



# SERVICE STATION MANUAL

## • Engine 500 cc

Piaggio & C. S.p.A.  
Pontedera  
After Sales Service  
Dis. 594766 - 04/01

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We decline all liability for the use of non-original spare parts or accessories that have not been tested and/or approved.

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# SERVICE STATION MANUAL

## X9 500 cc

This manual has been prepared by Piaggio & C. S.p.A. for use in the workshops of authorised Piaggio dealers and sub-agents.

It is assumed that the person utilising this manual for servicing or repairing Piaggio vehicles has a knowledge of the principles of mechanics and standard procedures for vehicle repair. Any important changes in vehicle characteristics or specific repair operations will be divulged by means of updates to this manual.

Satisfactory repair or service cannot be achieved without the necessary equipment and tools. Refer to the pages of this manual concerning specific tools and equipment and the special tools catalogue.

Critical information in the manual is indicated as follows.

**N.B.:** Important information for facilitating and explaining a procedure.

**Warning** - Procedures that must be followed to avoid damage to the vehicle.

**Caution** - Procedures that must be followed to eliminate the risk of injury to repair / service personnel.

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**GENERAL INFORMATION AND  
MAINTENANCE**

**1**



### Safety prescriptions

- If the work to be carried out requires the vehicle engine to be running, make sure the workshop is well ventilated and use proper exhausters. Do not run the engine in closed places. Exhaust fumes are toxic.
- Battery electrolyte contains sulphuric acid. Protect the eyes, clothes and skin. Sulphuric acid is highly corrosive, if it comes into contact with eyes or skin, wash the affected area abundantly with water and seek immediate medical assistance.
- The battery produces hydrogen gas which is potentially explosive. Do not smoke near the battery and keep naked flames and sparks well clear, especially when the battery is on charge.
- Petrol is highly flammable and can be explosive in certain conditions. Do not smoke in the work area and do not introduce naked flames or sparks.
- Clean brake shoes, drums and pads in a well ventilated place. When using compressed air direct the jet away from you to avoid inhaling the dust. Although the brake linings are asbestos-free, inhalation of the resulting dust is harmful.

### Maintenance regulations

- Use only genuine PIAGGIO spare parts and recommended lubricants. The use of non-original or non-conforming spare parts can cause damage to the vehicle.
- The only specific tools that can be used are those expressly designed for this vehicle.
- Always fit new gaskets, seal rings and split pins when reassembling parts.
- After disassembly, clean parts with non-flammable solvent or a solvent with a high flash point. Lubricate all surfaces before reassembly with the exception of conical couplings.
- After reassembling, check that all the components are correctly installed and that they work perfectly.
- Use only metric tools for disassembly, assembly and maintenance work. Metric screws, nuts and bolts cannot be interchanged with BS components. The vehicle may be damaged if unsuitable tools or nuts, bolts or screws are used.
- When working on the electrical system, ensure electrical components are correctly installed, paying particular attention to ground and battery connections.

**Specifications (500 cc 4-stroke, 4-valves H<sub>2</sub>O engine)**

**ENGINE**

Type ..... single-cylinder, 4-stroke  
 Bore ..... 92 mm  
 Stroke ..... 69 mm  
 Displacement ..... 460 cm<sup>3</sup>  
 Compression ratio ..... 10.5 : 1  
 Timing ..... chain-operated overhead single-shaft flywheel side, integrated phonic wheel, 4-valves and automatic starting valve lifter

Valves play: intake ..... 0.15mm  
 exhaust ..... 0.15mm

Valves play adjustment ..... threaded register on equalizers

Idle speed ..... 1450±50 rpm  
 CO% value ..... 1±1.5%

Starting system ..... electric starter

Lubrication ..... trochoid pump (inside the crankcase), oil filter and pressure adjustment by-pass

Lubrication pressure ..... 4 bar  
 Minimum allowed pressure (at 100°C) ..... 0.8 bar

Fuel system ..... electronic injection with electric fuel pump, throttle body Ø 38mm and single injector

Max power (at crankshaft) ..... 29 kW (39 CV) 7250 rpm  
 Max torque (at crankshaft) ..... 40 N·m (4 Kgm) 5500 rpm

Cooling system ..... liquid, by means of motorized pump, 3-way thermostat and electric fan.

Transmission ..... automatic speed variator by means of expanding pulleys, V-belt, automatic clutch, reduction gear, and transmission compartment cooling by air forced-circulation.

Ignition type ..... high efficiency inductive type integrated with injection, variable spark advance and separated high voltage coil

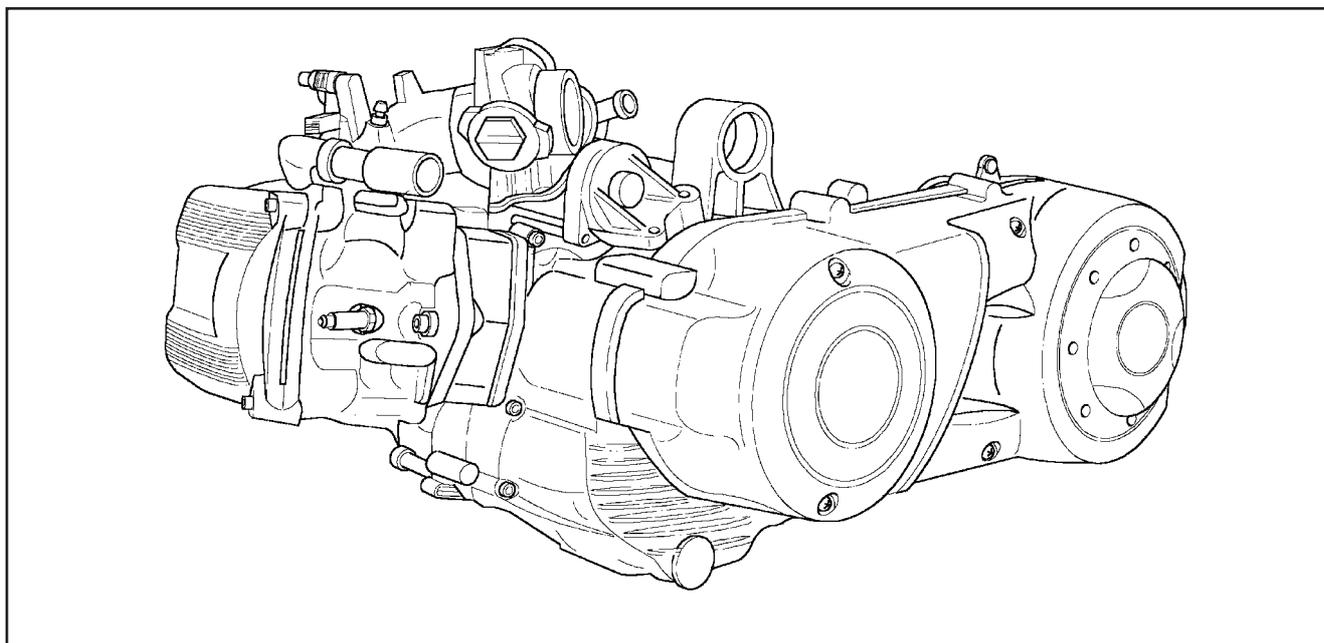
Spark advance (before T.D.C.) ..... variable controlled by injection power unit

Spark plug ..... CHAMPION RG 6 YC  
 NGK CR7 EKB

Engine-wheel ratio ..... short: 1/11.988  
 long: 1/ 4.86

Engine oil ..... SAE 5W/40 exceeding API SJ specifications

Quantity ..... ~ 1.7 l  
 Hub oil ..... TUTELA ZC 90  
 Quantity ..... 250cc  
 Cooling system capacity ..... ~ 1.8 l



### Spark plug

#### Check and replacement

**Warning** - Remove the spark plug when the engine cold. Replace the spark plug every 12,000 Km. The use of unsuitable control units or spark plugs other than those specified can seriously damage the engine.

**Recommended spark plug:** **CHAMPION RG 6 YC**  
**NGK CR 7 EKB**

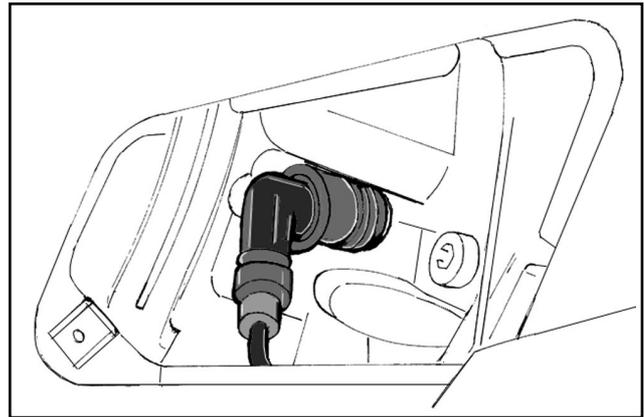
- Put the vehicle on its central stand.
- Open the door on the left side of the vehicle by levering in the recess in the lower part of the door after removing the screw.
- Disconnect the spark plug high voltage cable cap;
- Unscrew the spark plug with the spanner provided; check the spark plug to see if the insulator is cracked, the electrodes are worn out or excessively sooty. Also check the condition of the sealing washer and measure the electrodes gap with a suitable thickness gauge.

**Electrode gap: 0.7 - 0.8 mm**

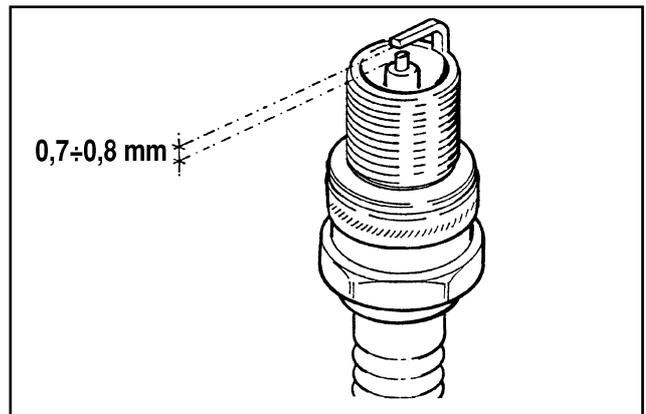
- If necessary adjust the gap by carefully bending the side electrode. If the spark plug has any of the defects mentioned above replace it with a plug of the recommended type;
- Insert the plug into the hole with the proper inclination, screw it in fully by hand and then tighten it with the specially designed spanner.

**Tightening torque: 10 N·m (1 Kg·m)**

- Push the spark plug cap all the way down onto the spark plug and then proceed to the reassembly.



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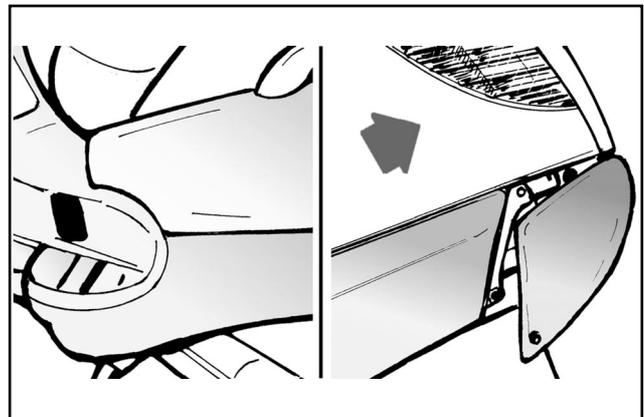


01\_002

### Air filter

- Remove the left-hand lower side panel
- Remove the cleaner cap after unscrewing the eight fixing screws, including one screw of the knob type.
- Pull out the filter element.
- Replace the air filter with a new one.

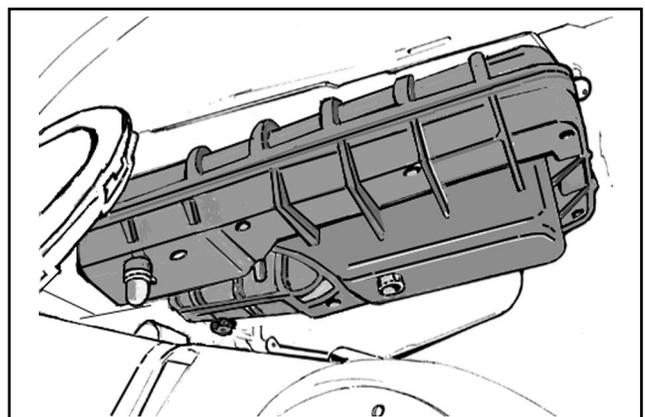
**N.B.:** Check and if necessary blow the air filter every 6,000 km. Direct the air jet from the inside to the outside of the filter (i.e. in the opposite direction to the air flow during normal engine operation).



01\_003

**Warning** - If the vehicle is mostly used on dusty roads, the air filter needs to be cleaned and replaced at shorter intervals than indicated in the Maintenance Schedule.

**Warning** - Do not run the engine if the air filter is not in place as this would result in excessive wear of the cylinder and piston as well as in damage to the throttle body.



01\_004

## Engine oil level

In four-stroke engines oil is used to lubricate the valve gear components, the crankshaft bearings and the thermal unit. **A lack of engine oil can cause serious damage to the engine.**

In all four-stroke engines, oil deterioration and consumption are, to some extent, normal, especially during running-in. Consumption partly depends on the riding style (for example, constantly riding at full throttle increases oil consumption).

### Checking the oil level

Perform this operation when the engine cold, as described below:

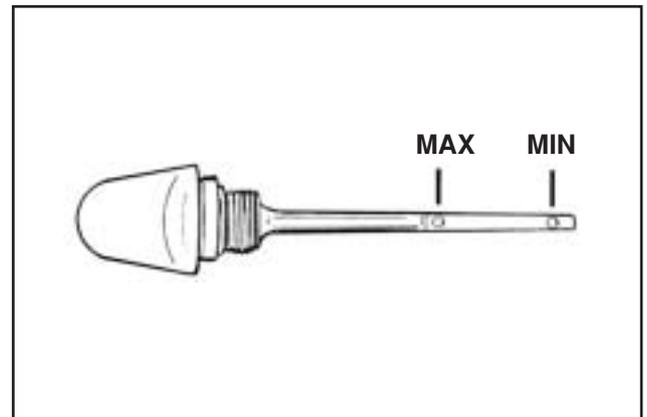
- 1) Put the vehicle on its central stand on a flat surface.
- 2) Unscrew dipstick «A», dry it with a clean cloth and refit by **screwing it completely**.
- 3) Remove the dipstick again and check that the oil level is between the MAX and MIN marks on the dipstick; top up if necessary.

When the oil level is at MAX the engine contains 1700 cc of oil.

The level will be lower if checked after using the vehicle (i.e. when the engine is hot). To obtain a correct indication of the oil level, wait for at least 10 minutes after switching off the engine.

Since a certain amount of oil remains in the circuit, the replenishment must be made by adding approximately 1,500 cc of fresh oil through cap «A». Subsequently start the engine, let it idle for a few minutes and then switch it off. After about 5 minutes, check the level and if necessary top up **without ex-ceeding the MAX level**. The filter cartridge must be replaced every time the oil is changed. For top-ups and renewals use fresh oil of the **Selenia HI Scooter 4 Tech type**.

**N.B.:** Renew the oil when the engine is hot.



01\_005

### Topping up

If the oil level is too low, top up by adding fresh oil **without exceeding the MAX level**.

Approximately **400 cc** of oil are needed to restore the level between the **MIN** and **MAX** marks.

### Oil pressure warning light

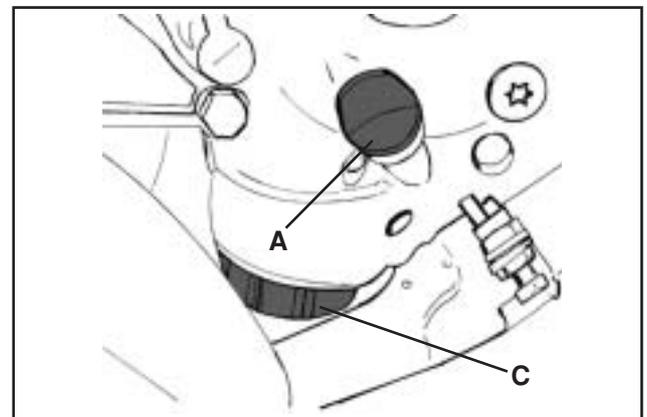
A warning light on the instrument panel comes on when the ignition key is turned to the "ON" position. The light must go out after the engine has started.

**Should the warning light come on while braking, idling or cornering, check the oil level and the lubrication system as soon as possible.**

### Renewing the oil and the filter

The oil and the filter must be renewed every 6,000 km. Drain all the oil from the engine by removing gauze strainer drain plug «B» on the transmission side. To facilitate the outflow, also remove cap/dipstick «A».

Once the oil has drained completely through the drain hole, unscrew oil filter cartridge «C» and remove it as described below.



01\_006



01\_007

### Replacing the filter

**Warning** - Do not dispose of the oil in the environment. Carry out the disposal of the oil, the gasket and the filter in accordance with the law.

**Warning** - To avoid burns, take care not to touch hot engine parts.

- Remove the silencer.
- Remove filler plug «A».
- Remove and clean the drain plug gauze strainer with compressed air.
- Using a strap wrench for filters, remove cartridge filter «C».
- Ensure that the O-rings on the prefilter and the drain plug are in good condition.
- Lubricate the O-rings and then refit the gauze strainer and the oil drain plug. Tighten the drain plug with the prescribed torque.
- Fit a new cartridge filter after lubricating the O-ring. Turn in until the gasket makes contact and then screw it with the prescribed torque.
- Reinstall the silencer.
- Add engine oil as previously described.

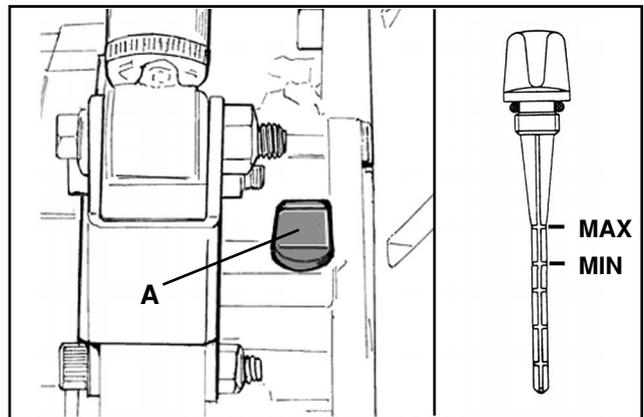
**Tightening torque:**

**Oil filter: 12 - 16 N·m**

Recommended oil: **Selenia HI Scooter 4 Tech**

### Checking the hub oil level

- Put the vehicle on the central stand on level ground.
- Unscrew oil dipstick «A», wipe it with a clean cloth, reinsert it and **then screw it in fully**.
- Pull out the dipstick again and check that the oil level is between the MIN and MAX marks (see figure); if the level is below the MIN mark, top up with oil.
- Reinsert the dipstick and screw it tight.



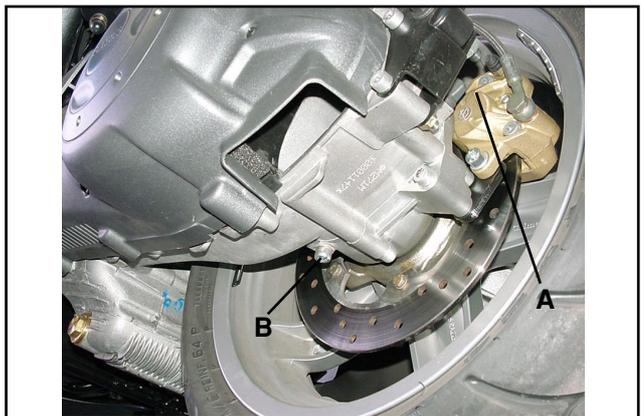
01\_008

### Renewing the hub oil

- Remove oil filler plug «A».
- Unscrew oil drain plug «B» and drain all the oil.
- Retighten the oil drain plug and then fill the hub with fresh oil.

Hub oil capacity: ~ 250 cc

Recommended oil: **TUTELA ZC 90**



01\_009

## Engine cooling

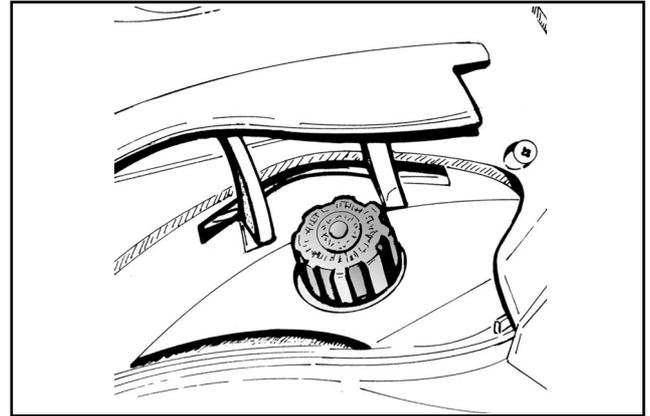
### Adding coolant and bleeding air from the system.

The level of the fluid must be checked every 6,000 km when the engine is cold.

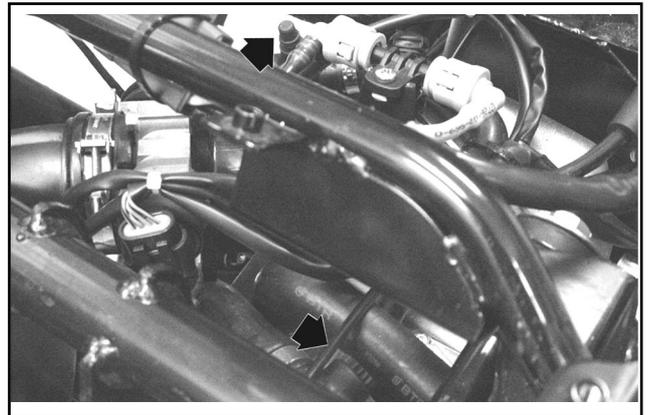
Follow these steps:

- Put the vehicle on the central stand on level ground.
- Remove the expansion tank cap and top up if the coolant is below or near the MIN level in the expansion tank. The level of the fluid should always be between the MIN and MAX marks.
- To have an indication of the coolant level, refer to the groove in the plastic strip that can be seen through the coolant filler hole. The upper and lower parts of the groove correspond to the MAX and MIN levels respectively.
- The coolant consists of a 50 percent mixture of demineralized water and antifreeze solution with a base of ethylene glycol and corrosion inhibitors.  
Total coolant capacity: ~ 1.8 lt
- To check the presence of air in the circuit follow the procedure described in Chapter 11 - Cooling.
- Switch off the engine and allow it to cool down. After a few minutes, remove the expansion tank cap and check the level of the fluid.
- If necessary, top up by pouring fresh coolant into the expansion tank up to the correct level.

**Warning** - To prevent the coolant from leaking out of the expansion tank during use, be sure to never exceed the MAX level when refilling.



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01\_011

## Water pump

If the water pump becomes noisy or liquid leaks through the pump drain hole, check the water pump as described in Chapter 5-Flywheel cover. Follow these steps:

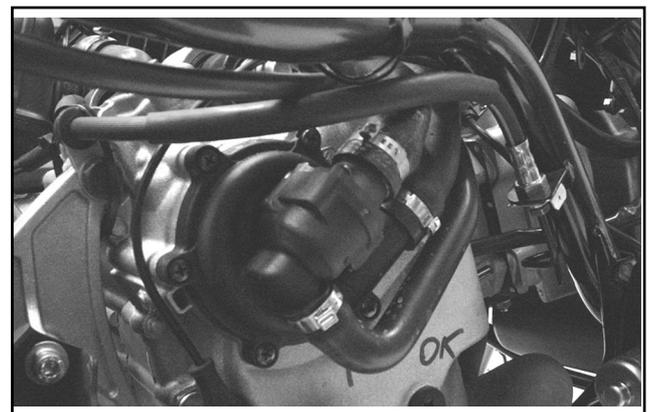
- Put the vehicle on the central stand on level ground.
- Remove the lower right-hand side panel and the right-hand footboard as described in Chapter 8-Bodywork of the X9- 500 cc manual;
- Remove the sleeves from the water pump cover and the filler cap from the expansion tank and empty the cooling circuit.
- Drain the cooling system by removing the sleeves located on the water pump cover and the plug located on the expansion tank.

**Warning** - Perform the operation when the engine is cold.

- Remove the water pump cover shown in the figure after loosening the six fixing screws.
- Cooling circuit capacity: ~ 1.8 lt.
- As described in Chapter 5-Engine of the X9 500cc manual, partially drain the system and overhaul the pump.

- After solving the problem and refitting all components, fill and bleed the cooling circuit again.

**N.B.:** Change the coolant as described in Chapter 11-Cooling.



01\_012

### Checking the valve gear timing

- With a wrench of the TORX type, remove the timing check plug located on the flywheel cover.
- Remove the transmission cover and relevant insulation as described in Chapter 3-Automatic Transmission.
- Remove the head cover as described in Chapter 7-Thermal Unit and Timing System.
- Turn the driving shaft by means of the driving pulley until the reference mark on the magneto support coincides with the mark on the flywheel cover (TDC).
- Make sure that the reference mark on the phonic wheel is aligned with the mark on the head. If necessary, turn the driving shaft accordingly.



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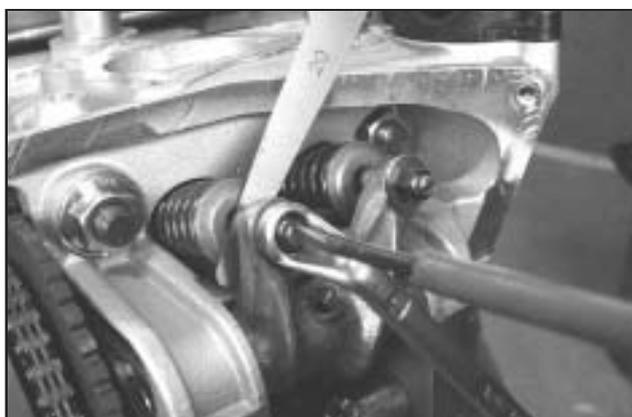
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### Valves play check/adjustment

- Check the valves play after aligning the valve timing reference marks as described in the previous section.
- Check that the valve-register play corresponds with the indicated values by means of a feeler gauge. If the valve play values, intake and exhaust respectively, do not correspond with those indicated below, adjust them by loosening the check nut and acting on the register with a screwdriver, as shown in the figure.

Intake: 0.15mm cold engine  
Exhaust: 0.15mm cold engine



05\_233

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### Checking pressure at the end of the compression

- Remove the spark plug cap with the engine cold.
- Remove the spark plug.
- Fit a compression control gauge in the spark plug seat by means of a 10mm plug connection. Tighten to the prescribed torque.
- Start the engine by means of the starting motor and with throttle body fully open until the gauge pointer stops. If the pressure is between 8 - 11 bar, remove the tool and reassemble the spark plug.
- If the measured pressure is lower than the recommended values, check the engine revs number; if it is lower than 450 rpm, check the starting system; if the revs number is correct or slightly higher, check the timing. If no troubles are found, proceed as follows:
- Check that the cylinder gasket is the right one.
- Check the thermal zone sealings (compression rings-valves).

#### Tightening torque:

**Compression test connection: 10 N·m**

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**SPECIFIC TOOLING**

**2**



## Specific Tooling

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### Specific tools for Piaggio X9 500 cc 4-stroke 4-valve

| RECOMMENDED TOOLS                                 |           |
|---------------------------------------------------|-----------|
| TOOL NAME                                         | PART NO.  |
| Circlip pliers                                    | 002465Y   |
| Steering thrust ring removing drift               | 020004Y   |
| Crankshaft aligning tool                          | 020074Y   |
| Support for "METABO HG 1500/2" air heater         | 020150Y   |
| "METABO HG 1500/2" air heater                     | 020151Y   |
| Mityvac-type vacuum pump                          | 020329Y   |
| Stroboscopic gun for two- and four-stroke engines | 020330Y   |
| Digital multimeter                                | 020331Y   |
| Single battery charger                            | 020333Y   |
| Multiple battery charger                          | 020334Y   |
| Magnetic stand and dial gauge                     | 020335Y   |
| Engine support connection                         | 020482Y   |
| Engine mount base                                 | 020527Y   |
| Engine mount revolving base                       | 020604Y11 |

 = New tools

| <b>NECESSARY TOOLS</b>                                                                                    |                 |
|-----------------------------------------------------------------------------------------------------------|-----------------|
| <b>TOOL NAME</b>                                                                                          | <b>PART NO.</b> |
| STEERING SEAT FITTING TOOL, to be fitted with parts 9 - Lower bearing adaptor, 10 - Upper bearing adaptor | 001330Y         |
| Bell Ø 80 mm                                                                                              | 001467Y002      |
| 20 mm pliers                                                                                              | 001467Y006      |
| Bell Ø 63 mm                                                                                              | 001467Y007      |
| 18 mm pliers                                                                                              | 001467Y008      |
| Bell Ø 45 mm                                                                                              | 001467Y017      |
| Bell Ø 60 mm                                                                                              | 001467Y031      |
| 15 mm pliers                                                                                              | 001467Y034      |
| Hub bearing extraction bell                                                                               | 001467Y035      |
| Steering tube ring spanner                                                                                | 020055Y         |
| Oil pressure gauge                                                                                        | 020193Y         |
| Valve seal rings assembly tool                                                                            | 020306Y         |
| 37x40 mm adaptor                                                                                          | 020358Y         |
| 42x47 mm adaptor                                                                                          | 020359Y         |
| 52x55 mm adaptor                                                                                          | 020360Y         |
| 20 mm guide (Driven pulley bearings)                                                                      | 020363Y         |
| 25 mm guide (Driven pulley bearings)                                                                      | 020364Y         |
| Ø 28x30 mm adaptor                                                                                        | 020375Y         |
| Adapter sleeve                                                                                            | 020376Y         |
| Bushing (valve removing tool)                                                                             | 020382Y012      |
| 15 mm guide                                                                                               | 020412Y         |
| Valve oil seal extractor                                                                                  | 020431Y         |
| Oil pressure gauge unio                                                                                   | 020434Y         |
| 17 mm guide (countershaft bearings)                                                                       | 020439Y         |
| Driven half pulley spring compressor                                                                      | 020444Y         |
| 46-55 mm spanner                                                                                          | 020444Y009      |
| Ø 24 mm adaptor                                                                                           | 020456Y         |
| Steering tube lower bearing extractor                                                                     | 020458Y         |
| Drift for fitting bearing on steering tube                                                                | 020459Y         |
| Injection tester kit                                                                                      | 020460Y         |
| Flywheel extractor                                                                                        | 020467Y         |
| Piston fitting band                                                                                       | 020468Y         |
| Injection tester reprogramming kit                                                                        | 020469Y         |
| Piston pin retainer fitting tool                                                                          | 020470Y         |
| Countershaft timing peg                                                                                   | 020471Y         |
| Flywheel retaining tool                                                                                   | 020472Y         |
| Clutch bell housing retaining tool                                                                        | 020473Y         |
| Drive pulley stop spanner                                                                                 | 020474Y         |
| Piston position comparator support                                                                        | 020475Y         |
| Pillar kit                                                                                                | 020476Y         |
| Ø 37 mm adaptor                                                                                           | 020477Y         |
| Driven pulley needle roller drift                                                                         | 020478Y         |
| Countershaft stop spanner                                                                                 | 020479Y         |
| Fuel pressure measuring kit                                                                               | 020480Y         |
| Control unit interface wiring harness                                                                     | 020481Y         |
| 30 mm guide                                                                                               | 020483Y         |
| Piston stop fork                                                                                          | 020512Y         |
| Compass wrench (valve lifter bell stop)                                                                   | 020565Y         |
| Exhaust gas analyser                                                                                      | 494929          |

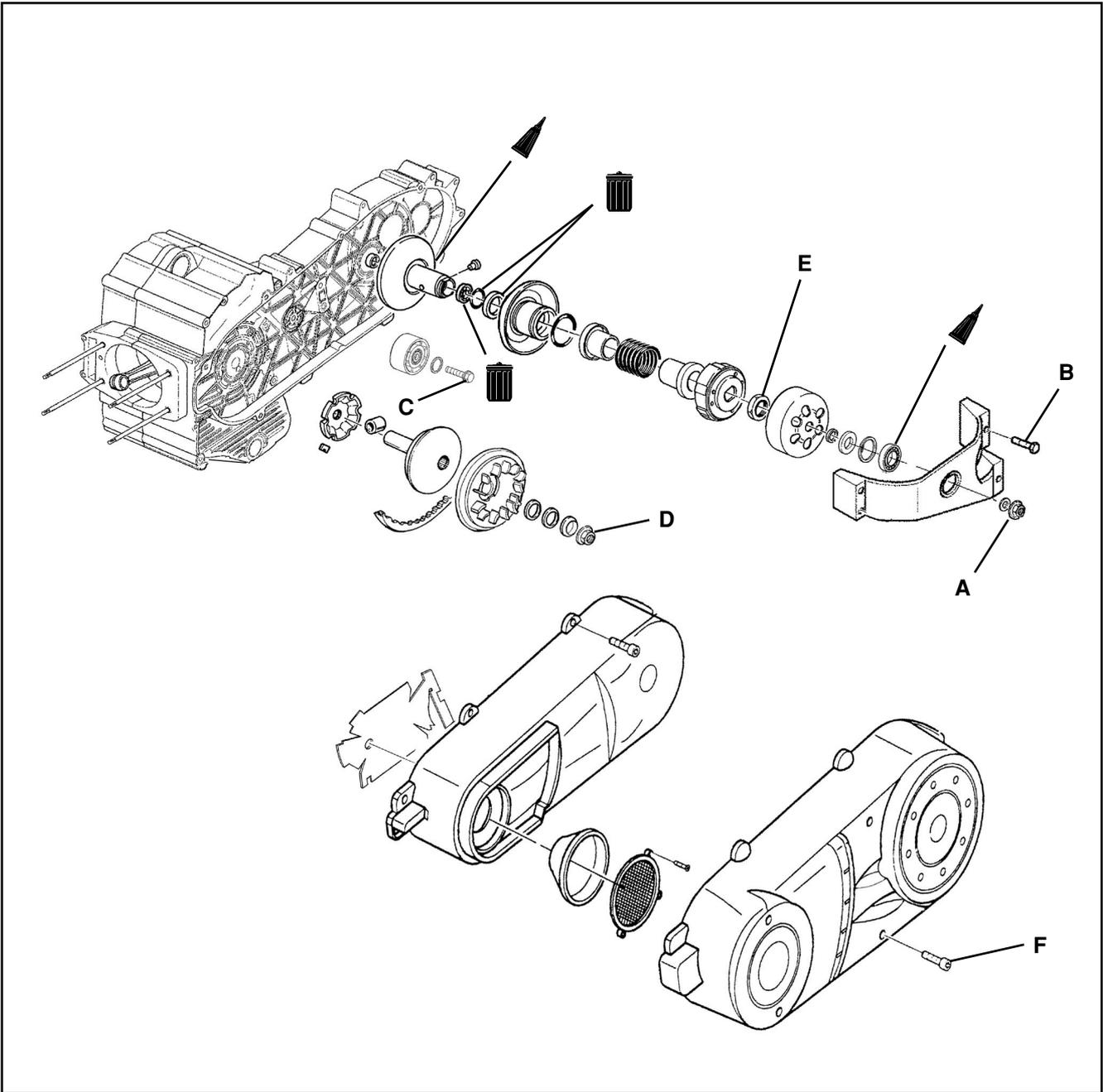
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**AUTOMATIC TRANSMISSION**

**3**



# AUTOMATIC TRANSMISSION



 LUBRICATE WITH OIL

 APPLY PRODUCT

 WARNING: HANDLE WITH CARE

 LUBRICATE WITH GREASE

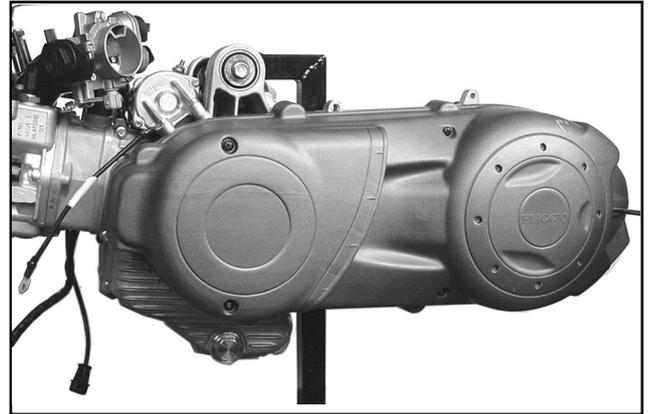
 CLEAN WITH CARE

 ALWAYS REPLACE

| REFERENCE  | A     | B     | C     | D       | E     | F     | G | H | I | L | M | N | O | P | Q |
|------------|-------|-------|-------|---------|-------|-------|---|---|---|---|---|---|---|---|---|
| QUANTITY   | 1     | 4     | 1     | 1       | 1     | 7     |   |   |   |   |   |   |   |   |   |
| TORQUE N·m | 90-92 | 23-26 | 17-20 | 160-175 | 65-75 | 11-13 |   |   |   |   |   |   |   |   |   |

**External transmission cover**

- Unloose the 5 fixing screws
- Remove the external plastic cover



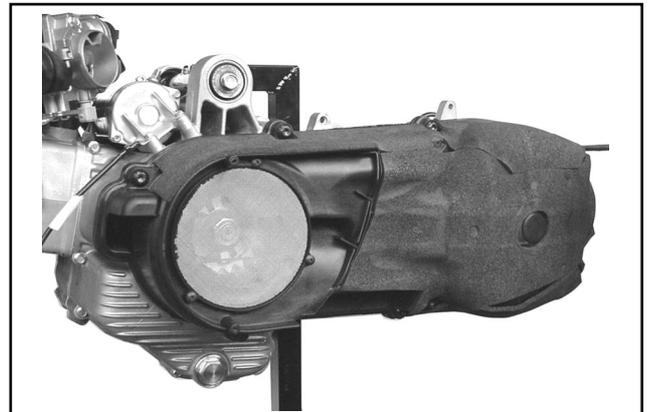
05\_006

3

**Transmission cover**

- Unloose the 7 fixing screws
- Remove the cover and net filter

**N.B.:** Disassemble the net filter only if it is to be replaced.

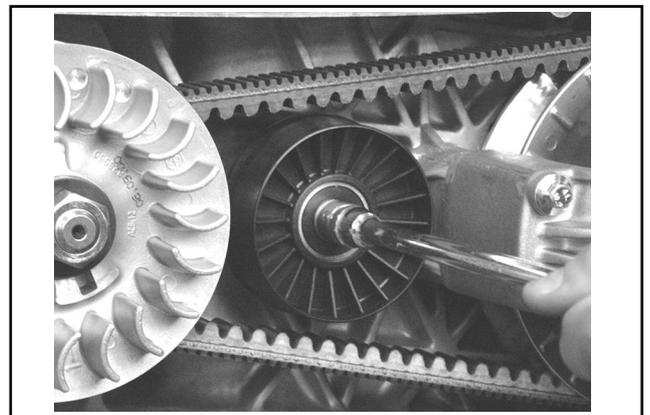


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**Belt antflapping roller**

- Check that the roller is in good condition and that it turns freely.
- Unloose the fixing screw with a 13 mm wrench
- Remove the roller and relevant bearing.

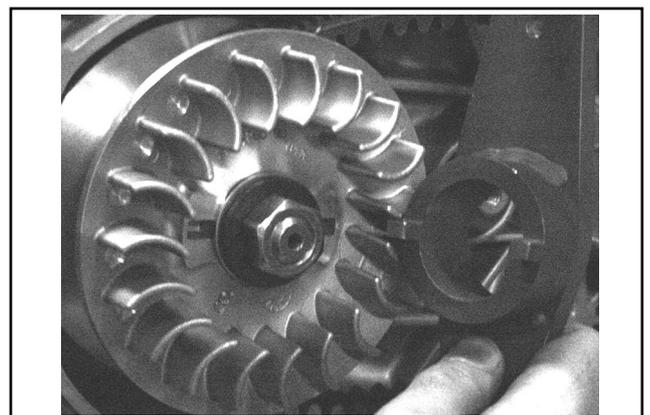
**N.B.:** If the roller does not turn freely, replace it.



05\_008

**Driving pulley**

- Turn the pulley central nut with a 27 mm wrench to align the internal holes horizontally, therefore allowing for the specific tool fitting.

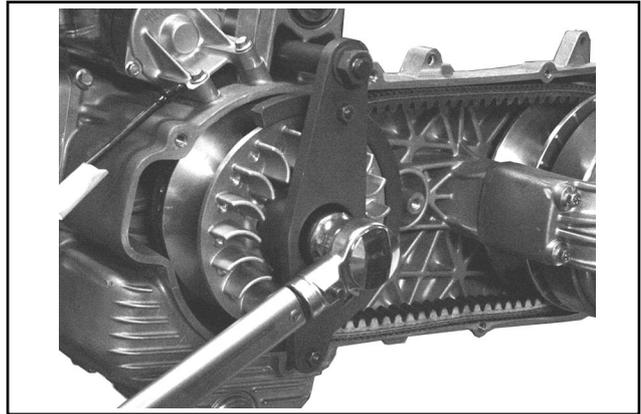


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**Specific tool:**  
Driving pulley lock wrench    020474Y

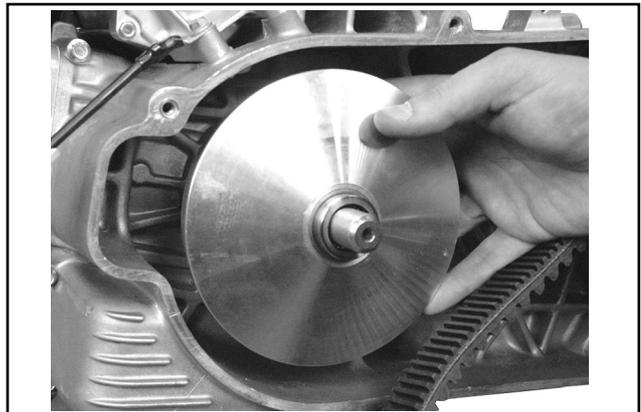
## Automatic transmission

- First fit the specific tool stop ring on the pulley until the groove is fully in contact.
- Afterwards, insert the tool so that the studs on the ring fit the holes in the tool.
- Tighten, also manually, the two fixing nuts of the tool
- Unloose the central nut.
- Remove the cup washer and the plain washer.
- Remove the fixed driving half pulley.
- Remove the washer to bush connection.



05\_010

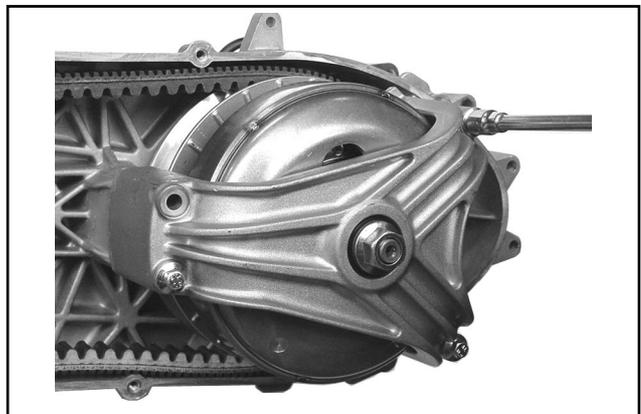
- Move the belt downwards.
- Hold the roller stop plate, remove the mobile driving half pulley with its bush and rear washer, taking care not to let the rollers come out.



05\_011

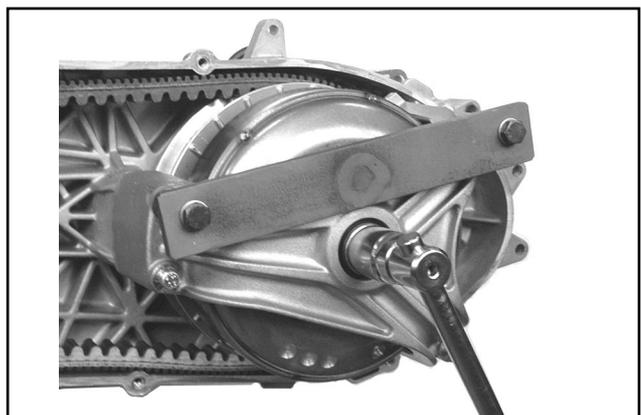
## Driven pulley axle support

- To be able to fit the specific tool for removal of the driven pulley shaft nut, unloose the 2 upper screws of the driven pulley axle support.
- Manually turn the clutch housing as to partially uncover one of the holes in the driven pulley axle support.



05\_012

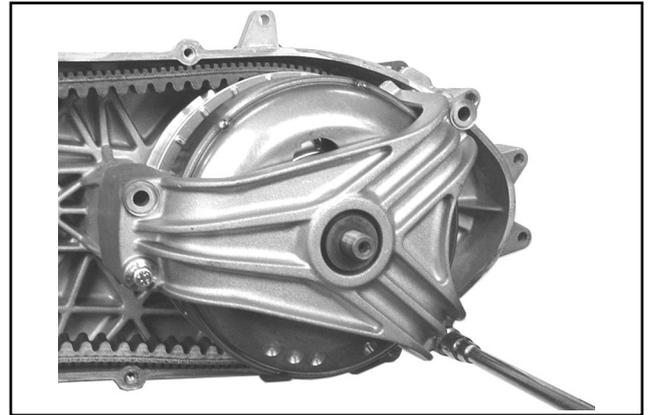
- Insert the specific tool on the driven pulley axle support, checking that the tooth fits the hole in the housing previously uncovered, and that it is resting on the support.
- Tighten the 2 fixing screws.
- Unloose the driven pulley shaft nut.



**Specific tool:**  
**Clutch housing stop tool 020473Y**

05\_013

- Remove the specific tool
- Unloose the 2 remaining fixing screws of the driven pulley axle support.
- Remove the driven pulley axle support and the washer.
- Remove the spacer below.

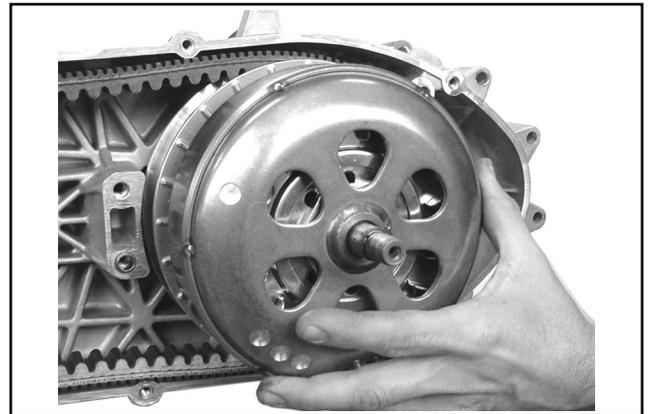


05\_014

3

### Clutch housing

- Remove the clutch housing.



05\_015

- Check that the clutch housing shows no signs of wear or damage.
- Measure the clutch housing I.D.

Standard value: 160.2 mm

Max value: 160.5 mm

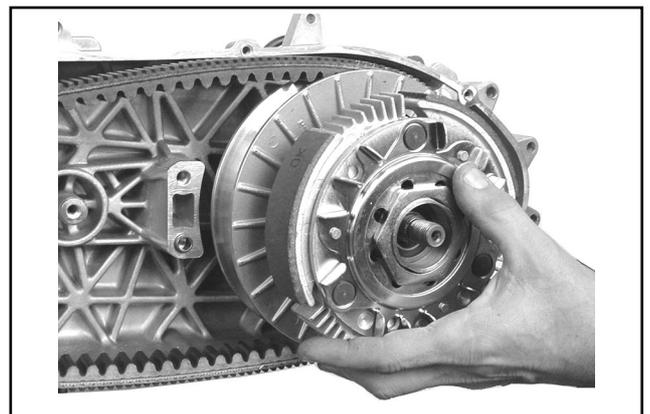
**N.B.:** Check that the measured eccentricity is max 0.2 mm



05\_016

### Driven pulley assembly

- Remove the driven pulley assembly and relevant belt.



05\_017

## Automatic transmission

### Clutch disassembly

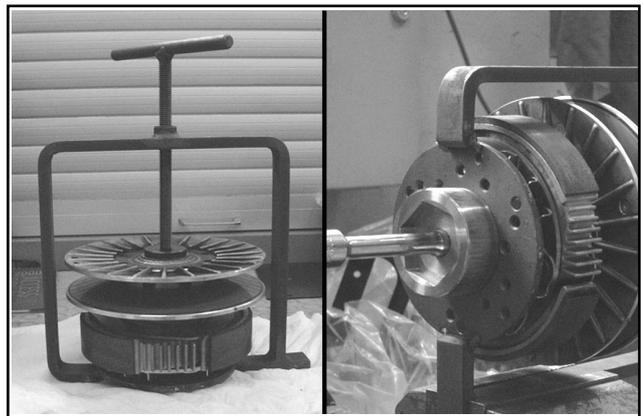
- Remove the clutch and driven pulley by means of the specific tool;
- Prepare the tool with the pins screwed in the «E» position on the internal side;
- Assemble the driven pulley assembly on the tool and insert the pins in the ventilation holes;
- Bring the rear stop screw in contact with the fixed driven pulley, as shown in the figure.

**Warning** - Put the tool in a vice firmly. Do not overtighten the rear screw to avoid buckling the tool.

- Remove the fixing ring nut with the specific spanner of 55 mm.
- Unloose the tool screw and dismount the driven pulley, clutch, spring with sheath assembly

#### Specific tools:

Driven pulley spring compressor    020444Y  
55 mm spanner                            020444Y009  
Ring                                            020444Y010



05\_019

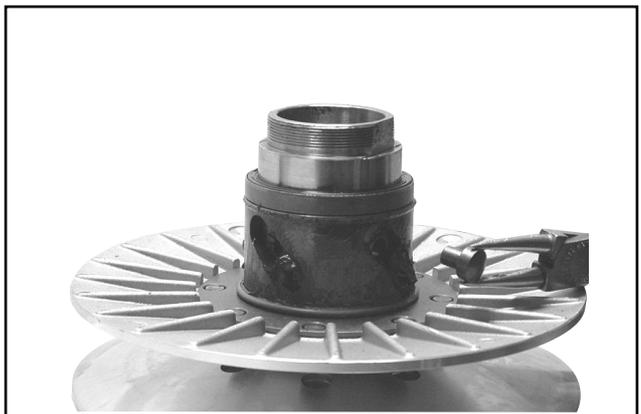
### Pins stop collar

- Remove the collar by means of 2 screwdrivers.



05\_020

- Remove the 4 guide pins.
- Remove the mobile driven half pulley.



05\_021

**Fixed driven half pulley bearings**

- Check that the bush shows no signs of wear or damage; if necessary, replace the fixed driven half pulley.
- Remove the stop ring with the pliers.



05\_022

- Remove the ball bearing by inserting the specific tool in the roller bearing.

**N.B.:** Hold the pulley to avoid damaging the thread.

**Specific tools:**

|                      |                |
|----------------------|----------------|
| <b>Handle</b>        | <b>020376Y</b> |
| <b>24 mm adapter</b> | <b>020456Y</b> |
| <b>20 mm guide</b>   | <b>020363Y</b> |

**N.B.:** If the bearings are overhauled with the driven pulley unit assembled, make sure to support the unit with bell 001467Y002.



05\_023

- Remove the roller bearing by means of the specific tool, supporting the fixed half pulley with the bell.

**Specific tools:**

|                         |                   |
|-------------------------|-------------------|
| <b>Handle</b>           | <b>020376Y</b>    |
| <b>28x30 mm adapter</b> | <b>020375Y</b>    |
| <b>25 mm guide</b>      | <b>020364Y</b>    |
| <b>Bell</b>             | <b>001467Y002</b> |



05\_024

**Fixed driven half pulley**

- Check the belt contact surface out for signs of wear.
- Measure the pulley bush O.D.

Minimum allowed diameter: 49.96 mm  
Standard diameter: 49.965 mm



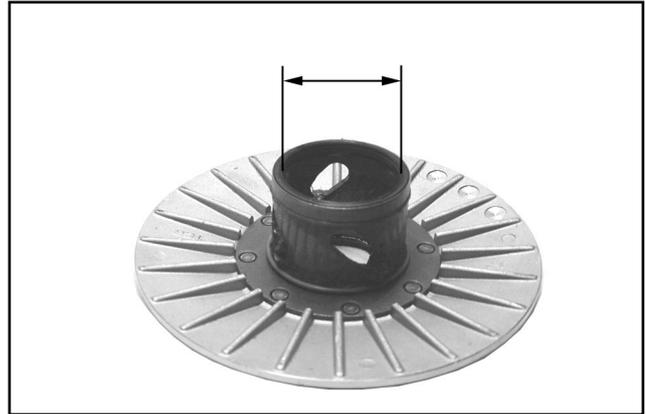
05\_025

## Automatic transmission

### Mobile driven half pulley

- Check the belt contact surface out for signs of wear.
- Remove the 2 internal and external O rings.
- Measure the mobile half pulley bush I.D.

Maximum allowed diameter: 50.08 mm  
Standard diameter: 50.085 mm



05\_026

### Fixed driven half pulley bearings assembly

- Fit a new roller bearing using the specific tool

**N.B.:** Put the bearing and the incorporated oil seal on the outside.

- Hold the half pulley to avoid damaging the thread.  
Operate with tool 001467Y002, with the driven pulley unit completely assembled.

**Specific tool:**

**Driven pulley roller case tool 020478Y**

**Bell 001467Y002**



05\_027

- Fit a new ball bearing by means of the specific tool.

**Specific tools:**

**Handle 020376Y**

**37 mm adapter 020477Y**

**20 mm guide 020363Y**

- Fit the stop snap ring.



05\_028

### Driven pulley assembly

- Fit the new oil seals
- Fit the new O rings

**N.B.:** The O rings come supplied in 2 sizes. The larger one is installed on the work end radius, half pulley base.

- Fit the half pulley on the bush taking care not to damage the upper O ring.



05\_029

- Check the pins and collar condition, and then reassemble them.
- Lubricate the driven pulley assembly with a hook-bill greaser. Apply 10 gr. of TUTELA MRM2 grease through one of the holes inside the bush until grease comes out of the opposite hole.

### Spring

- Measure the free length of the mobile driven half pulley spring.

Standard length: 125.5 mm  
Limit allowed after use: 120 mm

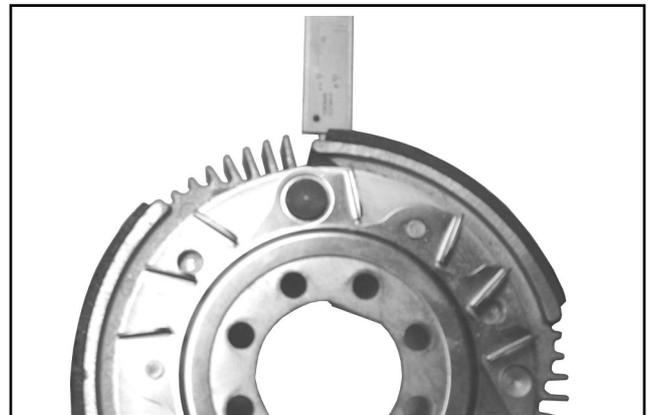


05\_030

- Check the thickness of the clutch weights friction material.  
Minimum allowed thickness: 1 mm
- The weights must show no traces of grease. If necessary, check the seals of the driven pulley assembly.

**N.B.:** During the running in phase the weights must have a central contact surface and must not be different one from the other to avoid the clutch jerking

- Do not open the weights with the tools to avoid the return springs load variation.

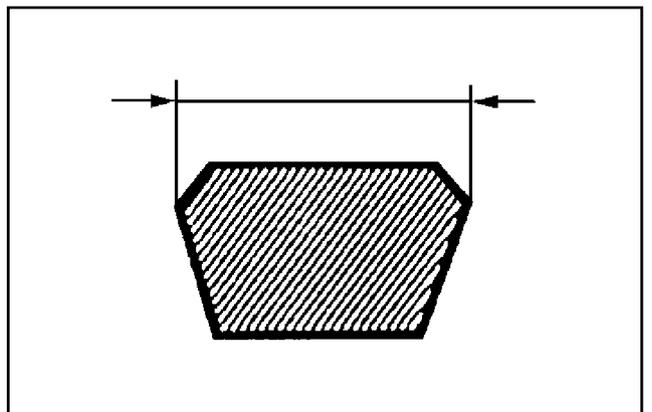


05\_031

### Driving belt

- Check that the driving belt is not damaged.
- Check the belt width.

Minimum width: 25 mm  
Standard width: 26.2 mm



05\_034

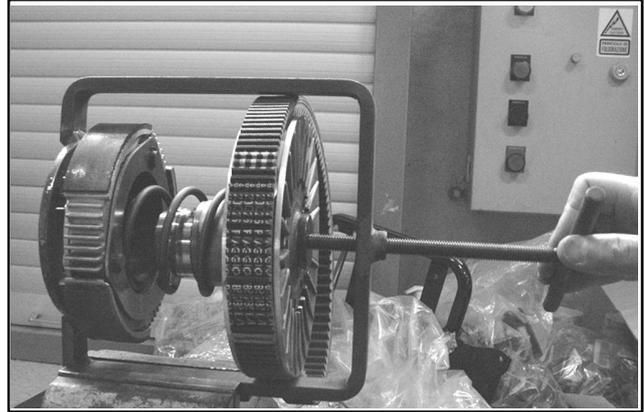
## Automatic transmission

### Clutch reassembly

- Prepare the specific tool as already done during the disassembly phase;
- Preassemble the driven pulley unit with the driving belt according to its direction of rotation.
- Insert the driven pulley unit, spring with sheath and clutch in the tool.

#### Specific tools:

**Driven pulley spring compressor** 020444Y  
**Adapter ring** 020444Y010



05\_032

- Compress the spring and insert the clutch on the driven pulley bush.

**N.B.:** Take care not to damage the sheath or the bush threaded end.

- Screw the ring nut manually and then tighten it with the specific wrench to the prescribed torque.

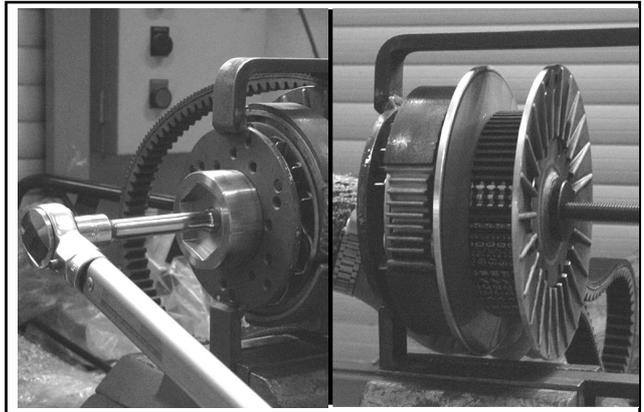
#### Tightening torque:

**Clutch ring nut: 65 - 75 N·m**

#### Specific tool:

**55 mm wrench: 020444Y009**

- To facilitate the reassembly operation, turn the mobile driven pulley and fit the belt on the smaller diameter.



05\_033

### Mobile driving half pulley

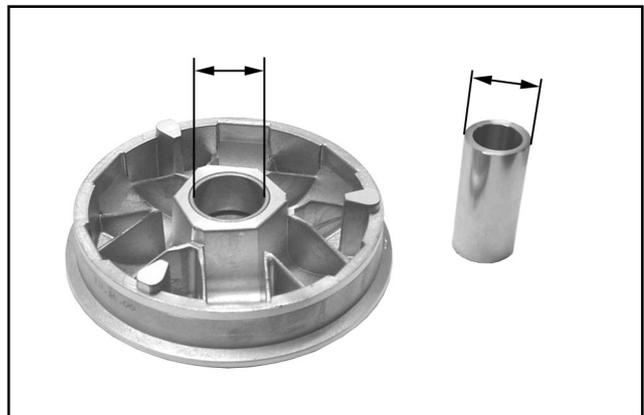
- Check that the internal bushes shown in the figure show no signs of anomalous wear. Measure the I.D. Maximum allowed diameter: 30.12 mm Standard diameter: 30.021 mm

**Warning** - Do not lubricate or clean the bushes.

- Measure the O.D. of the pulley sliding bush shown in the figure.

Minimum allowed diameter:  $\varnothing$  29.95 mm

Standard diameter:  $\varnothing$  29.959 mm



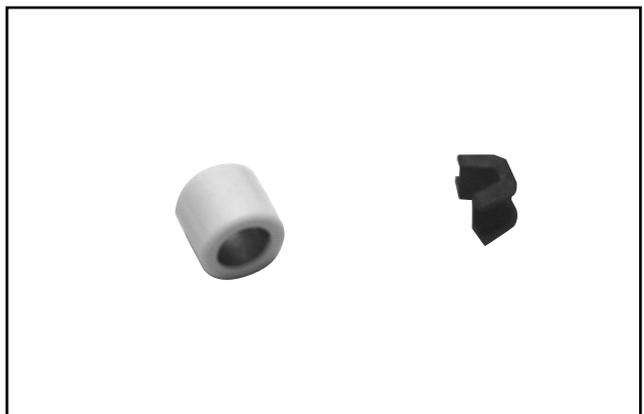
05\_035

- Check that the rollers are not damaged or worn.

Minimum allowed diameter:  $\varnothing$  24.5 mm

Standard diameter:  $\varnothing$  24.9 mm

- Check that the shoes of the roller stop plate are not worn.
- Check the rollers housing and belt contact surfaces condition on both half pulleys.

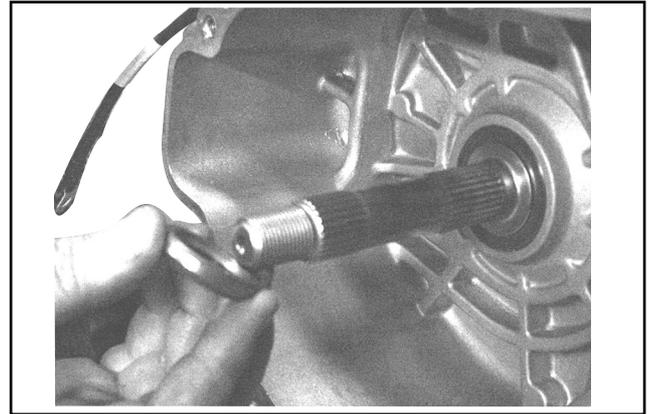


05\_036

## Automatic transmission

### Rollers housing assembly

- Fit the spacer with the internal beveling facing the insertion side.



05\_041

3

- Put the rollers in the half pulley as shown in the figure.
- The covered side must rest on the internal thrust side of the roller housing.



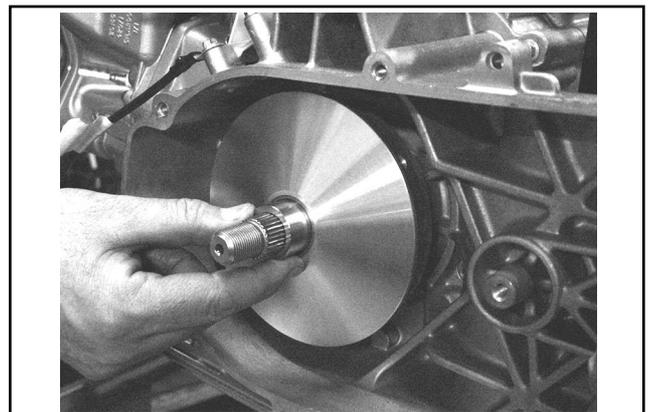
05\_042

- Assemble the half pulley with the rollers stop plate and the sliding shoes.



05\_043

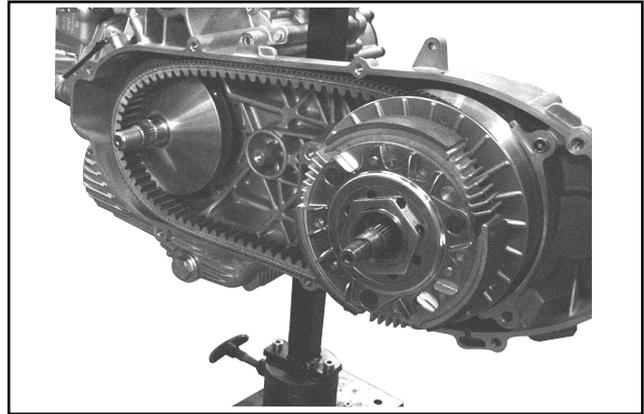
- Fit the half pulley on the driving shaft.
- Fit the spacer bush.



05\_044

**Driven pulley unit assembly**

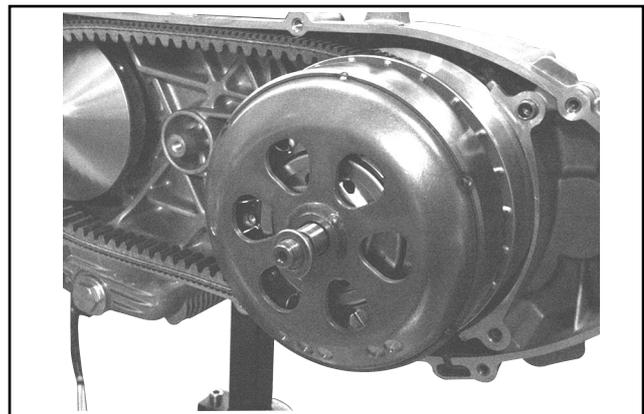
- Fit the driven pulley unit and relevant belt.



05\_045

**Housing assembly**

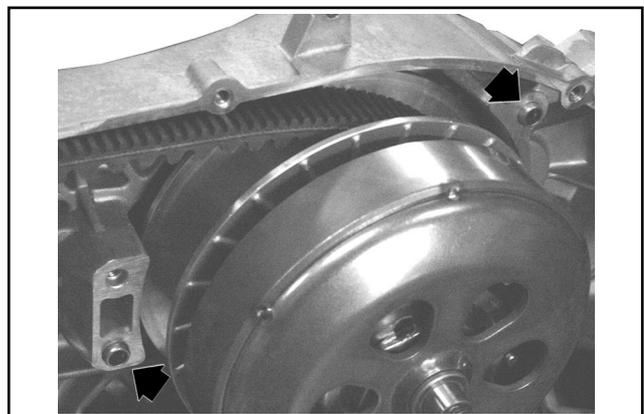
- Fit the housing and the spacer



05\_046

**Driven pulley axle support assembly**

- Make sure the 2 centering dowels are properly fitted in the crankcase.



05\_047

**Driven pulley axle support bearings disassembly**

- Check that the bearing turns freely. Replace the bearing if necessary.
- Remove the snap ring.



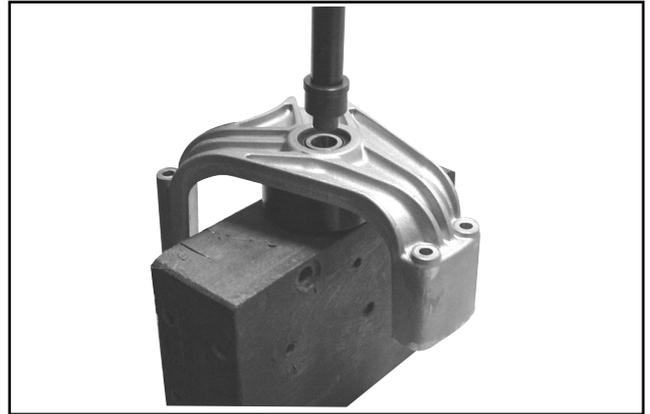
05\_037

- Hold the driven pulley axle support by means of the specific tool 001467Y002.
- Remove the bearing by means of the specific tool.

**N.B.:** If the bearing decay has caused the external race to lose strength, replace the driven pulley axle support.

**Specific tools:**

|                         |                   |
|-------------------------|-------------------|
| <b>Bell</b>             | <b>001467Y002</b> |
| <b>Handle</b>           | <b>020376Y</b>    |
| <b>28x30 mm adapter</b> | <b>020375Y</b>    |
| <b>17 mm guide</b>      | <b>020439Y</b>    |



05\_038

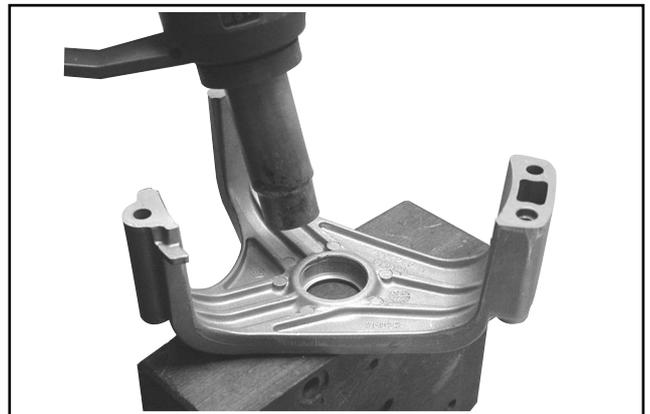
3

**Driven pulley axle support bearing assembly**

- Heat the driven pulley axle support with the thermal gun.

**Specific tool:**

|                   |                |
|-------------------|----------------|
| <b>Air heater</b> | <b>020151Y</b> |
|-------------------|----------------|

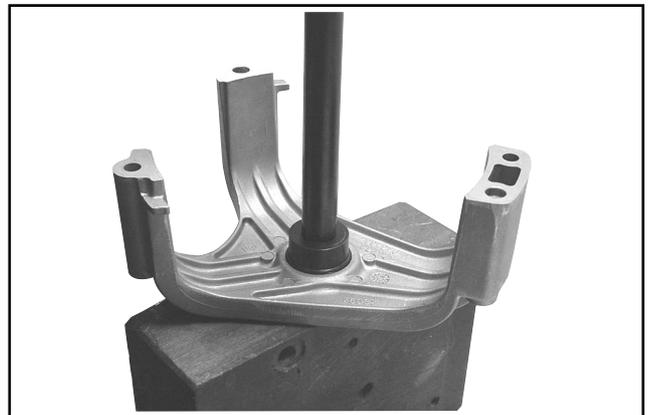


05\_039

- Fit the bearing on the specific tool. Grease it to prevent it from coming out.
- Refit the new bearing by means of the specific tool.
- Refit the snap ring.

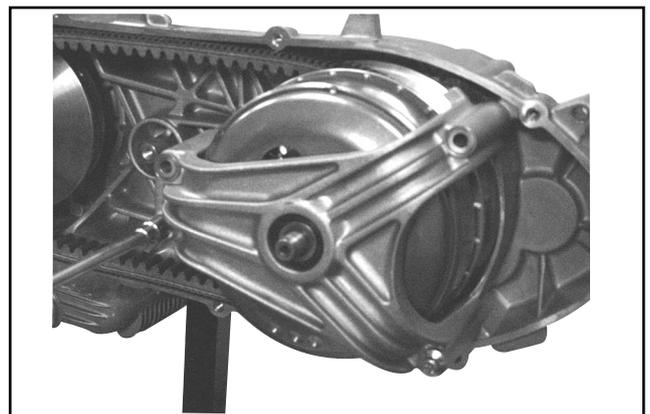
**Specific tools:**

|                          |                |
|--------------------------|----------------|
| <b>Handle for drifts</b> | <b>020376Y</b> |
| <b>37x40 mm adapter</b>  | <b>020358Y</b> |
| <b>17 mm guide</b>       | <b>020439Y</b> |



05\_040

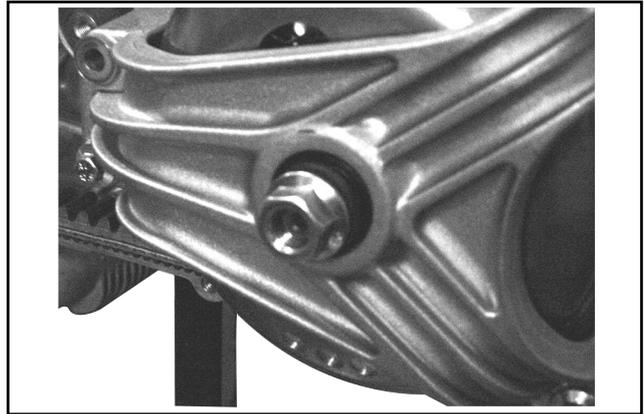
- Fit the driven pulley axle support and tighten the two lower screws.



05\_048

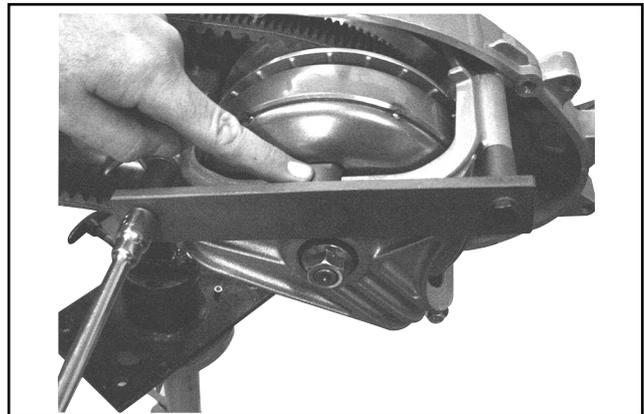
## Automatic transmission

- Fit the washer and the nut.



05\_049

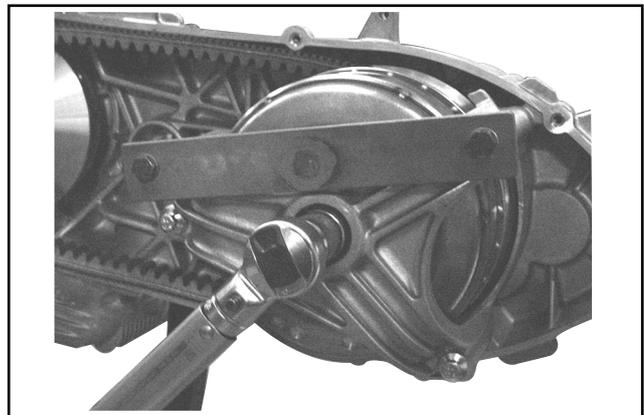
- Insert the specific tool tooth in the hole on the housing.
- Tighten the 2 screws making sure that the catch is in contact with the driven pulley axle support.



05\_050

**Specific tool:**  
**Clutch housing lock tool 020473Y**

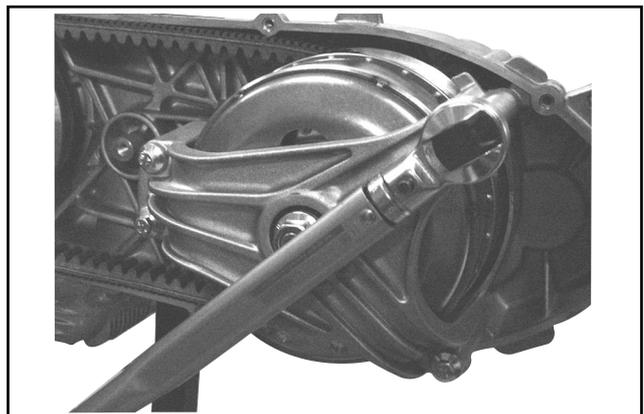
- Tighten the housing fixing nut to the prescribed torque.



05\_051

**Tightening torque:**  
**Driven pulley shaft nut: 90 - 92 N·m**

- Remove the specific tool
- Insert the 2 remaining fixing screws of the driven pulley axle support and cross-tighten the 4 screws to the prescribed torque.

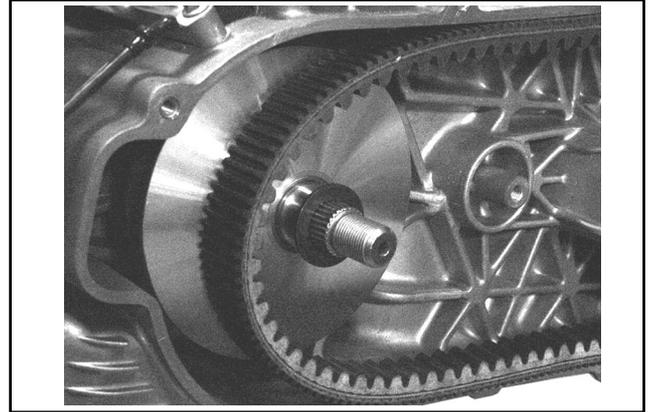


05\_052

**Tightening torque:**  
**Driven pulley axle support fixing screws: 23 - 26 N·m**

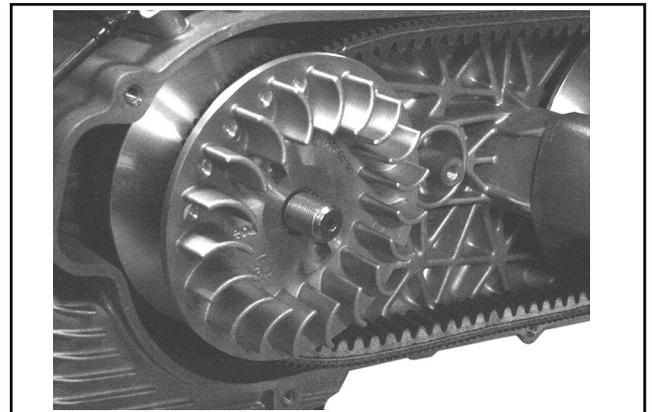
**Fixed driving half pulley assembly**

- Fit the spacer



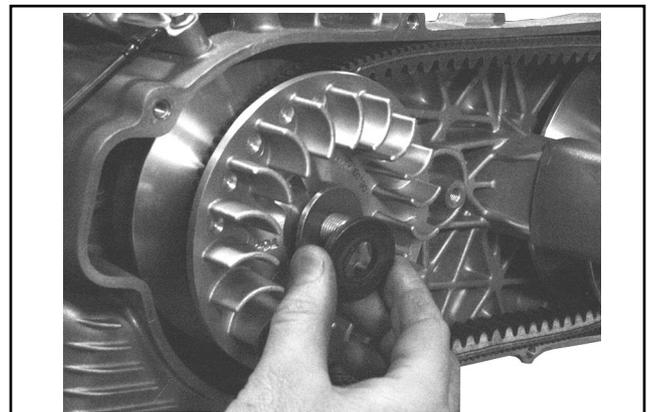
05\_053

- Fit the fixed driving half pulley making sure it is in contact with the spacer and with the sliding bush of the mobile driving pulley



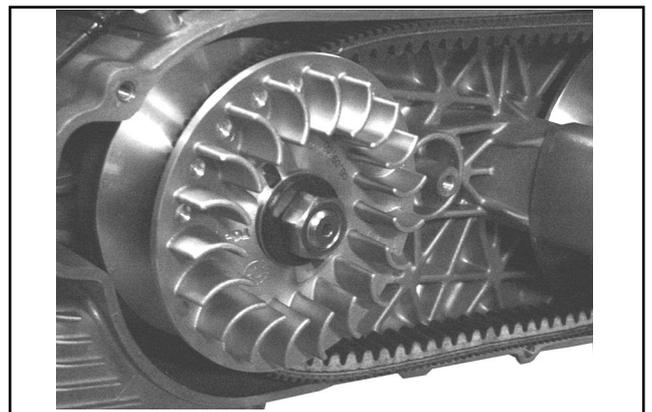
05\_054

- Fit the plain washer and the cup washer as shown in the figure.



05\_055

- Insert the nut in its previous position (nut side in contact with the cup washer).



05\_056

## Automatic transmission

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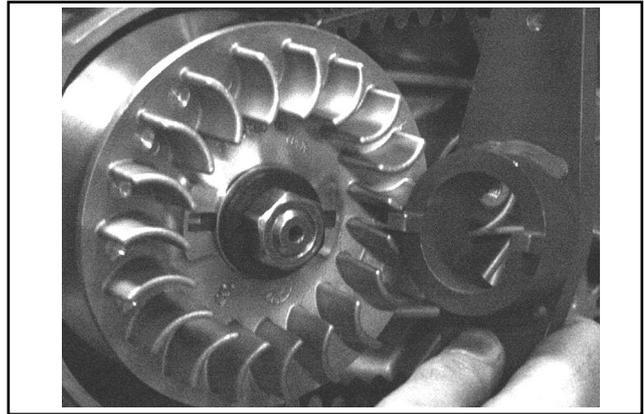
[ine-500-cc-motorcycle-service-repair-station-manual/](#)

- Turn the pulley central nut aligning its holes horizontally to be able to install the specific tool.

**N.B.:** Make sure that the lock wrench fits easily in the pulley and engine crankcase.

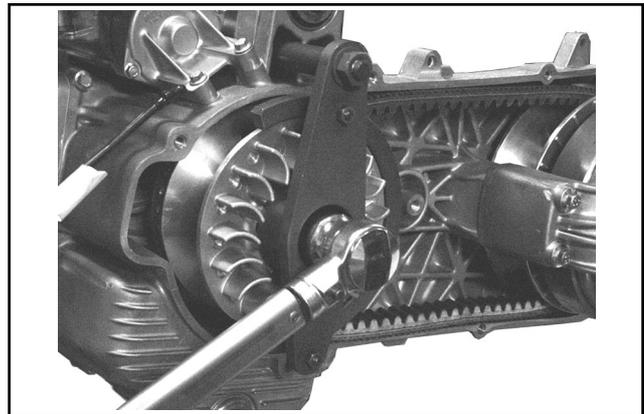
### Specific tool:

**Driving pulley lock wrench 020474Y**



05\_009

- Fully insert the stop ring from the rear side.
- Fit the tool by drawing the nuts near manually and making sure it is on a flat surface.
- Tighten the driving pulley fixing nut to the prescribed torque.
- Remove the specific tool.



05\_010

### Tightening torque:

**Driving pulley nut: 157 - 172 N·m**

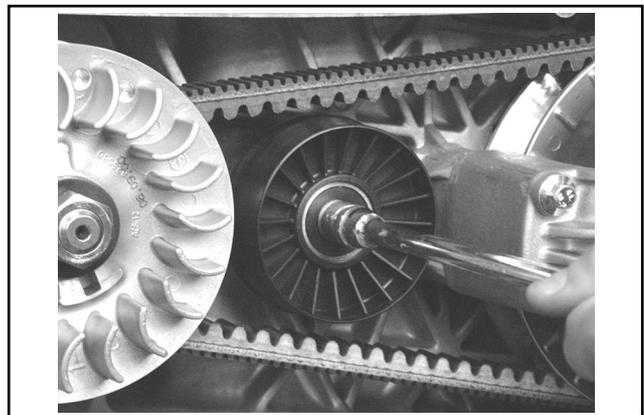
### Belt antflapping roller assembly

- Fit the belt antflapping roller with the belt containment edge to the engine crankcase side.
- Tighten the central screw to the prescribed torque.

**N.B.:** Turn the driven pulley and/or the driving pulley until the belt is properly tensioned.

### Tightening torque:

**Antflapping roller screw: 16.7 - 19.6 N·m**



05\_008

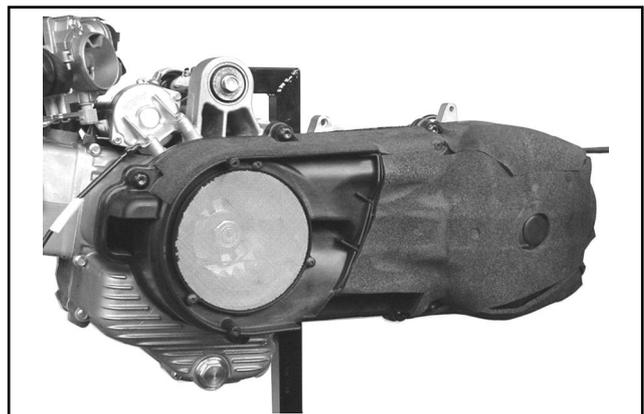
### Transmission cover

**N.B.:** Check the transmission air filter metal net condition. If damaged, replace it. If necessary, clean it by blowing compressed air.

- Fit the transmission cover.
- Fully tighten the 7 fixing screws to the prescribed torque.

### Tightening torque:

**Transmission cover screws: 10.8 - 12.8 N·m**



05\_007

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