

# WORKSHOP MANUAL



## 50 cc ENGINE HORIZONTAL CYLINDER I.A.E (Exhaust air injection)

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## CHARACTERISTICS AND TIGHTENING TORQUES

### CHARACTERISTICS

<b>Engine</b>	Single cylinder 2-stroke Exhaust air injection
Cooling	Forced air
Bore x stroke	39.9 x 39.8 mm
Cubic capacity	49.9 cc
Max. power output	3.2 kW at 7100 rpm
Max. torque at	6800 rpm
Ignition	CDI
Spark plug	NGK BR7HS or EYQUEM R 850
Magneto	Kokusan 89 W
Starter motor	Mitsuba 150 W or Moric 160 W
Air pump	Dell'orto
Carburettor	Gurtner PY 12
Oil pump	Dell'orto
Oil pump control unit	Dell'orto
Exhaust	Catalytic

### TIGHTENING TORQUES

Spark plug	2 m.daN
Engine speed sensor	1 m.daN
Cylinder casings	1 m.daN
Air pump	0,7 m.daN
Covers	1 m.daN
Cylinder head	1,2 m.daN
Starter motor	1 m.daN
Drive pulley	4 m.daN
Driven pulley	4,5 m.daN
Inlet manifold	1 m.daN
Rotor	4 m.daN
Stator	1 m.daN
Fan	0,7 m daN

#### Capacities

Transfer box	0.12 L.
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#### Engine marking

Engine type	HA1
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## SPECIAL IMPORTANT POINTS

### **SPECIAL IMPORTANT POINTS**

#### *Oil and fuel*

This engine is designed to run on 95 or 98 unleaded fuel only

The oil used for the separate lubrication system is « Esso 2T Spécial » or « Esso 2T Spécial anti-fumée » approved by the manufacturer

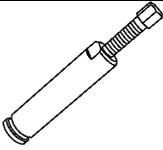
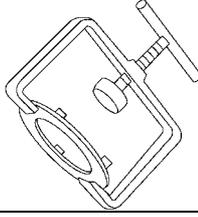
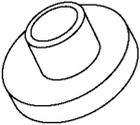
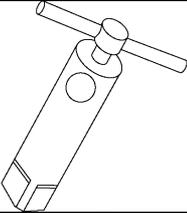
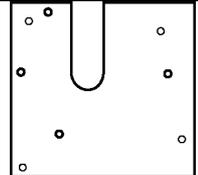
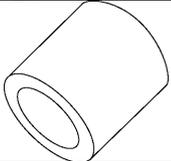
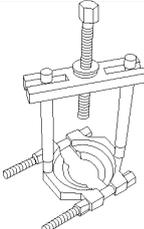
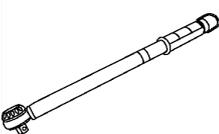
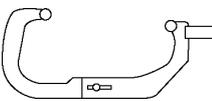
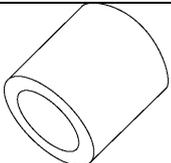
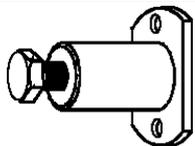
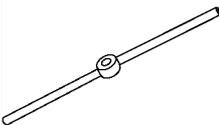
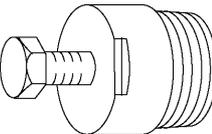
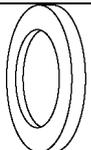
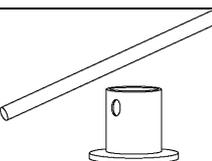
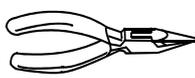
The oil is injected directly into the carburettor via an electric pump which is controlled by a control unit

#### **Note:**

Petrol is highly inflammable, do not smoke in the working area and avoid proximity to flames or sparks. Work in a clear and well-ventilated area.

## SPECIAL TOOLS

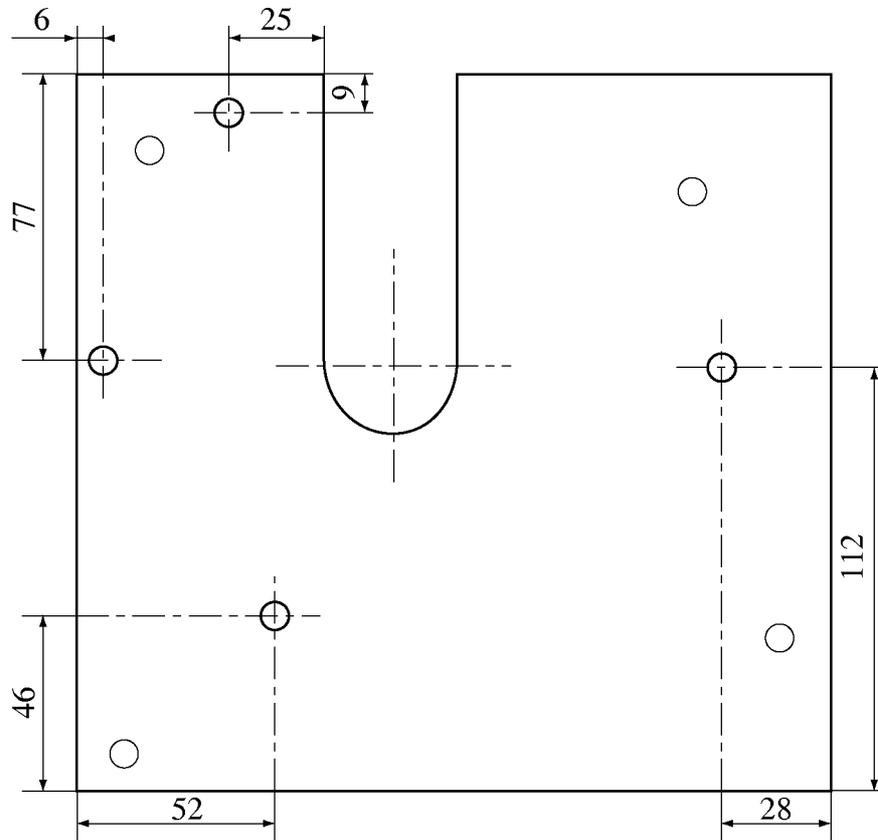
### SPECIAL TOOLS

	Tool N°	Designation	Used with				
	64706	Casing extractor and opening tool	casing opening plate + pin		752127	Clutch compression tool	756725
	64710	Shoulder locator	64706		752237	Adjustable pin wrench	
	64765	Engine support	engine support bracket		754006	Modified casing cover plate	64706
	68007	Protective cap small model	755985		755585	bearing extractor tool	
	68994	Torque wrench 8 Nm to 54 Nm	extension 752235 adapter 752236		755982	Engine support adapter	64765
	69098	Protective cap large model	64706		755983	Casing opening tool	68007
	69104	Pin nut	750069		755985	flywheel extractor	68007
	750069	Stud Ø10 pitch 125	69104		756668	Crank assembly lip seal tool	
	750808	Thrust washer	64706		756725	38 mm box wrench	752127
	752000	Piston circlip pliers					

## SPECIAL TOOLS

Gauge to adapt the casing opening plate for engine P/N 754006 for the HA1 engine

- Dimensions in mm
- Holes with diameter of 7 mm



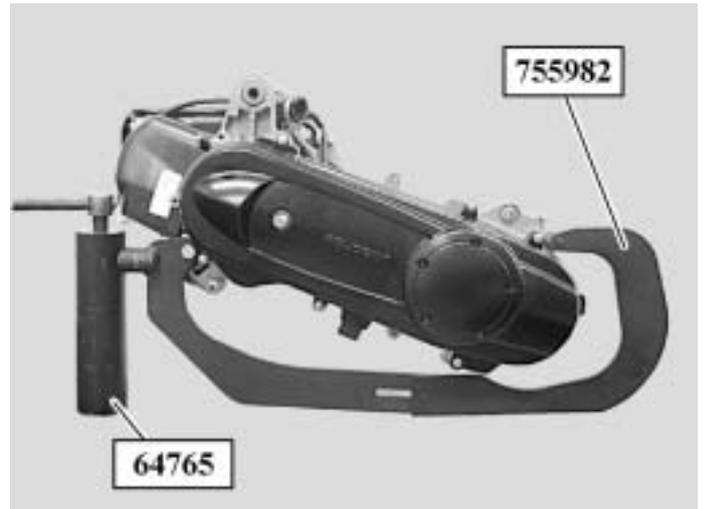
Scale: 1/2

## DISASSEMBLY

### DISASSEMBLY

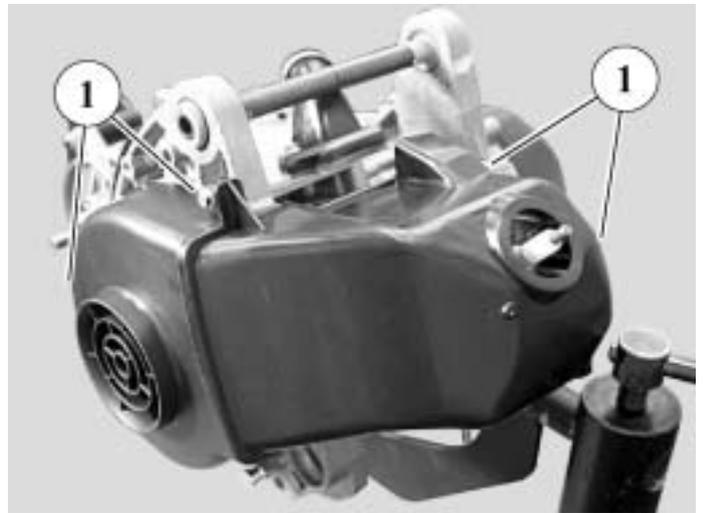
#### Putting the engine on the stand

- Fit the engine to adapter P/N 755982
- Put the assembly on stand P/N 64765 clamped in the jaws of a vice



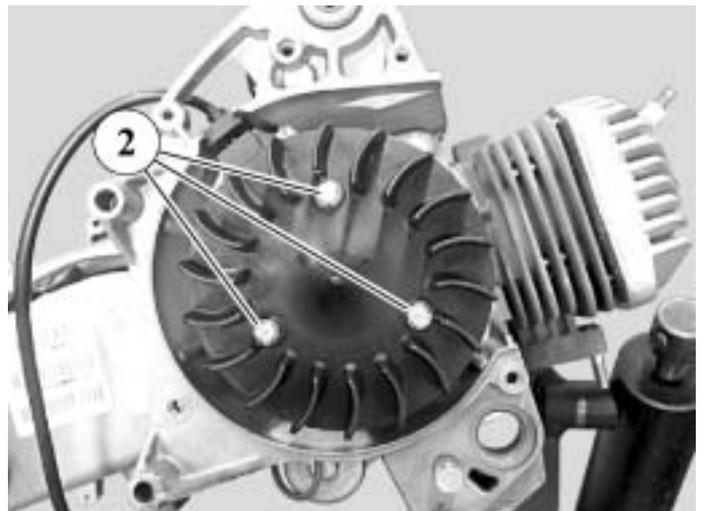
#### To remove the cooling system

- Remove the 4 fixing bolts (1) from the cooling volute and the cylinder cover
- Remove the cooling volute and the cylinder cover
- Tightening torque when refitting: 1 m.daN



- Remove the fan 3 fixing bolts (2)
- Remove the fan

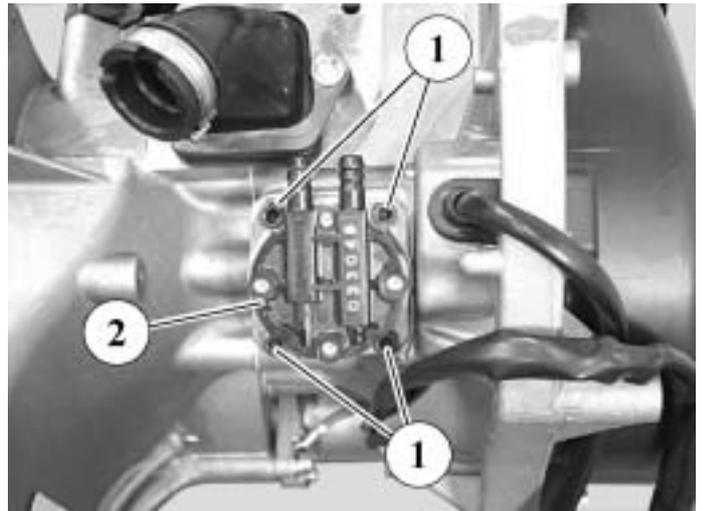
- Tightening torque when refitting: 0.7 m.daN



## DISASSEMBLY

### Removal of the air pump

- Remove the 4 fixing bolts (1)
  - Remove the air pump (2)
- Tightening torque when refitting: 0.7 m.daN

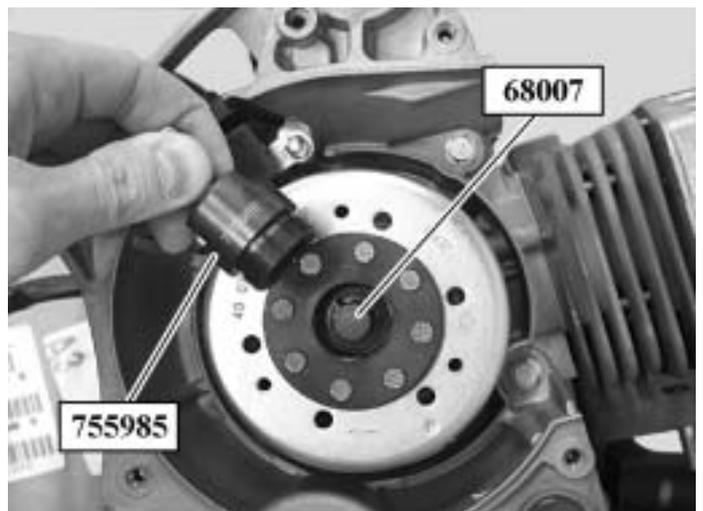


### To remove the magneto flywheel

- Hold the rotor (1) with the pin wrench P/N 752237
  - Remove the nut
- Tightening torque when refitting: 4 m.daN



- Fit protective cap P/N 68007 to the end of the crankshaft
- Tighten flywheel extractor P/N 755985 on the rotor
- Lock the flywheel extractor and turn the thrust bolt until the rotor is released



## DISASSEMBLY

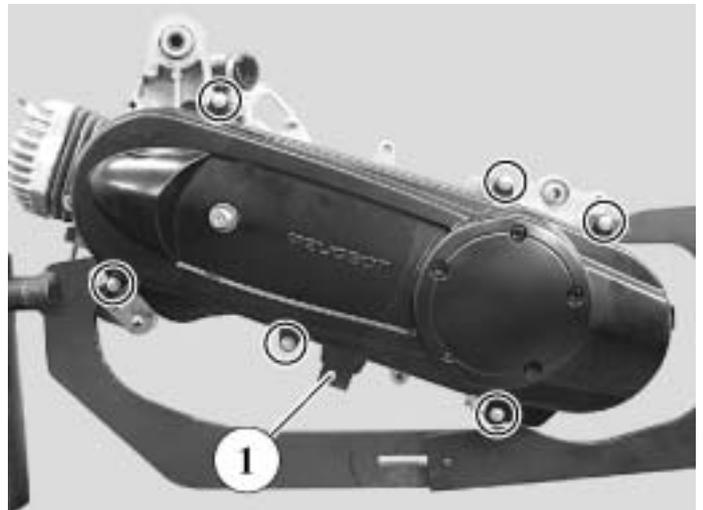
### To remove the stator and engine speed sensor assembly

- Remove the engine speed sensor 2 fixing bolts (1) and the stator assembly 2 fixing bolts (2)
  - Remove the stator and sensor assembly (3)
  - Remove the key (4) from the crank
- Tightening torque when refitting: 1 m.daN



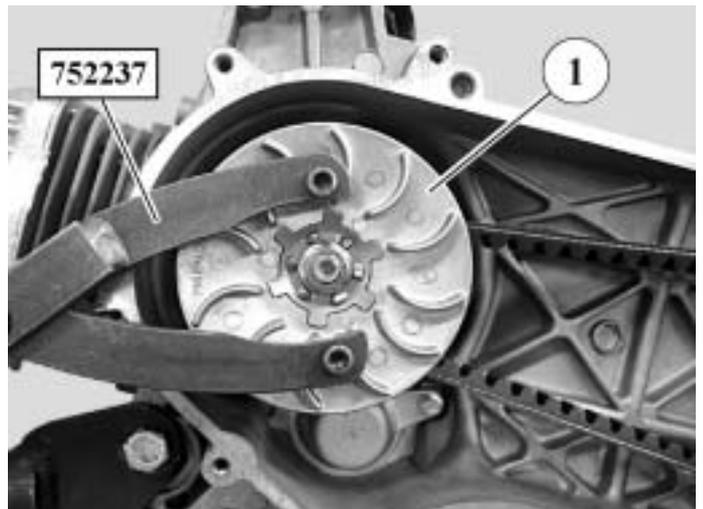
### To remove the primary transmission cover

- Remove the transmission cover 6 fixing bolts
  - Remove the cover and the stand stop (1)
- Tightening torque when refitting: 1 m.daN



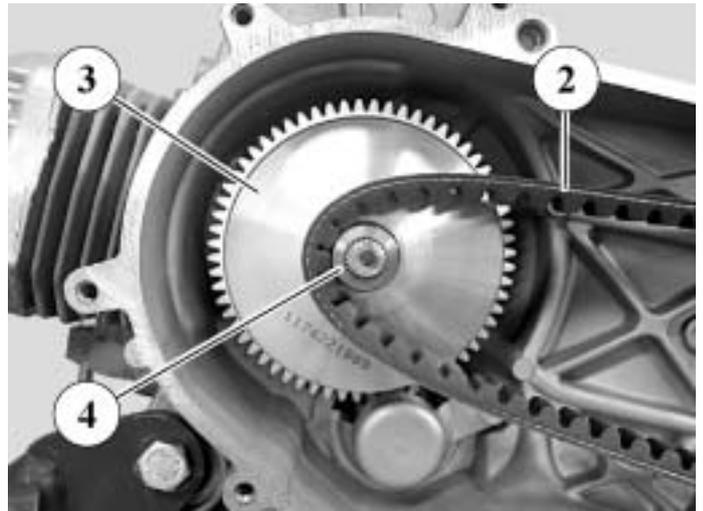
### To remove the drive pulley

- Lock the fixed flange (1) with tool P/N 752237
- Remove the fixed flange nut and washer
- Remove the fixed flange

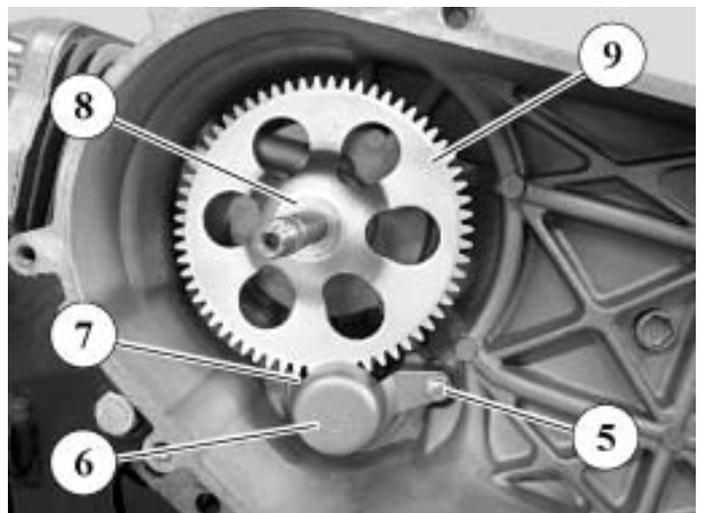


## DISASSEMBLY

- Remove the belt (2)
- Remove the drive pulley (3) with the guide hub (4)



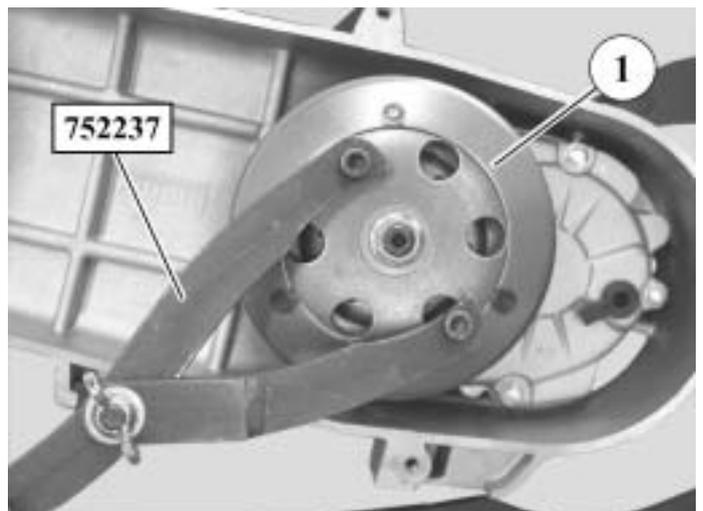
- Remove the starter dog (7) bearing (6) fixing bolt (5) (depending on the model)
- Remove the bearing
- Remove the washer 12x22x1 (8)
- Remove the starter ring (9)
- Remove the starter dog (depending on the model)



- Tightening torque when refitting the bearing: 1 m.daN
- Tightening torque when refitting the pulley: 4 m.daN

### To remove the driven pulley

- Lock the clutch drum (1) with the pin wrench P/N 752237
- Remove the nut
- Remove the clutch drum and the clutch / driven pulley assembly



- Tightening torque when refitting: 4.5 m.daN

## DISASSEMBLY

### To remove the secondary transmission cover

**Note:** Supply a container to catch the transfer box oil when the cover is removed

Oil filling and level check of the transfer box are carried out through plug (3)

- Remove the cover (2) six fixing bolts (1)
- Remove the cover with the primary shaft (4)
- Tightening torque when refitting: 1 m.daN

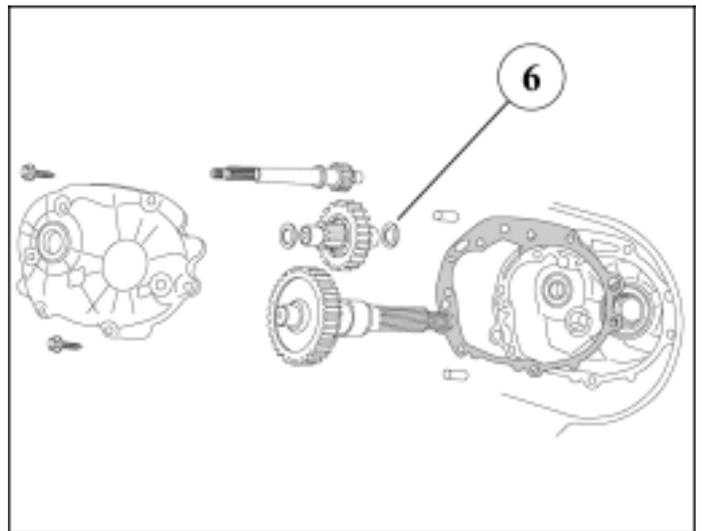
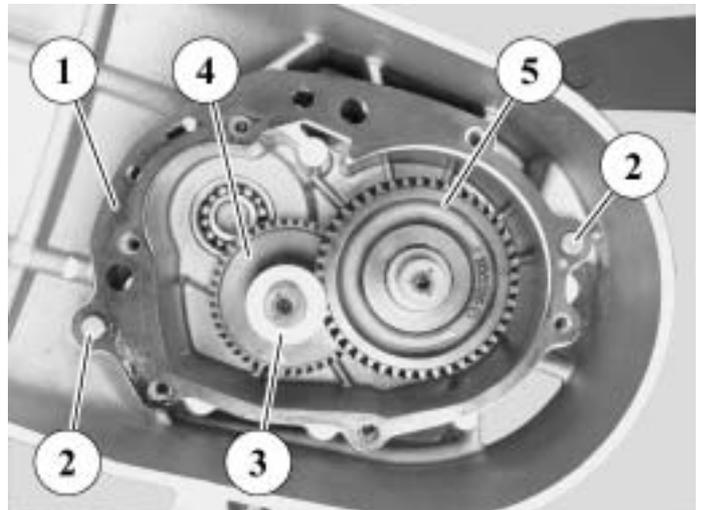
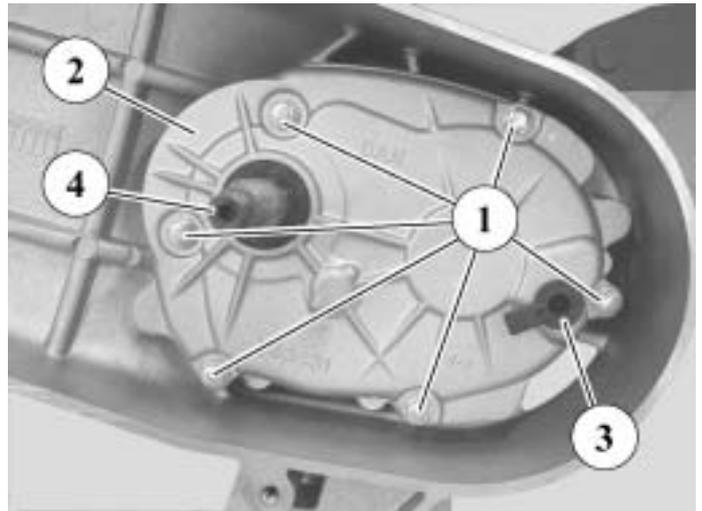
**Note:** the primary shaft may be removed from the cover by pushing it by means of a mallet

### To remove the secondary transmission

- Remove the paper gasket (1) and the 2 locating pins (2)
- Remove the first thrust washer (3) (14 x 27 x 0.5) from the intermediate shaft (4)
- Remove the secondary shaft (5)

**Note:** take care not to damage the seal on the wheel side when removing the secondary shaft, as the oil could leak out through a drain hole in the casing located between the seal on the wheel side and the bearing

- Remove the intermediate shaft and its second thrust washer (6) (14 x 27 x 0.5) located behind it

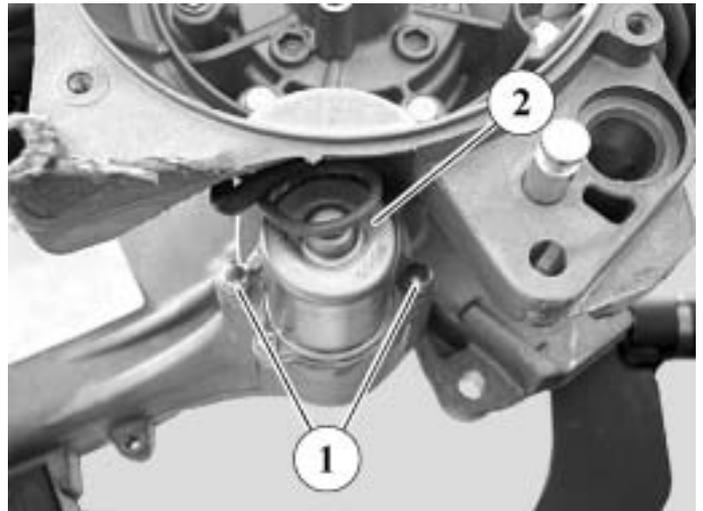


## DISASSEMBLY

### To remove the starter motor (depending on model)

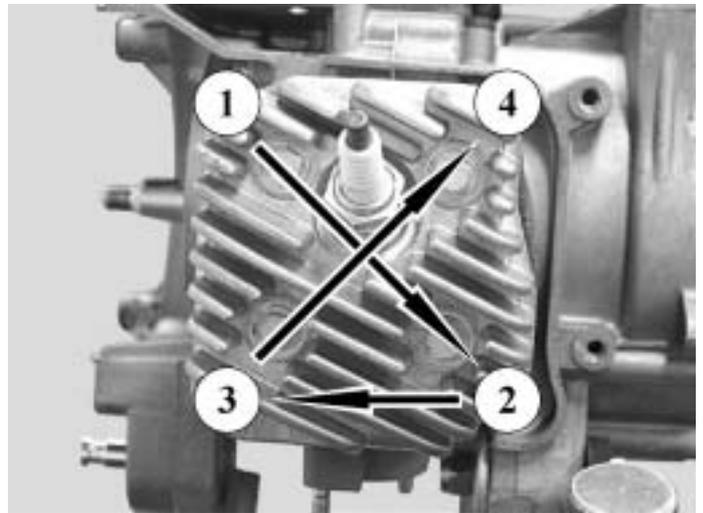
- Remove the starter motor (2) two fixing bolts and washers (1)
- Remove the starter motor and its O-ring

**Note:** the bottom bolt is used for the engine earth (green wire connected to – battery)



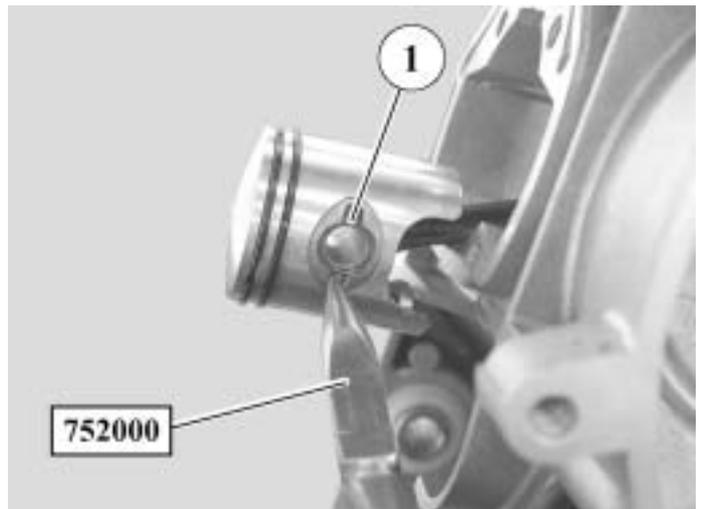
### To remove the cylinder head/cylinder assembly

- Slacken off the cylinder head/cylinder 4 mounting bolts in the order shown, in 2 or 3 stages
- Remove the 4 bolts
- Remove the cylinder head and its gasket
- Remove the cylinder and its bottom seal



### To remove the piston

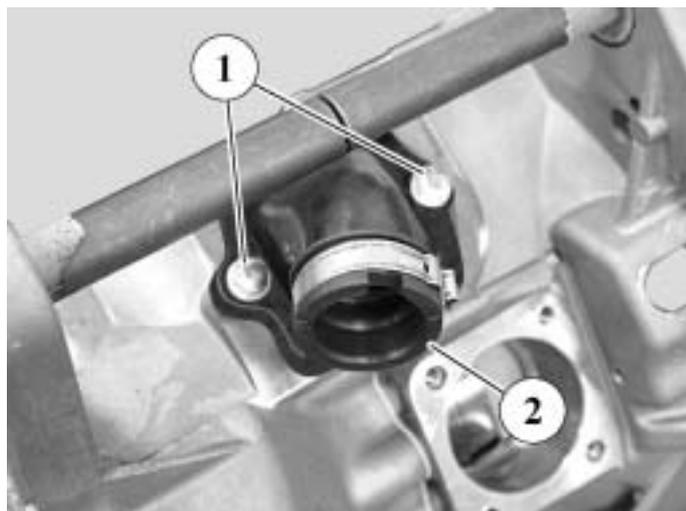
- Remove the circlips (1) with pliers P/N 752000
- Remove the gudgeon pin
- Remove the piston
- Remove the needle bearing race from the connecting rod end



## DISASSEMBLY

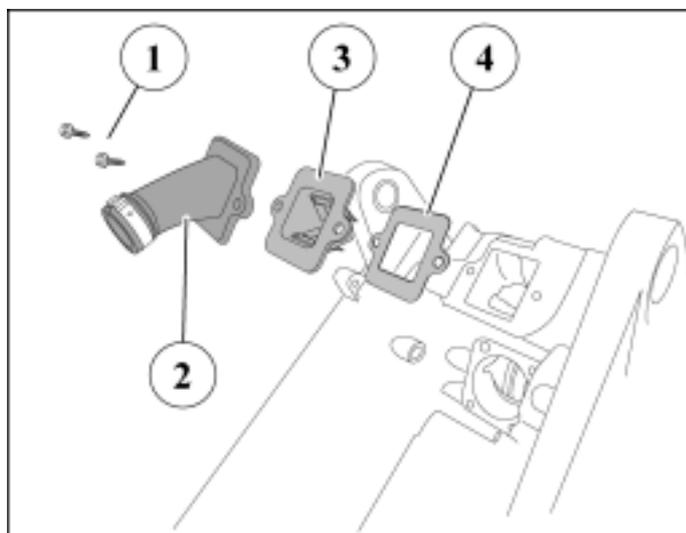
### *To remove the inlet manifold and valve*

- Remove the inlet manifold (2) 2 fixing bolts (1)
- Remove the inlet manifold



- Remove the valve assembly (3)
- Remove the gasket (4)

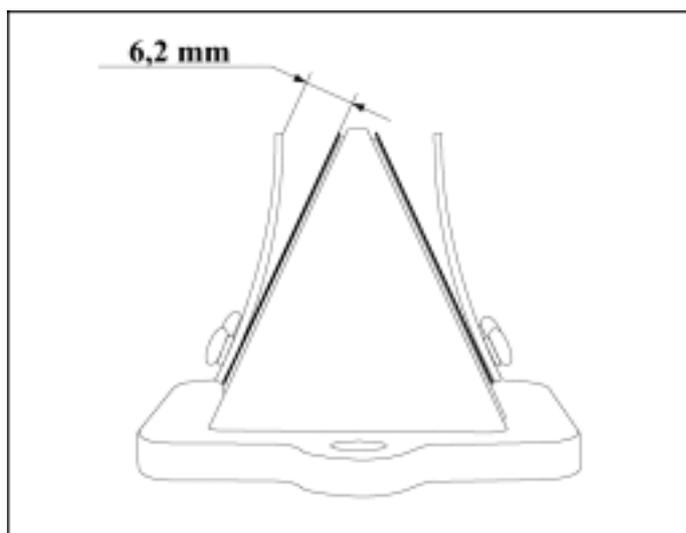
- Tightening torque when refitting: 1 m.daN



**Note:** the gasket must be renewed each time it is removed.

- Check that the valve assembly blades and support are in perfect condition

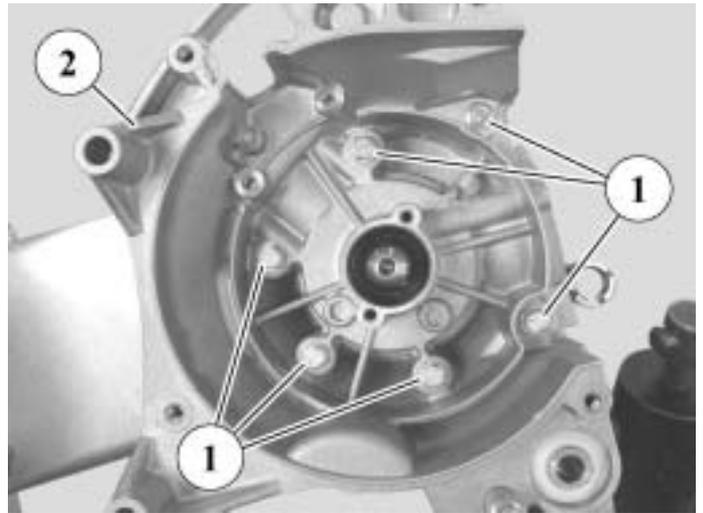
**Note:** The position of the limiter must be  $6,2 \pm 0,3$  mm from the valve support



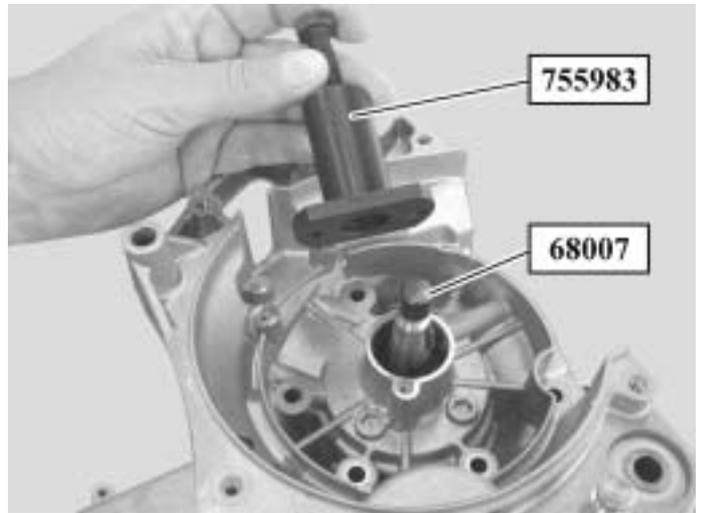
## DISASSEMBLY

### *To open the engine casings*

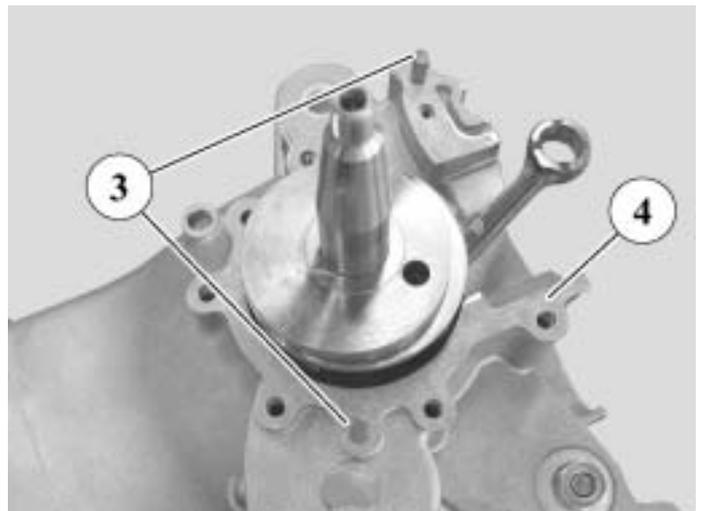
- Remove the RH casing (2) six fixing bolts (1)



- Fit the protective cap P/N 68007 to the crank 68007
- Fit to the RH casing tool P/N 755983 secured by 2 bolts
- Hold the connecting rod to prevent it from coming into contact with the casings
- Tighten the tool centre screw until the casings separate



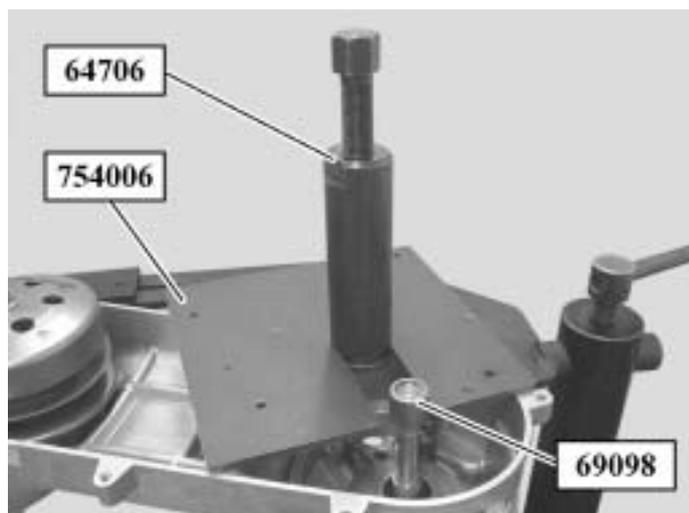
- Remove the RH casing
- Remove the 2 locating pins (3) and the gasket (4)



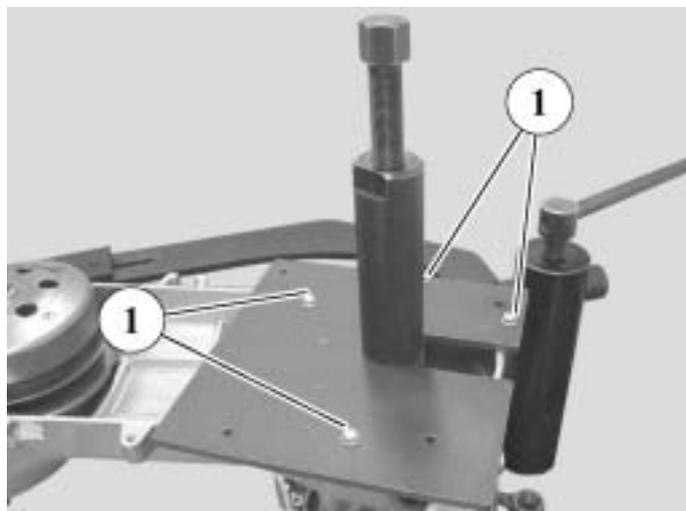
## DISASSEMBLY

### *To remove the crankshaft*

- Fit the protective cap P/N 69098 to the crank assembly
- Fit to the casing tool P/N 64706 fitted with plate P/N 754006 modified as indicated in chapter "Special Tools"



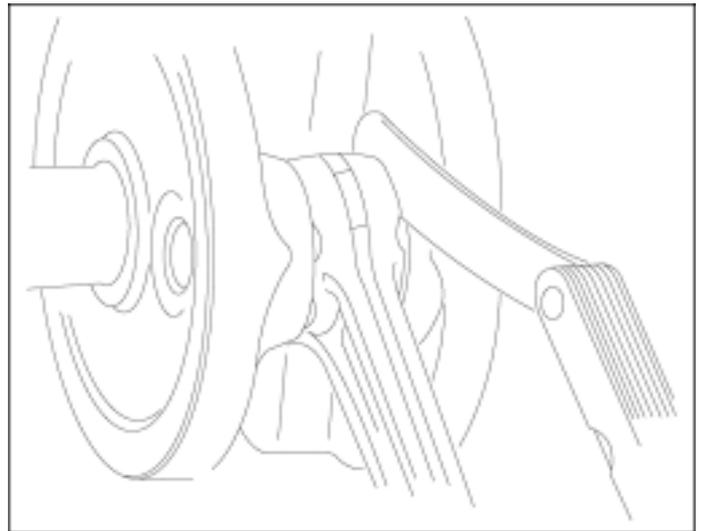
- Fit the assembly to the casing with 4 bolts (1) (the plate opening facing the cylinder side)
- Tighten the tool centre screw holding the crank with one hand on the other side until it is fully extracted



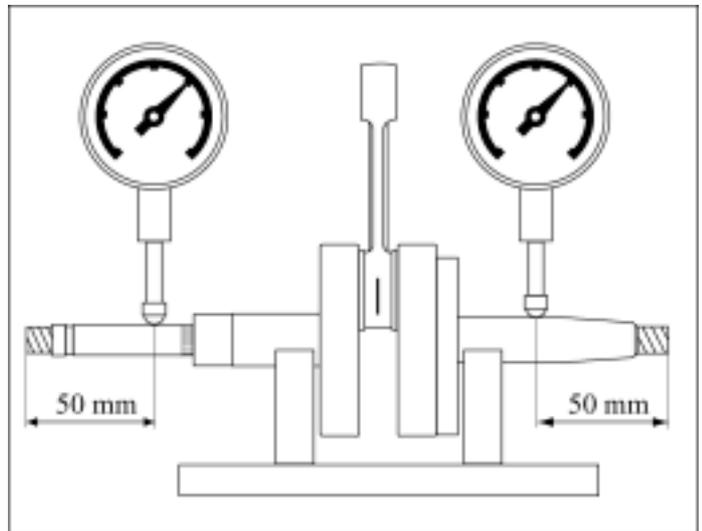
## DISASSEMBLY

### Checking the crankshaft

- Using a set of shims, check the big end side play
- The maximum side float on the connecting rod end must not exceed: 7/10mm



- The out-of-round values measured on the ends of the crank assembly should not exceed 5/100 mm and must be measured:
  - 50 mm from the transmission side end
  - 50 mm from the magneto flywheel end



**REFITTING SPECIFIC COMPONENTS**

*To fit the crank assembly bearings*

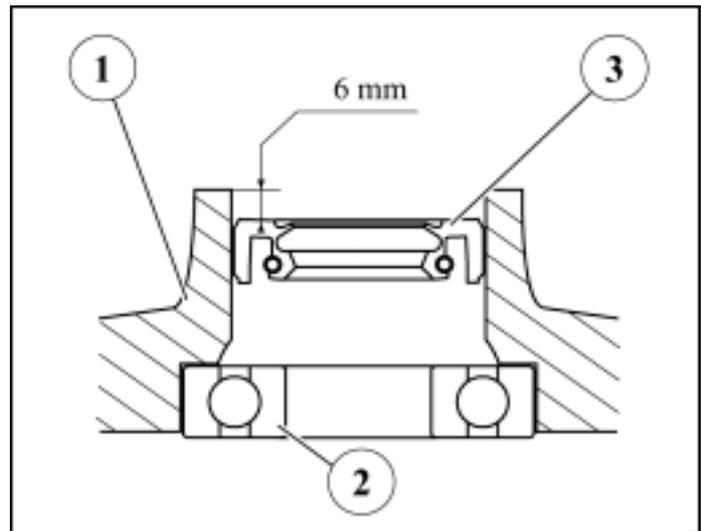
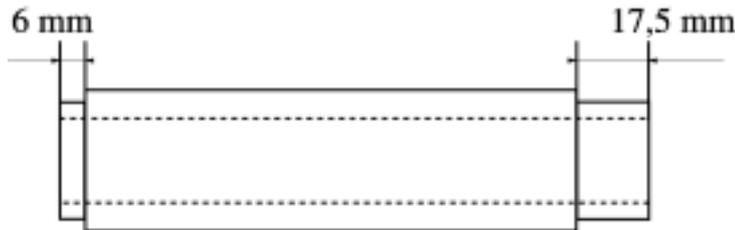
**Note:**

- The crank assembly bearings and seals must be renewed each time the engine casings are opened
- When the casings are opened, if the bearings stay on the crank assembly, use tool P/N 755585 to remove them
- If the bearings stay in the casings, the casings should be heated with a heat gun to remove them

**This operation should be done quickly in order to remove and refit a bearing to each casing**

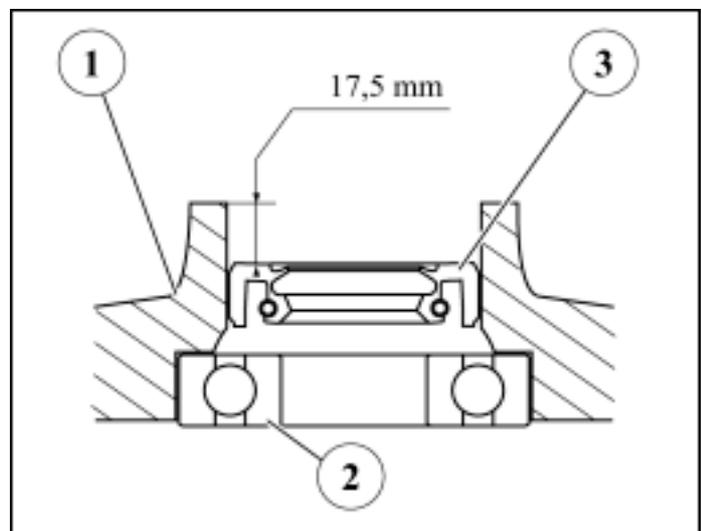
- Set one of the casings (1) on its mating surface, heat it (80 to 90°C) until the bearing drops out of its own accord
- Remove the seal
- While the casing is expanded fit the new bearing (2) fully home in its housing
- Fit a new seal (3) in each casing using tool P/N 756668

**Note:** The tool P/N 756668 enables fitting of both seals. Each side of the tool is dedicated to one of the seals.



The seals should be positioned as follows:

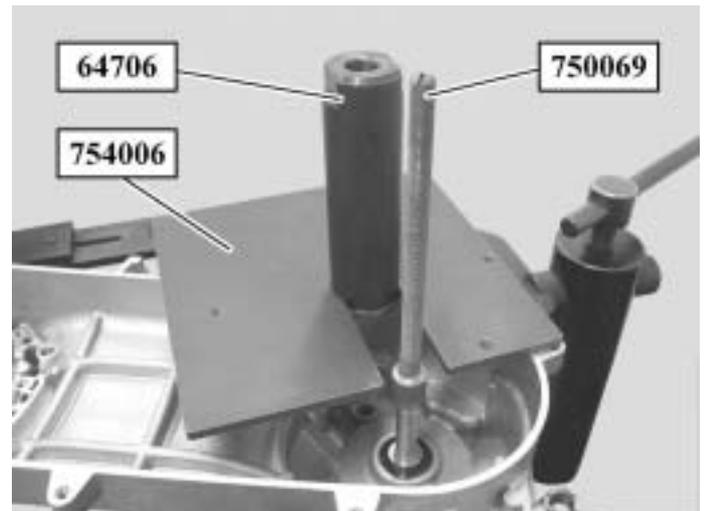
- The seal on the drive pulley side  $6 \pm 0,5$  mm from the outer edge of the casing (LH engine casing)
- The seal on the magneto flywheel side  $17.5 \pm 0,5$  mm from the outer edge of the casing (RH engine casing)



## REFITTING SPECIFIC COMPONENTS

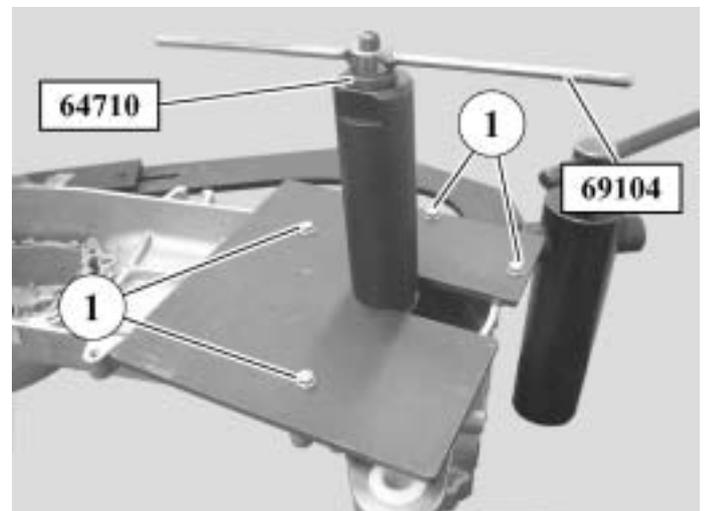
### *Assembling the engine casings*

- Insert the crankshaft into the LH casing bearing
- Tighten pin P/N 750069 on the end of the crank assembly
- Fit tool P/N 64706 fitted with plate P/N 754006 on pin

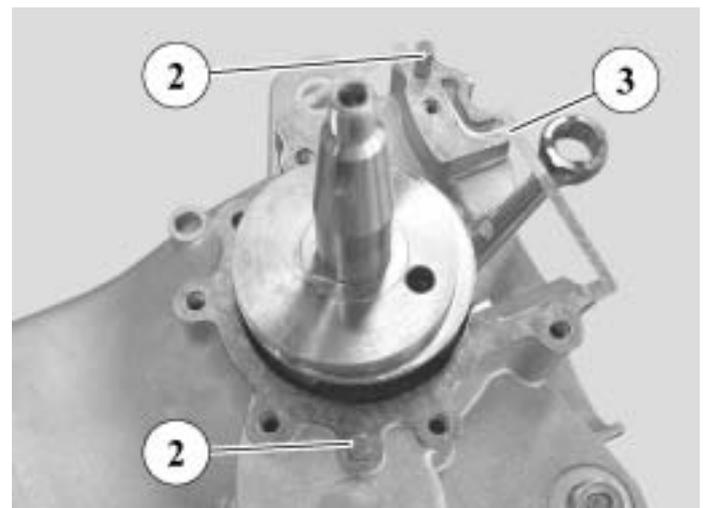


- Centre the assembly on the casing using 4 bolts (1)
- Fit centring tool P/N 64710 to tool P/N 64706
- Tighten pin nut P/N 69104 on pin P/N 750069 in order to bring the crankshaft into contact with the bearing ensuring that the connecting rod is facing the cylinder side

**Note:** hold the crankshaft on the RH side with the rotor fitted over the key



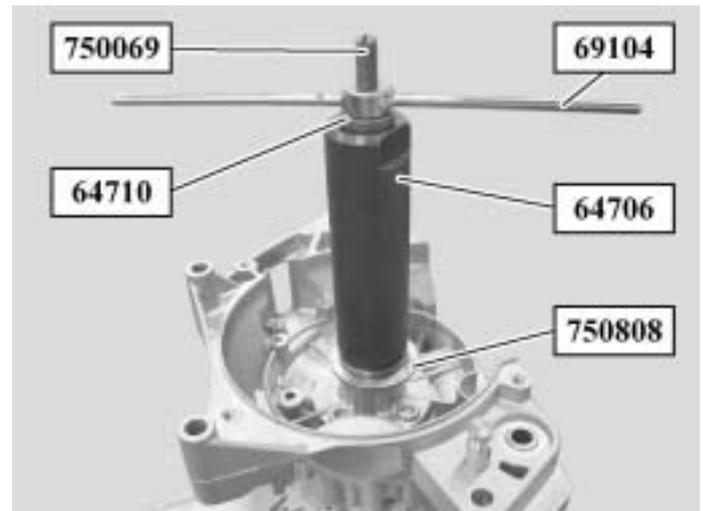
- Fit the two locating pins(2) and a new paper gasket (3) with no oil or grease to the LH casing



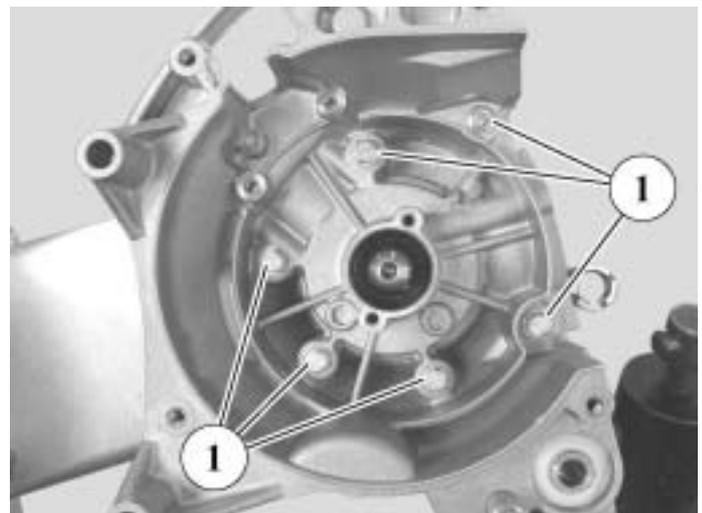
## REFITTING SPECIFIC COMPONENTS

- Fit the RH casing onto the LH casing / crankshaft assembly taking care not to damage the seal with the pin if the pin is still on the crankshaft
- Tighten pin P/N 750069 on the end of the crankshaft
- Fit to the casing and in the following order:
  - washer P/N 750808 (50x29x3mm)
  - tool P/N 64706
  - centring tool P/N 64710
- Tighten pin nut P/N 69104 until the casings are fully closed

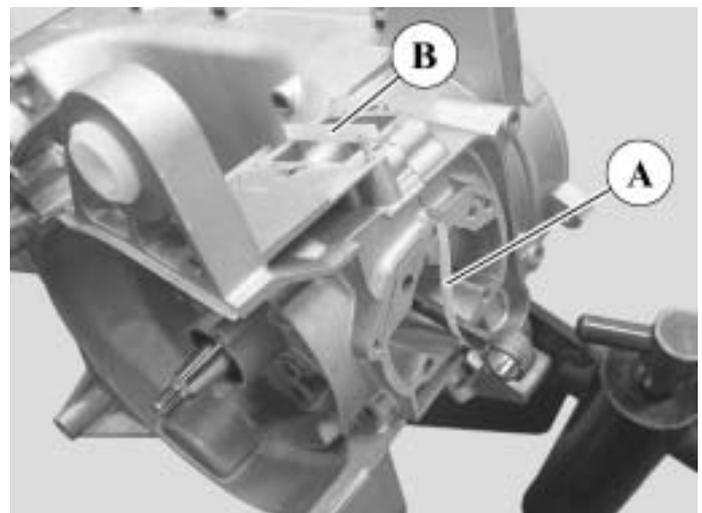
**Note:** Hold the crankshaft by the fixed flange fitted to the splines



- Fit and tighten the 6 securing bolts (1)
- Tightening torque: 1 m.daN
- **Check the crankshaft turns freely in the casings**



- Cut the casing seal flush at (A) and (B)
- Grease the crankshaft and bearings with 2-stroke oil

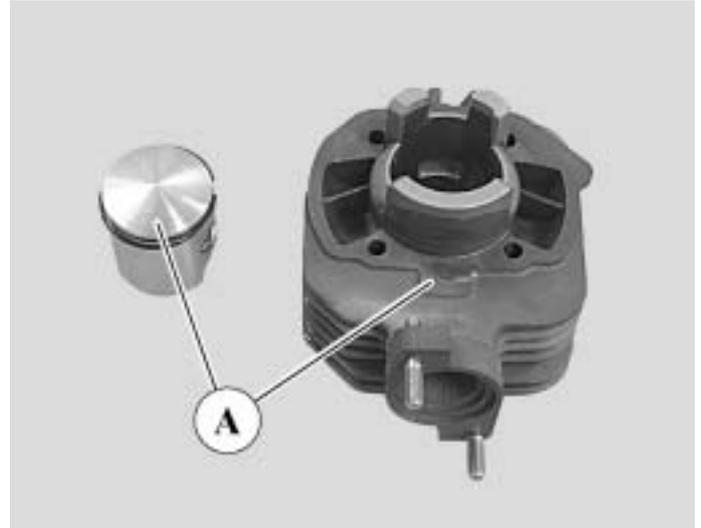


## REFITTING SPECIFIC COMPONENTS

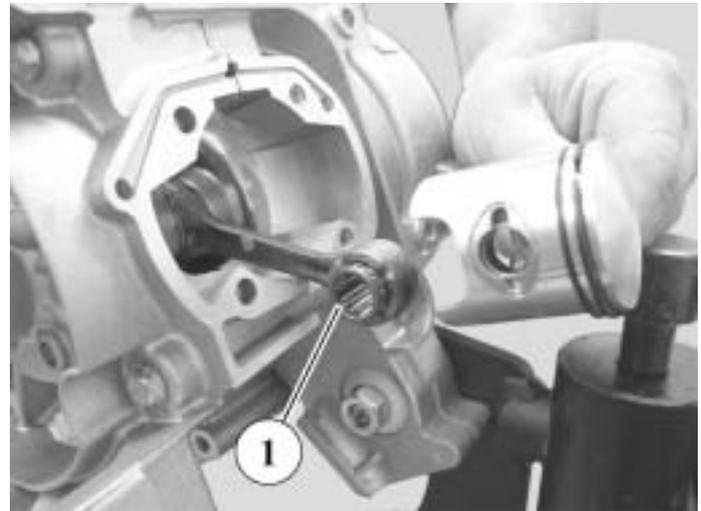
### *To fit the piston*

- Check the cylinder/piston assembly pairing (A)

PAIRING	
Cylinder	Piston
<b>1</b>	<b>A1</b>
<b>11</b>	
<b>2</b>	<b>A2</b>
<b>22</b>	

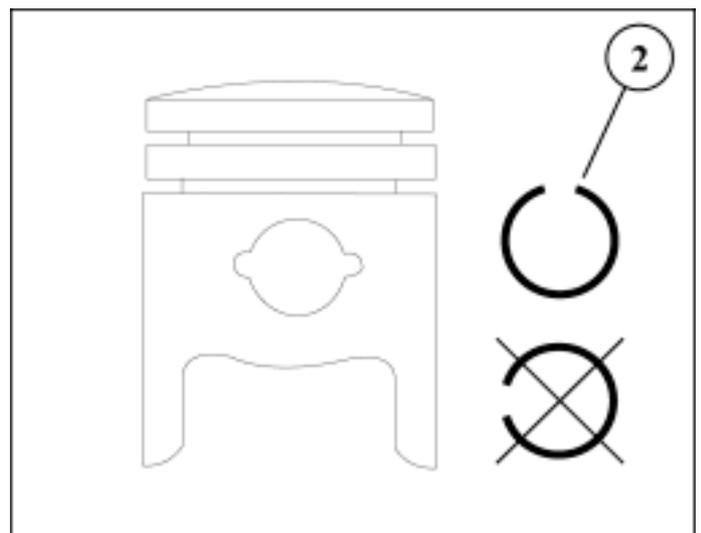


- Fit the needle bearing cage (1) into the connecting rod little end after lubricating it with 2-stroke oil
- Fit the piston to the connecting rod, the positioning spigots on the piston rings facing the inlet side
- Fit the gudgeon pin and circlips



**Important:** The circlips must be changed each time they are removed

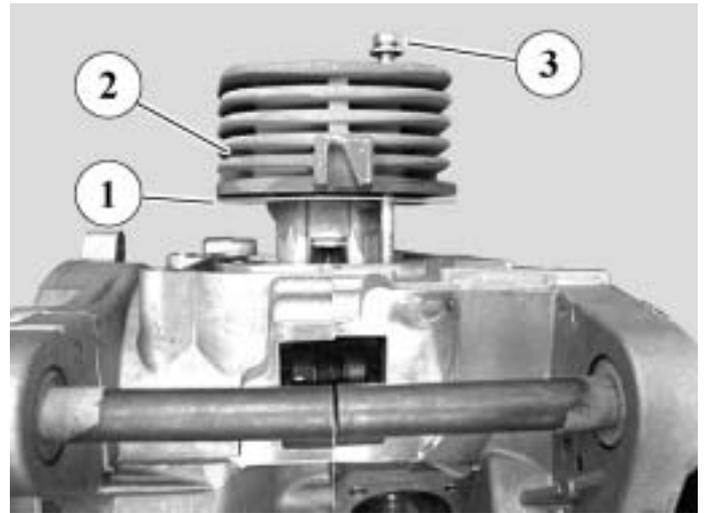
- The circlip gaps (2) must face upwards or downwards, but under no circumstances to the side



## REFITTING SPECIFIC COMPONENTS

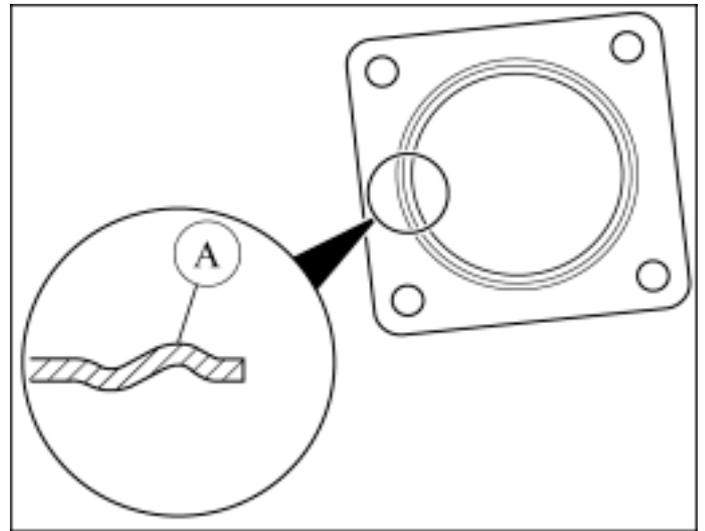
### *To fit the cylinder*

- Fit a new bottom seal (1), the right way round, without oil or grease
- Ensure that the piston ring gaps are opposite the piston positioning spigots
- Fit the cylinder (2) and insert it while compressing the piston rings by hand
- Check the bottom seal is properly positioned on the casing using a cylinder head fixing bolt (3)



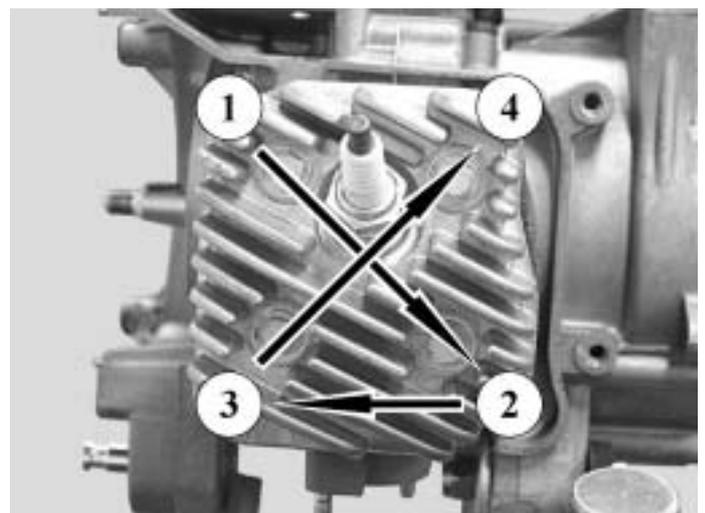
### *To fit the cylinder head*

- Check the cylinder head mating surface is in perfect condition
- Fit the 4 fixing bolts to the cylinder head with their washers
- Fit the gasket to the cylinder head, with the bead (A) on the cylinder head side



- Fit the bolt-washer, cylinder head and gasket assembly to the cylinder
- Tighten the cylinder head 4 fixing bolts in the order shown

- This operation is carried out in two phases:
  1. pre-tighten the bolts to a torque of 0.8 m.daN
  2. final torque: 1.2 m.daN



## REFITTING SPECIFIC COMPONENTS

### To fit the magneto flywheel

- Fit the key (1) to the crank
- Fit the stator and engine speed sensor assembly (2)
- Fit and tighten the stator assembly two fixing bolts (3)

- Tightening torque: 1 m.daN

- Fit and tighten the engine speed sensor 2 securing bolts (4)

- Tightening torque: 1 m.daN

- Fit the rotor to the crankshaft ensuring it is perfectly positioned on the key
- Lock the rotor with the adjustable pin wrench P/N 752237
- Fit and tighten the rotor nut

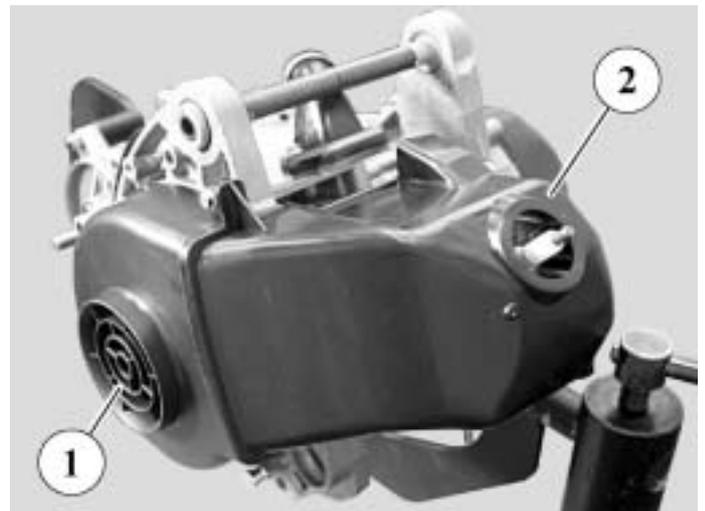
- Tightening torque: 4 m.daN



### To fit the cooling system

- Fit the cooling turbine and its 3 bolts
- Fit the volute (1) and cylinder cover (2) with their 4 bolts

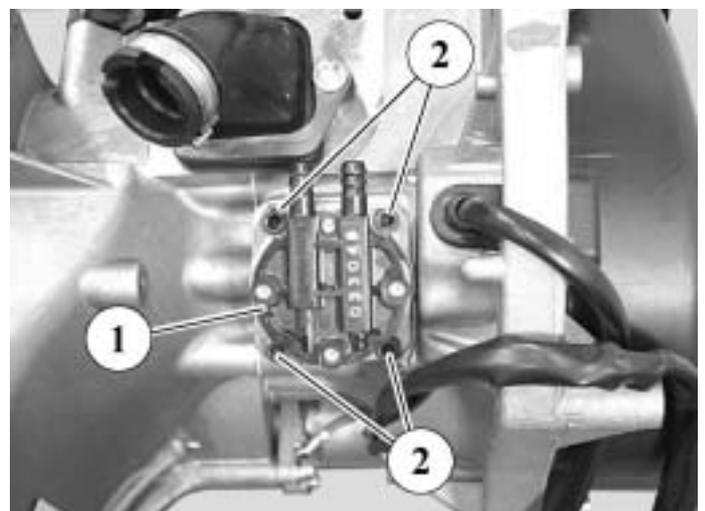
- Tightening torque: 1 m.daN



### To refit the air pump

- Fit the air pump (1) with its 2 centring studs and a new **lightly** greased O-ring
- Fit and tighten the 4 securing bolts (2)

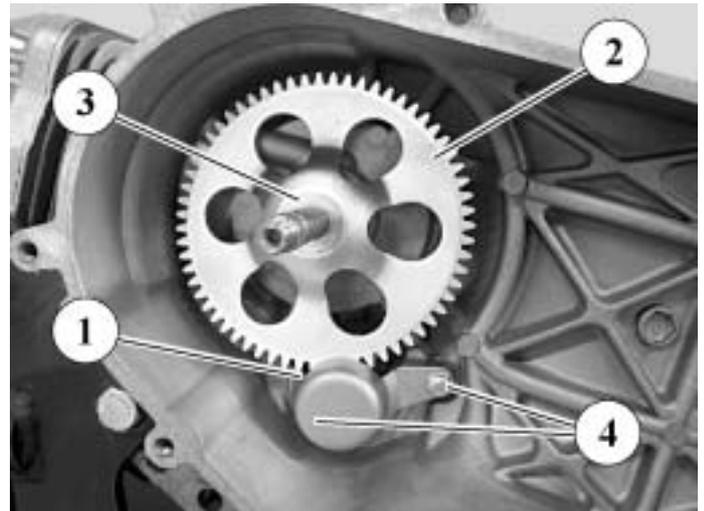
- Tightening torque: 0.7 m.daN



## REFITTING SPECIFIC COMPONENTS

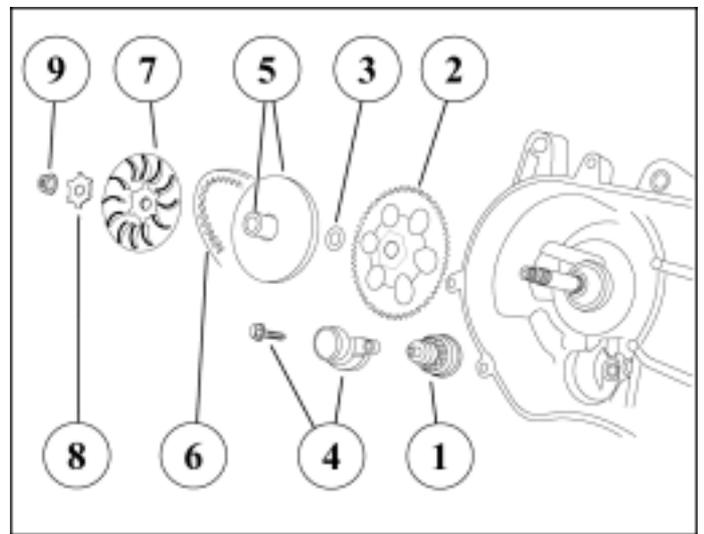
### To fit the starter dog (depending on the model)

- Fit the starter motor dog (1)
  - Fit the starter ring (2) to the crankshaft and position it on the splines
  - Fit the washer 12x22x1 (3)
  - Fit the bearing and its securing bolt (4)
- Tightening torque: 1 m.daN



### To fit the drive pulley assembly

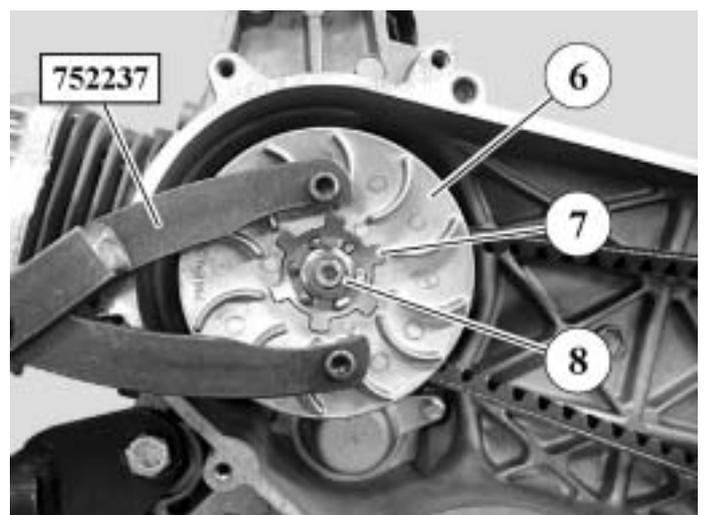
- Fit the drive pulley with its guide hub onto the crank
  - Fit the belt (6) to the guide hub
  - Fit the fixed flange (7) to the crankshaft checking it is properly positioned on the crankshaft splines
  - Fit the washer (8) and the nut (9) and tighten finger tight
  - Lock the fixed flange with tool P/N 752237
  - Tighten the nut
- Tightening torque: 4 m.daN



**Note:** it is forbidden to use a pneumatique torque gun; this may upset the crank position

### **Important:** Precautions when refitting the drive pulley

Certain parts of the drive pulley must not be discarded or cut down to a smaller size. Any modifications may cause the nut to tighten against the crankshaft splines instead of the fixed flange and damage the crankshaft splines

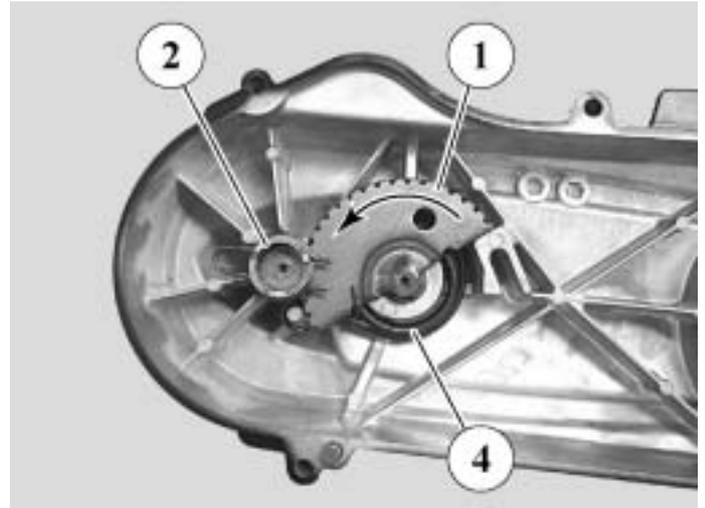


## MISCELLANEOUS OPERATIONS

### MISCELLANEOUS OPERATIONS

#### To remove the starter system

- Operate the starter quadrant (1) by hand and remove the kickstart drive gear (2) and its washer



- Turn the cover over and remove circlip (3) with circlip pliers P/N 69117

- Remove the washer, the starter quadrant (1) and the spring (4) from the transmission cover



#### To fit starter system

- Fit the return spring (4), with the longest loop on peg (A) in the cover

- Fit the starter quadrant (1) into the bearing bush previously greased

- Hook the second loop (B) of the spring onto the starter quadrant

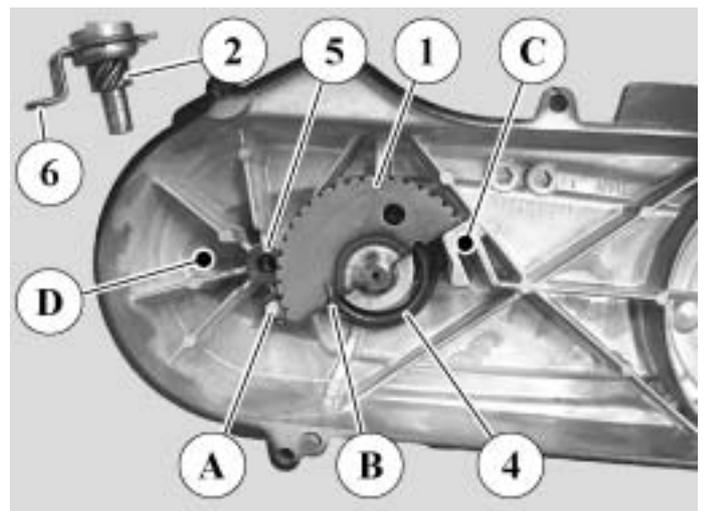
- Set the spring so that the starter quadrant is positioned against its stop (C) in the cover

- Turn the cover over and fit the washer and circlip to the quadrant shaft

Fit the washer (5) into the kickstart drive gear housing

- Set the quadrant at around 1/8 turn in order to be able to fit the kickstart drive gear

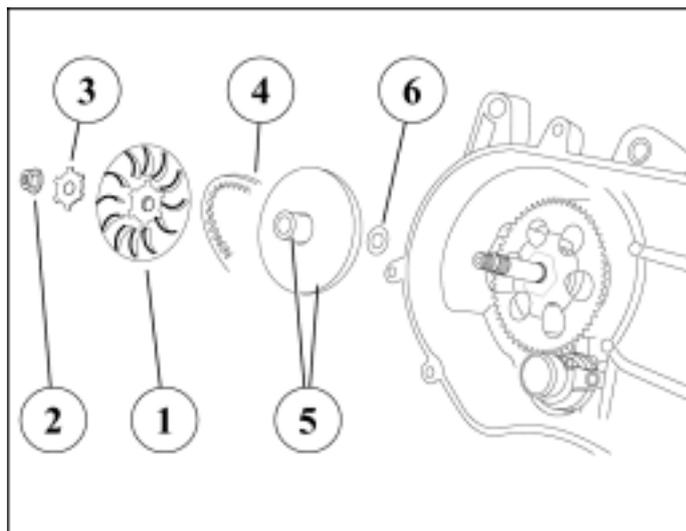
- Fit the kickstart drive gear pin (6) around the cover boss (D)



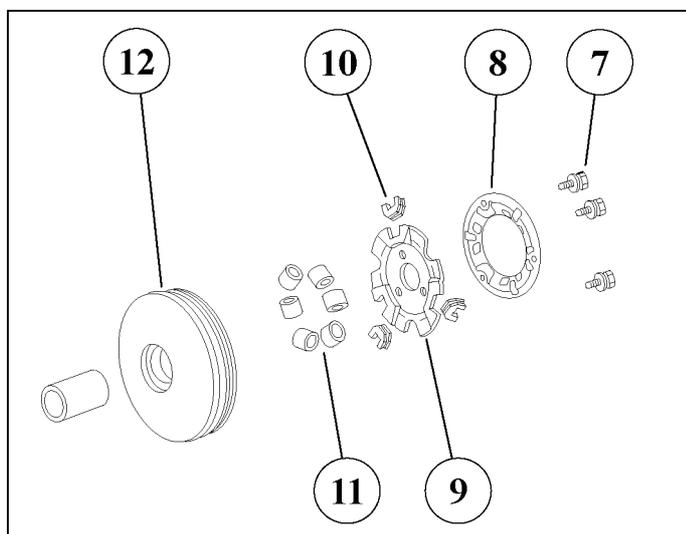
## MISCELLANEOUS OPERATIONS

### *Drive pulley rollers replacement*

- Remove the transmission cover 6 fixing bolts
- Remove the cover and the rubber stop of the stand
- Lock the fixed flange (1) with tool P/N 752237
- Remove the fixed flange nut (2) and washer (3)
- Remove the fixed flange
- Remove the belt (4)
- Remove the guide hub and the drive pulley (5)
- Check the washer 12x22x1 (6) is fitted and check its condition



- Remove the stop (8) 3 fixing bolts (7)
- Remove the stop
- Remove the holder (9) and its 3 plastic guides (10)
- Remove the 6 rollers (11) from the rotating flange (12)



The rollers must be changed if they show flats due to excessive wear

Re-assemble in reverse order to dismantling without greasing the rollers

Slightly grease the rotating flange bore (high temperature grease)

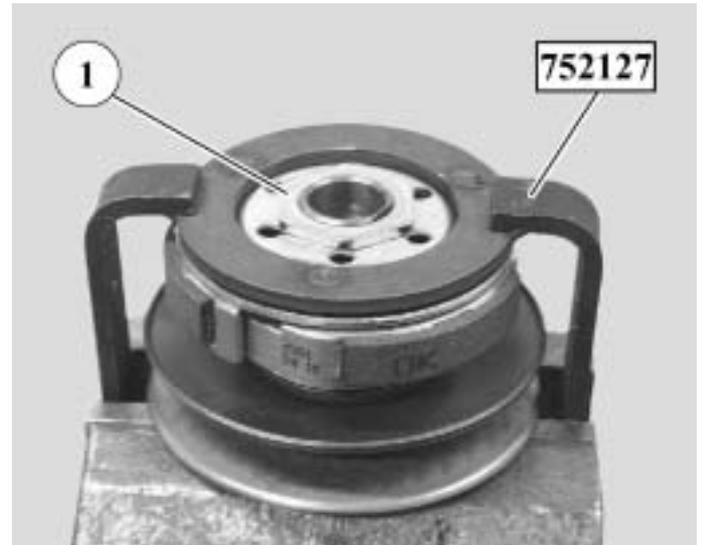
**Note:** Do not over-grease to avoid splashing the belt

- Tightening torque when refitting the drive pulley: 4 m.daN

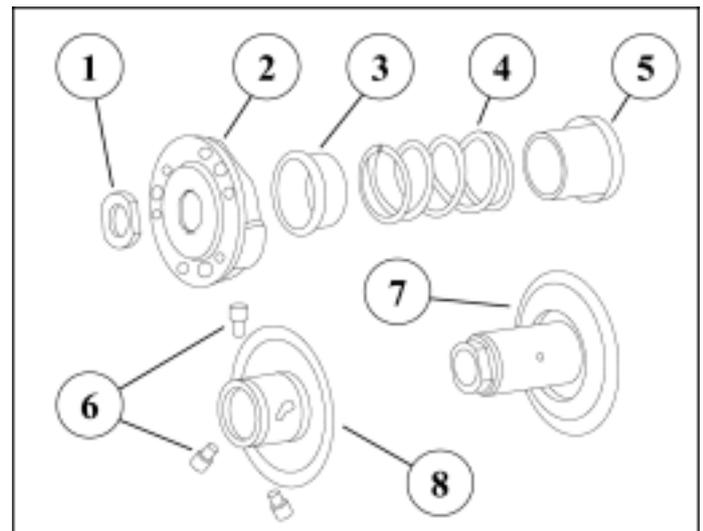
## MISCELLANEOUS OPERATIONS

### *To remove the clutch lining assembly*

- Remove the transmission cover 6 fixing bolts
- Remove the cover
- Lock the clutch drum with the pin wrench P/N 752237
- Remove the nut
- Clamp the two strands of the belt to lower it between the flanges
- Remove the clutch drum and the clutch / driven pulley assembly and the belt
- Compress the clutch / driven pulley assembly with tool P/N 752127 clamped in the jaws of a vice
- Remove nut (1) using spanner P/N 756725
- Slacken tool P/N 752127



- Remove the clutch lining assembly (2), the upper centring sleeve (3), the spring (4) and the lower centring sleeve (5)
- Remove the 3 pins (6) from the governor seat
- Separate the fixed (7) and rotating (8) flanges



## MISCELLANEOUS OPERATIONS

### *To refit the clutch lining assembly*

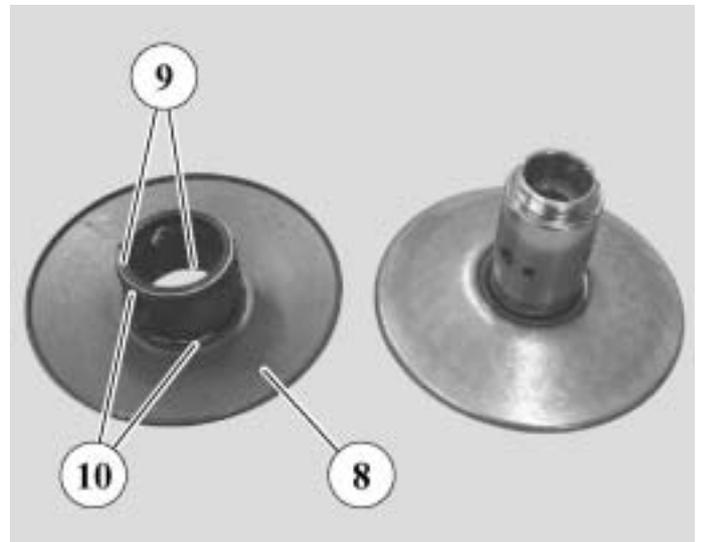
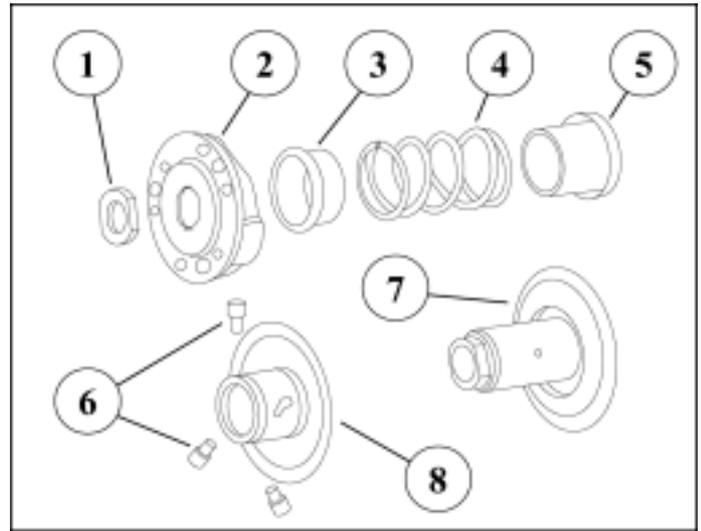
After checking the 2 lip seals (9) and the 2 O-rings of the rotating flange (8) are in good condition, grease the governor seat 3 pins (6) (high temperature grease) and assemble the parts in reverse order to removal

- Compress the clutch / driven pulley assembly with tool P/N 752127
- Tighten the nut (1)

- Tightening torque when refitting: 4.5 m.daN

**Note:** Before fitting the clutch / drive pulley assembly to the input shaft, fit the belt into the pulley bottom by opening the flanges by hand

- Fit the clutch / drive pulley assembly
  - Fit the clutch cover
  - Fit and tighten the nut
- Tightening torque: 4.5 m.daN
- Fit the transmission cover and the rubber stop of the stand
  - Fit and tighten the cover 6 securing bolts
- Tightening torque: 1 m.daN





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