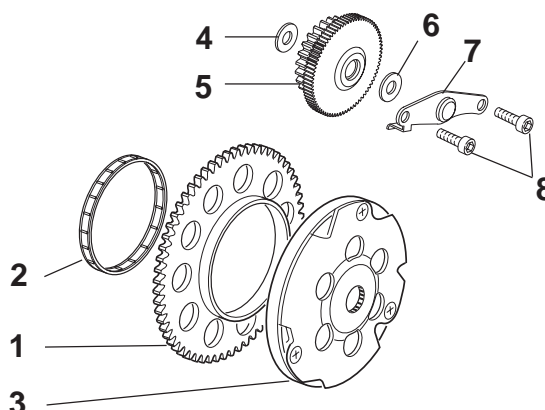
Tightening torque: **50 Nm**

Fitting the starting clutch

Fit the bush on the crankshaft.



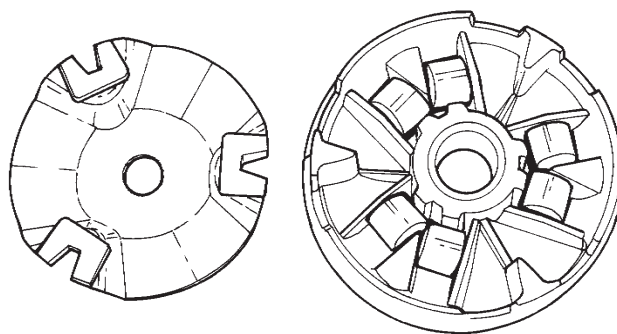
Fit, in the following order, the starting gear (1) lubricated with transmission oil, the roller bearing (2), the starting clutch (3), the washer (4), the starting gear (5) lubricated with oil, and the other washer (6). Fasten plate (7) by tightening the two fixing screws (8).



Tightening torque: **9 Nm**

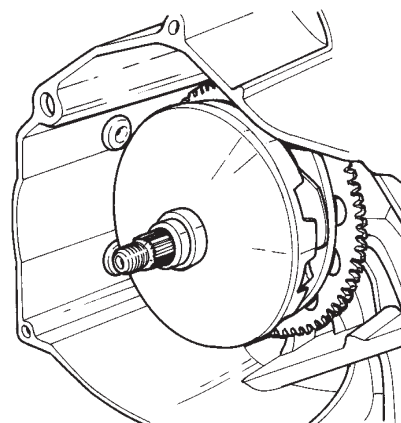
Fitting the primary pulley

Thoroughly clean the sliding surfaces of the centrifugal weights and then fit them in their slots. Fit the driving lugs on the lug holder, fit the latter to the pulley, and then insert the bush.



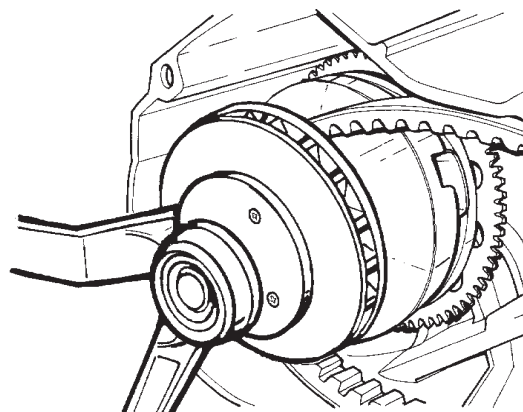
Fit the movable primary pulley while holding the lug holder to prevent the weights from falling.

⚠ CAUTION : Take care not to nip your fingers between the pulley and the crankcase.



Fit, in the following order, the shim, the fixed primary pulley, the spider, the start coupling, the washer and the nut.

Hold the crankshaft with the pulley spanner and tighten the nut.



6

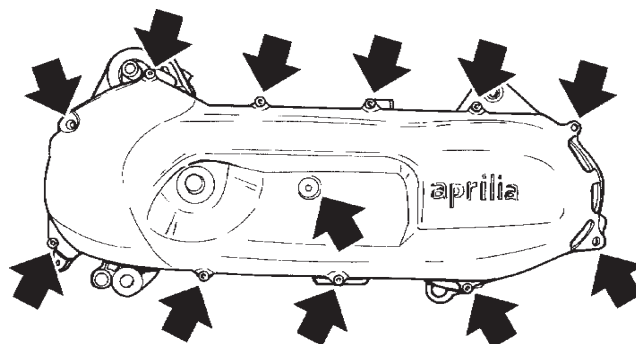
Tightening torque: **33 Nm**

Pulley spanner: 8106707

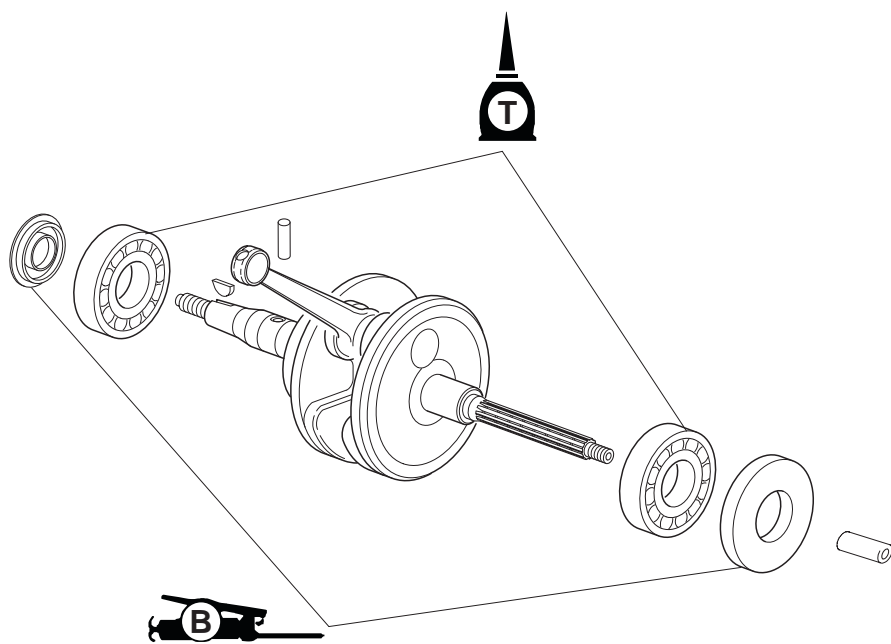
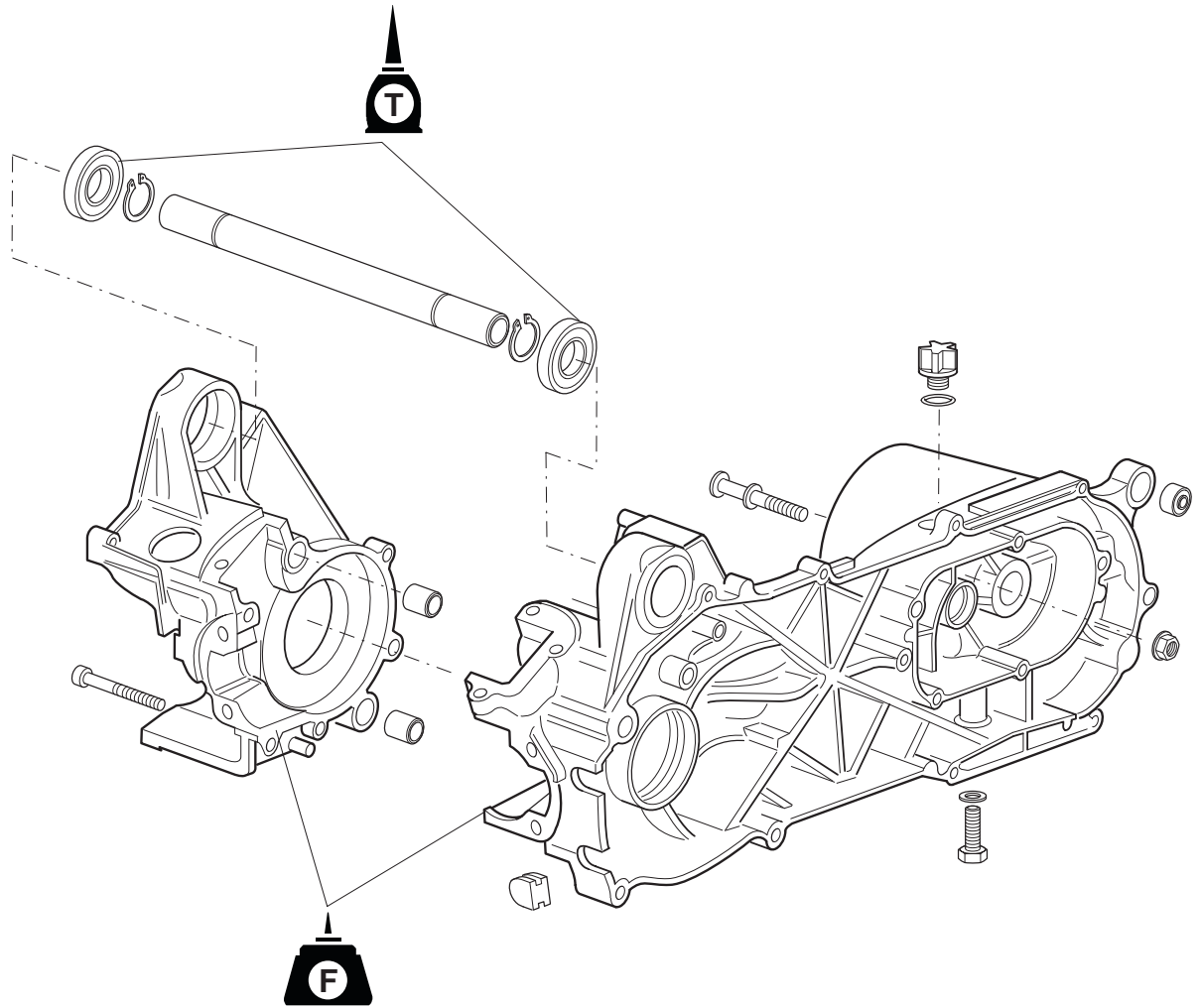
Reassembling the starting system

Fit the pegs in their respective housings. Fit a new gasket on the crankcase cover and secure the latter by means of the twelve fixing screws shown in the figure.

Fit the starting pedal and fasten it with the fixing screw.

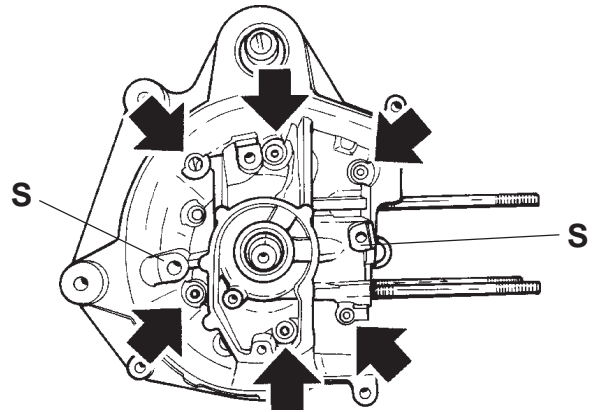


Tightening torque for fixing screws: **12 Nm**



Removing the right-hand crankcase and the crankshaft

Remove the 6 screws fixing the right-hand crankcase.

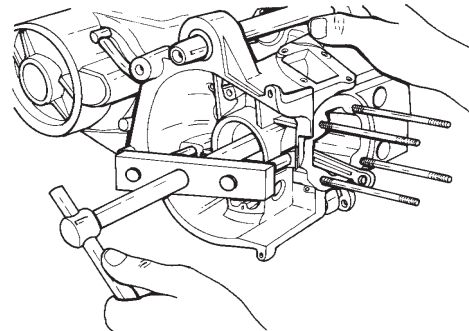


Tension the crankcase separator after fixing it to the two cast supports (S in the figure above) with an M8 thread.

CAUTION : Tighten the tool support bolts making sure that the tool is parallel with the crankcase.

CAUTION : Lubricate between the spacer tube and the crankcase bearings. Hit the axle while applying a rotary effort with the crankcase separator. Use a mallet on the half crankcase, taking care to hit the reinforced part, not the gasket contact surface.

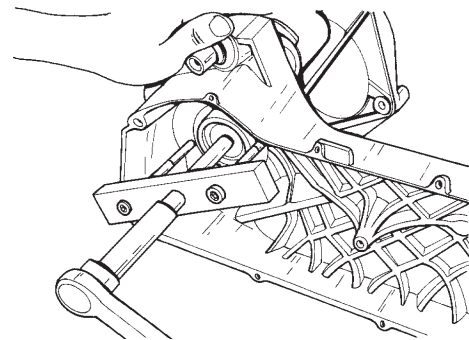
Crankcase separator: 8106698



Remove the crankshaft with the crankcase separator after fitting the latter to the two cast supports with an M8 thread.

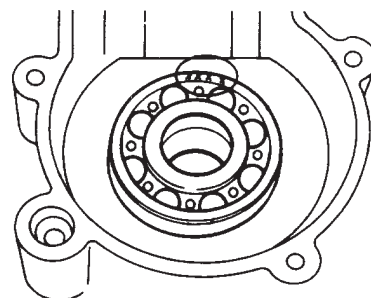
CAUTION : Tighten the tool support bolts making sure that the tool is parallel with the crankcase.

Crankcase separator: 8106698

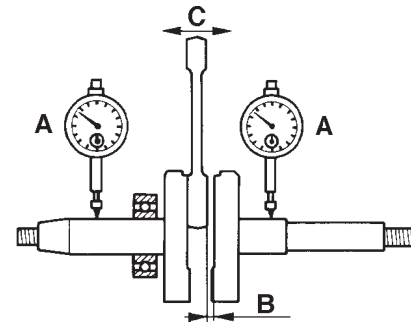


Checking the crankcase, the crankshaft and the connecting rod

Check the crankshaft bearings by rotating their inner races. Replace any bearing that does not rotate smoothly, or that shows any radial play or excessive side play. If the inner race of the bearing is stiff, clean it thoroughly, apply a little lubricant to the bearing, and then perform the test again. Uneven rotation of the bearing may be due to the presence of dirt or foreign bodies in the pin. Once the pin has been thoroughly cleaned, the inner race of the bearing should no longer be stiff or rotate jerkily when turned manually. If the rotation is still abnormal, replace the bearing.



Check the condition of the connecting rod. Check if the axle shafts are worn or scored. Check the condition of the connecting rod big-end bearing by rotating it around its pin. Check that the float of the connecting rod big end (C) is 0.4 to 0.8 mm. Check that the side play of the connecting rod (B) is 0.20 to 0.50 mm. If, after the component has been carefully cleaned, the big-end bearing is still stiff, does not rotate smoothly, or has an excessive play, proceed to replace it.



⚠ CAUTION : The replacement of the big-end bearing should be carried out by a skilled technician using the special tools required and a large hydraulic press. DO NOT ATTEMPT to replace the big-end bearing if you do not possess the necessary tools and technical skills. Please contact Aprilia's Customer Care.

Also check that the connecting rod is not bent, and that its travel is exactly perpendicular to the axle shafts. Using a series of V-blocks, measure the eccentricity of the two axle shafts at the points shown in the figure. The eccentricity (A) must not exceed 0.03 mm. Should this limit be exceeded, please contact Aprilia's Customer Care to have the axle shafts realigned.

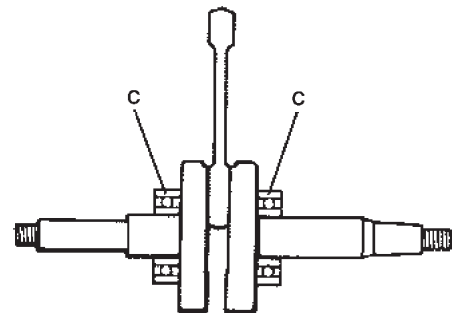
Crankcase separator: 8106698

Crankshaft bearing extractor: 8140152

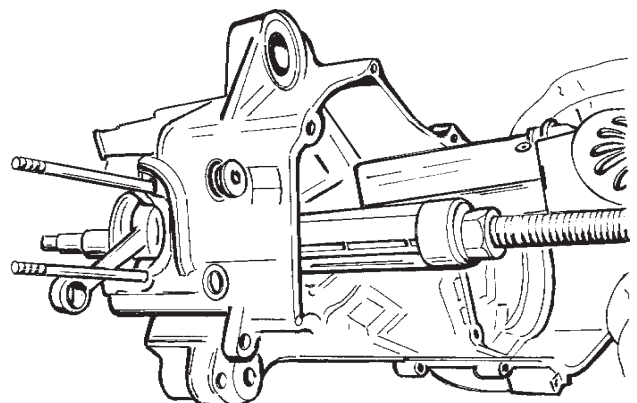
Fitting the bearings

Fit two new bearings (C) on the crankshaft by pressing a length of tube of suitable diameter on the inner race of each bearing.

Push the bearing home using a mallet or a hydraulic press.



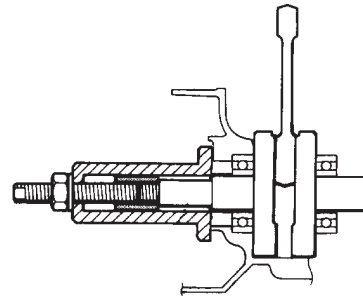
Using an automatic heater, heat the crankcase to approximately 150° C (~10 minutes' operation) and then drive the connecting rod assembly into the left-hand crankcase as described in the paragraph "Fitting the crankshaft".



Fitting the crankshaft

⚠ CAUTION : Apply grease to the oil seals and oil to the bearings so as to protect the crankshaft against possible scoring and facilitate the fitting.

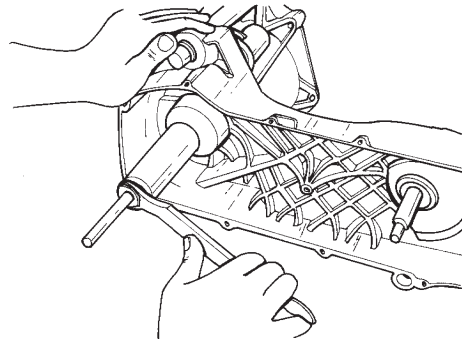
Connect the crankshaft fitting tool, and then fit the adaptor and the spacer.



Crankshaft assembly installing tool: 8140234

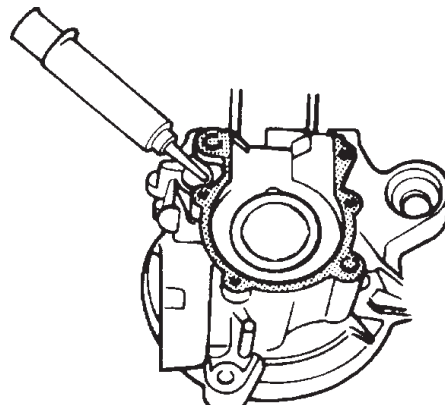
Install the crankshaft in the left-hand crankcase.

IMPORTANT: Move the connecting rod to the top dead centre and hold it with one hand. Rotate the installing tool with the other hand until the lower part of the crankshaft rests on the bearing.

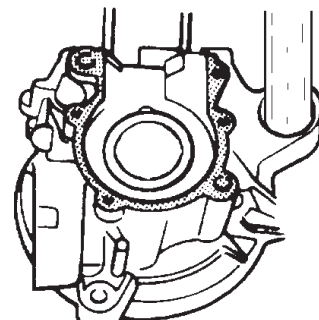


Fitting the crankcase

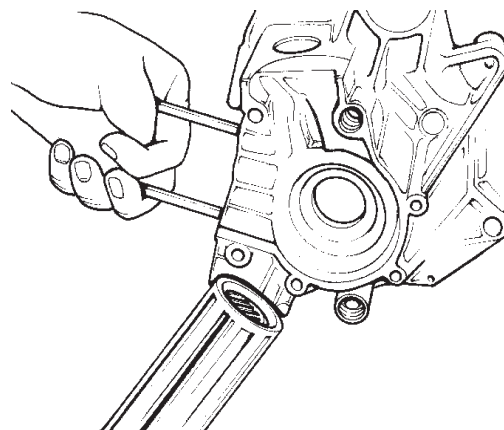
Apply a sealant to the mating surfaces of both crankcase halves.



Fit the spacer tube and the reference grub screws.

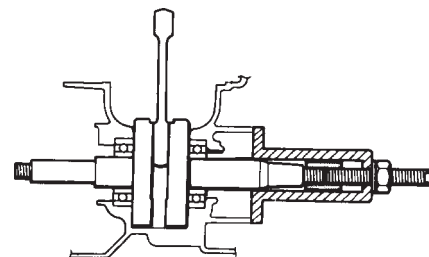


Using an automatic heater, heat the right-hand crankcase to approximately 150° C (~10 minutes' operation) and fix the connecting rod assembly into the right-hand crankcase as described in the following paragraph.



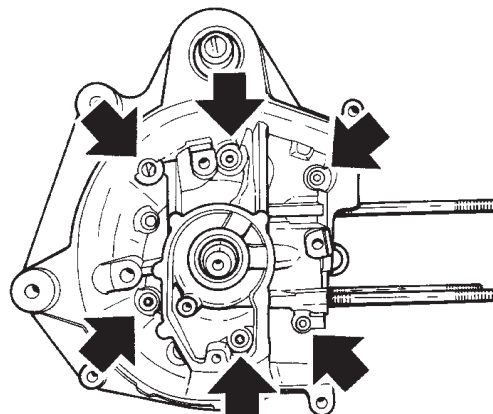
Position the right-hand crankcase, connect the crankshaft installing tool and use it to bring the two crankcase halves into contact.

IMPORTANT: Keep the connecting rod at the top dead centre with one hand. With the other hand rotate the tool nut until the lower part of the right-hand crankcase comes into contact with the left-hand crankcase.



Crankshaft assembly installing tool: 8140234

Tighten the six fixing screws in a crosswise pattern in numerical order.

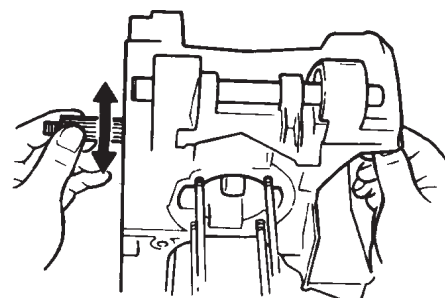


Tightening torque: **9 Nm**.

After completing the operation, check that the crankshaft has been properly installed.

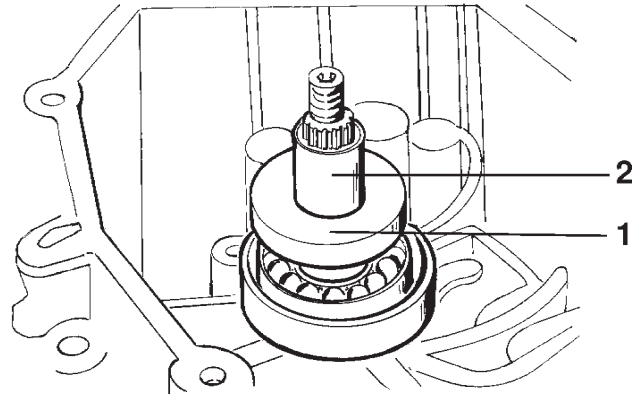
IMPORTANT: If necessary, use a plastic mallet to restore the axial play.

CAUTION : Carry out this operation with a plastic or rubber mallet, not an iron hammer. Take care not to hit the crankcase.

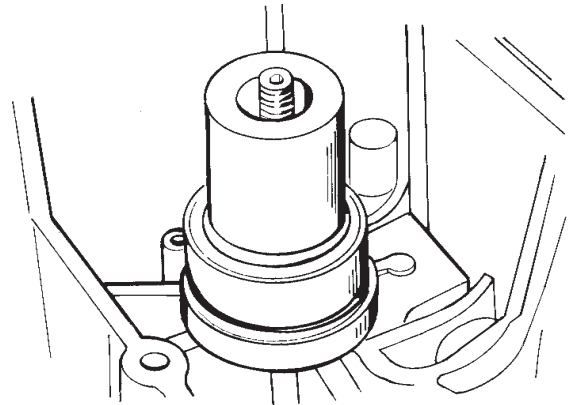


Fitting the crankshaft oil seal

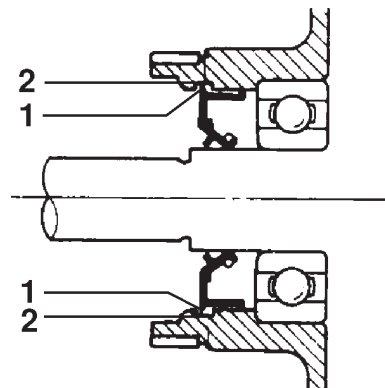
Fit the oil seal (1) and then the centring bush (2) taking care to smear the lip of the oil seal with lithium soap grease (see Table of Lubricants).



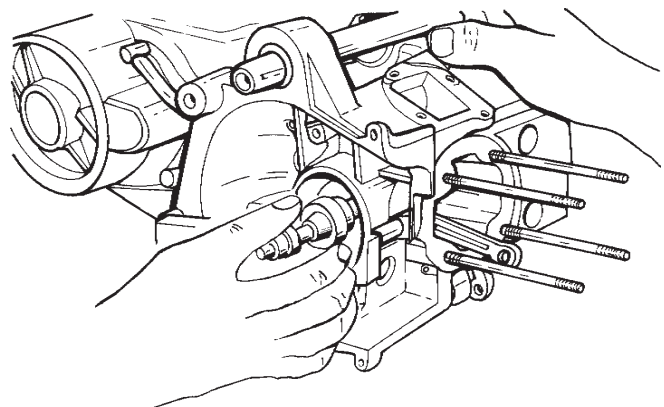
To facilitate the fitting, use a tube of suitable diameter.



Once the parts are in place, check that the oil seal lip (1) is seated in the crankcase recess (2) as shown in the figure.



Fit the oil seal in the right side of the engine taking care to smear the oil seal rims with lithium soap grease (see Table of Lubricants).



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8140246



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