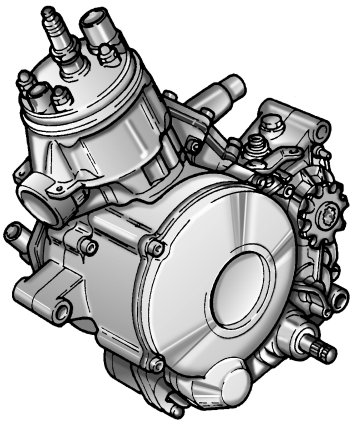
aprilia

Workshop manual

AM6



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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

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CONTENTS

1

Chapter 6

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.

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 2-3.

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

GEARBOX OIL

Use IP FC SAE 75W-90 oil or Agip GEAR SYNTH oil. 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.

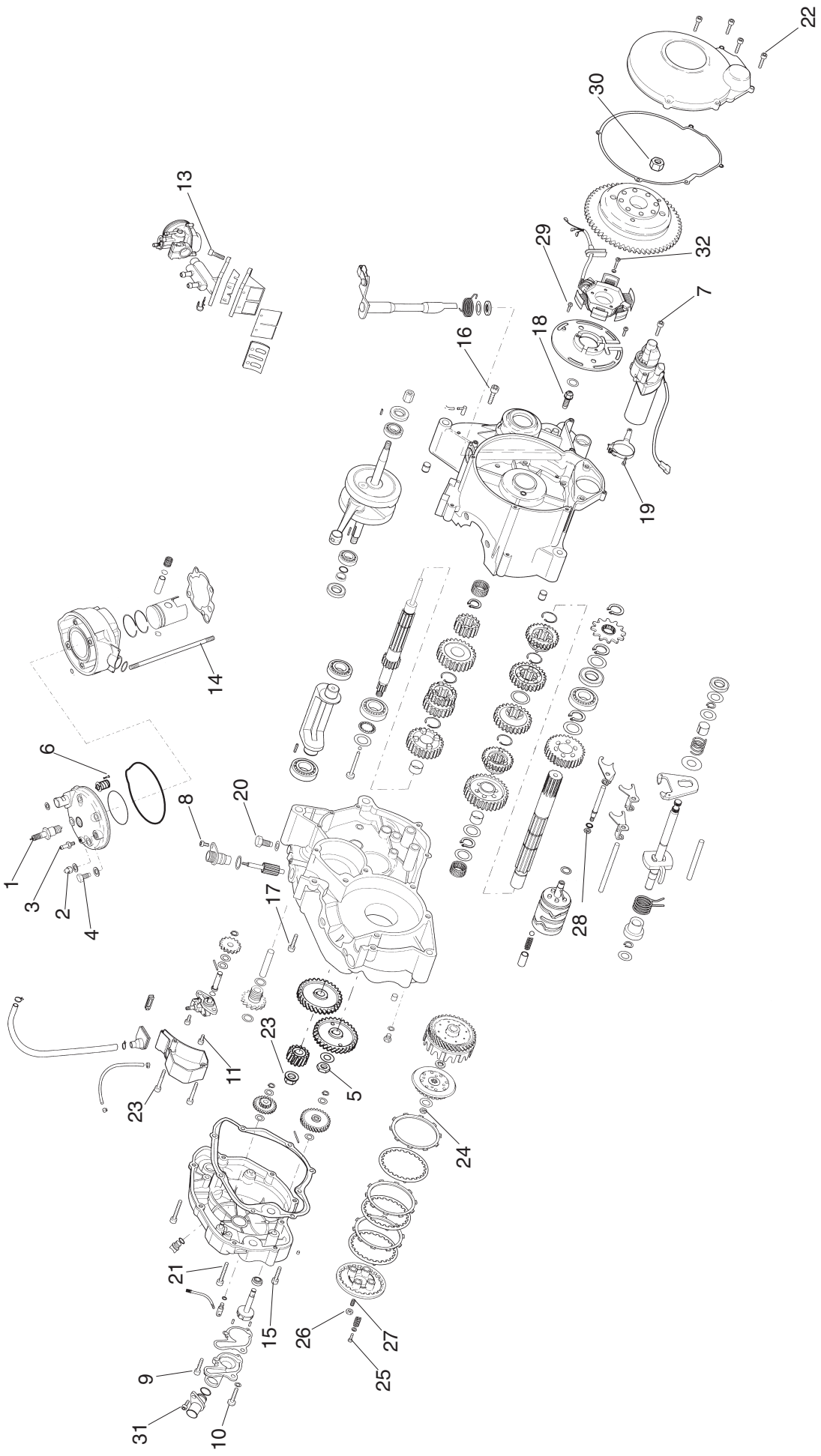
⚠CAUTION : Never remove the filler cap while the engine is hot: the coolant is under pressure, and may spurt out and cause burns.

⚠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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Tightening torques

Type	Description	Qty	Type	Tightening torque Nm
1	Spark plug	1	M14 x 1,25	20 ÷ 25
2	Cylinder head nut	4	M7 x 1	14 ÷ 16
3	Pipe connection	1	M8 x 1,25	24 ÷ 26
4	Cylinder head screw	1	M14 x 1,25	16 ÷ 20
5	Countershaft nut	1	M12 x 1	45 ÷ 50
6	Thermostat screw	2	M4 x 0,7	2,5 ÷ 3,5
7	Starter motor screw	2	M6 x 1	10 ÷ 12
8	Revolution counter gear screw	1	M6 x 1	4 ÷ 6
9	Water pump screw	2	M6 x 1	4 ÷ 6
10	Coolant drain screw	1	M6 x 1	4 ÷ 6
11	Oil pump screw	2	M5 x 0,8	6 ÷ 8
12	Oil pump cover screw	2	M5 x 0,8	3 ÷ 4
13	Intake manifold screw	4	M6 x 1	9 ÷ 11
14	Cylinder stud	4	M7 x 1	10 ÷ 12
15	Clutch cover screw	1	M6 x 1	2 ÷ 4
16	Half crankcase screw, flywheel side	13	M6 x 1	10 ÷ 12
17	Half crankcase screw, clutch side	1	M8 x 1,25	17 ÷ 18
18	Neutral indicator switch	1	M10 x 1,25	1 ÷2
19	Starter motor bracket screw	1	M5 x 0,8	6 ÷ 8
20	Kick-start sliding stop screw	1	M12 x 1,25	24 ÷ 26
21	Clutch cover screw	7	M6 x 1	10 ÷ 12
22	Flywheel cover screw	5	M6 x 1	1 ÷ 2
23	Main gear nut	1	M12 x 1,25	65 ÷ 75
24	Clutch drum nut	1	M12 x 1,25	55 ÷ 60
25	Pressure plate screw	4	M5 x 0,8	3 ÷ 5
26	Pressure plate nut	1	M14 x 1,25	26 ÷ 28
27	Clutch adjusting screw	1	M14 x 1,25	screw in fully
28	Gear selector nut	1	M7 x 1	14 ÷ 16
29	Stator plate screw	3	M4 x 0,7	3 ÷ 4
30	Flywheel magneto nut	1	M10 x 1,25	43 ÷ 45
31	Water pump sleeve screw	1	M6 x 1	4 ÷ 6
32	Stator screw	3	M4 x 0,7	3 ÷ 4

TABLE OF LUBRICANTS

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

* **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 range of -30° C to +140° C, dropping point ranging from 150° C to 230° C, excellent protection against corrosion, resistance to water and oxidation.**

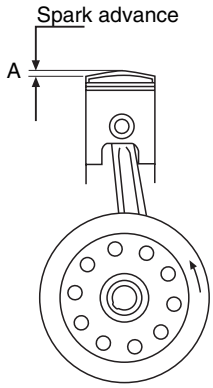
*** **Only use nitrite-free antifreeze and anticorrosive products ensuring protection down to -35° C.**

Ignition timing

To check the ignition timing, follow these steps:

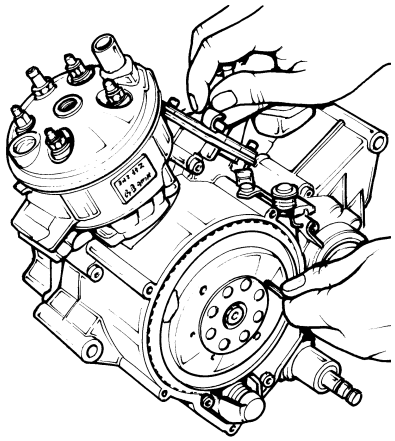
a) Screw a centesimal comparator into the spark plug hole.
b) Turn the crankshaft to the TDC (Top Dead Centre) and zero the comparator.
c) Turn the crankshaft clockwise (opposite direction to operation) until the gauge indicates value "**A**" (see table and figure).

Spark plug type	Ducati electronic 85 W 6 poles
"A" spark advance value	1,4
Corresponding spark advance value	20°

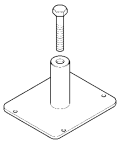
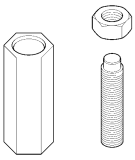
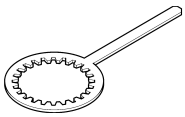
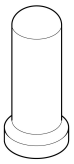
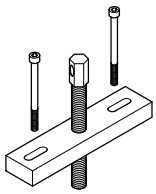
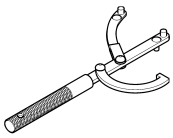
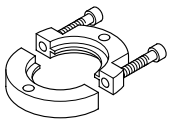


d) Check the alignment of the two reference marks for the ignition timing by inserting a Ø 4 mm pin into the hole in the flywheel.
e) If the timing is not obtained, loosen the fastening screws of the fixed part, rotate as much as needed in the proper direction, then retighten the screws and repeat steps b), c) and d).

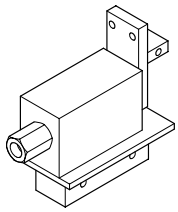
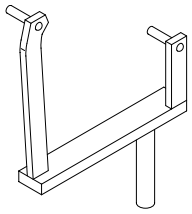
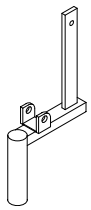
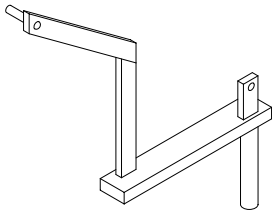
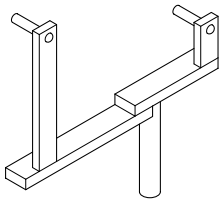
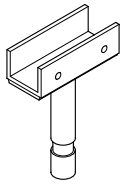
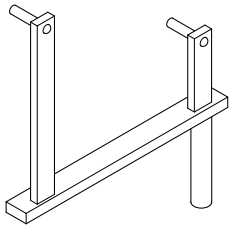
Engine fastening tool: 8201532



Tools - Tool kit no. 8222355

 8201525	Crankshaft extractor	 8201529	Pump oil seal drift
 8201526	Tool for crankshaft assembly	 8201530	Clutch lever oil seal drift
 8201527	Clutch bell housing spanner	 8201531	Connecting rod assembly drift, clutch and flywheel sides
 8201528	Selector shaft oil seal drift	 8106698	Extractor
 8106702	Flywheel retainer	 8140152	Crankshaft bearing extractor

Engine support tools kit No. 8134405

	**Base support**		**Engine support AM6-AM345**
	**Engine support RS 250**		**Engine support MA-MY**
	**Engine support 655**	 **8104101**	**Universal engine support**
	**Engine support 122-123**		

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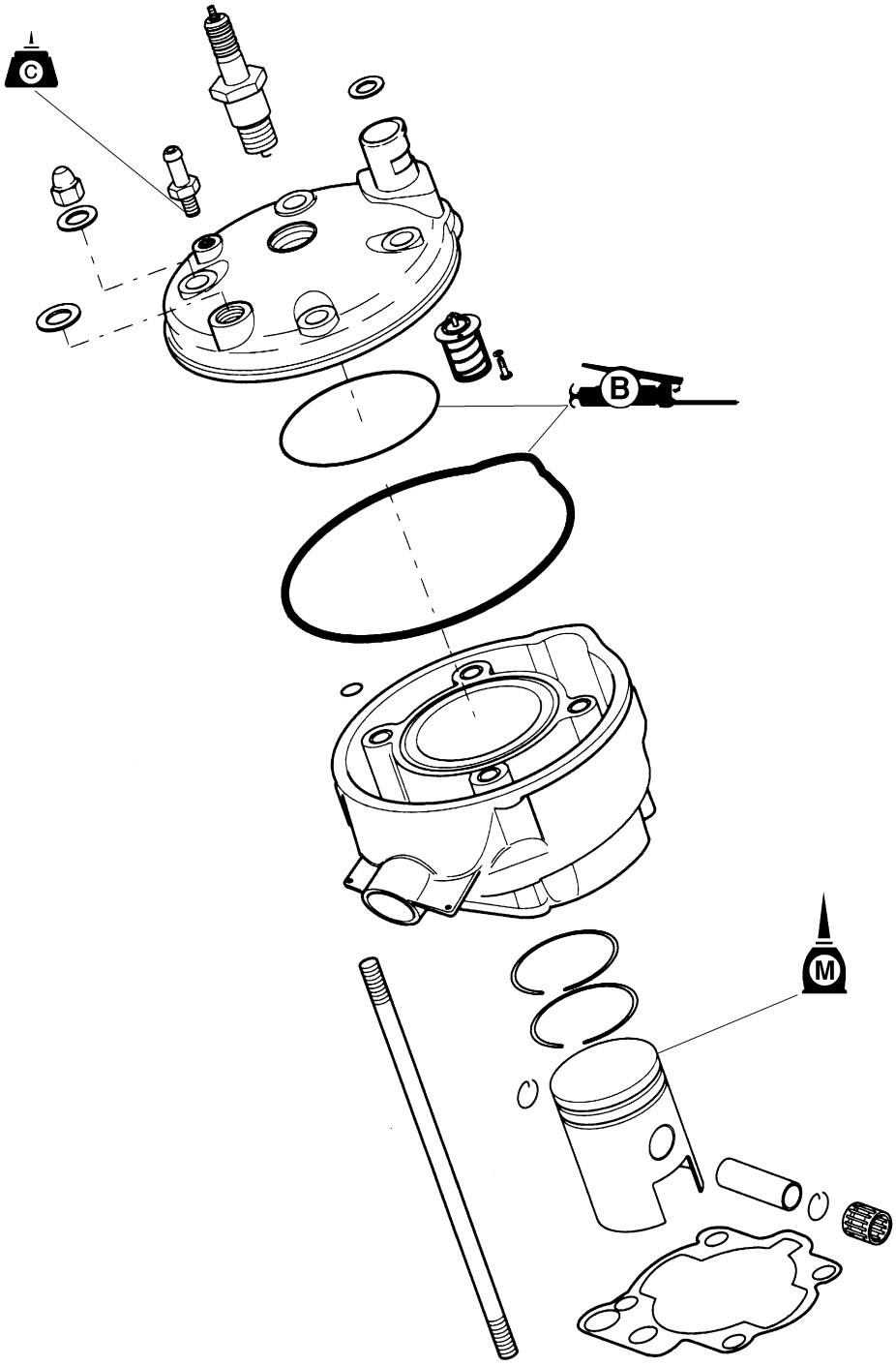
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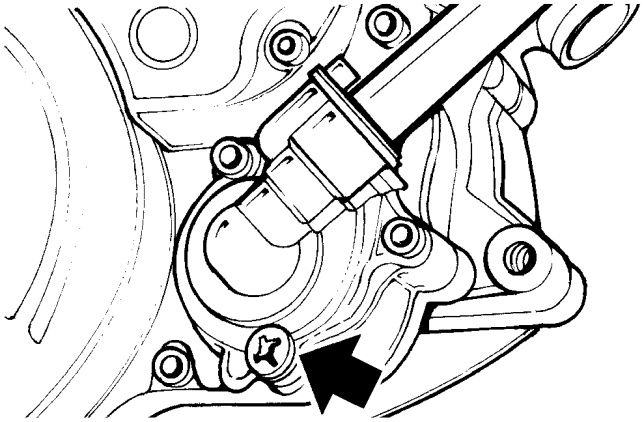
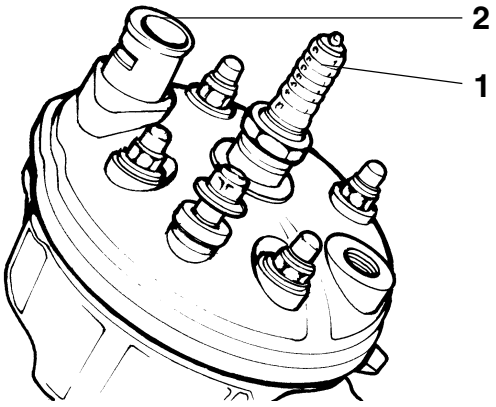
Removing the cylinder head

Remove the drain screw from the pump cover (see figure) and allow the coolant to drain completely. (This operation must be carried out 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.
Refer to the specific information for the coolant used.

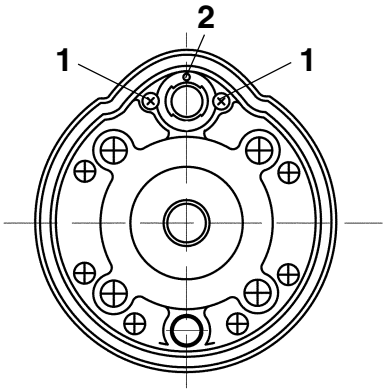
Remove the spark plug (1) and the water connection (2), unscrew the four cylinder head locknuts and remove the related washers. Remove the cylinder head and the head O-ring.



Removing the thermostat

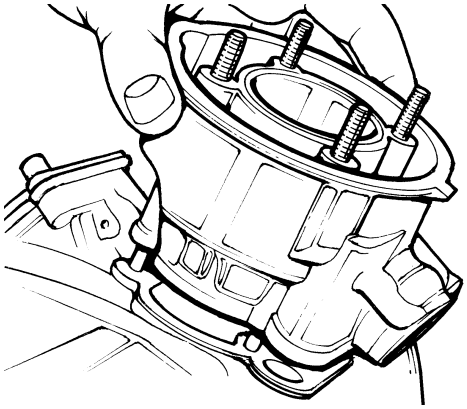
Loosen the two fixing screws (1), remove the thermostat and check its mechanical condition.

IMPORTANT: During the assembly, the thermostat hole (2) must be as high as possible to prevent the forming of air locks.

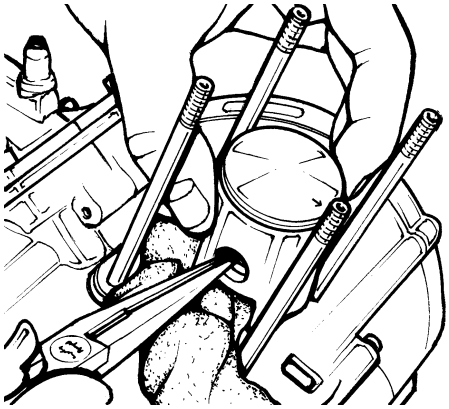


Removing the cylinder

Remove the cylinder while keeping the piston in place, then remove the cylinder base gasket, the inner O-ring and the four O-rings on the cylinder studs.



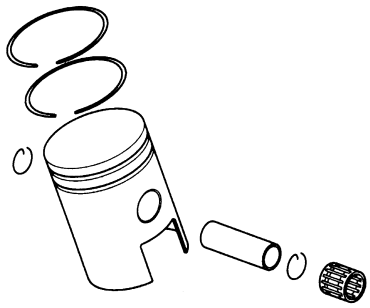
Removing the piston



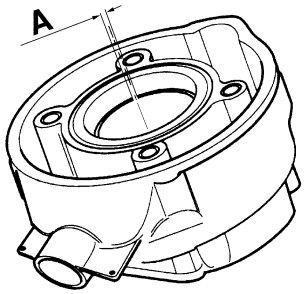
⚠CAUTION : Before removing the piston pin retaining rings, close the crankcase opening with a clean rag so as to prevent the circlips from falling into the engine.

Remove the two retaining circlips and pull out the piston pin.
IMPORTANT: To avoid damage to the connecting rod when a two-diameter piston pin is used, tap gently while supporting the piston on the opposite side.
Remove the piston and the roller cage it contains.

Checking the power plant



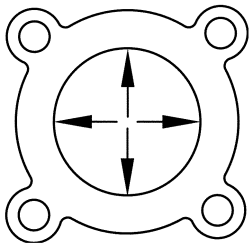
Carefully decoke the piston top using a scraper, taking care not to damage the piston surface.
Check the fitting of the piston and the lubricated piston pin. The piston pin must show no signs of wear or damage and be fitted by manual pressure without yielding under its own weight.



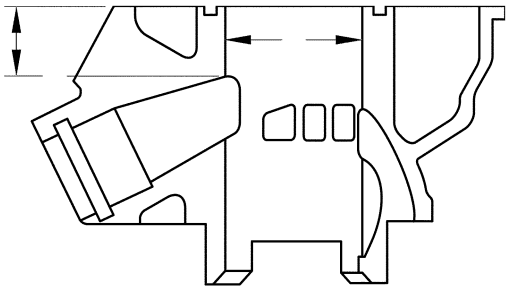
Ensure that the piston rings are in perfect condition and that the clearance between the ring ends is as shown in the table below.
The measurements must be taken using a feeler gauge positioned horizontally. To obtain this, position the rings in the cylinder using the lower part of the piston.

RINGS	GAP (mm) "A"
New	0.15 ÷ 0.30 mm
Used	up to 1.0 mm

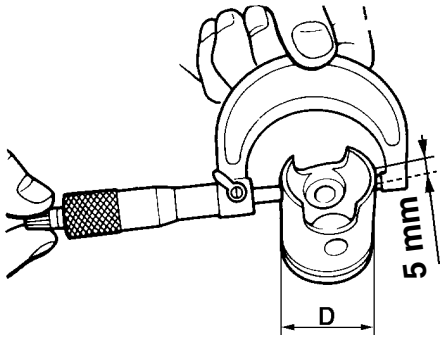
Check that the cylinder water jacket shows no signs of seizing notches, increasing wear, and scoring. Using a bore measuring device, check the cylinder bore in two directions forming an angle of 90° (one parallel to the piston pin axis and the other perpendicular to it). The maximum allowable ovalization is 0.03 mm. Change the piston every time this value is exceeded.



Repeat the measurement at several points along the barrel between the cylinder upper surface and the exhaust port.



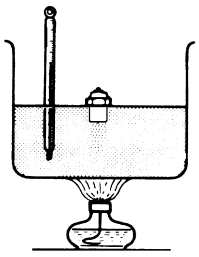
Measure the diameter of the piston (D) using a micrometer. Take the measurement 5 mm from the lower rim of the piston as shown in the figure.



⚠ CAUTION : The maximum allowable ovalization is 0,10mm. Change the cylinder and piston assembly every time this value is exceeded.

Checking the thermostat

After checking the mechanical condition of the thermostat, put it in a basin filled with water. Place the basin on a burner and, using a thermometer with a scale extending to at least 100° C, check that the thermostat is activated at approximately 70° C, and stays open at higher temperatures. Turn off the burner and check that the thermostat closes when the temperature falls below 70° C. Should the test be unsuccessful, replace the thermostat with a new one.



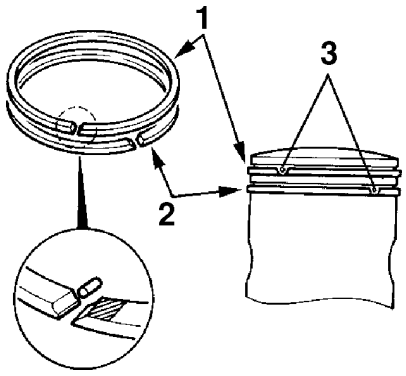
Checking the gasket seats

Ensure that the rest surfaces of the gaskets are in good condition and perfectly clean. Remove any carbon formation with a scraper, taking care not to damage the gasket seats.

Refitting the power plant

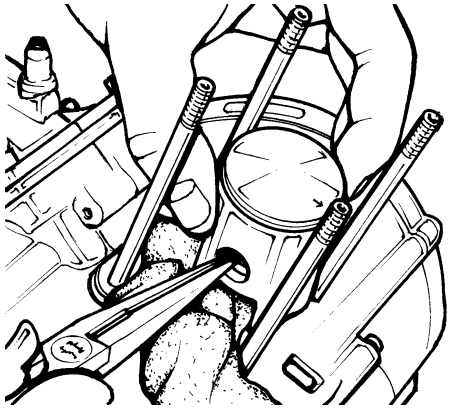
Fit the new upper ring (1) and lower ring (2) on the piston with the tapered side facing upwards. Refer to pins (3).

⚠ 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.



⚠ CAUTION : Before refitting the piston pin retaining circlips close the crankcase opening with a clean rag so as to prevent the circlips from falling into the engine.

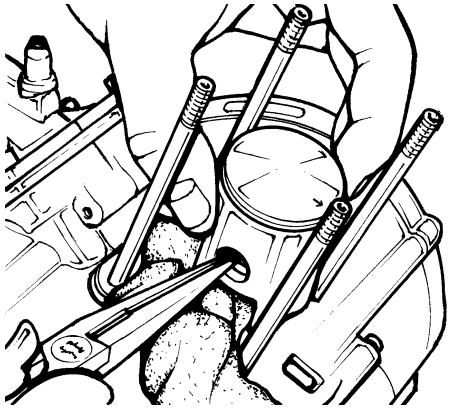
IMPORTANT: Remember that the piston rings must be fitted with the rounded edge facing the piston pin.



Before reassembling the cylinder head unit, check that the piston pin roller cage is in good condition. Fit the piston so that the arrow on the piston top faces the exhaust, then fit the piston pin and its retaining circlips taking care not to drop them into the crankcase.

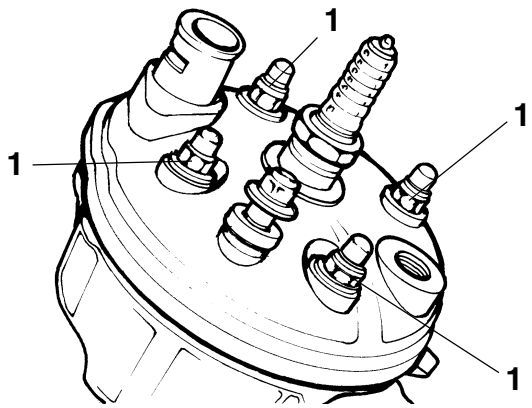
IMPORTANT: Before proceeding to the assembly, thoroughly clean all the components with a low-flash solvent, then lubricate the parts with oil for fuel mixture (see table of lubricants).

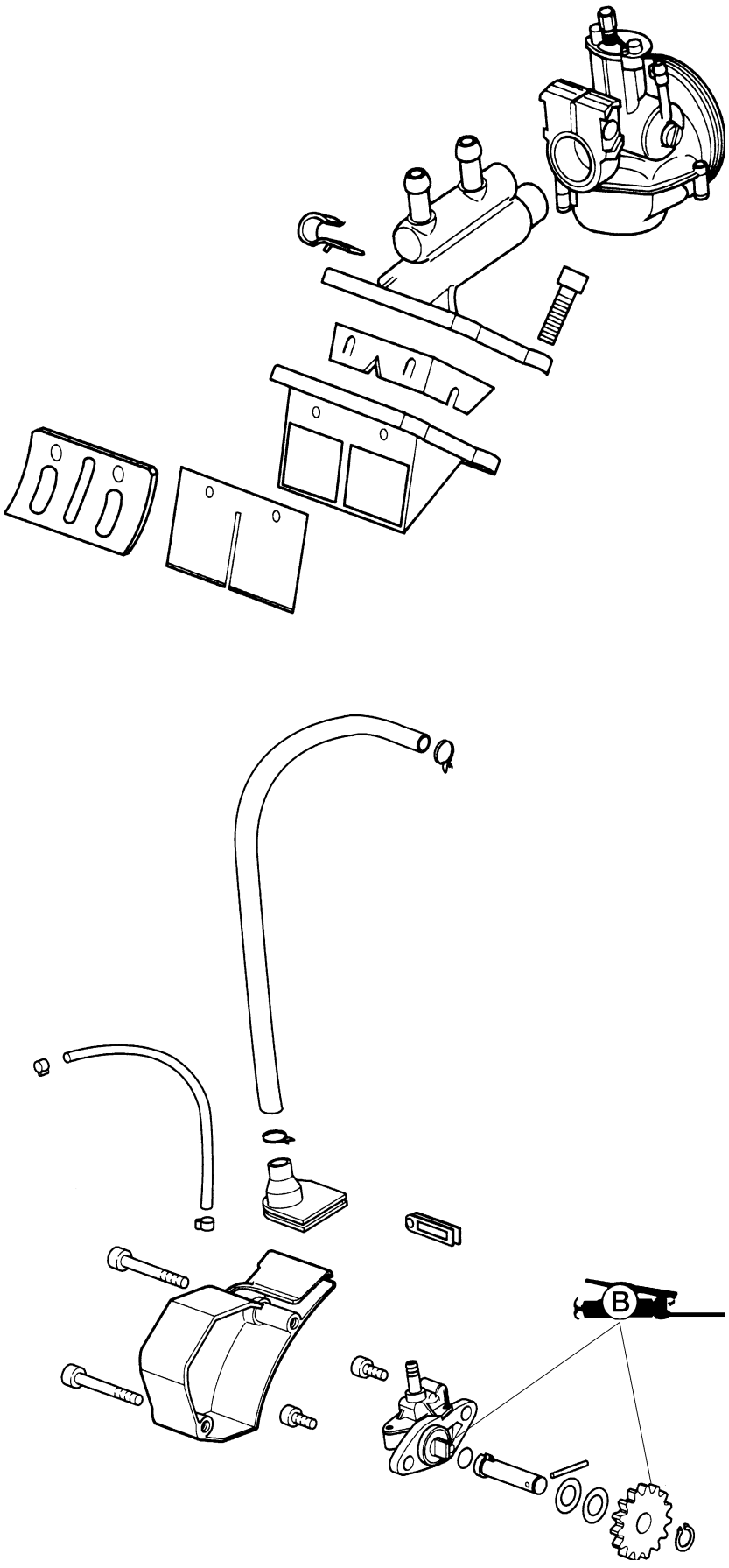
⚠DANGER : To avoid inhaling toxic fumes, always operate in well-ventilated places.



Fit a new gasket on the cylinder, the cylinder, a new central O-Ring, new O-Rings in the studs, a new O-Ring on the head, the head (remove any carbon formation first), lock diametrically opposed nuts (1) in an even manner, checking that the O-Ring on the head has been correctly positioned.

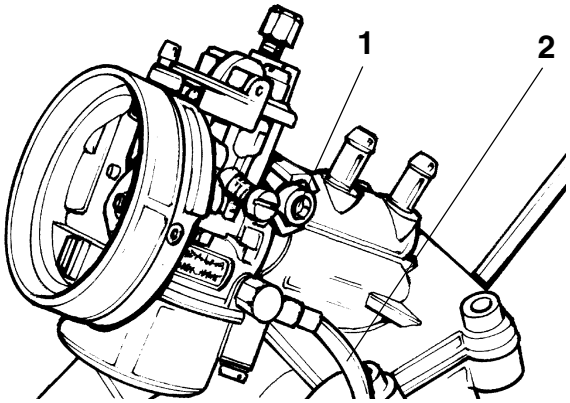
Tightening torque: **14 ÷ 16 Nm**




B

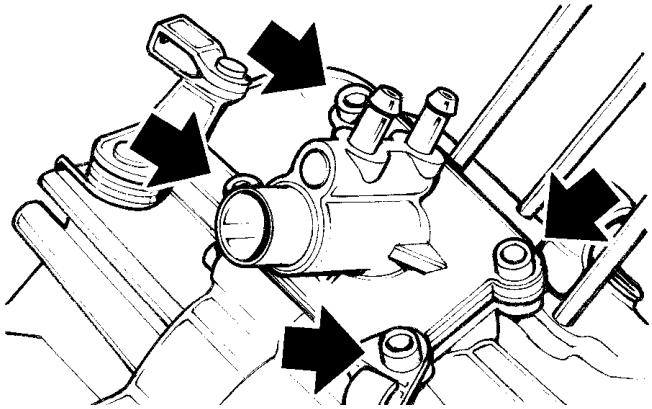
Removing the carburettor

Remove the fixing screw (1) shown in the figure and the related nut, then detach the oil feed pipe (2)q and remove the carburettor.



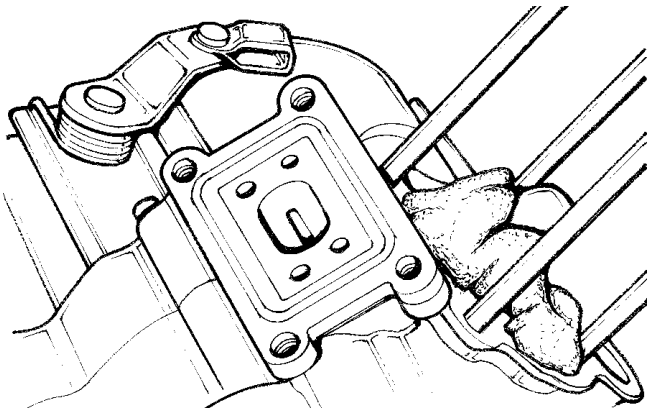
Removing the intake manifold

Loosen the four screws shown in the figure, remove the clutch cable bridge and pull off the manifold.



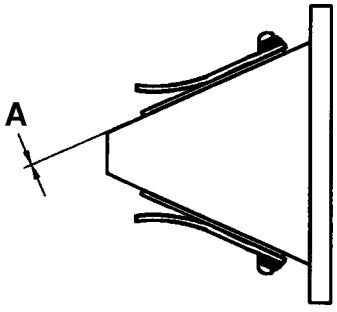
Removing the reed valve unit

Remove the reed valve unit and insert a cloth in the intake slot so as to prevent foreign bodies from entering and hindering the operation of the mechanisms.

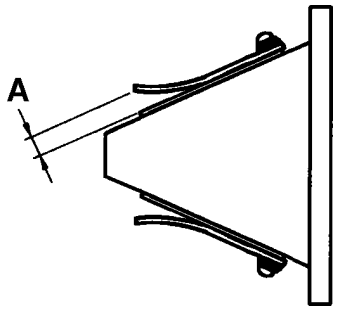


Checks

Measure the bending limit (A) of the reed valve. If it falls outside the tolerance range, replace the valve.
Bending limit: 0.1 - 0.7 mm.



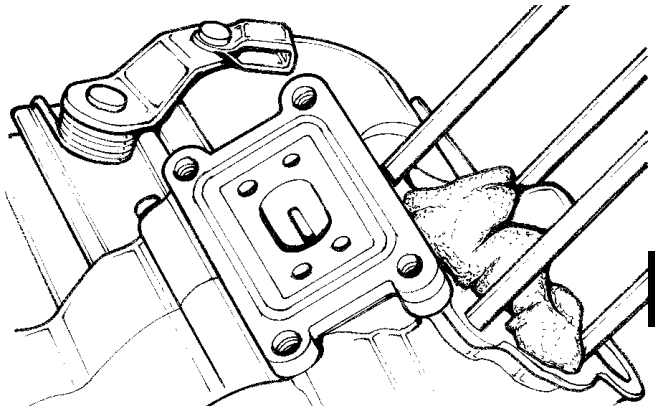
Measure the height of the reed valve stops (A). If it is outside the tolerance range, replace the stops.
Reed valve stop height: 9 mm ± 0.3 mm.



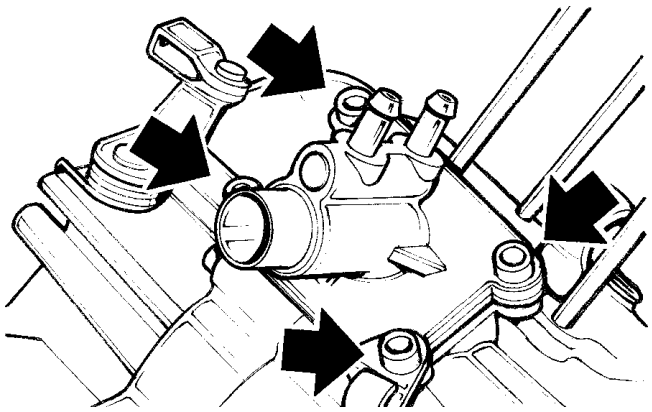
⚠ CAUTION : Never attempt to repair the reed valve or its support.

Fitting the reed valve unit

Replace the reed valve unit after removing the cloth that had previously been inserted into the intake slot to prevent dirt from getting in.



Fit the intake manifold and fasten it with the fixing screws after inserting the clutch cable bridge. Tighten the 4 screws in a progressive and crossed way.

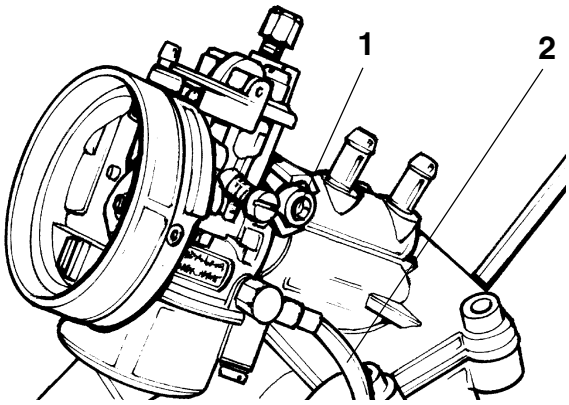


Tightening torque: **9÷11 Nm**

Fitting the carburettor

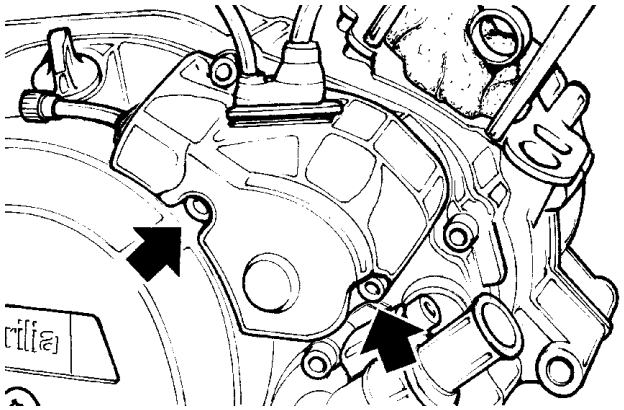
Fit the carburettor to the manifold and fasten it using the relevant screw (1) and nut.

IMPORTANT: Connect the oil delivery pipe (2) again.

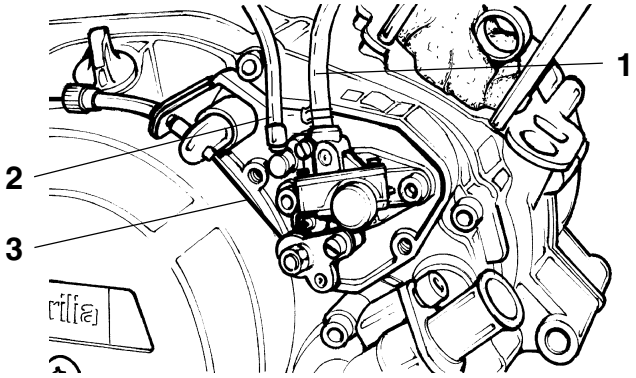


Removing the oil mixer

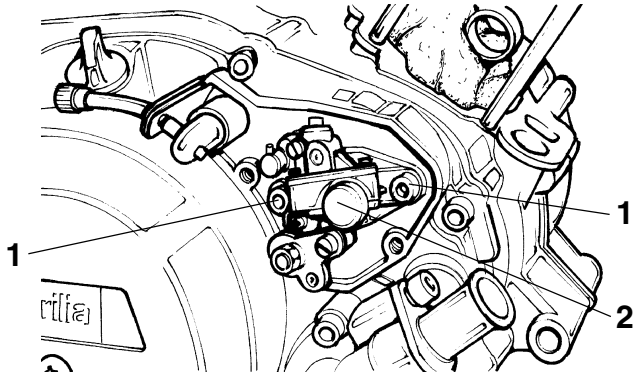
Loosen the two screws shown in the figure, and remove the oil pump cover.



After removing the clamp, detach the line that feeds oil to the pump (1) and stop it to prevent the oil from coming out. Detach the pipe that feeds oil from (2) the pump to the carburettor.
Detach the control cable (3) that is fastened to the pump lever.

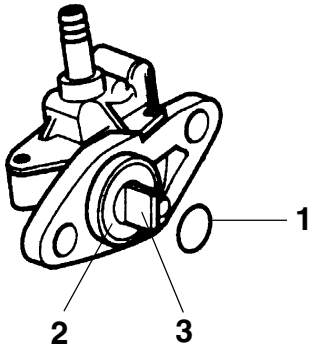


Loosen the two fixing screws (1), take off the oil pump (2), and then remove the O-ring.



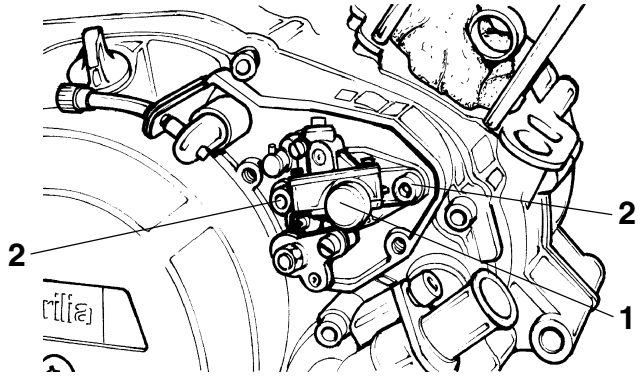
Checks

Check that the pump oil feed line and the carburettor oil feed pipe are not damaged. Ensure that neither pipe contains air bubbles.
Replace the O-ring (1) and the oil seal (2), and check the condition of the drive pin (3).



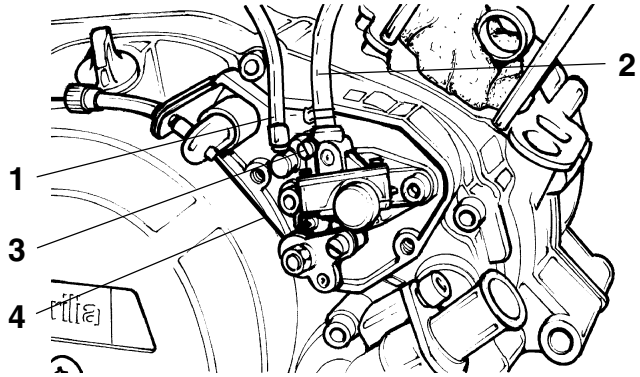
Fitting the oil pump

Replace the oil pump (1) and screw (2) it to the crankcase.



Fit the carburettor oil feed pipe (1) and ensure that there are no air bubbles. Also fit the line that feeds oil to the pump (2), and then fasten both pipes with the related clamps.

IMPORTANT: When working on the oil pump, air bubbles may enter and remain in the pipes and the pump itself, and subsequently hinder lubrication while the engine is running. Therefore it is important to bleed the pump by means of the screw shown in the figure before running the engine.

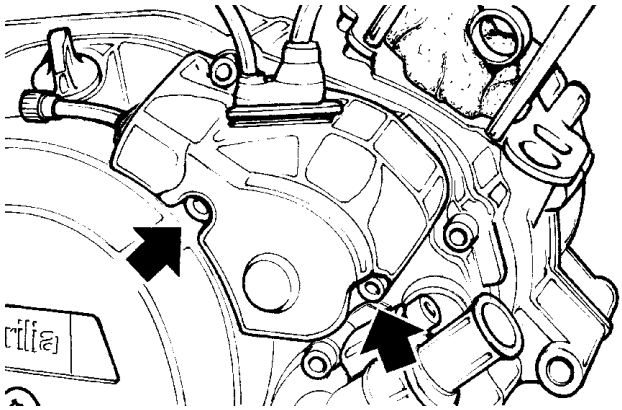


Remove the bleeding screw (3) from the pump and allow the oil and any air bubbles to come out. When the oil starts flowing out with no bubbles, the bleeding is complete and the screw can be retightened.

⚠ 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.

Refit the control cable (4) on the pump lever checking that the closed position of the accelerator cable on the knob is aligned with the two reference marks. If not, use the register to adjust.

Replace the oil pump cover and fasten it using the two fixing screws.

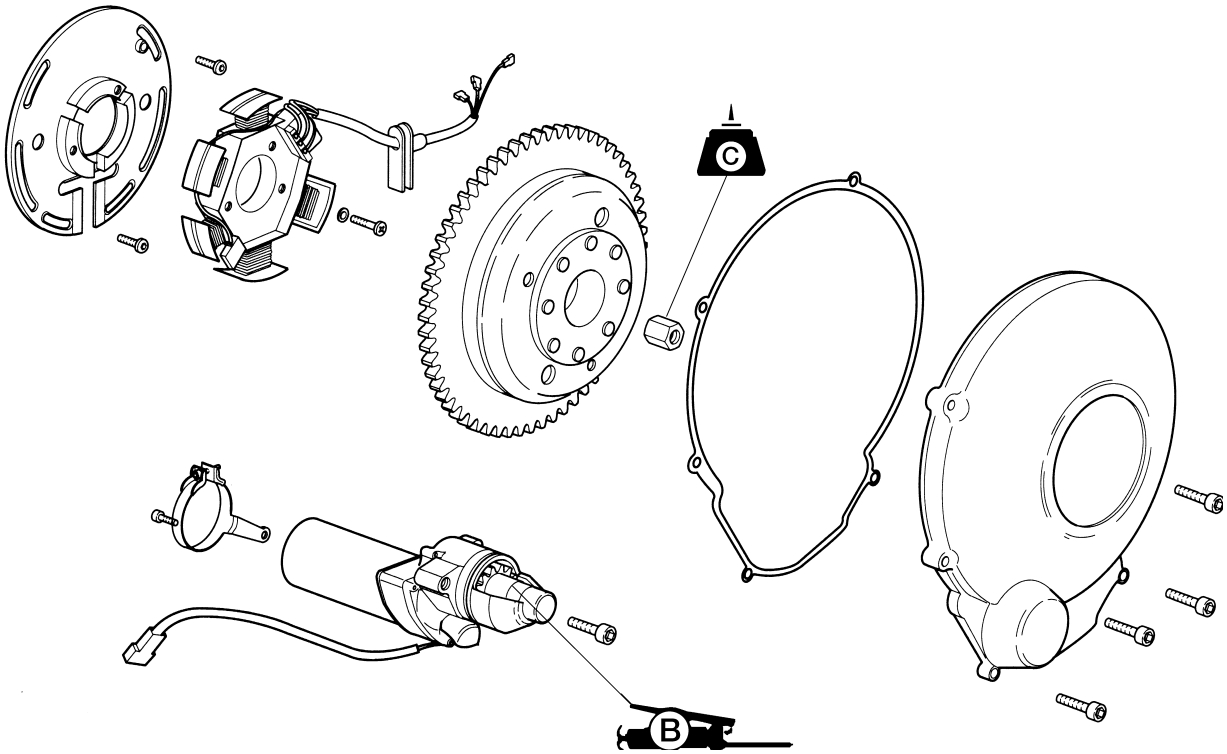


⚠ DANGER : To avoid serious skin damage due to prolonged contact with oil, accurately wash the hands after handling the lubricant.

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

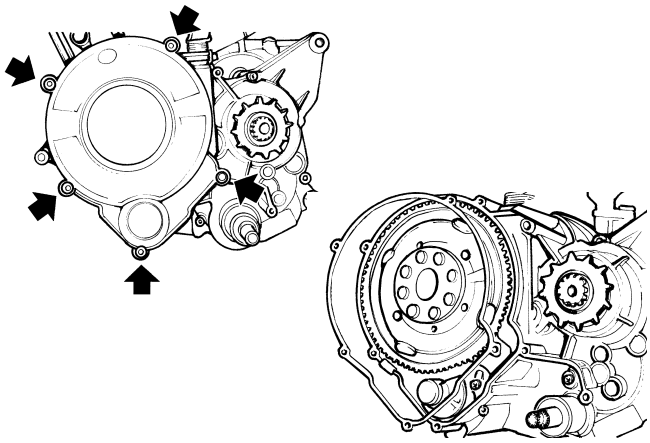
KEEP OUT OF REACH OF CHILDREN

NOTES


C
B

Removing the flywheel cover

Remove the five screws shown in the figure, take off the flywheel cover and carefully remove the cover gasket. Check the condition of both the cover gasket and the flywheel cable rubber.

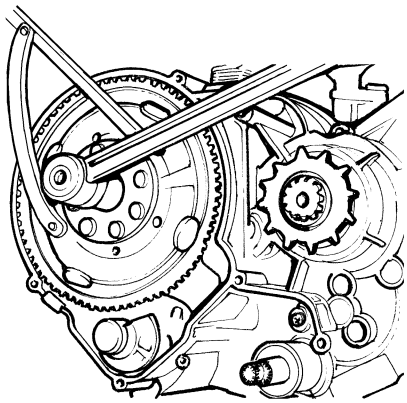


Removing the flywheel

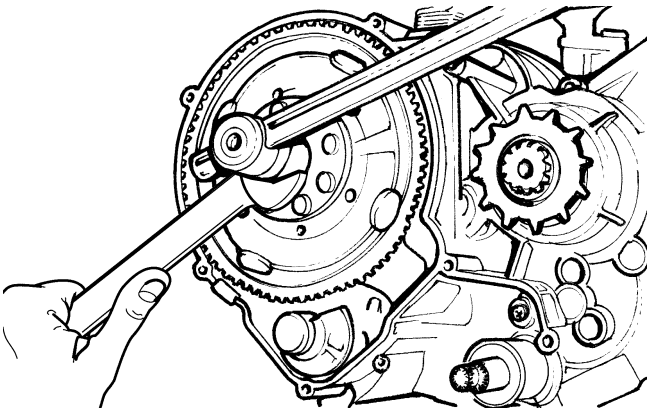
Lock the flywheel magneto rotor using the special tool and undo the fixing nut with a 15 mm spanner.

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

Flywheel locking tool: 8106702

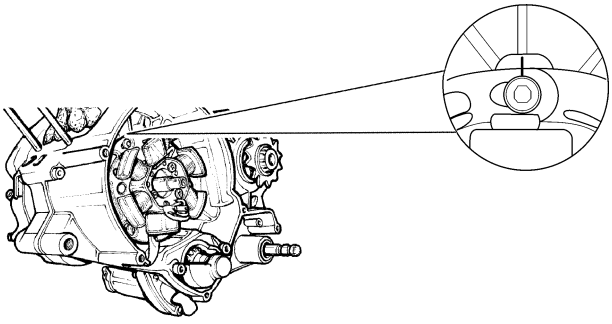


Remove the flywheel magneto rotor using an extrator with suitable dimensions, screw it in the rotor's threaded seat, keep it into place with a spanner and act on the central screw with a 17 mm spanner.

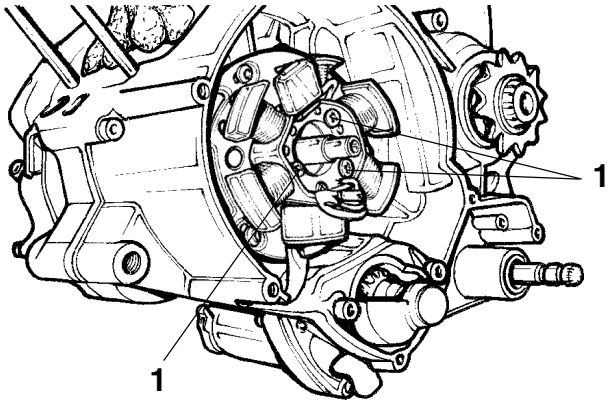


Removing the stator

IMPORTANT: Before removing the stator, make two reference marks on the crankcase and the stator plate so as to ensure proper reassembly.



After removing the three stator fixing screws (1), remove the stator plate, and then the key.



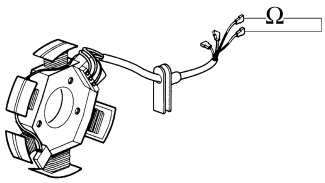
Flywheel checks

Check the mechanical condition of all flywheel components. Check the wear condition of the ring gear, the tongue seat and the tongue groove on the crankshaft. Replace any worn-out component.

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

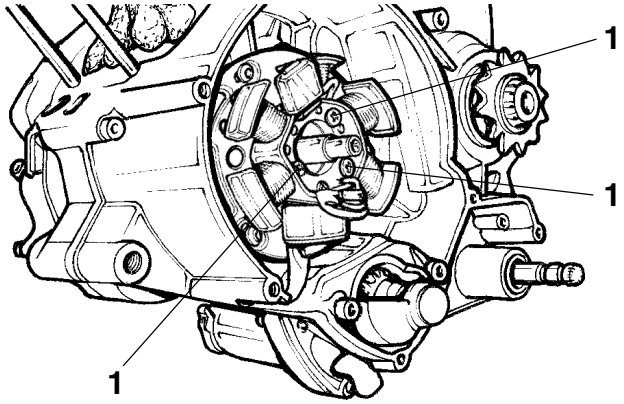
Checks	Cables colour	Value
Pick-up	R-B	125 Ω ± 15 Ω
Loading coil	V-B	730 Ω ± 35 Ω
Generator coil	G-B	0 Ω

B = White
G = Yellow
R = Red
V = Green



Fitting the flywheel

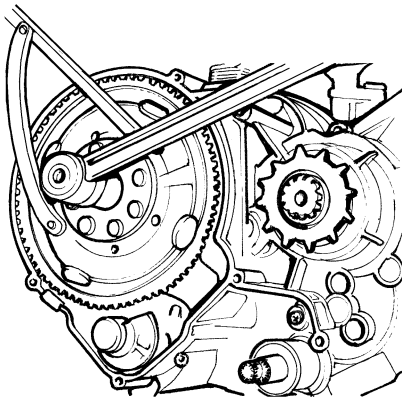
Fit the stator plate aligning it with the reference marks. Fit the flywheel magneto key, insert the stator cables in the rubber on the crankcase, fit the stator into its housing and lock the fixing screws (1). If a new plate or a new block is installed, check the ignition timing (see chapter 2).
Tightening torque of stator plate screws: **3 ÷ 4 Nm**
Tightening torque of stator screws: **3 ÷ 4 Nm**



Fit the rotor and lock it.

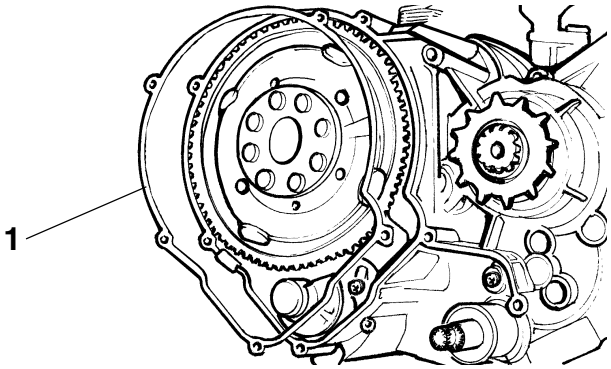
⚠ CAUTION : Since the flywheel locknut is tightened with a considerable torque, caution should be exercised in order to prevent injury.

IMPORTANTE: Apply thread locking compound Loctite (see Lubricants table) before locking the nut.

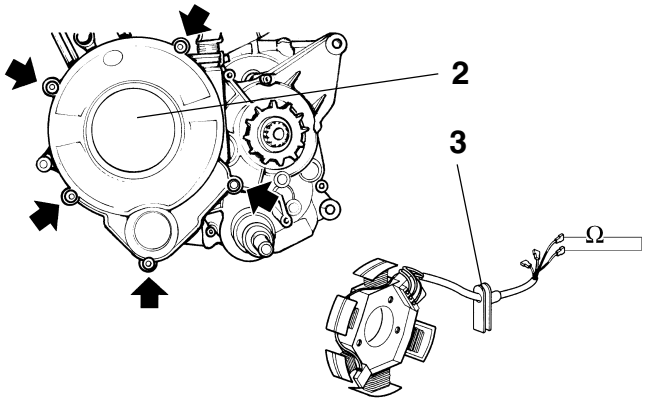


Fitting the flywheel cover

Refit the gasket (1), the flywheel cover (2) making sure to properly refit the flywheel cables rubber (3) in its housing. Tighten the screws shown in the figure.

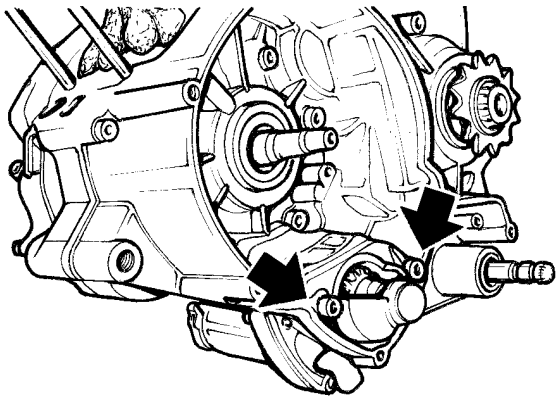


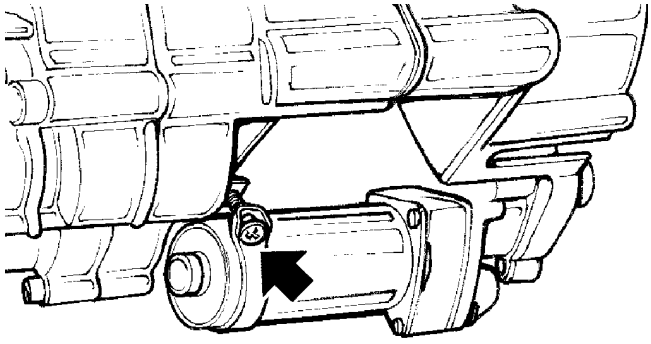
Tightening torque: **1 ÷ 2 Nm**



Removing the starter motor

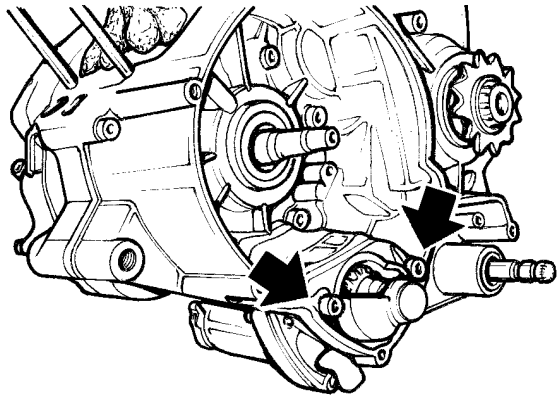
In case of the starting motor failure, check the electrical connections and adjust if necessary.
Remove the two screws positioned under the cover of the left-hand crankcase half and the screw that fixes the bracket at the back of the starter motor.



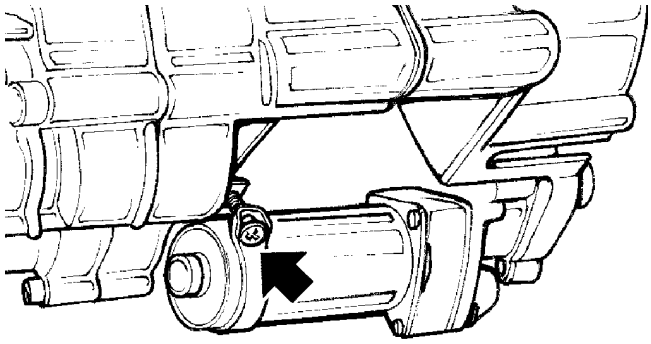


Fitting the starter motor

Ensure that the O-ring is properly seated in its groove, apply a thin film of special grease for oil seals, then refit the starter motor and fasten it using the fixing screws.

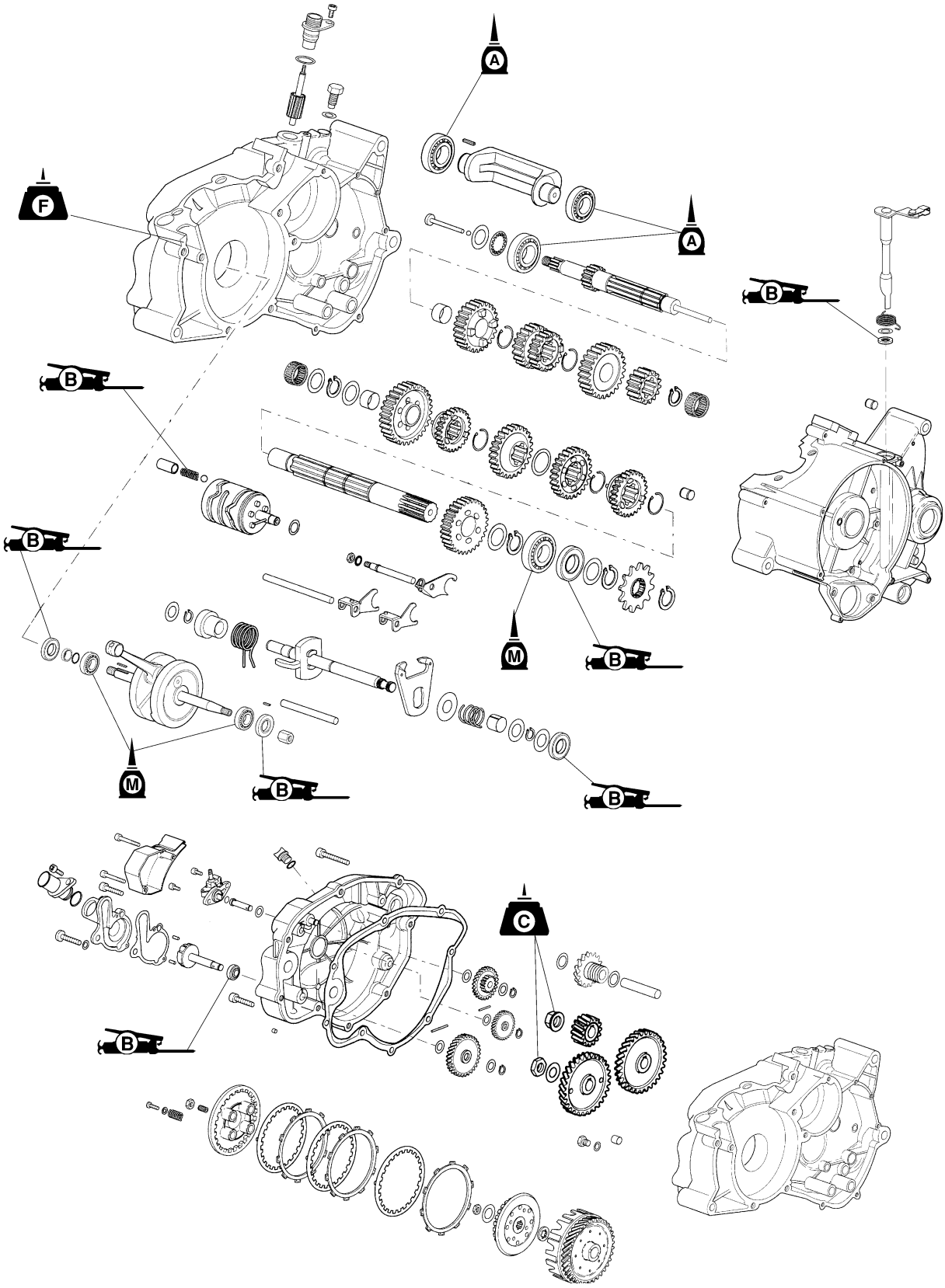


Tightening torque: **5 Nm**



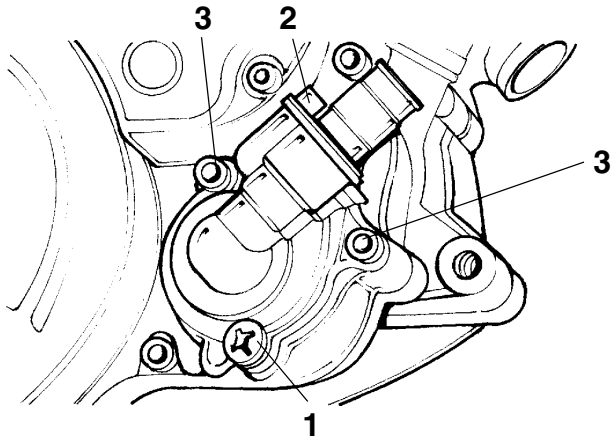
5

NOTES


A
A
F
B
B
B
M
B
M
B
B
C
B

Removing the water pump

Drain the cooling system by unscrewing the drain screw (1). Unscrew the screw (2) and remove the water sleeve. Unscrew the three screws (3) and remove the pump casing paying attention to the two dowels (4, shown in the figure below).

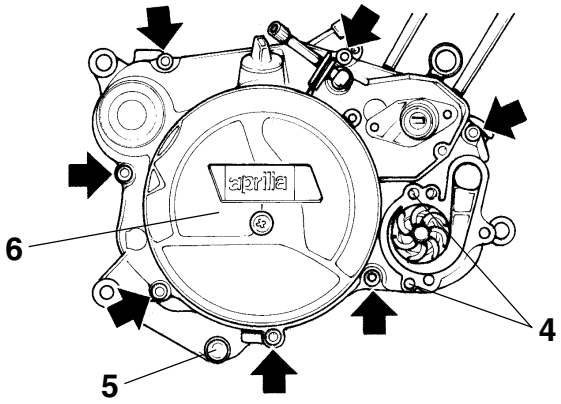


Removing the clutch cover

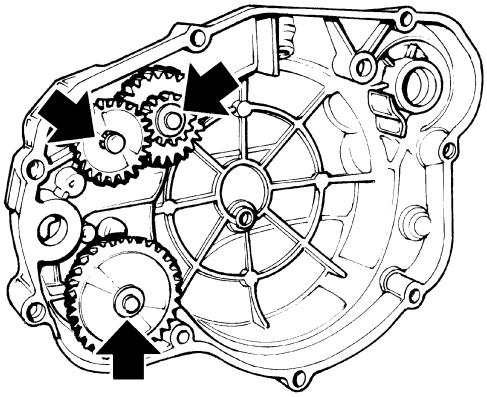
Remove the bleeding screw (5) and the washer shown in the figure, and then drain all the oil.

⚠ CAUTION : Used oil contains substances that are dangerous to the environment. Dispose of used oil without causing harm to the environment and in compliance with the regulations in force. Engine oil can seriously damage the skin if handled daily for a long time. It is therefore recommended that operators carefully wash their hands after handling oil. When handling products with a base of petroleum, it is strongly recommended to wear disposable latex or nitrile gloves.

Loosen the seven fixing screws and remove the clutch cover (6) and the related gasket.

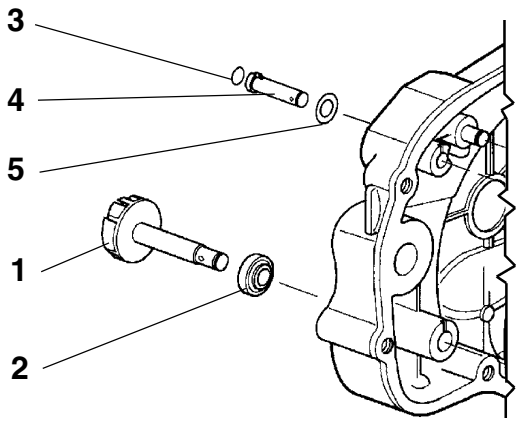


Remove the seeger circlips of the three plastic gears from the clutch cover. Remove the gears, taking care to make a note of the positions of the various washers.



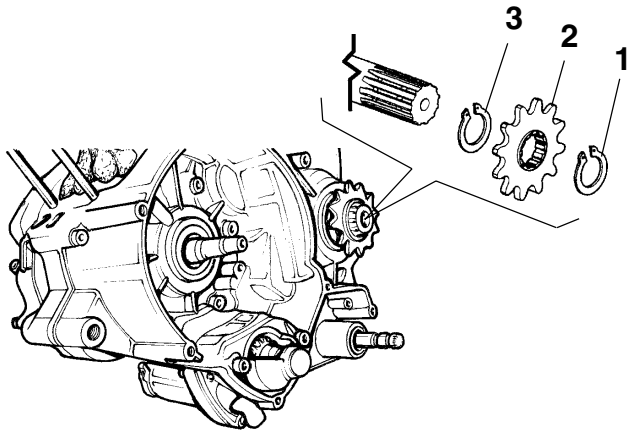
Remove the water pump impeller (1) and the relevant oil seal (2).

Remove the O-Ring (3), the oil pump pin (4) and the related shim (5).



Removing the pinion

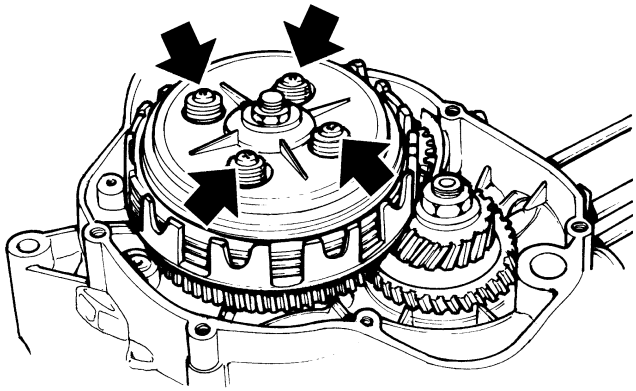
Remove the seeger circlips (1) with a pair of ring pliers. Pull off the pinion (2) by hand, and remove the seeger circlip (3) underneath.



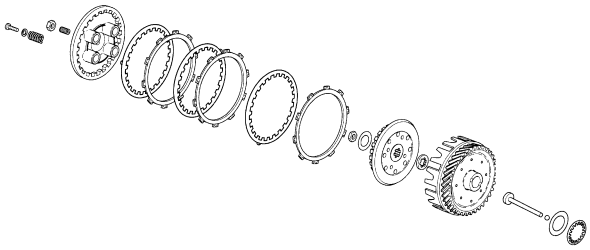
⚠ CAUTION : The pinion may have very sharp edges. Special care should be taken to prevent hand injury while removing it.

Disassembling the clutch

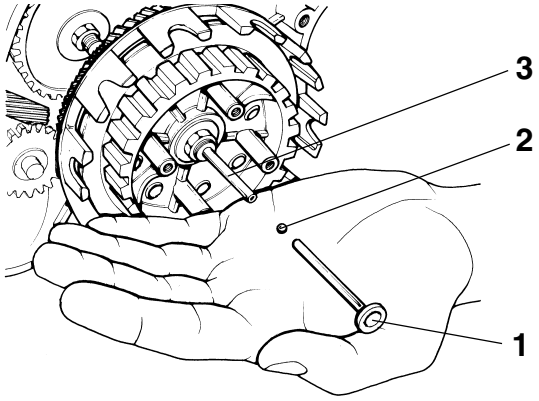
Loosen the screws that compress the clutch springs, then remove the clutch plate and the whole set of discs.



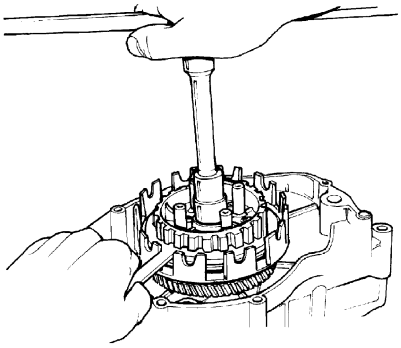
⚠ CAUTION : When disassembling the clutch, pay special attention to the relative positions of the components to ensure that they are reassembled properly.



Remove the push rod (1), the ball (2) and the second push rod (3) from the central hole in the gear driving shaft.



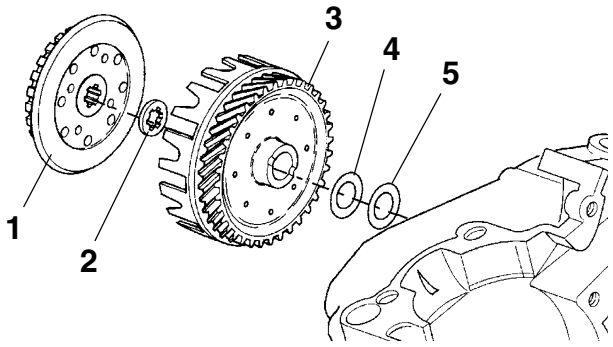
Straighten the tongue of the locking plate under the clutch drum locknut.
Using the specially designed retaining spanner and a 17 mm T wrench, completely unscrew and remove the clutch drum locknut.



⚠ CAUTION : Since the clutch locknut is tightened with a considerable torque, caution should be exercised in order to prevent injury. Also make sure that the clutch retaining spanner does not damage the clutch drum.

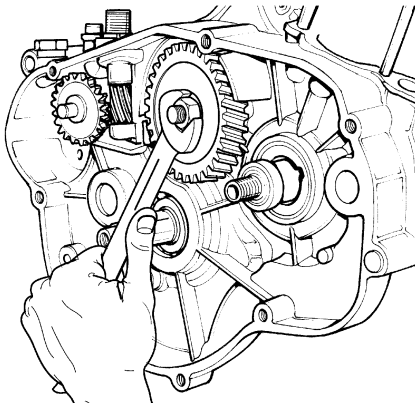
Clutch bell housing fastening tool: 8201527

Remove in the following order the clutch drum (1), the spacer (2), the clutch gear (3), the thrust ring (4) and the coned washer (5), paying attention to the way it is fitted to be able to replace it properly.



Removing the countershaft

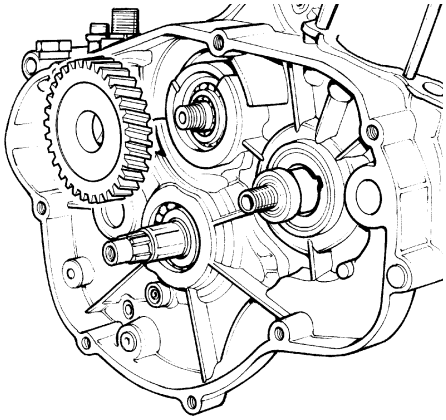
While holding the flywheel magneto with the specially designed retaining spanner, loosen the countershaft locknut with a 17 mm spanner.



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

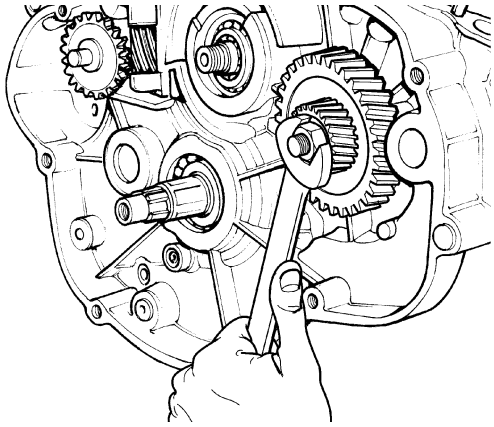
Flywheel locking tool: 8106702

Remove the gear from the countershaft with the related key.



Removing the drive pinion

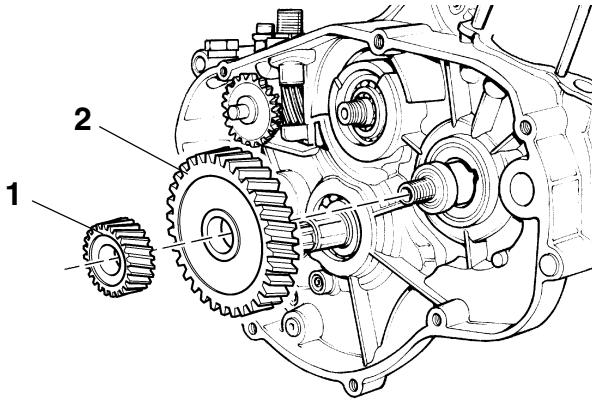
Unscrew the nut using a 19 mm spanner while holding the flywheel with the specially designed spanner.



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

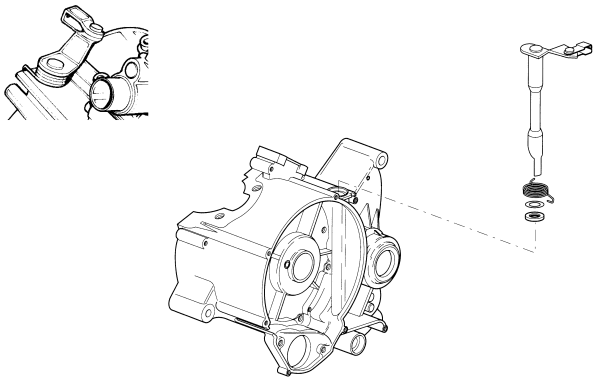
Flywheel locking tool: 8106702

Remove in the following order the drive pinion (1), the countershaft driving gear (2), the key, the spacer bush and the O-ring.



Clutch control lever

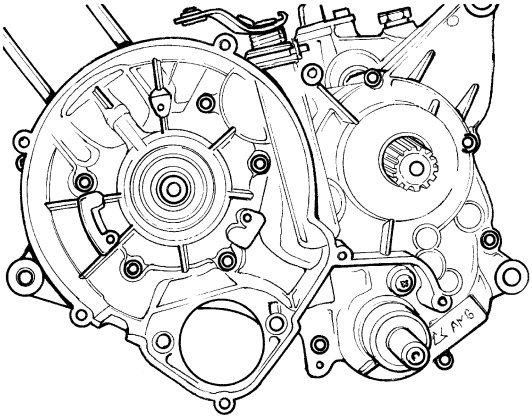
Remove the clutch lever assembly, the return spring, the washer and the oil seal.
When reassembling, fit a new oil seal using the specially designed tool.



Clutch lever oil seal drift: 8201530

Disassembling the crankcase

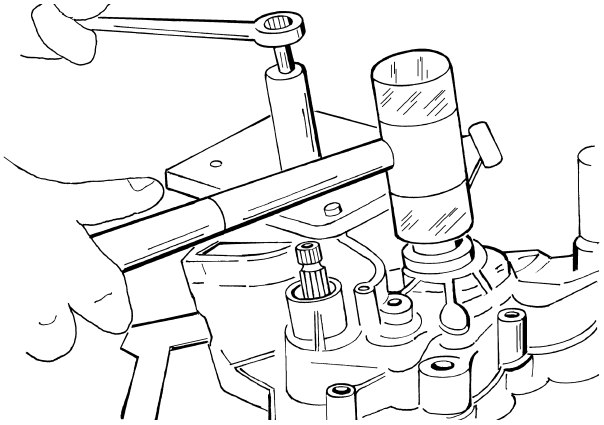
Remove the 13 screws joining the two crankcase halves.



To separate the two crankcase halves, use the specially
designed extractor on the left-hand side, and tap with a wooden, leather, rubber or plastic mallet alternately on the selector shaft and on the drive axle so as to obtain gradual and parallel removal of the crankcase halves.

IMPORTANT: Make a note of the thickness of the thrust rings that are fitted to each shaft. Ensure that no rings are left in the crankcase half that has been removed.

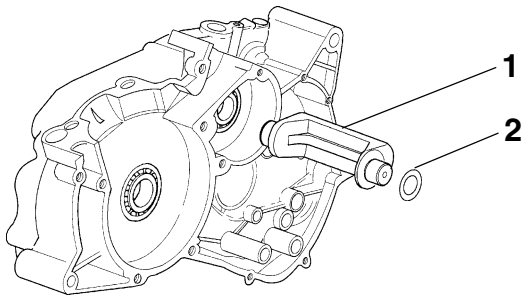
Connecting rod assembly extractor: 8201525



Countershaft disassembly

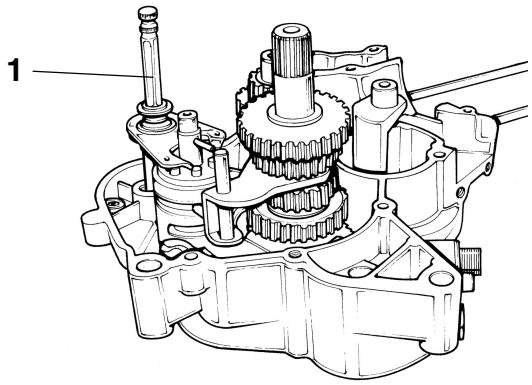
Separate the two crankcase halves to remove the countershaft (1) and its shim (2).

IMPORTANT: remove the countershaft bearing on the flywheel side using a suitable extractor after having heated the bearing housing to ~ 70 °C.



Removing the selector shaft

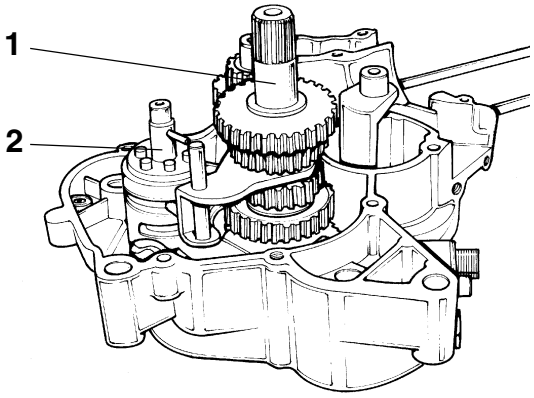
Remove the selector shaft (1) and its lower thrust ring.



Removing the driven shaft

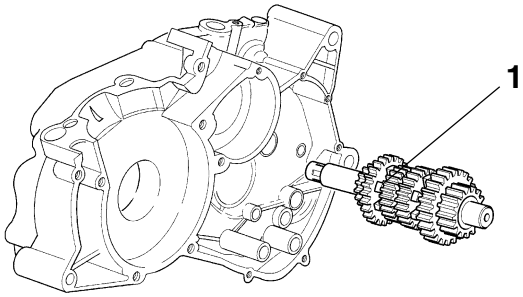
Remove the driven shaft (1) along with the shift cam (2) and the shift forks. Subsequently remove the lower washers after slightly lifting the driving shaft.

⚠ CAUTION : Remove the gear indicator ball and spring located under the desmodromic shaft.



Removing the driving shaft

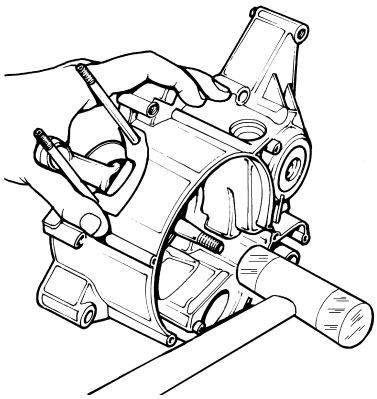
Remove the driving shaft (1) using a wooden, leather or plastic mallet, and taking care not to damage the thread.



Removing the crankshaft

Remove the crankshaft assembly from the crankcase half on the clutch side tapping with a plastic or rubber mallet, taking care not to damage the thread.

⚠ CAUTION : The bearings should be removed from their housings only when they need to be replaced. To replace the bearings, use drifts with suitable diameters to drive the bearings onto the crankcase by applying pressure to their outer rings.
Otherwise, use the provided extractor to remove the bearing from the driving shaft.



Crankshaft bearing extractor: 8140152

IMPORTANT: Before driving a bearing, it is advisable to heat its housing to approximately 75° C.

Preliminary operations

Wash the two crankcase halves and the bearings with a low-flash solvent, then blow them with compressed air.

IMPORTANT: make sure that the bearings do not turn whilst being blowed with compressed air in order not to damage them. Inspect the bearings by turning the inner ring. The irregular rotation or resistance may be due to the presence of dirt. Wash the bearings with a liquid detergent and dry them carefully, then check them again. Replace the bearing if the irregular rotation persists.

⚠ DANGER : Perform this operation in a well-ventilated place and away from open flames.

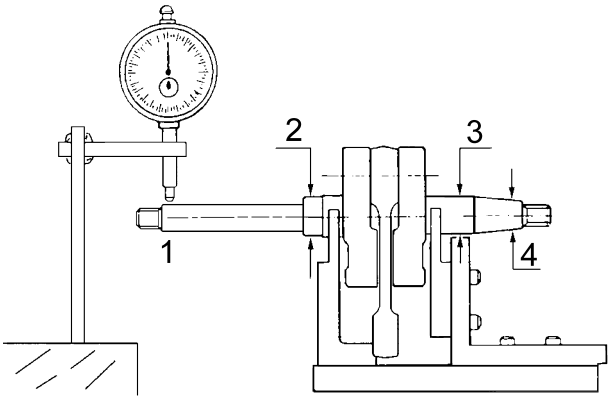
Checking the crankshaft assy and flywheel

Check the connecting rod and flywheel condition. Check if the axle shafts are worn or scored. Check the connecting rod condition by turning it on its pin. Carefully clean the component, subsequently check that it rotates freely and that the clearance is not excessive. Replace if necessary.

⚠ CAUTION : The connecting rod must only be replaced by a qualified person using special tools and a large-sized hydraulic press. DO NOT replace the connecting rod by yourself unless you have an adequate technical knowledge and the special tools needed for carrying out this operation. Apply to Aprilia's Service Center.

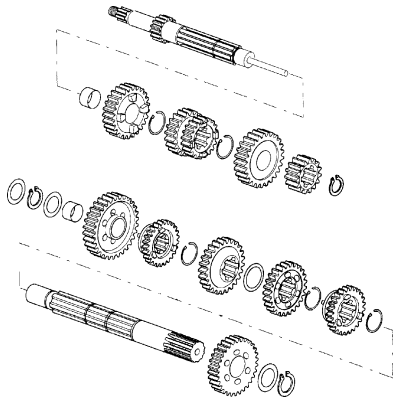
Also check that the connecting rod is not bent and that its stroke is at right angles to the axle shafts. Measure out the eccentricity of the two axle shafts as shown in the figure, with the aid of a series of V-shaped blocks or the flywheel control support.
Limit of eccentricity: 0.04 mm

Align the axle shafts if this value is exceeded. To carry out this operation, apply to Aprilia's Service Center.



Disassembly of driven and driving shaft gears

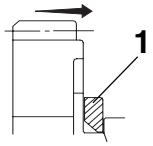
Remove the snap circlips taking care to mark down the position of the shims and gears. Check if the pin clutches are worn, chipped or rounded. Replace if necessary. Check the gears regular sliding.

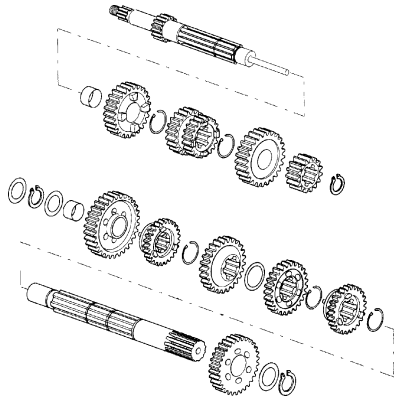


Reassembly of driven and driving shaft gears

Lubricate all the components and then refit them.

⚠ CAUTION : Always use new snap circlips (1) and assemble them with the sharp edge, on the opposite side to the maximum stress direction, as shown in the figure.

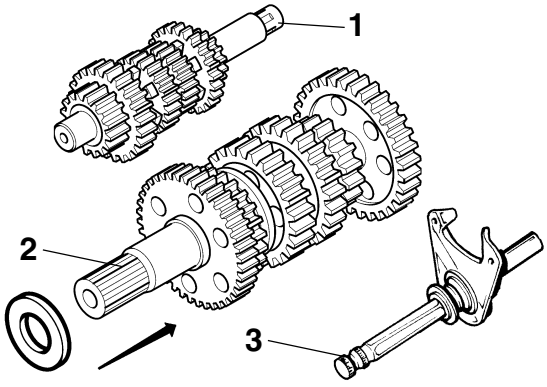




Checking the end play

Place the shaft being checked into its seat respecting the shims position. Tighten the two crankcase halves with at least 6 screws. Measure the end play with the aid of a comparator and moving the shaft manually. Carry out the measurement at the threaded end (1) of the driving shaft and at the splined end (2) of the driven shaft and selector shaft (3). If the play exceeds the specified value, compensate by fitting washers with suitable thickness during the assembly.

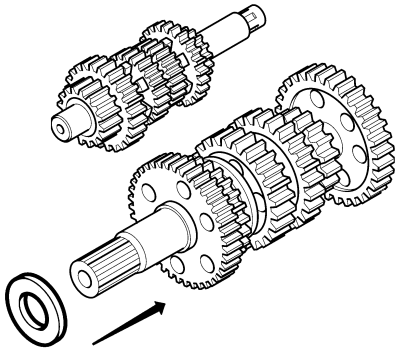
Driving shaft end play: 0.5 mm
Driven shaft end play: 0.5 mm



Checking the gear shaft

Check that the gear shaft is in good condition and fit the washers according to the position marks. If replaced, check that it is assembled in the same way as before.
Driving shaft end play: 0.5 mm
Driven shaft end play: 0.5 mm

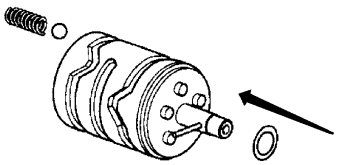
To check the end play, see section “Checking the end play”.



Checking the desmodromic shaft

Measure the distance of the desmodromic shaft thrust ring on both the crankcase and the part, and compensate for the difference by fitting a shim washer as shown in the figure.

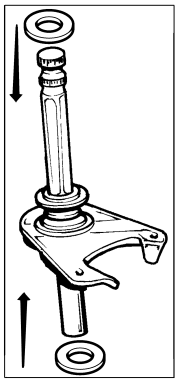
End play (without spring and ball): 0.1 ÷ 0.2 mm

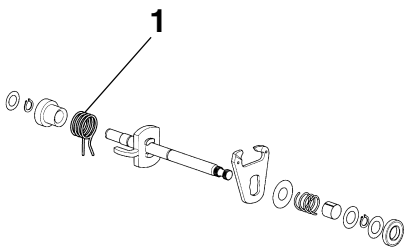


Checking the selector shaft

Measure the distance of the selector shaft thrust rings on both the crankcase and the part, and compensate for the difference by fitting shim washers as shown in the figure. Check the operation of the return spring (1).
Selector shaft end play: 0.5 mm

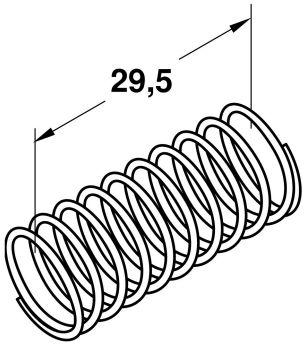
To check the end play see section “Checking the end play”.





Checking the clutch

Verify the operation of the clutch unit. Check the condition of the iron discs and ensure that the driving notches on the cork discs are not excessively distorted, and that their covering shows no signs of burns. Make sure that the grooves in the clutch drum and the slotted holes in the clutch bell housing are not excessively dented. Also check that the free length of the clutch springs is not less than 29.5 mm. Replace as necessary.

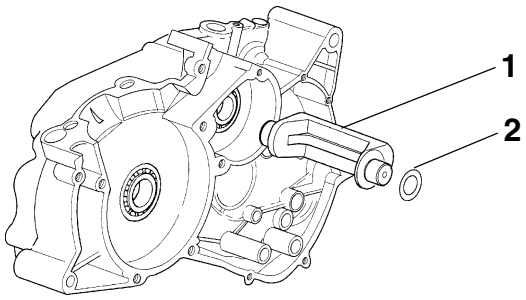


Checking the gear shaft bearings

Check the regular turning of the gear shaft bearings. Replace if necessary using pads of suitable dimensions.

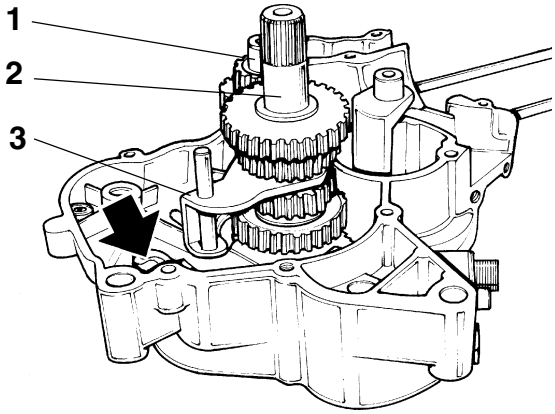
Fitting the countershaft

Fit the countershaft (1) in the crankcase (right side) and slip on the shim washer (2).

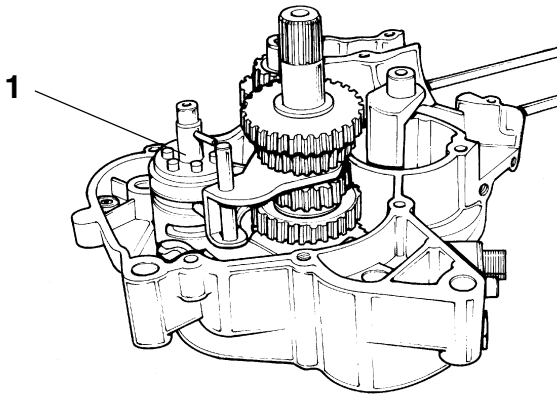


Assembling the transmission components

Place the clutch-side (right) half crankcase on a support, then fit the spring and the gear indicator ball in their housing (see figure) after smearing them with a little grease so as to prevent them from coming out. Fit the thrust ring (0.6 mm in thickness) on the driven shaft (1). Apply a little grease to the ring to keep it in contact with the low gear. Fit the driving (2) and driven shafts (1) together and position the fork on the former (3). Place the assembly in the crankcase.

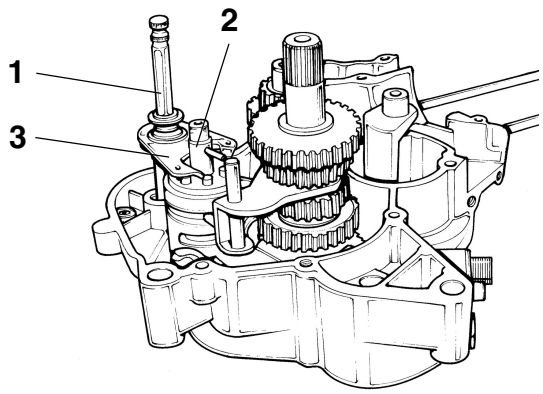


Fit the desmodromic shaft (1).
Fit the fork in the sliding of the 2nd and 3rd gear along with its guide pin.



Assembling the selector unit

Fit the selector unit with the lower washer (0.6 mm in thickness) and insert the return spring lips into the securing bridge.
Check that, when the selector (1) and desmodromic shafts (2) are pressed all the way, the lips of the control fork (3) must be flush with the cam upper surface. If not, change the lower washer of the selector shaft with another of suitable
thickness and compensate for the change by replacing the upper one
so as to keep the distance of the thrust rings unchanged.

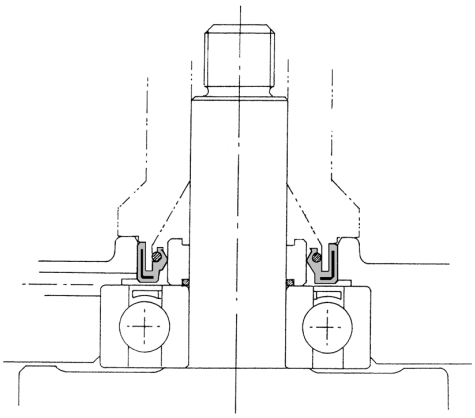


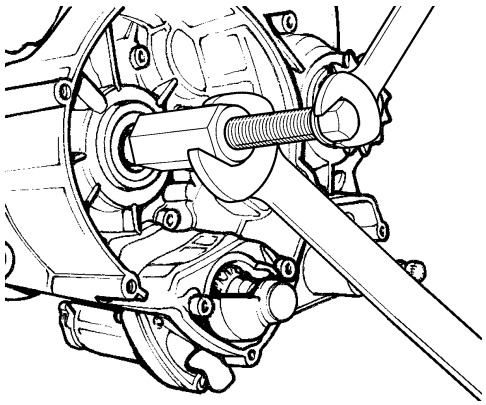
Also check that, when the desmodromic shaft is positioned on the 2 nd gear, the cam rollers are at equal distances from the fork lips. If not, gently distort the spring ends until the desired situation is obtained.

Checking the gear shaft operation

Mate the two crankcase halves by tightening at least three screws facing each other. Check that the shifting sequence is correct.
The gearshift must operate smoothly.

Fitting the connecting rod assembly





Fit the two crankshaft oil seals using the specially designed drifts.
Connecting rod assembly drift, clutch and flywheel sides: 8201531
This operation can also be performed before reassembling the transmission. This approach prevents the gears from being displaced by any impact occurring during the fitting of the oil seals.
IMPORTANT: On motors produced as of 1995, the oil seal on the clutch side must be fitted in the opposite direction (see figure).
Refit the new O-Ring into the seat obtained in the driving shaft, and then fit the new spacer.
Fit the crankshaft in the crankcase (left side) using the relevant tool. While holding the connecting rod at the TDC with a 13 mm spanner, tighten the nut with a 27 mm spanner until the crankshaft assembly comes into contact with the bearing. To make the fitting easier, heat the crankcase half using an automatic heater up to a temperature of about 90 ÷ 100 °C.

⚠ CAUTION : Oil generously to protect the crankshaft against scoring and make the fitting easier.

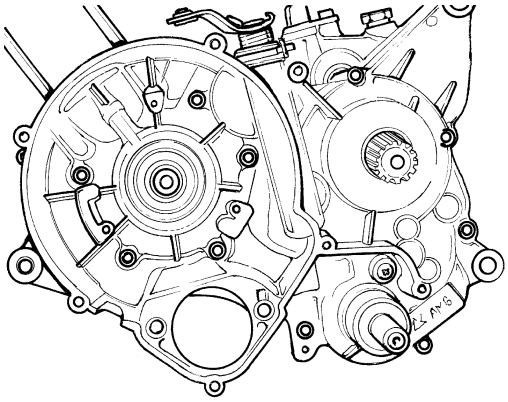
Connecting rod assembly fitting tool: 8201526

Assembling the crankcase

Make sure of the presence of the thrust rings.
Apply liquid seal over the mating surfaces of the crankcase halves and oil the shafts. Fit the left-hand crankcase half on top of the other and tap gently with a wood and leather or plastic mallet until the mating is complete.
Fit new oil seals.

Oil seal drift, clutch side: 8201531

Fit the 13 screws. Screw in evenly, starting from the central screws and proceeding outwards. Fully tighten pairs of diametrically opposed screws so as to uniformly join the two crankcase halves.
Check that all the shafts can move freely. If not, hammer them in an axial direction, allowing them to slump.
Check that no shafts have an excessive end float. In that case, open the crankcase and change the upper shim washer with a suitable one.



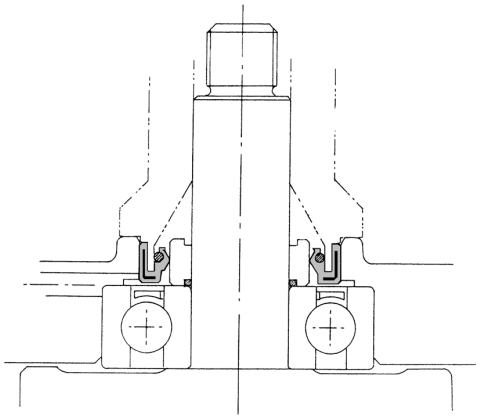
Tightening torque: **10 ÷ 12 Nm**

Fitting the oil seals on the driven and selector shafts

Fit the two oil seals using the provided pads. Abundantly lubricate the oil seal seats and proceed with caution. Check that the oil seal seats of the crankcase have no burrs or deep indentations that may compromise the seal.

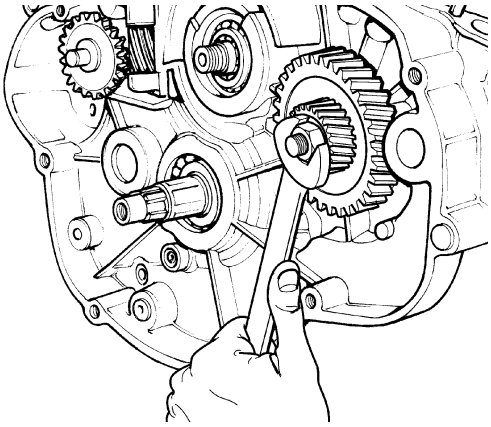
IMPORTANT: The ends of the driven and selector shafts have very sharp edges. If an oil seal should come into contact with them, it would certainly get damaged.

Selector shaft oil seal drift: 8201528



Assembling the gear and pinion

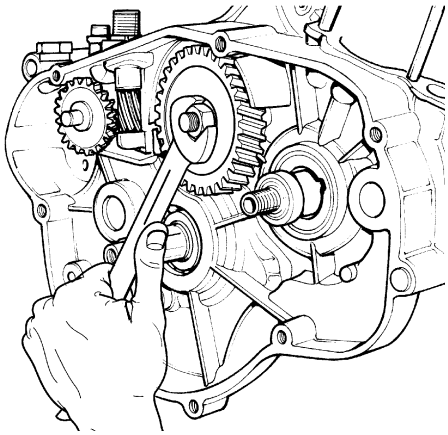
Check if the pinion and the gear are worn. If either of the gears needs to be changed, it is advisable to replace both of them. This will ensure better performance and noiseless operation.



Fitting the countershaft gear

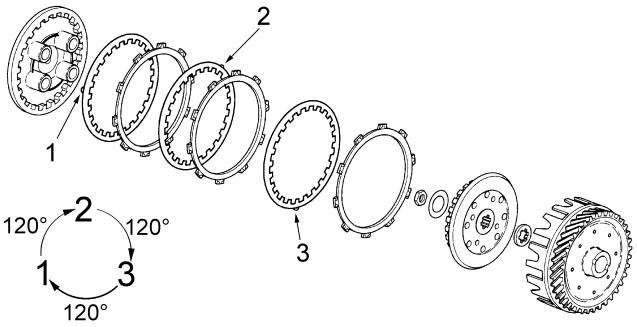
Fit these parts on the crankshaft in the following order: oil seal, O-ring, collar, key, countershaft drive gear, main drive gear and nut. Tighten it with the magneto flywheel locking spanner).
Fit the key and the balance gear on the countershaft taking care to align the reference marks on the two gears and using the flywheel magneto locking spanner. Apply thread locking compound Loctite (see Lubricants table) and then fit the drive gear.

Tighten the pinion nut with a torque of **67 ÷ 75 Nm**
Tighten the gear nut with a torque of **45 ÷ 50 Nm**



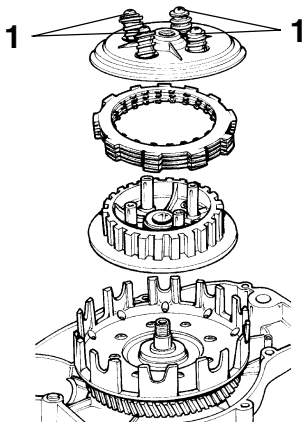
⚠ CAUTION : Since the pinion locknut is tightened with a considerable torque, caution should be exercised in order to prevent injury.

Assembling the clutch



Using the reverse procedure to engine disassembly, reassemble the clutch unit taking care to replace the washer provided with a nut locking tongue. Fit the clutch drum locknut, tighten it and then bend the tongue. Fit the clutch rod, the ball and the pressure plate.
Fit the drum and the clutch discs following the order shown in the figure.

⚠ CAUTION : The iron discs must be so positioned that the notches indicated by the arrows are rotated 120° with reference to one another, the notch on the first disc facing upwards to ensure a proper balancing, therefore avoiding anomalous vibrations.

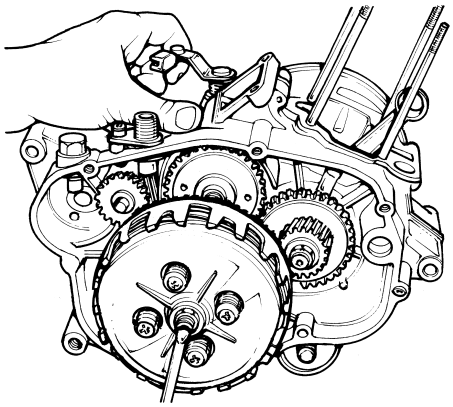


Fit the clutch plate taking care to align the reference marks.
Fit the springs and the spring fixing screws (1), and then tighten them.

Tightening torque: **55 ÷ 60 Nm**
Tightening torque: **3 ÷ 5 Nm**

Lock the clutch bell housing using the tool: 8201527

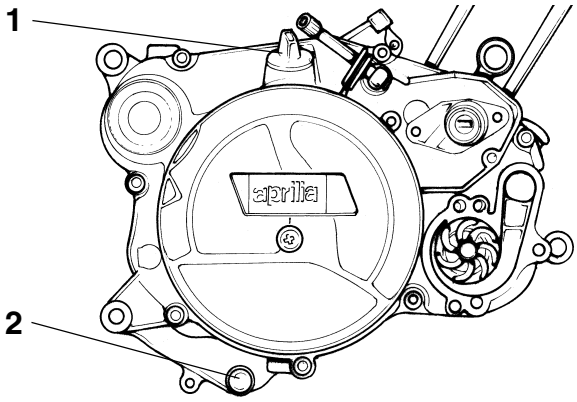
Checking the clutch position



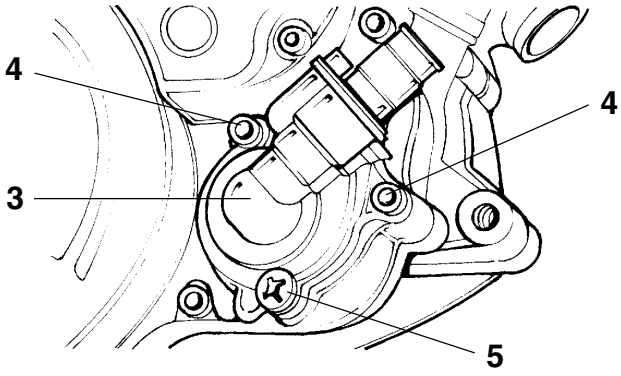
The clutch is properly positioned when the lever is parallel with the cover rest surface.
To obtain this position, use the adjuster located on the end disc and an adequate screwdriver.

Tightening torque: **26 ÷ 28 Nm**

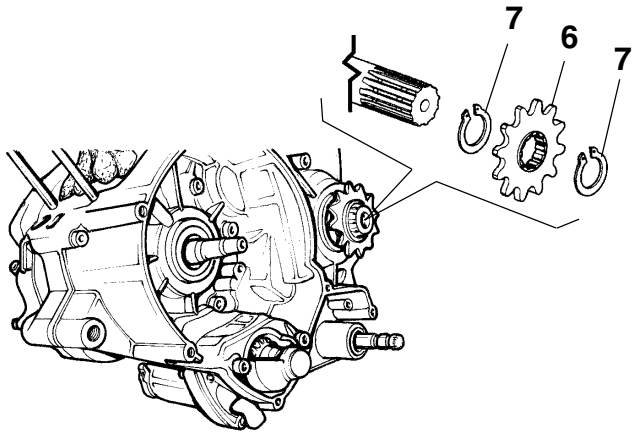
Fitting the clutch cover parts



Using the relevant drift, fit the water pump oil seal. Abundantly lubricate the oil seal seat.
Using the reverse procedure to the disassembly, replace the pump impeller, the water and oil pump gears, and the related washers. Use new seeger rings.
Fit a new gasket on the crankcase, the clutch cover and fasten with the screws.
Refit the oil drain screw (1), replace the gasket with a new one.
Pour oil in the engine (0,750 kg.) through the top hole (2).
Tighten the cover screws with a torque of: **10 ÷ 12 Nm**
Tighten the oil drain screw with a torque of: **17 ÷ 18 Nm**
Water pump oil seal drift: 8201529



Be careful not to damage the water pump and the mixer gears whilst refitting.
Fit the water pump cover (3) and fix it with the three screws (4), using a new gasket.
Refit the water drain screw (5) replacing the gasket with a new one.
Tighten the cover with a torque of: **4 ÷ 6 Nm**
Tighten the drain screw with a torque of: **4 ÷ 6 Nm**



Fit the pinion (6) and the two circlips (7) chain transmission side.

IMPORTANT: Whenever a new pinion is required, it is advisable to replace the gear and the chain as well.

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