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# **SERVICE STATION MANUAL**

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**664727-664732 (IT-EN-FR-DE-ES-EL)**

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**OREGON 250**

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# SERVICE STATION MANUAL

## OREGON 250

The descriptions and illustrations given in this publication are not binding. While the basic specifications as described and illustrated in this manual remain unchanged, PIAGGIO-GILERA reserves the right, at any time and without being required to update this publication beforehand, to make any changes to components, parts or accessories, which it considers necessary to improve the product or which are required for manufacturing or construction reasons.

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# SERVICE STATION MANUAL

## OREGON 250

This service station manual has been drawn up by Piaggio & C. Spa to be used by the workshops of Piaggio-Gilera dealers. It is assumed that the user of this manual for maintaining and repairing Piaggio vehicles has a basic knowledge of mechanical principles and vehicle repair technique procedures. Any significant changes to vehicle characteristics or to specific repair operations will be communicated by updates to this manual. Nevertheless, no mounting work can be satisfactory if the necessary equipment and tools are unavailable. It is therefore advisable to read the sections of this manual concerning special tools, along with the special tool catalogue.

**N.B.** Provides key information to make the procedure easier to understand and carry out.

**CAUTION** Refers to specific procedures to carry out for preventing damages to the vehicle.

**WARNING** Refers to specific procedures to carry out to prevent injuries to the repairer.



**Personal safety** Failure to completely observe these instructions will result in serious risk of personal injury.



**Safeguarding the environment** Sections marked with this symbol indicate the correct use of the vehicle to prevent damaging the environment.



**Vehicle intactness** The incomplete or non-observance of these regulations leads to the risk of serious damage to the vehicle and sometimes even the invalidity of the guarantee.

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## INDEX OF TOPICS

CHARACTERISTICS

CHAR

TOOLING

TOOL

MAINTENANCE

MAIN

TROUBLESHOOTING

TROUBL

ELECTRICAL SYSTEM

ELE SYS

ENGINE FROM VEHICLE

ENG VE

ENGINE

ENG

SUSPENSIONS

SUSP

BRAKING SYSTEM

BRAK SYS

COOLING SYSTEM

COOL SYS

CHASSIS

CHAS

PRE-DELIVERY

PRE DE

TIME

TIME

INDEX OF TOPICS

CHARACTERISTICS

CHAR

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## Rules

This section describes general safety rules for any maintenance operations performed on the vehicle.

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### Safety rules

- If work can only be done on the vehicle with the engine running, make sure that the premises are well-ventilated, using special extractors if necessary; never let the engine run in an enclosed area. Exhaust fumes are toxic.
  - The battery electrolyte contains sulphuric acid. Protect your eyes, clothes and skin. Sulphuric acid is highly corrosive; in the event of contact with your eyes or skin, rinse thoroughly with abundant water and seek immediate medical attention.
  - The battery produces hydrogen, a gas that can be highly explosive. Do not smoke and avoid sparks or flames near the battery, especially when charging it.
  - Fuel is highly flammable and it can be explosive given some conditions. Do not smoke in the working area, and avoid naked flames or sparks.
  - Clean the brake pads in a well-ventilated area, directing the jet of compressed air in such a way that you do not breathe in the dust produced by the wear of the friction material. Even though the latter contains no asbestos, inhaling dust is harmful.
- 

### Maintenance rules

- Use original PIAGGIO spare parts and lubricants recommended by the Manufacturer. Non-original or non-conforming spares may damage the vehicle.
  - Use only the appropriate tools designed for this vehicle.
  - Always use new gaskets, sealing rings and split pins upon refitting.
  - After removal, clean the components using non-flammable or low flash-point solvents. Lubricate all the work surfaces, except tapered couplings, before refitting these parts.
  - After refitting, make sure that all the components have been installed correctly and work properly.
  - For removal, overhaul and refit operations use only tools with metric measures. Metric bolts, nuts and screws are not interchangeable with coupling members with English sizes. Using unsuitable coupling members and tools may damage the scooter.
  - When carrying out maintenance operations on the vehicle that involve the electrical system, make sure the electric connections have been made properly, particularly the ground and battery connections.
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## Vehicle identification

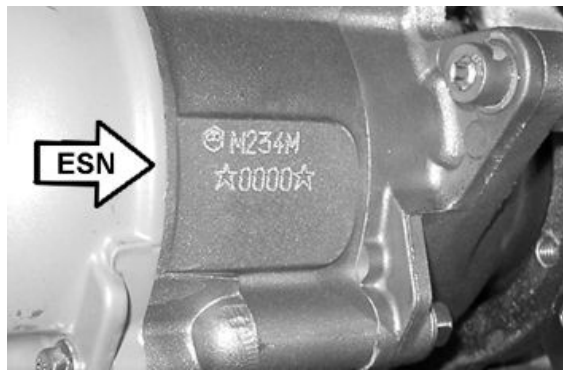
Chassis prefix (Vehicle Identification Number):

\*RGEYN25D56A000039\*

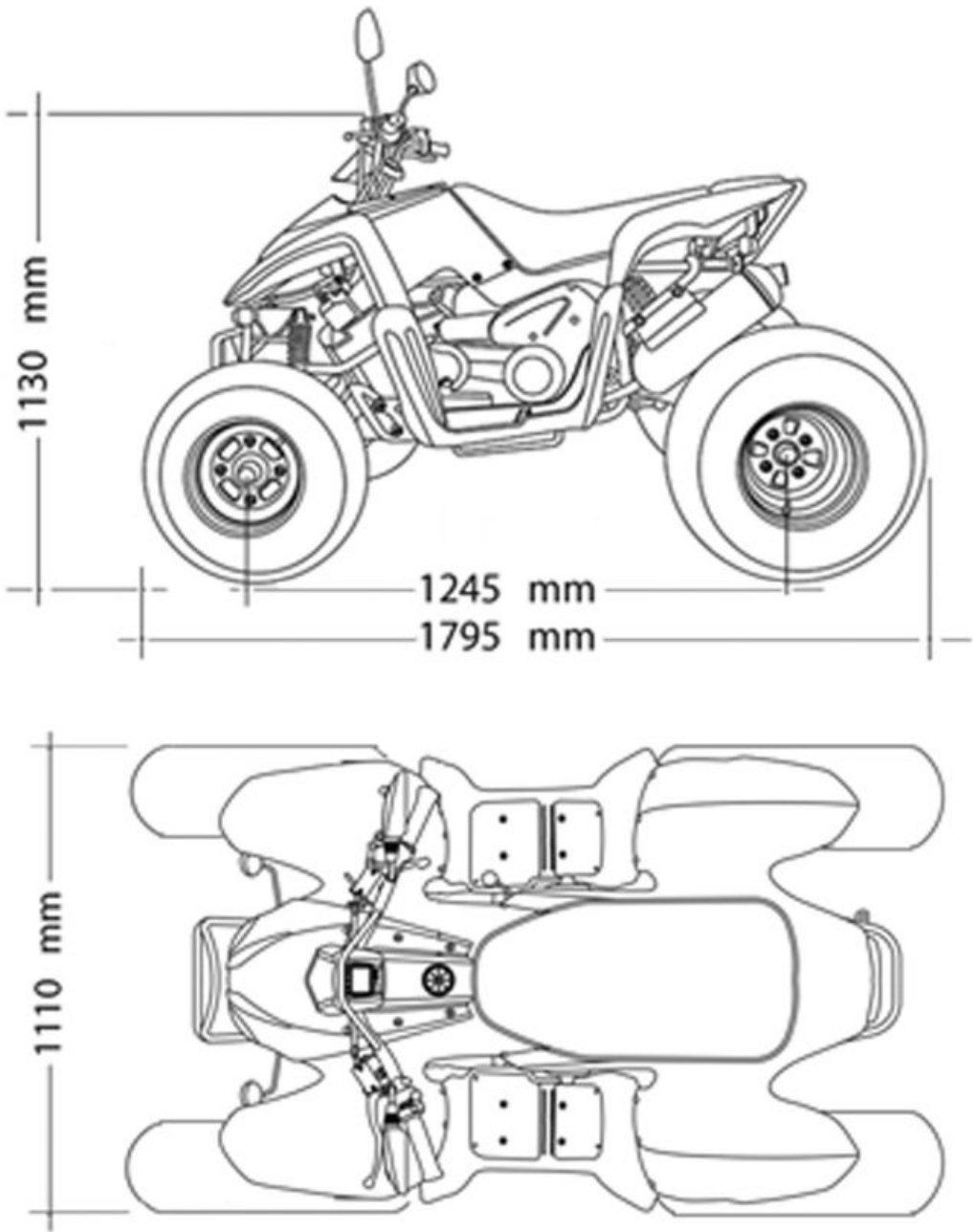


Engine ESN prefix (Engine Serial Number):

M237M \*0024511\*



Dimensions and mass



**DIMENSIONS AND WEIGHTS**

| Specification          | Desc./Quantity |
|------------------------|----------------|
| Kerb weight            | 206 kg         |
| Maximum weight allowed | 364 kg         |
| Max. height            | 1,130 mm       |
| Width                  | 1,110 mm       |

| Specification | Desc./Quantity |
|---------------|----------------|
| Wheelbase     | 1,245 mm       |
| Length        | 1,795 mm       |

## Engine

### ENGINE

| Specification                         | Desc./Quantity                                                                     |
|---------------------------------------|------------------------------------------------------------------------------------|
| Type                                  | Single-cylinder, 4-stroke                                                          |
| Engine capacity                       | 244 cm <sup>3</sup>                                                                |
| Bore x stroke                         | 72 x 60 mm                                                                         |
| Compression ratio                     | 11 ± 0.5 : 1                                                                       |
| Engine idle speed                     | 1,700 ± 100 rpm                                                                    |
| Valve clearance                       | intake 0.10<br>outlet 0.15                                                         |
| MAX. power                            | 14.3 kW at 8,000 rpm                                                               |
| MAX torque                            | 19.6 Nm at 6,500 rpm                                                               |
| Timing system                         | 4 valves, single overhead camshaft, chain-driven.                                  |
| Lubrication                           | Engine lubrication with lobe pump, chain-driven and double filter: mesh and paper. |
| Lubrication pressure                  | 4 bar                                                                              |
| Minimum lubrication pressure (100° C) | 0.8 bar                                                                            |
| Fuel supply                           | KEHIN CVEK 30 Carburettor                                                          |
| Cooling                               | Forced liquid circulation cooling.                                                 |
| Fuel                                  | Unleaded petrol (95 RON)                                                           |

## Transmission

### TRANSMISSION

| Specification   | Desc./Quantity                                                                                          |
|-----------------|---------------------------------------------------------------------------------------------------------|
| Transmission    | Automatic expandable pulley variator with torque server, V belt, self-ventilating automatic dry clutch. |
| Final reduction | Gear reduction unit in oil bath.                                                                        |

## Capacities

### REFUELLING (CAPACITY)

| Specification                               | Desc./Quantity |
|---------------------------------------------|----------------|
| Fuel tank (reserve)                         | ~12 l (-)      |
| Engine oil                                  | 1.30 l         |
| Engine oil level top-up between MIN and MAX | ~ 0.20 l       |
| Cooling circuit                             | 1.5 l          |
| Transmission oil - Reverser                 | 0.15 l         |
| Transmission oil - Rear wheel hub           | ~ 0.25 l       |

## Electrical system

### ELECTRICAL SYSTEM

| Specification          | Desc./Quantity                                                              |
|------------------------|-----------------------------------------------------------------------------|
| Start-up               | Electric                                                                    |
| Ignition               | Electronic capacitive discharge, with variable timing and separate HV coil. |
| Ignition advance       | 10° ± 1° - 2,000 rpm                                                        |
| Spark plug             | CHAMPION RG4HC                                                              |
| Alternative spark plug | NGK CR8EB                                                                   |

| Specification | Desc./Quantity                  |
|---------------|---------------------------------|
| Battery       | 12 V-12Ah SEALED BATTERY        |
| Generator     | Three-phase alternating current |

## Frame and suspensions

### FRAME AND SUSPENSIONS

| Specification           | Desc./Quantity                                                                                               |
|-------------------------|--------------------------------------------------------------------------------------------------------------|
| Chassis                 | Tubular and sheet steel.                                                                                     |
| Front suspension        | Independently articulated, double-acting shock absorbers and spring preloading adjustable to five positions. |
| Front suspension travel | 104 mm                                                                                                       |
| Rear suspension         | Swinging arm and double-acting single shock absorber and adjustable preload.                                 |
| Rear suspension travel  | 95.5 mm                                                                                                      |

## Brakes

### BRAKES

| Specification | Desc./Quantity                                                                                                                                           |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Front brake   | Ø 170 mm disc with hydraulic control activated by the handlebar right-hand lever or the brake pedal.                                                     |
| Rear brake    | Ø 170 mm disc, placed at the centre of the axle of the rear wheels, with hydraulic control operated by the handlebar left-side lever or the brake pedal. |

## Wheels and tyres

### WHEELS AND TYRES

| Specification                        | Desc./Quantity       |
|--------------------------------------|----------------------|
| Wheel rim type                       | Pressed steel.       |
| Front rim                            | 5.5" x 10            |
| Rear rim                             | 8" x 10              |
| Front tyre                           | 21/7 - 10" Tubeless  |
| Rear tyre                            | 22/10 - 10" Tubeless |
| Front tyre pressure (with passenger) | 0.7 bar (-)          |
| Rear tyre pressure (with passenger)  | 0.7 bar (-)          |

## Secondary air

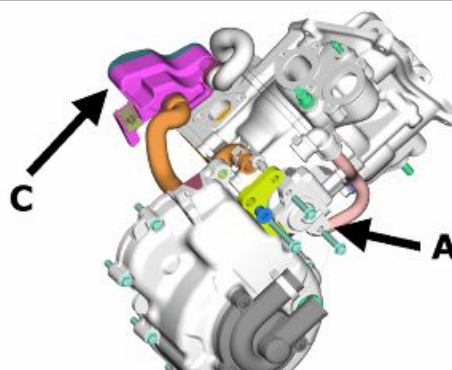
General notes:

The SAS for Quasar 250 Euro 2 engines operates in a similar manner to the SAS for 2T engines.

The differences are the following:

instead of entering through the muffler as for 2T engine, the secondary air enters directly in the discharge pipe on the head.

The 2T reed valve has a diaphragm. The unit "A", indicated in the figure, has a cut-off device



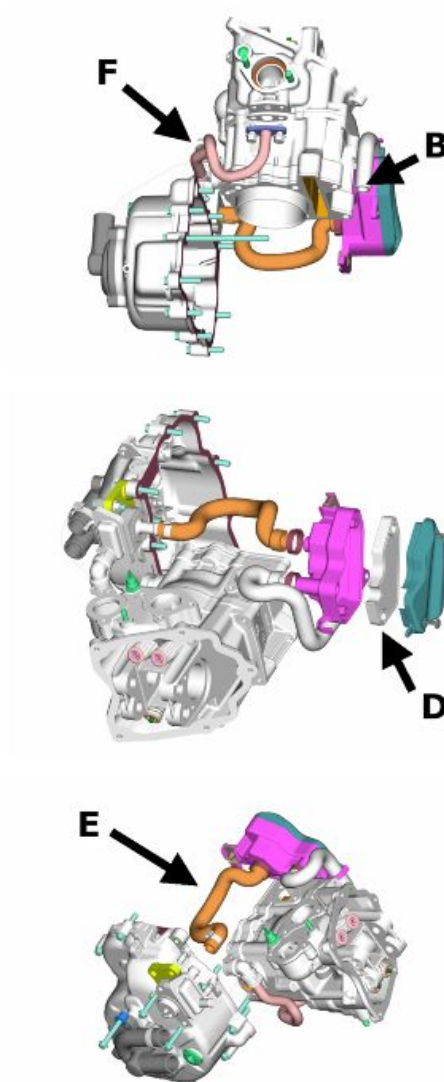
connected to the depression intake on the inlet manifold that cuts the air inlet in deceleration, to avoid explosions in the muffler.

System description:

Air is sucked in through the hole "B" and gets through the tube into the filter housing "C" where the filtering element "D" is.

Now, the filtered air enters the diaphragm device "A" and then is channelled to the head.

The air passes through a flanged pipe "E" connected to the air head and reaches a discharge joint in order to supply oxygen to the unburned gases before the catalytic converter, thus favouring an improved reaction of the catalytic converter.



## Carburettor

### 250cc Version

## Keihin

### KEIHIN CARBURETTOR

| Specification                         | Desc./Quantity |
|---------------------------------------|----------------|
| Depression carburettor                | CVEK-30        |
| Body stamping                         | CVEK           |
| Stamping                              | 303A           |
| Tapered pin notches position from top | Fixed position |
| Max. air jet                          | 70             |
| Diffuser nozzle                       | Ø 2.8          |
| Starter jet                           | 42             |
| Starter device resistance             | ~ 20 Ω         |
| Diffuser                              | Ø 29           |



| Specification                             | Desc./Quantity    |
|-------------------------------------------|-------------------|
| Tapered pin stamping                      | NDWA              |
| Minimum mixture set screw initial opening | $\pm \frac{1}{4}$ |
| Throttle valve spring                     | 150 ÷ 250 g       |
| Minimum air jet                           | 115               |
| Minimum jet                               | 38                |
| Max. jet                                  | 100               |
| Starter air jet                           | Ø 1.5 (body)      |
| Starter diffuser nozzle                   | Ø 1.5 (body)      |

N.B.

THE IDENTIFICATION LETTER CAN VARY WITH EACH CARBURETTOR UPDATE

## Tightening Torques

For correct tightening, the expansion tank cap locking torque has been standardised to **2.5 Nm**

### PRODUCTS

| Product         | Description                | Specifications                               |
|-----------------|----------------------------|----------------------------------------------|
| (°) Loctite 243 | Medium-strength threadlock | Apply LOCTITE 243 medium-strength threadlock |

### FRONT BRAKE

| Name                              | Torque in Nm |
|-----------------------------------|--------------|
| Front calliper - hub              | 38÷40        |
| Brake fluid pipe-calliper fitting | 18÷22        |
| Disc - flange coupling screws     | 18÷22 (°)    |
| Oil bleed screw                   | 12÷16        |

### REAR BRAKE

| Name                                  | Torque in Nm |
|---------------------------------------|--------------|
| Parking calliper - support bracket    | 28÷30        |
| Rear brake calliper - support bracket | 40÷45        |
| Support bracket - rear hub            | 28÷30        |
| Calliper screws                       | 18÷22 (°)    |
| Oil bleed screw                       | 8÷12         |
| Disc - hub coupling screws            | 18÷22 (°)    |

### TELAIO

| Name                                       | Torque in Nm |
|--------------------------------------------|--------------|
| Engine - chassis support front retainer    | 44           |
| Engine - chassis lower retainer            | 44           |
| Engine - chassis front support retainer    | 44           |
| Engine - engine rear support rear retainer | 24           |
| Engine rear support retainer               | 24           |

### ENGINE - REVERSER

| Name                                                          | Torque in Nm |
|---------------------------------------------------------------|--------------|
| Bearing retention flange screws                               | 5 (°)        |
| Fork - fork control shaft connecting screws                   | 10           |
| Reverser housing cover closing screws                         | 10           |
| Bracket - crankcase connecting screws                         | 28÷32        |
| Reverser unit connecting screws to chassis connecting bracket | 50           |

### ENGINE - TRANSMISSION

| Name                                       | Torque in Nm |
|--------------------------------------------|--------------|
| Crown - crown holder flange locking screws | 45           |
| Exhaust end/chassis fixing screws          | 25÷30        |

**FRONT SUSPENSION**

| Name                      | Torque in Nm |
|---------------------------|--------------|
| Wheel holder flange nut   | 60÷70        |
| Wheel nuts                | 70÷80        |
| Rear axle tightening nut  | 200          |
| Steering arms fixing nuts | 50           |

**REAR SUSPENSION**

| Name                               | Torque in Nm |
|------------------------------------|--------------|
| Rear shock absorber - chassis      | 44           |
| Rear shock absorber - swinging arm | 80           |
| Swinging arm - chassis pin nut     | 132          |
| Rear hub - swinging arm retainers  | 140          |

**STEERING**

| Name                               | Torque in Nm |
|------------------------------------|--------------|
| Handlebar fixing screws            | 10           |
| Steering tube - chassis fixing nut | 55÷58        |
| Vertical u-bolt - chassis screws   | 27÷30        |

**CRANKCASE AND CRANKSHAFT**

| Name                                                                     | Torque in Nm |
|--------------------------------------------------------------------------|--------------|
| Internal engine crankcase bulkhead (transmission-side half shaft) screws | 4 ÷ 6        |
| Engine-crankcase coupling screws                                         | 11 ÷ 13      |
| Starter motor screws                                                     | 11 ÷ 13      |
| Crankcase timing system cover screws (°)                                 | 3.5 ÷ 4.5    |

**ENGINE - FLYWHEEL**

| Name                               | Torque in Nm |
|------------------------------------|--------------|
| Pick-Up clamping screws            | 3 ÷ 4        |
| Stator assembly screws (°)         | 3 ÷ 4        |
| Flywheel cover fixing screws       | 5 - 6        |
| Flywheel nut (250)                 | 94 ÷ 102     |
| Screw fixing freewheel to flywheel | 13 ÷ 15      |

**ENGINE - TRANSMISSION**

| Name                             | Torque in Nm |
|----------------------------------|--------------|
| Rear hub cover screws            | 24 ÷ 27      |
| Driven pulley shaft nut          | 54 ÷ 60      |
| Transmission cover screws        | 11 ÷ 13      |
| Drive pulley nut                 | 75 ÷ 83      |
| Clutch unit nut on driven pulley | 55 ÷ 60      |
| Belt support roller screw        | 11 ÷ 13      |

**ENGINE - CYLINDER HEAD**

| Name                                 | Torque in Nm |
|--------------------------------------|--------------|
| Manifold-silencer retaining bolt     | 15 ÷ 20      |
| Nut fixing muffler to cylinder head  | 16 ÷ 18      |
| Camshaft retention plate screw       | 4 ÷ 6        |
| Timing chain tensioner central screw | 5 - 6        |
| Timing chain tensioner support screw | 11 ÷ 13      |
| Starter ground support screw         | 11 ÷ 15      |
| Timing chain tensioner slider screw  | 10 ÷ 14      |
| Inlet manifold screws                | 11 ÷ 13      |
| Tappet set screw lock nut            | 6 ÷ 8        |
| Starter ground screw                 | 7 ÷ 8.5      |
| Head fixing side screws              | 11 ÷ 12      |
| Nuts fixing head to cylinder (*)     | 27 ÷ 29      |
| Tappet cover screws                  | 6 ÷ 7        |
| Spark plug                           | 12 ÷ 14      |

LUBRICATION

| Name                                 | Torque in Nm |
|--------------------------------------|--------------|
| Hub oil drainage plug                | 15 ÷ 17      |
| Oil filter on crankcase fitting      | 27 ÷ 33      |
| Engine oil drainage plug/mesh filter | 24 ÷ 30      |
| Oil filter                           | 4 ÷ 6        |
| Oil pump cover screws                | 0.7 ÷ 0.9    |
| Screws fixing oil pump to crankcase  | 5 - 6        |
| Oil pump control crown screw         | 10 ÷ 14      |
| Oil pump cover plate screws          | 4 ÷ 6        |
| Oil sump screws                      | 10 ÷ 14      |
| Minimum oil pressure sensor          | 12 ÷ 14      |

N.B.

Before fitting the nuts, lubricate them with engine oil

N.B.

Use new nuts

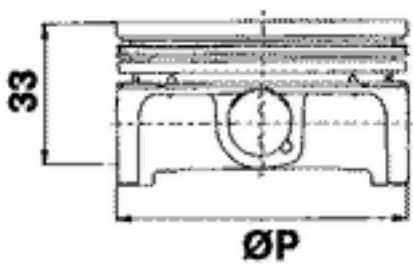
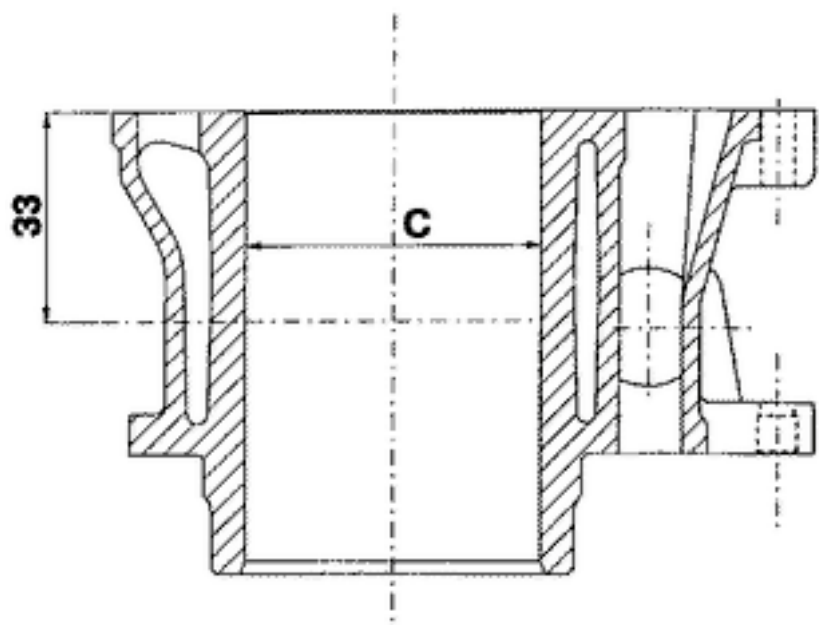
Overhaul data

Assembly clearances

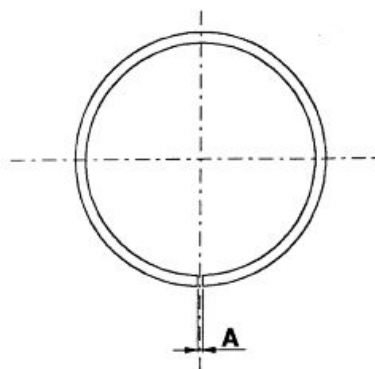
Cylinder - piston assy.

COUPLING CATEGORIES

| Name              | Initials | Cylinder        | Piston          | Play on fitting |
|-------------------|----------|-----------------|-----------------|-----------------|
| Cylinder / piston | A        | 71.990 ÷ 71.997 | 71.953 ÷ 71.960 | 0.030 - 0.044   |
| Cylinder / piston | B        | 71.997 ÷ 72.004 | 71.960 ÷ 71.967 | 0.030 - 0.044   |
| Cylinder / piston | C        | 72.004 ÷ 72.011 | 71.967 ÷ 71.974 | 0.030 - 0.044   |
| Cylinder / piston | D        | 72.011 ÷ 72.018 | 71.974 ÷ 71.981 | 0.030 - 0.044   |



## Piston rings



### SEALING RINGS

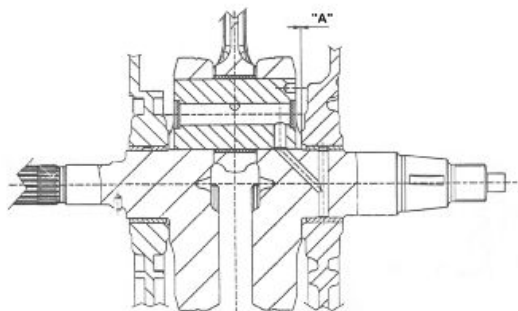
| Name             | Description | Dimensions | Initials | Quantity    |
|------------------|-------------|------------|----------|-------------|
| Compression ring |             | 72 x 1.5   | A        | 0.15 ÷ 0.30 |
| Oil scraper ring |             | 72 x 1     | A        | 0.20 ÷ 0.40 |
| Oil scraper ring |             | 72 x 2.5   | A        | 0.20 ÷ 0.40 |

## Crankcase - crankshaft - connecting rod

### Characteristic

#### crankshaft - crankcase axial clearance

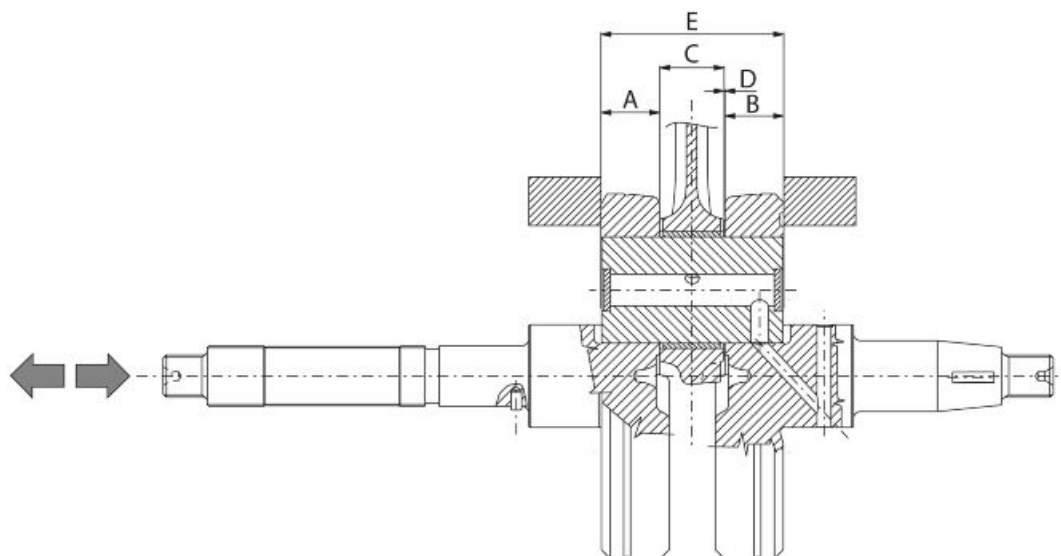
A= 0.15 ÷ 0.40 (when cold)



### CRANKSHAFT

| Titolo     | Durata/Valore | Testo Breve (< 4000 car.)               | Indirizzo Immagine |
|------------|---------------|-----------------------------------------|--------------------|
| Crankshaft |               | Crankshaft to crankcase axial clearance |                    |

*Crankshaft to crankcase axial clearance*



### CRANKSHAFT AXIAL CLEARANCE

| Name                          | Description | Dimensions     | Initials | Quantity        |
|-------------------------------|-------------|----------------|----------|-----------------|
| Half-shaft, transmission side |             | 16.6 +0-0.05   | A        | D = 0.20 - 0.50 |
| Flywheel-side half-shaft      |             | 16.6 +0-0.05   | B        | D = 0.20 - 0.50 |
| Connecting rod                |             | 18 -0.10 -0.15 | C        | D = 0.20 - 0.50 |
| Spacer tool                   |             | 51.4 +0.05     | E        | D = 0.20 - 0.50 |

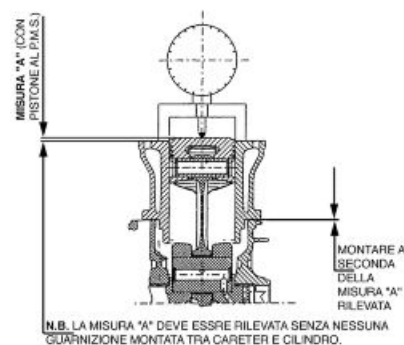
### Slot packing system

N.B.

MEASUREMENT "A" TO BE TAKEN IS A VALUE OF PISTON RE-ENTRY, IT INDICATES BY HOW MUCH THE PLANE FORMED BY THE PISTON CROWN FALLS BELOW THE PLANE FORMED BY THE TOP OF THE CYLINDER. THE FURTHER THE PISTON FALLS INSIDE THE CYLINDER, THE LESS THE BASE GASKET IS TO BE APPLIED (TO RECOVER THE COMPRESSION RATIO) AND VICE VERSA.

### SHIMMING

| Name     | Measure A   | Thickness  |
|----------|-------------|------------|
| shimming | 3.70 - 3.60 | 0.4 ± 0.05 |
| shimming | 3.60 - 3.40 | 0.6 ± 0.05 |
| shimming | 3.40 - 3.30 | 0.8 ± 0.05 |



### Products

#### PRODUCTS

| Product         | Description                                    | Specifications                                                                               |
|-----------------|------------------------------------------------|----------------------------------------------------------------------------------------------|
| AGIP GREASE PV2 | Grease for steering bearings and spindle seats | Soap-based lithium and zinc oxide grease containing NLGI 2; ISO-L-XBCIB2 of the swinging arm |

| Product                     | Description                                                                     | Specifications                                                                                  |
|-----------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| MONTBLANC MOLYBDENUM GREASE | Grease for driven pulley shaft adjusting ring and movable driven pulley housing | Grease with molybdenum disulphide                                                               |
| AGIP FILTER OIL             | Oil for air filter sponge                                                       | Mineral oil with specific additives for increased adhesiveness                                  |
| AGIP GREASE MU3             | Grease for odometer transmission gear case                                      | Soap-based lithium grease with NLGI 3; ISO-L-XBCHA3, DIN K3K-20                                 |
| AGIP CITY HI TEC 4T         | Engine oil                                                                      | SAE 5W-40 Synthetic oil that exceed the requirements of API SL, ACEA A3, JASO MA specifications |
| AGIP GP 330                 | Calcium complex soap-based grease with NLGI 2; ISO-L-XBCIB2                     | Grease (brake control levers, throttle grip)                                                    |
| AGIP CITY HI TEC 4T         | Four-stroke engine oil                                                          | Lubricating oil for flexible shafts (throttle control)                                          |
| AGIP ROTRA 80W-90           | Rear hub oil                                                                    | SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications                          |
| AGIP PERMANENT SPEZIAL      | coolant                                                                         | Monoethylene glycol-based antifreeze fluid, CUNA NC 956-16                                      |
| AGIP CHAIN SPRAY            | Spray lubricating grease                                                        | Spray lubricating grease for chains and gears                                                   |

INDEX OF TOPICS

TOOLING

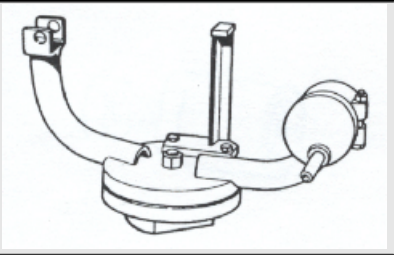
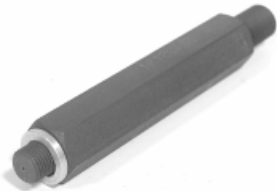
TOOL

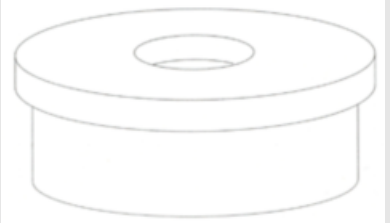
APPROPRIATE TOOLS

| Stores code | Description                        |                                                                                      |
|-------------|------------------------------------|--------------------------------------------------------------------------------------|
| 020151Y     | Air heater                         |    |
| 020331Y     | Digital multimeter                 |   |
| 020334Y     | Multiple battery charger           |  |
| 001467Y014  | Pliers to extract ø 15-mm bearings |  |
| 020412Y     | 15 mm guide                        |  |



| Stores code | Description                     |                                                                                       |
|-------------|---------------------------------|---------------------------------------------------------------------------------------|
| 020335Y     | Magnetic support for dial gauge |    |
| 020565Y     | Flywheel lock calliper spanner  |    |
| 020439Y     | 17 mm guide                     |  |
| 020359Y     | 42x47-mm adaptor                |  |
| 020363Y     | 20 mm guide                     |  |

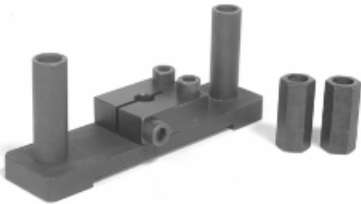
| Stores code | Description                               |                                                                                       |
|-------------|-------------------------------------------|---------------------------------------------------------------------------------------|
| 005095Y     | Engine support                            |     |
| 008564Y     | Flywheel extractor                        |    |
| 020434Y     | Oil pressure control fitting              |   |
| 020382Y011  | adapter for valve removal tool            |  |
| 020424Y     | Driven pulley roller casing fitting punch |  |
| 020431Y     | Valve oil seal extractor                  |   |

| Stores code | Description                           |                                                                                       |
|-------------|---------------------------------------|---------------------------------------------------------------------------------------|
| 020193Y     | Oil pressure gauge                    |    |
| 020306Y     | Punch for assembling valve seal rings |    |
| 020360Y     | Adaptor 52 x 55 mm                    |   |
| 020364Y     | 25-mm guide                           |  |
| 020375Y     | Adaptor 28 x 30 mm                    |  |
| 020376Y     | Adaptor handle                        |  |

| Stores code | Description                                         |                                                                                       |
|-------------|-----------------------------------------------------|---------------------------------------------------------------------------------------|
| 020444Y     | Tool for fitting/ removing the driven pulley clutch |     |
| 020330Y     | Stroboscopic light to check timing                  |     |
| 001467Y035  | Belle for OD 47-mm bearings                         |    |
| 020368Y     | driving pulley lock wrench                          |  |
| 020263Y     | Sheath for driven pulley fitting                    |   |
| 020262Y     | Crankcase splitting strip                           |   |

| Stores code | Description           |                                                                                     |
|-------------|-----------------------|-------------------------------------------------------------------------------------|
| 020430Y     | Pin lock fitting tool |  |

020428Y      Piston position check support



|         |                     |                                                                                      |
|---------|---------------------|--------------------------------------------------------------------------------------|
| 020426Y | Piston fitting fork |  |
|---------|---------------------|--------------------------------------------------------------------------------------|

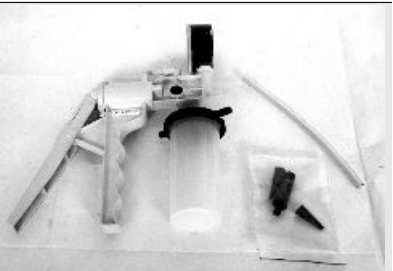
020425Y      Punch for flywheel-side oil seal

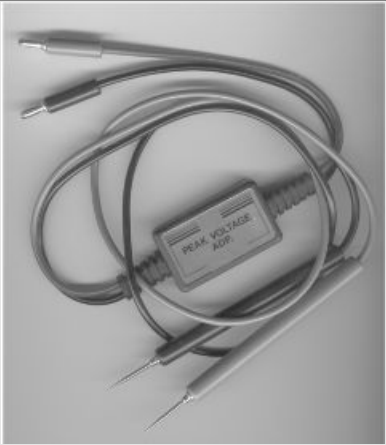


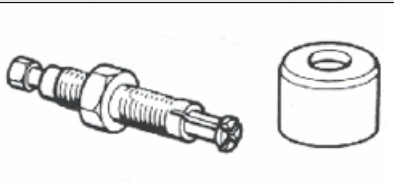
|         |                           |                                                                                       |
|---------|---------------------------|---------------------------------------------------------------------------------------|
| 020423Y | driven pulley lock wrench |  |
|---------|---------------------------|---------------------------------------------------------------------------------------|

020414Y      28-mm guide

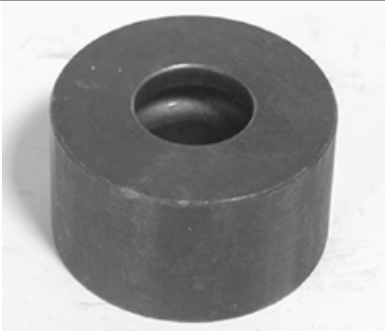


| Stores code | Description                                       |                                                                                      |
|-------------|---------------------------------------------------|--------------------------------------------------------------------------------------|
| 020393Y     | Piston fitting band                               |    |
| 020382Y     | Valve cotters equipped with part 012 removal tool |    |
| 020455Y     | 10-mm guide                                       |   |
| 020442Y     | Pulley lock wrench                                |  |
| 020329Y     | MityVac vacuum-operated pump                      |  |
| 020357Y     | 32 x 35 mm adaptor                                |                                                                                      |

| Stores code | Description                                    |                                                                                       |
|-------------|------------------------------------------------|---------------------------------------------------------------------------------------|
| 020409Y     | Multimeter adaptor - Peak voltage detection    |    |
| 020456Y     | Ø 24 mm adaptor                                |    |
| 020332Y     | Digital rev counter                            |  |
| 020074Y     | Support base for checking crankshaft alignment |  |
| 002465Y     | Pliers for circlips                            |  |

| Stores code | Description                                   |                                                                                      |
|-------------|-----------------------------------------------|--------------------------------------------------------------------------------------|
| 020454Y     | Tool for fitting piston pin stops (200 - 250) |    |
| 020622Y     | Transmission-side oil guard punch             |    |
| 020444Y011  | adapter ring                                  |   |
| 020444Y009  | 46x55 Wrench                                  |  |
| 001467Y     | Extractor for bearings for holes              |  |
| 020444Y010  | adapter ring                                  |  |



| Stores code | Description                             |                                                                                       |
|-------------|-----------------------------------------|---------------------------------------------------------------------------------------|
| 020655Y     | Adaptor 62x68 mm                        |    |
| 001467Y005  | Screw                                   |    |
| 001467Y003  | Nut                                     |   |
| 001467Y006  | Pliers to extract 20 mm bearings        |  |
| 001467Y017  | Ø 35 Bell                               |                                                                                       |
| 020408Y     | 72x75 adaptor                           |                                                                                       |
| 001467Y028  | Pliers to extract bearings, 35-mm diam. |  |
| 001467Y002  | Driver for OD 73 mm bearing             |  |
| 001467Y006  | Ø 17 Pliers                             |                                                                                       |
| 001467Y035  | Bell Ø 42                               |                                                                                       |

| Stores code | Description                     |
|-------------|---------------------------------|
| 020231Y     | Extractor for articulated heads |



INDEX OF TOPICS

MAINTENANCE

MAIN

## Maintenance chart

### INTERMEDIATE PERIODICAL CHECKS EVERY 2,500 KM

| Action                                  |
|-----------------------------------------|
| Engine oil - Level check / top-up       |
| Air filter - Cleaning                   |
| Crankcase ventilation system - Cleaning |

### AFTER 1,000 KM

| Action                                   |
|------------------------------------------|
| Safety blocks - Check                    |
| Chain - Tension check and Lubrication    |
| Engine oil filter - Replacement          |
| Oil mesh filter - Cleaning               |
| Electrical system and Battery - Check    |
| Coolant - Check                          |
| Brake fluid level - Check                |
| Reverser oil - Replacement               |
| Engine oil - Replacement                 |
| Hub oil - Replacement                    |
| Brake pads - Condition and wear check    |
| Tyres pressure and wear - Check          |
| Vehicle and brake test - Road test       |
| Suspensions - Check                      |
| Transmissions and controls - Lubrication |

### AT 10,000 KM; 20,000 KM; 30,000 KM; 40,000 KM; 50,000 KM,

| Action                                          |
|-------------------------------------------------|
| Safety blocks - Check                           |
| Spark plug - Replacement                        |
| Carburettor - Cleaning                          |
| Chain - Tension check and Lubrication           |
| Driving belt - replacement                      |
| Secondary air filter - cleaning                 |
| Air filter - Cleaning                           |
| Engine oil filter - Replacement                 |
| Oil mesh filter - Cleaning                      |
| Electrical system and Battery - Check           |
| Coolant - Check                                 |
| Brake fluid level - Check                       |
| Reverser oil - Replacement                      |
| Engine oil - Replacement                        |
| Hub oil - Replacement                           |
| Brake pads - Condition and wear check           |
| Sliding block / variable speed rollers - change |
| Tyres pressure and wear - Check                 |
| Vehicle and brake test - Road test              |
| Crankcase ventilation system - Cleaning         |
| Suspensions - Check                             |
| Transmissions and controls - Lubrication        |

### EVERY 2 YEARS

| Action                |
|-----------------------|
| Brake fluid - Change  |
| Coolant - Replacement |

## Carburettor

- Disassemble the carburettor in its parts, wash all of them with solvent, dry all body grooves with compressed air to ensure adequate cleaning.

- Check carefully that the parts are in good condition.
- The throttle valve should move freely in the chamber. Replace it in case of excessive clearance due to wear.
- If there are wear marks in the chamber causing inadequate tightness or a free valve slide (even if it is new), replace the carburettor.
- It is advisable to replace the gaskets at every refit

**WARNING****PETROL IS HIGHLY EXPLOSIVE ALWAYS REPLACE THE GASKETS TO AVOID PETROL LEAKS**

---

## Checking the spark advance

- To check ignition advance, use the stroboscopic light with induction pincers connected to the spark plug power wire.
- Connect the induction pincers being careful to respect the proper polarity (the arrow stamped on the pincers must be pointing at the spark plug).
- Place the light selector in central position (1 spark = 1 crankshaft revolution as in 2 T engines).
- Start the engine and check that the light works properly and the rpm indicator can read also the high rpm (e.g. 8000 rpm).
- If flash unsteadiness or revolution reading error is detected (e.g. half values), increase the resistive load on the spark plug power line ( $10 \div 15 \text{ K}\Omega$  in series to HV wire).
- Remove the plastic cap on the flywheel cover.
- Operating on the flash bulb phase difference calibrator, make the reference on the flywheel cover coincide with that on the rotor. Read the advance degrees indicated by the stroboscopic light.
- Check that the advance degrees corresponds with the rotation rpm as indicated in the table.
- If there are anomalies, check the Pick-Up and the control unit power supply (positive-negative), replace the control unit if necessary.
- The brand new control unit prevents that the engine rotation exceeds 2000 rpm.



- The programmed control unit allows the engine to rotate within the prescribed limits.

**Specific tooling**

020330Y Stroboscopic light to check timing

**Characteristic****Ignition advance**

$10^{\circ} \pm 1^{\circ}$  - 2,000 rpm

---

**Spark advance variation****Characteristic****Operation threshold**

First threshold :  $9600 \pm 50$

Second threshold :  $9800 \pm 50$

**Reactivation threshold**

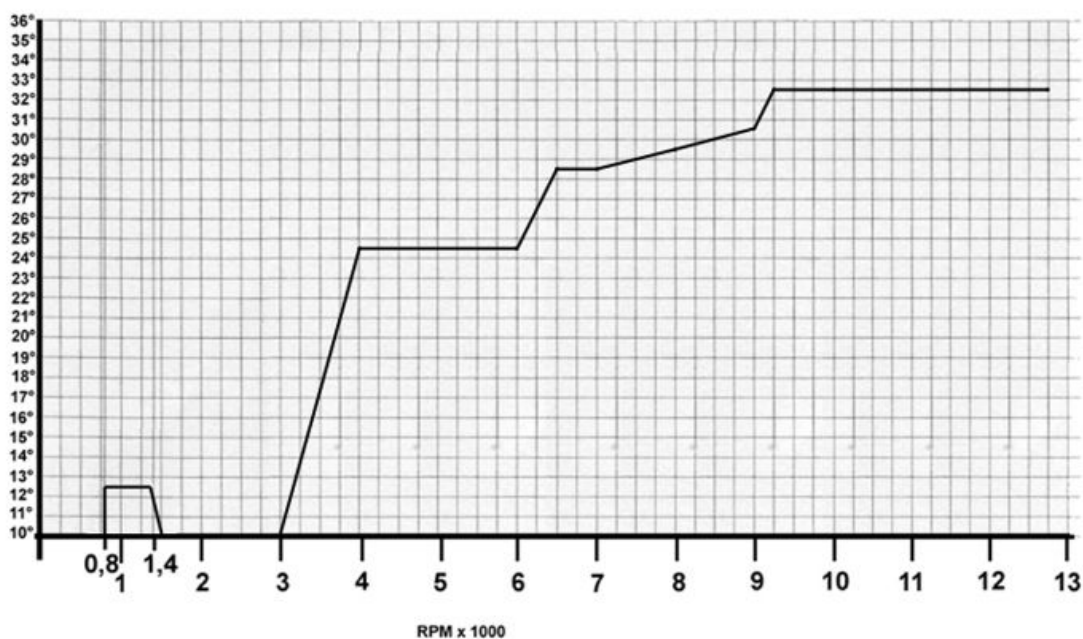
First threshold :  $9500 \pm 50$

Second threshold :  $9700 \pm 50$

**Spark elimination**

First threshold : 1 spark on 7

Second threshold : 2 sparks on 3



---

## Spark plug

- Thoroughly clean the bordering area before removing the spark plug from the engine head so that no dirt from the threaded opening accidentally gets into and may cause any damage.
- In order to remove the spark plug, disconnect the rubber cap «A», and unscrew it using the box-spanner supplied.



- To fit the spark plug properly, screw it manually until it stops and tighten to the prescribed torque.
- In order to obtain an efficient ignition, frequently check the electrode gap and the absence of deposits; replace the spark plug with one of the indicated type if required.

### CAUTION

**THE SPARK PLUG MUST BE REMOVED WHEN THE ENGINE IS COLD. REPLACE THE SPARK PLUG AS INDICATED IN THE SCHEDULED MAINTENANCE TABLE. USING NON-COMPLYING IGNITION CONTROL UNITS OR SPARK PLUGS OTHER THAN THOSE PRESCRIBED MAY SERIOUSLY DAMAGE THE ENGINE.**

### Characteristic

#### Spark plug

CHAMPION RG4HC

#### Alternative spark plug

NGK CR8EB

#### Electrode gap

0.7 ÷ 0.8 mm

#### Locking torques (N\*m)

Spark plug 12 ÷ 14

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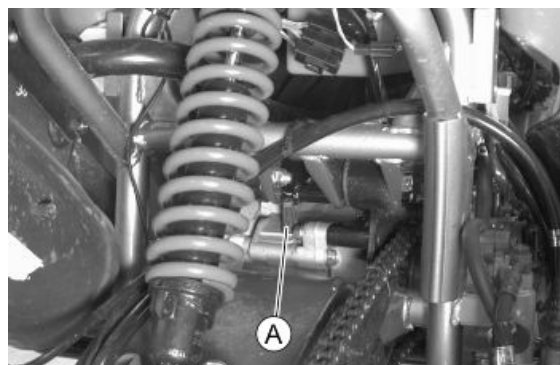
## Hub oil

---

### Check

Check there is oil in the rear hub. To check the rear hub oil level, proceed as follows:

1. Park the vehicle on level ground.
2. Unscrew the dipstick «A», wipe it clean with a cloth, reinsert it and tighten completely.
3. Remove the dipstick and check that the oil level is above the first notch from the bottom.



4. Screw the dipstick back in, checking that it is locked in place.

THE NOTCHES ON THE HUB OIL LEVEL DIPSTICK, EXCEPT THAT INDICATING THE MAX LEVEL, REFER TO OTHER MODELS FROM THE MANUFACTURER AND HAVE NO SPECIFIC FUNCTION FOR THIS MODEL.

**CAUTION**

RIDING THE VEHICLE WITH INSUFFICIENT HUB LUBRICATION OR WITH CONTAMINATED OR IMPROPER LUBRICANTS ACCELERATES THE WEAR AND TEAR OF THE MOVING PARTS AND CAN CAUSE SERIOUS DAMAGE.

**CAUTION**

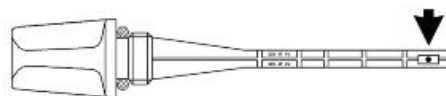
USED OILS CONTAIN SUBSTANCES HARMFUL TO THE ENVIRONMENT. FOR OIL CHANGE, CONTACT AN AUTHORISED PIAGGIO SERVICE CENTRE, AS THEY ARE EQUIPPED TO DISPOSE OF USED OILS IN AN ENVIRONMENTALLY FRIENDLY AND LEGAL WAY.

**CAUTION**

UPON REPLACING HUB OIL, AVOID THE OIL COMING INTO CONTACT WITH THE REAR BRAKE DISC.

**Recommended products****AGIP GEAR 80W-90 Rear hub oil**

SAE 80W-90, API GL-4 mineral multigrade oil



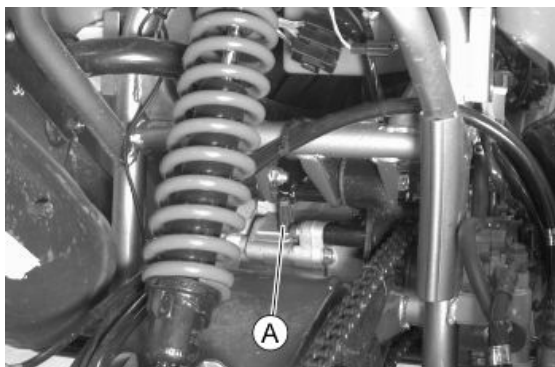
## Replacement

**Hub oil change**

- Remove the oil cap «A».
- Unscrew the oil drainage cap "B" and drain out all the oil.
- Screw the drainage plug again and fill the hub with recommended oil.

**Recommended products****AGIP ROTRA 80W-90 Rear hub oil**

SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications





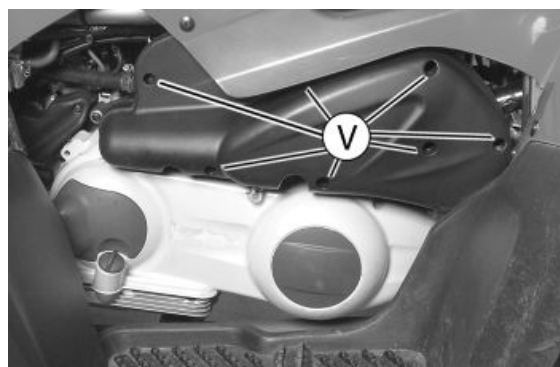


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## Air filter

Take out the air cleaner cover after having unscrewed the fixing screws «V», then take out the filtering element.

- Wash with water and neutral soap.
- Dry with a clean cloth and short blasts of compressed air.
- Soak with a mixture of 50 % petrol and 50 % recommended oil.
- Drip dry the filtering element and then squeeze it with your hands without wringing.



### CAUTION

NEVER RUN THE ENGINE WITHOUT THE AIR FILTER, THIS WOULD RESULT IN AN EXCESSIVE WEAR OF THE PISTON AND CYLINDER.

### CAUTION

WHEN TRAVELLING ON DUSTY ROADS, THE AIR FILTER MUST BE CLEANED MORE OFTEN THAN SHOWN IN THE SCHEDULED MAINTENANCE CHART.

## Recommended products

### AGIP FILTER OIL Oil for air filter sponge

Mineral oil with specific additives for increased adhesiveness

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## Engine oil

---

## Replacement

Oil and cartridge filter «C» must be changed emptying the engine by running off the oil through the drainage plug «B» of the mesh filter on the fly-wheel side. In order to facilitate oil drainage, loosen the cap/dipstick «A».

Since a certain quantity of oil still remains in the circuit, filling must be done with approx. 600 ÷ 650 cm<sup>3</sup> of oil through the plug «A». Then start up the vehicle, leave it running for a few minutes and switch off: after five minutes, check the level and if necessary top-up but **never exceeding the MAX level**. The oil cartridge filter must be changed at every oil change. For top-ups and change, use the recommended oil only.

### CAUTION



**RUNNING THE ENGINE WITH INSUFFICIENT LUBRICATION OR WITH INADEQUATE LUBRICANTS ACCELERATES THE WEAR AND TEAR OF THE MOVING PARTS AND CAN CAUSE IRRETRIEVABLE DAMAGE.**

### CAUTION



**USED OILS CONTAIN SUBSTANCES HARMFUL TO THE ENVIRONMENT. FOR OIL CHANGE, CONTACT AN AUTHORISED PIAGGIO SERVICE CENTRE, AS THEY ARE EQUIPPED TO DISPOSE OF USED OILS IN AN ENVIRONMENTALLY FRIENDLY AND LEGAL WAY.**

### CAUTION

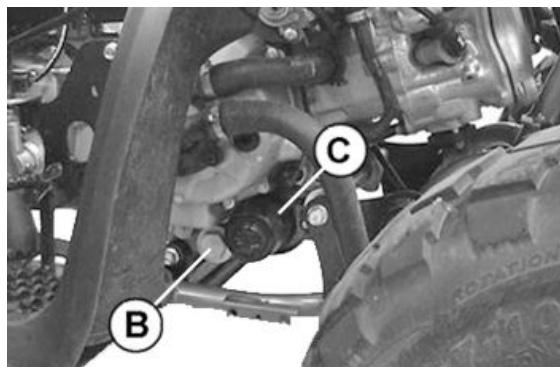
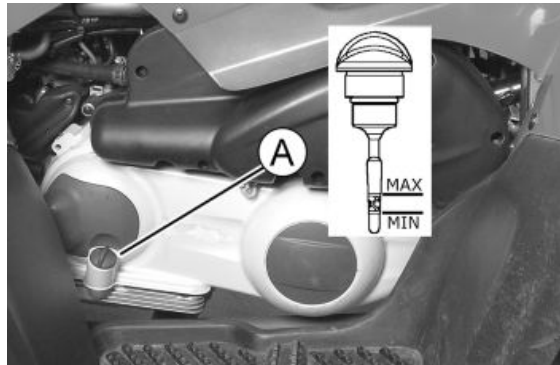


**USING OILS OTHER THAN THOSE RECOMMENDED CAN SHORTEN THE LIFE OF THE ENGINE.**

### Recommended products

#### AGIP CITY HI TEC 4T Engine oil

SAE 5W-40, API SL, ACEA A3, JASO MA Synthetic oil



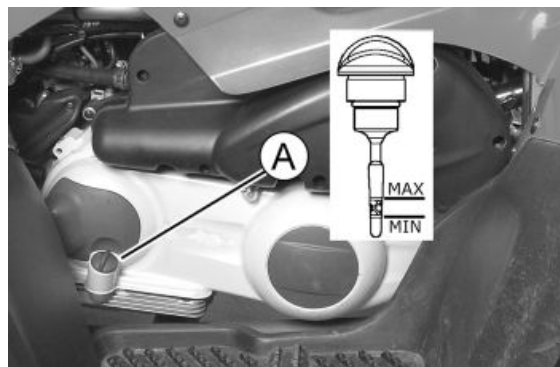
## Check

### OIL LEVEL CHECK

In 4-stroke engines, engine oil is used to lubricate the distribution elements, the main bearings and the thermal group. **An insufficient quantity of oil can seriously damage the engine.** In all 4-stroke engines, a loss of efficiency in oil performance and certain consumption should be considered normal. Consumption levels in particular reflect the conditions of use (i.e. when driving at "full acceleration" all the time, oil consumption increases). **In order to avoid problems, it is advisable to control oil level every time the vehicle is used.**

### LEVEL CHECK

Every time the vehicle is used, visually inspect engine oil level when the engine is cold (after completely unscrewing and taking out **the oil cap/dipstick**). Oil level should be somewhere between the **MAX** and **MIN** reference marks on the dipstick «A»; the vehicle must be on a horizontal surface when checking oil level. If the check is carried out after the vehicle has been used, and therefore the engine is hot, the level line will be lower; in order to carry out a correct check, wait at least 10 minutes after the engine has been stopped so as to get the correct level.

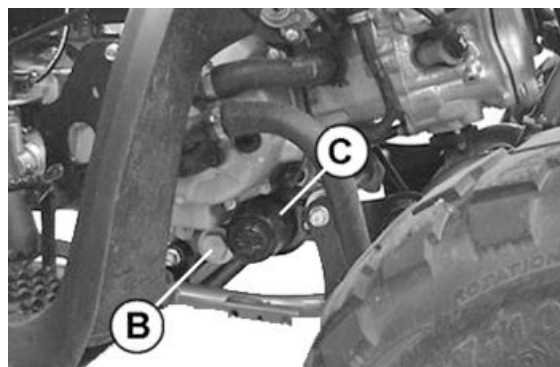


### OIL TOP-UP

Top-up oil after visual checking oil level and, if necessary, adding oil **without exceeding the MAX level**. Take your vehicle to an **Authorised Service Centre** for a frequent check and to have the oil topped-up.

### Characteristic

**Engine oil level top-up between MIN and MAX**  
~ 0.20 l



---

## Checking the ignition timing

- Remove the plastic cap on the flywheel cover.
- Turn the flywheel until the reference mark «T» on the rotor matches the reference mark on the flywheel cover as shown in the figure (TDC).



- Make sure that the 4V reference point on the camshaft control pulley is aligned with the reference point on the head as shown in the second figure.



If the reference is opposite the indicator on the head, turn the crankshaft once more.

For the use of this reference mark, remove the spark plug and turn the engine in the direction that is the reverse of the normal direction using a calliper spanner applied to the camshaft command pulley casing.

---

## Checking the valve clearance

- To check valve clearance, centre the reference marks of the timing system.
- Use a thickness gauge to check that the clearance between the valve and the register corresponds with the indicated values. When the valve clearance values, intake and drainage respectively, are different from the ones indicated below, adjust them by loosening the lock nut and operate on the register with a screwdriver as shown in the figure.



### Characteristic

#### Valve clearance

Inlet: 0.10 mm (when cold)

Outlet: 0.15 mm (when cold)

## Cooling system

### Level check

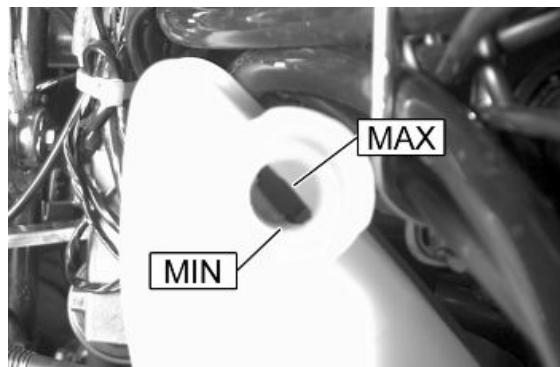
Engine is cooled by a forced-circulation coolant system. The coolant consists of a mixture of 50% de-ionised water and 50% glycol ethylene-based antifreeze solution with corrosion inhibitors.

The instrument panel is equipped with a warning light signalling a fault in the cooling system due to high temperature. If this warning light turns on, shut off the engine, let it cool down and check coolant level; if level is OK, check the cooling system.



Check coolant when the engine is cold as indicated in the scheduled maintenance table, following the steps below.

- Park the vehicle on flat ground.
- Remove the expansion tank cover turning it anticlockwise.
- Look inside the expansion tank: a mark on the plastic part indicates the maximum and minimum reference of the expansion tank.



- Top-up, if required, if the fluid level is below the **MIN** level on the scale inside the expansion tank.

The fluid level must always be between the **MIN** and **MAX** level reference marks.

If it is necessary to top up the coolant frequently, or if the expansion tank is completely dry, you should look for the cause in the cooling system.

- Replace coolant as indicated in the scheduled maintenance chart.

#### WARNING



**TO AVOID THE RISK OF SCALDING, DO NOT UNSCREW THE EXPANSION TANK COVER WHILE THE ENGINE IS STILL HOT.**

#### WARNING



**IN ORDER TO AVOID HARMFUL FLUID LEAKS WHILE RIDING, IT IS IMPORTANT TO MAKE SURE THAT THE LEVEL NEVER EXCEEDS THE MAXIMUM VALUE.  
IN ORDER TO GUARANTEE THE PROPER FUNCTION OF THE ENGINE, IT IS NECESSARY TO KEEP THE RADIATOR GRILLE CLEAN.**

**Recommended products****AGIP PERMANENT SPEZIAL coolant**

Monoethylene glycol-based antifreeze fluid, CUNA NC 956-16

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**Braking system**

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**Level check**

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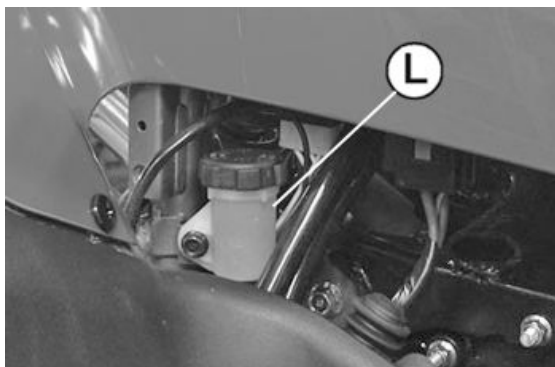
**BRAKE FLUID RESERVOIRS IN THE HANDLE-BAR**

The brake oil level is easily checked through the sight glass placed at the side of every brake pump on the right and left side of the handlebar.

To top-up, remove the two Phillips screws on the reservoir, lift the metal cap and top-up the brake fluid level.

**INTEGRAL BRAKE OIL RESERVOIR**

The integral circuit controlled by the brake pedal instead has a reservoir placed on the left side of the vehicle; this has a plastic cover with a screw that can be easily removed to top up the circuit.

**WARNING**

WHILE TOPPING UP, PAY ATTENTION NOT TO SPILL BRAKE FLUID FROM THE RESERVOIR. IF IT IS ACCIDENTALLY SPILLED, DRY IT IMMEDIATELY SINCE IT MAY DAMAGE THE SURROUNDING PARTS.

**WARNING**

TAKE YOUR VEHICLE TO AN AUTHORISED SERVICE CENTRE TO HAVE THESE OPERATIONS DONE.

**Recommended products****AGIP BRAKE 4 Brake fluid**

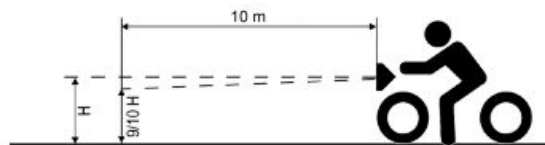
FMVSS DOT 4 Synthetic fluid

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## Headlight adjustment

Proceed as follows:

1. Position the half-loaded vehicle, in running order and with the tyres inflated to the prescribed pressure, on a flat surface 10 m away from a half-lit white screen; ensure that the longitudinal axis of the vehicle is perpendicular to the screen.
2. Turn on the headlight and check that the borderline of the beam projected on the screen is not higher than 9/10 or lower than 7/10 of the height of the centre of the headlight from the ground.
3. Otherwise, adjust the headlight by operating the screw «3» that can be reached from the front right side of the vehicle.



### WARNING

THE ABOVE PROCEDURE COMPLIES WITH THE "EUROPEAN STANDARDS" REGARDING MAXIMUM AND MINIMUM HEIGHT OF LIGHT BEAMS. REFER TO THE STATUTORY REGULATIONS IN FORCE IN EVERY COUNTRY WHERE THE vehicle IS USED.

## SAS filters inspection and cleaning

Undo the 2 fixing screws of the secondary air filter cover indicated in the figure, remove the cover and then take out the filtering element.

- Wash with water and mild soap.
- Dry with a clean cloth and short blasts of compressed air.

Remove the flywheel cover by operating on its clamps and remove the primary filtering element.

- Wash with water and neutral soap.
- Dry with a clean cloth and short blasts of compressed air.

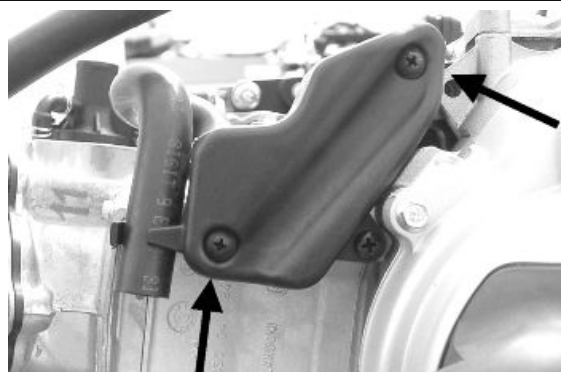
Check that the filter housing is cleaned.

### CAUTION

NEVER RUN THE ENGINE WITHOUT THE SECONDARY AIR FILTER

### CAUTION

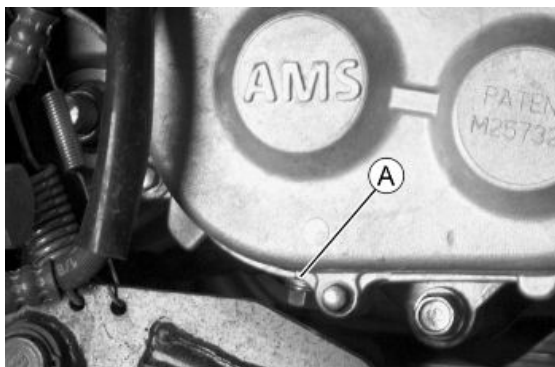
WHEN TRAVELLING ON DUSTY ROADS, THE AIR FILTER MUST BE CLEANED MORE OFTEN THAN SHOWN IN THE SCHEDULED MAINTENANCE CHART.



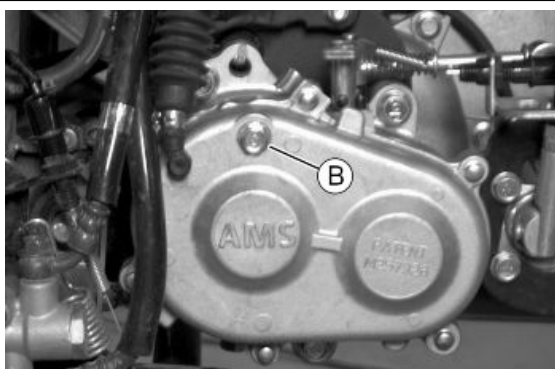
## Gearbox Oil

To replace the reverser oil:

- Remove the right footrest.
- Unscrew the nut «A» and drain out all the oil, pouring it into a container.



- Screw the discharge nut to the prescribed torque.
- Unscrew the filler nut «B».
- Pour the prescribed quantity of recommended oil and tighten the nut to the prescribed torque.
- Refit the right footrest.



### Recommended products

**AGIP ROTRA MP 80W-90 Transmission oil**

SAE 80W-90, API GL-5

### Characteristic

**Transmission oil - Reverser**

0.15 l

### Locking torques (N\*m)

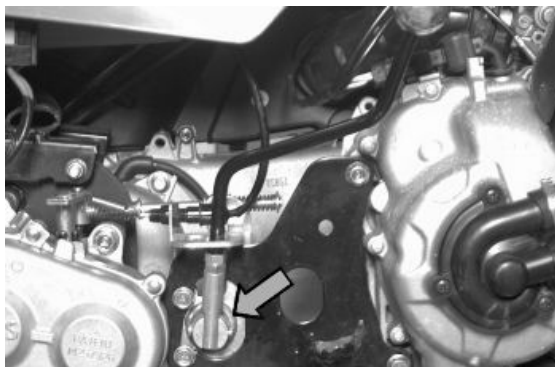
**Oil discharge nut 10-14 Oil filler nut 10-14**

- Lubricate the lever transmission with recommended grease to keep it efficient and to protect it against external agents.

### Recommended products

**AGIP CHAIN SPRAY Spray lubricating grease**

Spray lubricating grease for chains and gears





INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

This section makes it possible to find what solutions to apply when troubleshooting.

For each failure, a list of the possible causes and pertaining operations is given.

## Engine

### Poor performance

| <b><u>POOR PERFORMANCE</u></b>                              |                                                                                                                                                                                           |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Possible Cause</b>                                       | <b>Operation</b>                                                                                                                                                                          |
| The carburettor is dirty; fuel pump or vacuum valve damaged | Remove, wash with solvent and dry with compressed air or replace                                                                                                                          |
| Excess of encrustations in the combustion chamber           | Descalc the cylinder, the piston, the head and the valves                                                                                                                                 |
| Incorrect timing or worn timing system elements             | Time the system again or replace the worn parts                                                                                                                                           |
| Muffler obstructed                                          | Replace                                                                                                                                                                                   |
| Air filter blocked or dirty                                 | Remove the sponge, wash with water and car shampoo, then soak it in a mixture of 50% petrol and 50% specific oil. Press with your hand without squeezing, allow it to drip dry and refit. |
| Automatic starter failure                                   | Check: mechanical movement, electric connection and fuel supply, replace if required.                                                                                                     |
| Oil level exceeds maximum                                   | Check for causes and fill to reach the correct level                                                                                                                                      |
| Lack of compression: parts, cylinder and valves worn        | Replace the worn parts                                                                                                                                                                    |
| Transmission belt worn                                      | Replace                                                                                                                                                                                   |
| Inefficient automatic transmission                          | Check the rollers and the pulley movement, replace the damaged parts and lubricate the movable guide of the driven pulley with specific grease.                                           |
| Clutch slipping                                             | Check the clutch system and/or the bell and replace if necessary                                                                                                                          |
| Overheated valves                                           | Remove the head and the valves, grind or replace the valves                                                                                                                               |
| Wrong valve adjustment                                      | Adjust the valve clearance properly                                                                                                                                                       |
| Valve seat distorted                                        | Replace the head assembly                                                                                                                                                                 |
| Air filter dirty                                            | Remove the sponge, wash with water and car shampoo, then soak it in a mixture of 50% petrol and 50% specific oil. Press with your hand without squeezing, allow it to drip dry and refit. |
| Defective floating valve                                    | Check the proper sliding of the float and the functioning of the valve                                                                                                                    |

### Rear wheel spins at idle

#### **REAR WHEELS TURN WITH ENGINE AT IDLE**

| <b>Possible Cause</b> | <b>Operation</b>                  |
|-----------------------|-----------------------------------|
| Idling rpm too high   | Adjust the engine idle speed      |
| Clutch fault          | Check the springs / clutch masses |

### Starting difficulties

#### **DIFFICULT STARTING**

| <b>Possible Cause</b>                                         | <b>Operation</b>                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Altered fuel characteristics                                  | Drain off the fuel no longer up to standard; then, refill                                                                                                                                                                                                                                                               |
| Rpm too low at start-up or engine and start-up system damaged | Check the starter motor, the system and the torque limiter                                                                                                                                                                                                                                                              |
| Incorrect valve sealing or valve adjustment                   | Inspect the head and/or restore the correct clearance                                                                                                                                                                                                                                                                   |
| - Engine flooded.                                             | Try starting-up with the throttle fully open. If the engine fails to start, remove the spark plug, dry it and before refitting, make the motor turn so as to expel the fuel excess taking care to connect the cap to the spark plug, and this in turn to the ground.<br>If the fuel tank is empty, refuel and start up. |

| Possible Cause                                              | Operation                                                                                                                                                                                 |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Automatic starter failure                                   | Check: mechanical movement, electric connection and fuel supply, replace if required.                                                                                                     |
| Air filter blocked or dirty                                 | Remove the sponge, wash with water and car shampoo, then soak it in a mixture of 50% petrol and 50% specific oil. Press with your hand without squeezing, allow it to drip dry and refit. |
| Faulty spark plug or incorrect ignition advance             | Replace the spark plug or check the ignition circuit components                                                                                                                           |
| The carburettor is dirty; fuel pump or vacuum valve damaged | Remove, wash with solvent and dry with compressed air or replace                                                                                                                          |
| Battery flat                                                | Check the battery charge. If the battery shows signs of sulphation, replace it and bring a new battery into service.                                                                      |
| Intake coupling cracked or clamps incorrectly tightened     | Replace the intake coupling and check the clamps are tightened                                                                                                                            |
| Defective floating valve                                    | Check the proper sliding of the float and the functioning of the valve                                                                                                                    |
| Carburettor nozzles clogged                                 | Dismantle, wash with solvent and dry with compressed air                                                                                                                                  |
| Starter motor does not spin                                 | Press the brake pedal to enable start-up.                                                                                                                                                 |

## Excessive oil consumption/Exhaust smoke

### EXCESSIVE OIL CONSUMPTION/SMOKEY EXHAUST

| Possible Cause                                                                 | Operation                                                  |
|--------------------------------------------------------------------------------|------------------------------------------------------------|
| Worn valve guides                                                              | Check and replace the head unit if required                |
| Worn valve oil guard                                                           | Replace the valve oil guard                                |
| Oil leaks from the couplings or from the gaskets                               | Check and replace the gaskets or restore the coupling seal |
| Worn or broken piston rings or piston rings that have not been fitted properly | Replace the piston cylinder unit or just the piston rings  |

## Insufficient lubrication pressure

### POOR LUBRICATION PRESSURE

| Possible Cause                    | Operation                                                                    |
|-----------------------------------|------------------------------------------------------------------------------|
| By-Pass remains open              | Check the By-Pass and replace if required. Carefully clean the By-Pass area. |
| Oil pump with excessive clearance | Perform the dimensional checks on the oil pump components                    |
| Oil filter too dirty              | Replace the cartridge filter                                                 |
| Oil level too low                 | Restore the level adding the recommended oil type                            |

## Engine tends to cut-off at full throttle

### ENGINE STOP FULL THROTTLE

| Possible Cause                      | Operation                                                                                                                                                                          |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Faulty fuel supply                  | Check or replace the pump and the vacuum valve, check the vacuum intake and the pipe sealing                                                                                       |
| Incorrect float level               | Restore the level in the tank by bending on the float the thrusting reed of the petrol inlet rod so as to have the float parallel to the tank level with the carburettor inverted. |
| Water in the carburettor            | Empty the tank through the appropriate bleed nipple.                                                                                                                               |
| Maximum nozzle dirty - lean mixture | Wash the nozzle with solvent and dry with compressed air                                                                                                                           |

## Engine tends to cut-off at idle

### ENGINE STOP IDLING

| Possible Cause   | Operation                                              |
|------------------|--------------------------------------------------------|
| Incorrect timing | Time the system and check the timing system components |

| Possible Cause                                  | Operation                                                                                                                                                        |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cut off device failure                          | Check that the following parts work properly: valve; diaphragm; spring; and that the air calibration elements are clean; check if the sponge filter is clean too |
| Incorrect idle adjustment                       | Adjust                                                                                                                                                           |
| Pressure too low at the end of compression      | Check the thermal group seals and replace worn components                                                                                                        |
| Faulty spark plug or incorrect ignition advance | Replace the spark plug or check the ignition circuit components                                                                                                  |
| The starter remains on                          | Check: electric wiring, circuit not interrupted, mechanical movement and power supply; replace if necessary                                                      |
| Minimum nozzle dirty                            | Wash the nozzle with solvent and dry with compressed air                                                                                                         |

## Excessive exhaust noise

### EXCESSIVE EXHAUST NOISE

| Possible Cause                                                                                                                         | Operation                           |
|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Secondary air device cut-off valve not working                                                                                         | Replace the secondary air device    |
| Depression intake pipe of the secondary air device disconnected or dented                                                              | Replace the pipe                    |
| Reed valve of the secondary air device does not close correctly and wears out the rubber coupling between the device and the head pipe | Replace the device and the coupling |

## High fuel consumption

### HIGH FUEL CONSUMPTION

| Possible Cause              | Operation                                                                                                                                                                                 |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Float level                 | Restore the level in the tank by bending on the float the thrusting reed of the petrol inlet rod so as to have the float parallel to the tank level with the carburettor inverted.        |
| Loose nozzles               | Check the maximum and minimum nozzles are adequately fixed in their fittings                                                                                                              |
| Fuel pump failure           | Check that there is no fuel in the low-pressure duct                                                                                                                                      |
| Starter inefficient         | Check: electric wiring, circuit continuity, mechanical sliding and power supply                                                                                                           |
| Air filter blocked or dirty | Remove the sponge, wash with water and car shampoo, then soak it in a mixture of 50% petrol and 50% specific oil. Press with your hand without squeezing, allow it to drip dry and refit. |

## SAS malfunctions

### ANOMALIES IN THE SECONDARY AIR DEVICE

| Possible Cause                                                                                                                         | Operation                           |
|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Secondary air device cut-off valve not working                                                                                         | Replace the secondary air device    |
| Depression intake pipe of the secondary air device disconnected or dented                                                              | Replace the pipe                    |
| Reed valve of the secondary air device does not close correctly and wears out the rubber coupling between the device and the head pipe | Replace the device and the coupling |

## Transmission and brakes

## Clutch grabbing or performing inadequately

### IRREGULAR CLUTCH PERFORMANCE OR SLIPPAGE

| Possible Cause                                | Operation                                                                                                                                                                                                                                                   |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Faulty clutch                                 | Check that there is no grease on the masses. Check that the clutch mass contact surface with the casing is mainly in the centre with equivalent characteristics on the three masses. Check that the clutch casing is not scored or worn in an anomalous way |
| Final transmission (chain-crown-pinion) noise | Adjust the chain tension. To control and check, see relevant chapter.                                                                                                                                                                                       |

## Insufficient braking

### INSUFFICIENT BRAKING

| Possible Cause                            | Operation                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inefficient braking system                | Check the brake pad wear. Check that the brake discs are not worn, scored or warped. Check that the fluid level in the pumps is correct and change brake fluid if required. Check there is no air in the circuits; bleed the air if required. Check that the front brake calliper moves in axis with the disc. |
| Fluid leakage in hydraulic braking system | Failing elastic fittings, plunger or brake pump seals, replace                                                                                                                                                                                                                                                 |

## Brakes overheating

### BRAKES OVERHEATING

| Possible Cause                         | Operation                                                                                                                           |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Rubber gaskets swollen or stuck        | Replace gaskets.                                                                                                                    |
| Compensation holes on the pump clogged | Clean carefully and blast with compressed air                                                                                       |
| Brake disc slack or distorted          | Check the brake disc screws are locked; use a dial gauge and a wheel mounted on the vehicle to measure the axial shift of the disc. |
| Defective piston sliding               | Check calliper and replace any damaged part.                                                                                        |

## Electrical system

### Battery

### BATTERY

| Possible Cause | Operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Battery        | This is the device in the system that requires the most frequent attention and the most thorough maintenance. If the vehicle is not used for some time (1 month or more) the battery needs to be recharged periodically. The battery runs down completely in the course of 3 months. If the battery is fitted on a motorcycle, be careful not to invert the connections, keeping in mind that the black ground wire is connected to the negative terminal while the red wire is connected to the terminal marked+. |

## Turn signal lights malfunction

### TURN INDICATORS NOT WORKING

| Possible Cause                                     | Operation                                                                                             |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Blown fuse, relays not working, switch not working | Check that the electrical connections are not interrupted; otherwise, replace the damaged components. |

---

## Steering and suspensions

---

### Rear wheel

#### DIFFICULTY TO KEEP A PATH

| Possible Cause        | Operation                                                 |
|-----------------------|-----------------------------------------------------------|
| Tyres pressure/toe-in | Check tyre pressure; check toe-in if pressure is correct. |

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## Controls

### STEERING CONTROLS AND SUSPENSIONS

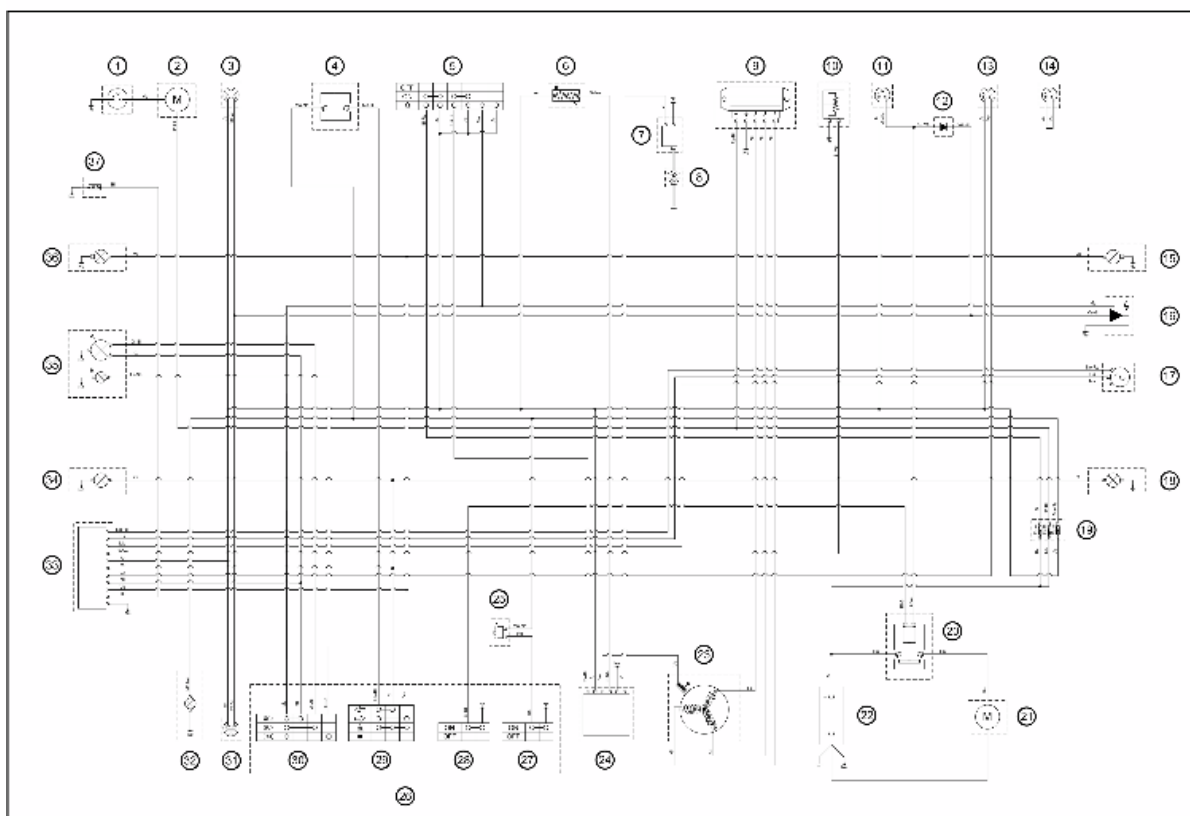
| Possible Cause                        | Operation                                                                                                                                       |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Torque not conforming                 | Check if the steering tube upper u-bolt and the lower nut fixing it to the chassis are adequately tightened.                                    |
| Steering hardening                    | Remove the arms; check the steering rotates properly. If it is free, service the ball joints, the arms and the suspension upper and lower arms. |
| Malfunctions in the suspension system | Check the suspension works properly; remove the shock absorber and check the suspension upper and lower arms swing properly.                    |
| Seal fault or breakage                | Replace the shock absorber if the silent block or the seals are damaged.                                                                        |

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## INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS

**KEY**

1. Thermoswitch
2. Electric fan
3. Stop button on right brake
4. Turn indicator relay
5. Key switch
6. Automatic starter
7. Coil
8. Spark plug
9. Voltage regulator
10. Fuel level transmitter
11. Stop button on brake pedal
12. Stop button on brake pedal LED
13. Reverse gear light button
14. Stop button on safety brake
15. Rear right turn indicator, 12V/10W
16. Stop light bulb, 12V 5x21W
17. Speed sensor
18. Rear left turn indicator, 12V/10W
19. Fuses



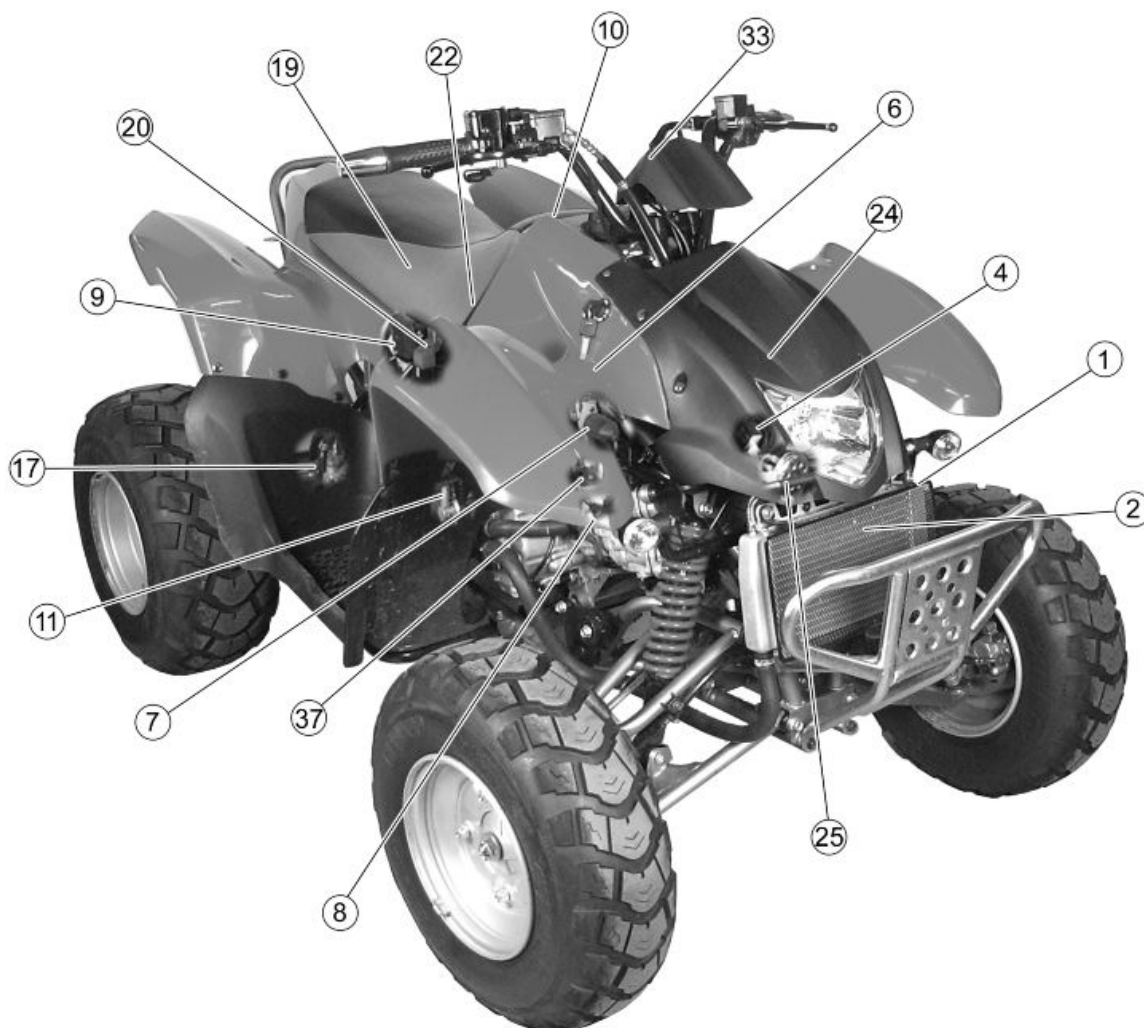
- 20. Start-up relay
- 21. Starter motor
- 22. 12V/12A Battery
- 23. Generator
- 24. CDI Control unit
- 25. Horn
- 26. Controls on left handlebar locking
- 27. Horn button
- 28. Starter button
- 29. Turn indicator selector
- 30. Light switch
- 31. Stop button on left brake
- 32. Instrument panel lighting bulb
- 33. Display
- 34. Front left turn indicator, 12V/10W
- 35. Front headlight
  - A. High-/low-beam light bulb, 12V/35W/35W
  - B. Tail light bulb, 12V/5W
- 36. Front right turn indicator, 12V/10W
- 37. Thermistor

**ELECTRIC CABLE COLOURS**

**Ar:** Orange, **Az:** Sky blue, **Bl:** Blue, **Ci:** Dark brown, **Gi:** Yellow, **Gr:** Grey, **Ma:** Brown, **Ne:** Black, **Ro:** Pink, **Rs:** Red, **Ve:** Light green, **Vi:** Purple, **Vs:** Dark green

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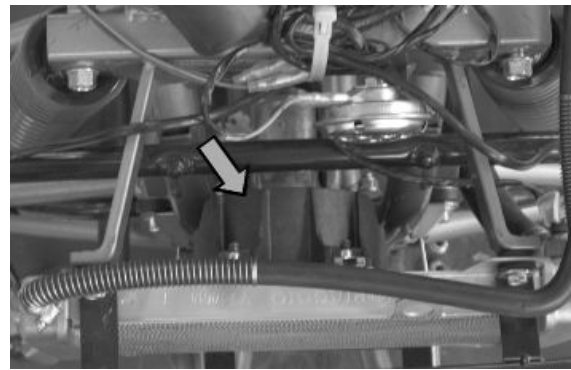
## Components arrangement



**1.** Thermoswitch: remove the front shield to reach it.



2. Electric fan: remove the front shield to reach it.



4. Turn indicator relay: remove the front shield to reach it.



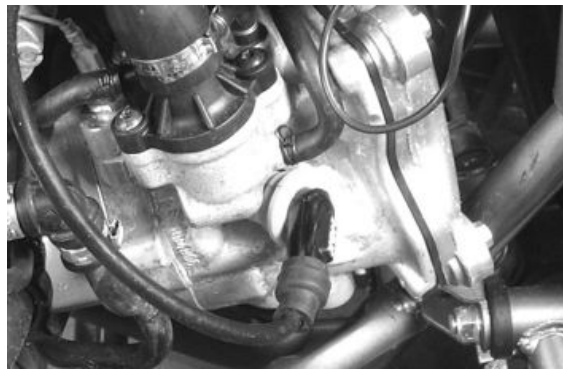
6. Automatic starter



7. HV coil: reach it from the inside of the right-side front mudguard.



- 8.** Spark plug: reach it from the inside of the right-side front mudguard.



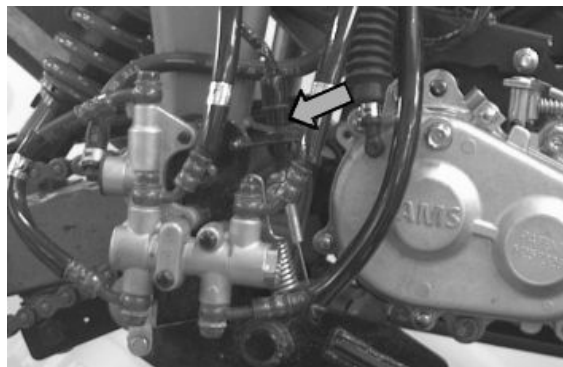
- 9.** Voltage regulator: remove the rear mudguard to reach it.

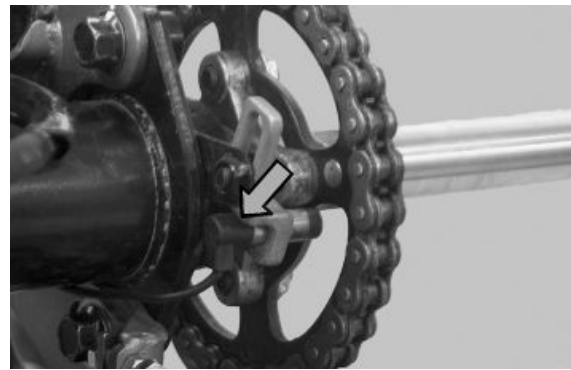


- 10.** Fuel level transmitter: remove the front mudguard to reach it.



- 11.** Stop button on brake pedal (start-up enabling switch).



**17. Speed sensor****19. Fuses: remove the saddle to reach them.****20. Start-up relay: remove the rear mudguard to reach it.****22. Battery: remove the saddle to reach it.**

**24.** Control unit: reach it from the inside of the left-side front mudguard.



**25.** Horn: remove the front shield to reach it



**33.** Display



**37.** Thermistor: reach it from the inside of the right-side front mudguard.

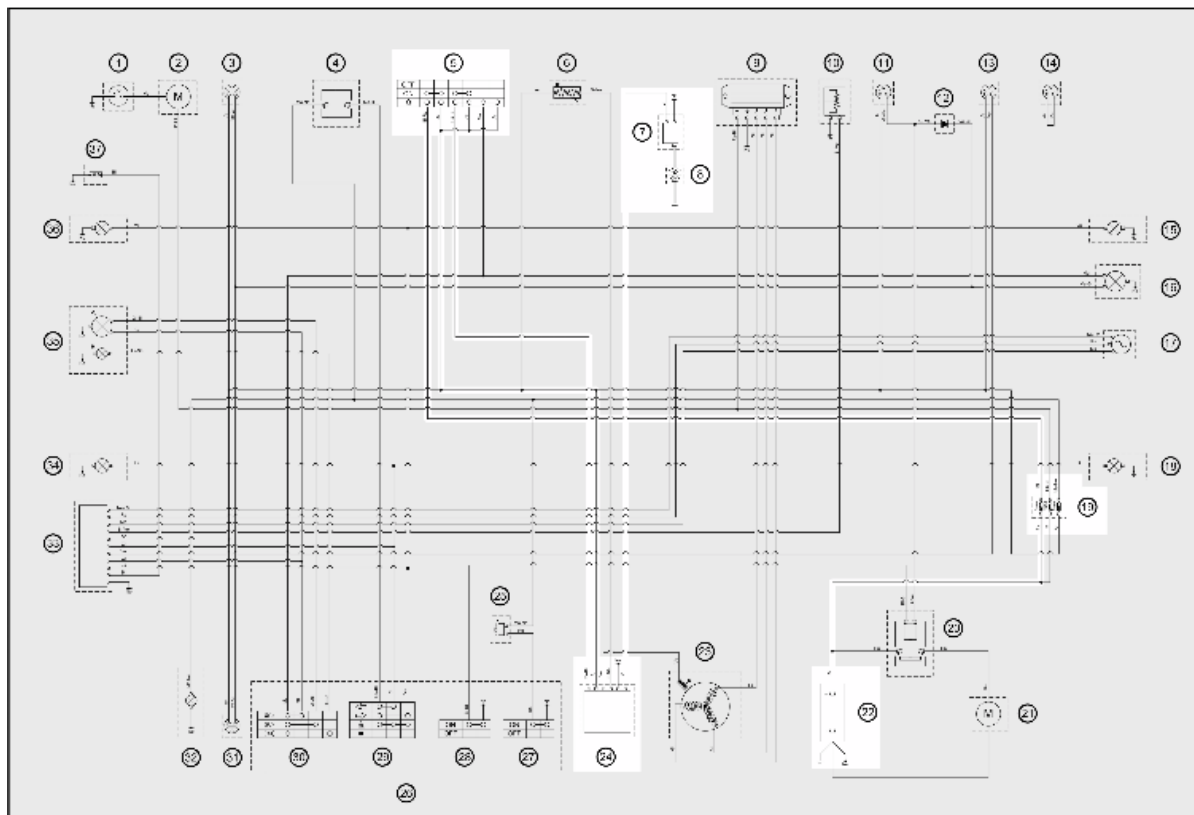


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## Conceptual diagrams

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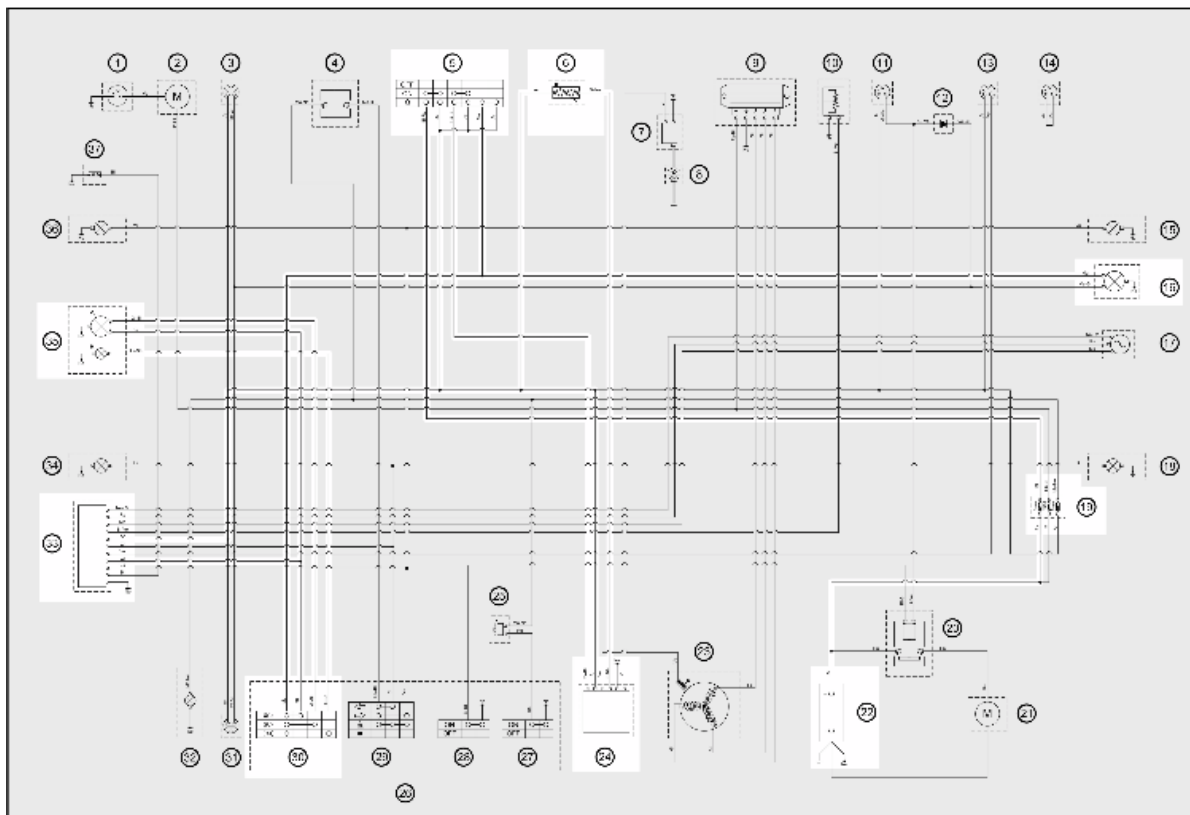
## Ignition



### KEY

- 5. Key switch
- 7. Coil
- 8. Spark plug
- 19. Fuses
- 22. 12V/12A Battery
- 24. CDI Control unit

## Headlights and automatic starter section

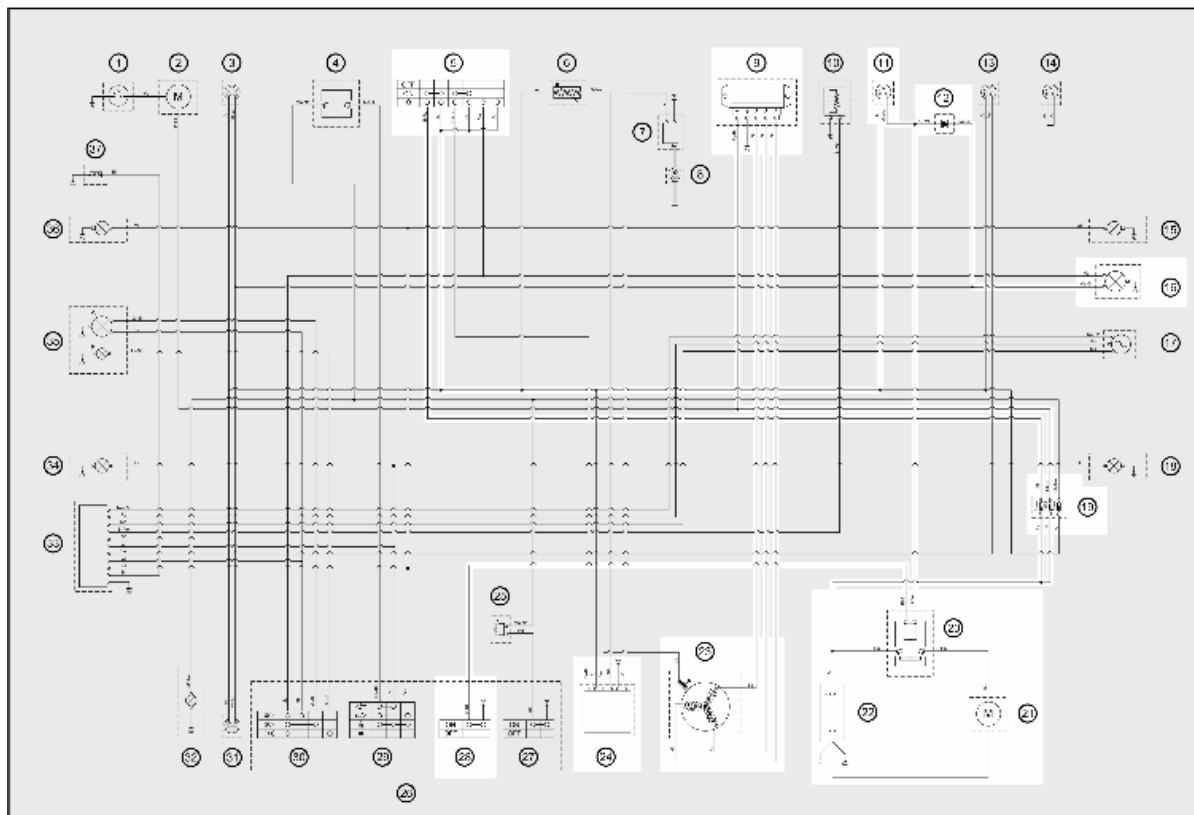


### KEY

- 5. Key switch
- 6. Automatic starter
- 16. Stop light bulb, 12V 5x21W
- 19. Fuses
- 22. 12V/12A Battery
- 24. CDI Control unit
- 30. Light switch
- 33. Display
- 35. Front light
- A. High-/low-beam light bulb, 12V/35W/35W
- B. Tail light bulb, 12V/5W



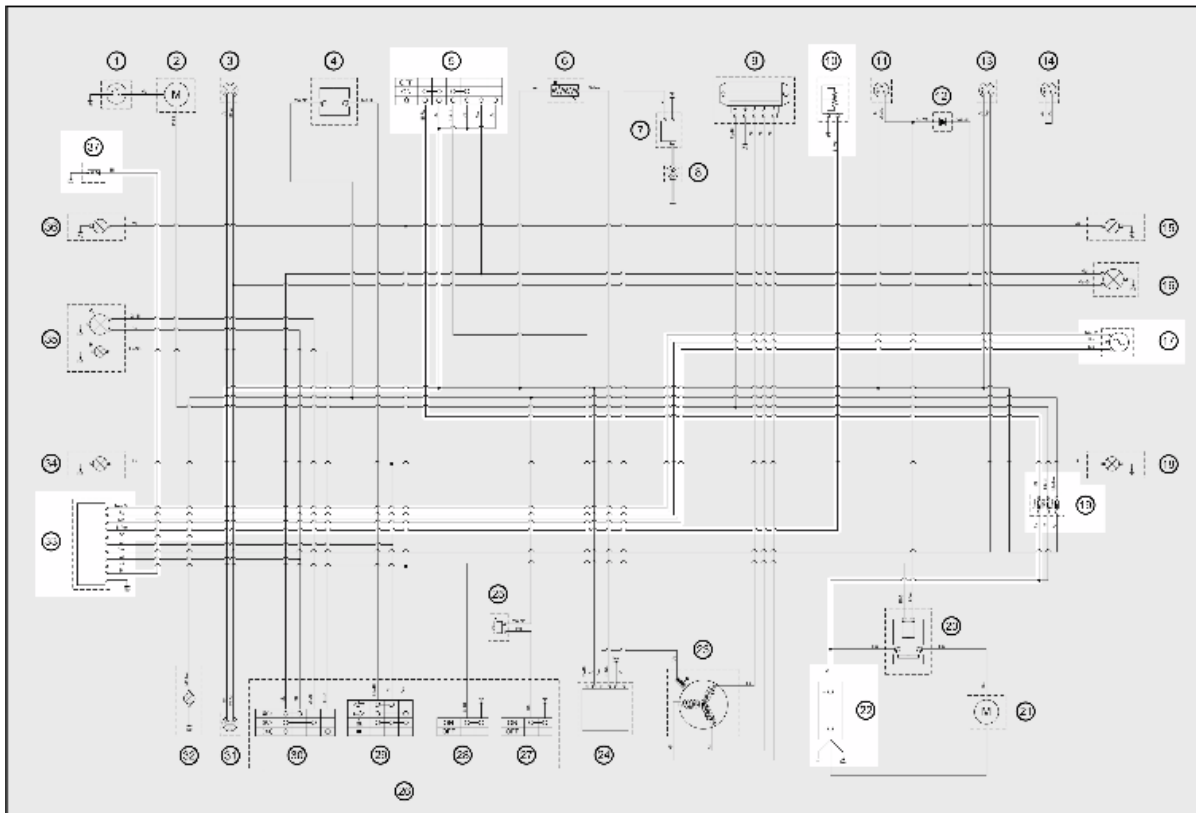
## Battery recharge and starting



### KEY

- 5. Key switch
- 9. Voltage regulator
- 11. Stop button on brake pedal
- 12. Stop button on brake pedal LED
- 16. Stop light bulb, 12V 5x21W
- 19. Fuses
- 20. Start-up relay
- 21. Starter motor
- 22. 12V/12A Battery
- 23. Generator
- 24. CDI Control unit
- 28. Starter button

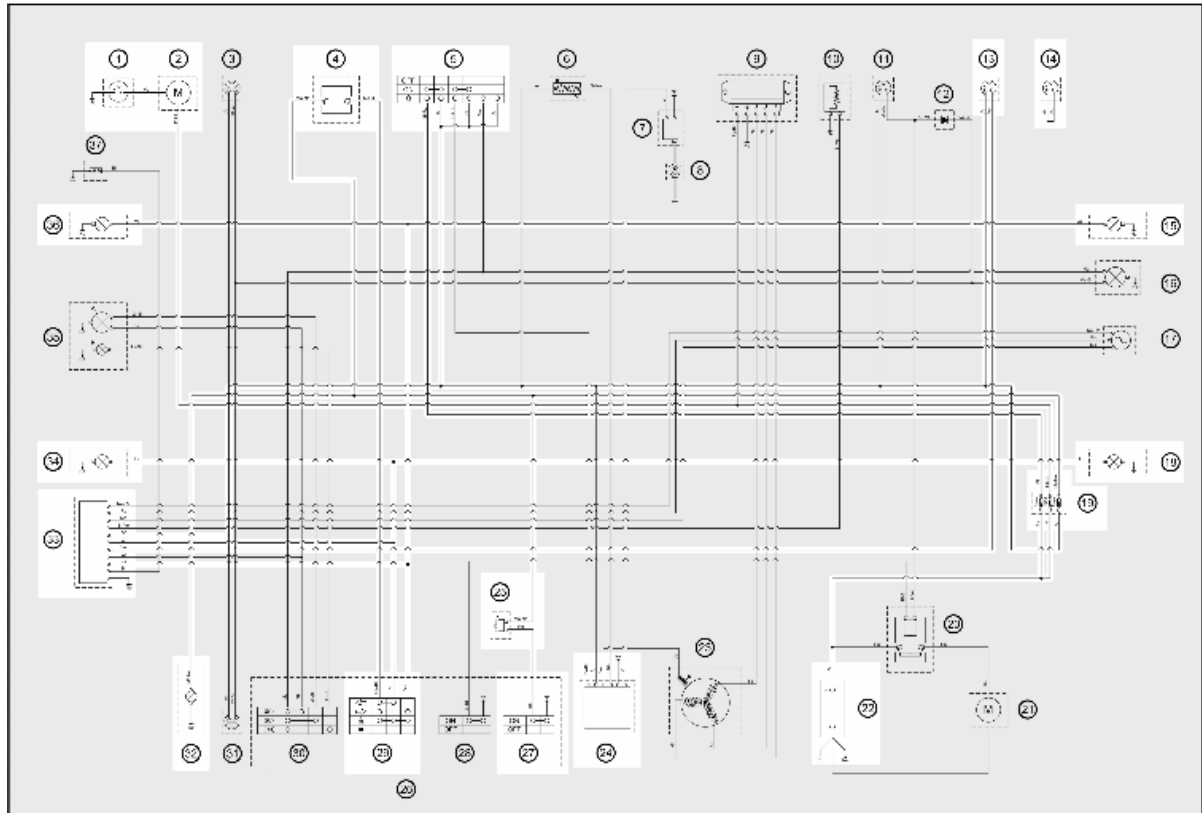
## Level indicators and enable signals section



### KEY

- 5. Key switch
- 10. Fuel level transmitter
- 17. Speed sensor
- 19. Fuses
- 22. 12V/12A Battery
- 33. Display
- 37. Thermistor

## Devices and accessories



## KEY

- 1. Thermoswitch
- 2. Electric fan
- 4. Turn indicator relay
- 5. Key switch
- 13. Reverse gear light button
- 14. Stop button on safety brake
- 15. Rear right turn indicator, 12V/10W
- 18. Rear left turn indicator, 12V/10W
- 19. Fuses
- 22. 12V/12A Battery
- 24. CDI Control unit
- 25. Horn
- 27. Horn button
- 29. Turn indicator selector
- 32. Instrument panel lighting bulb
- 33. Display
- 34. Front left turn indicator, 12V/10W

### 36. Front right turn indicator, 12V/10W

## Checks and inspections

### Ignition circuit

The battery provides the basic power supply. The system is adjusted so that the start-up system immediately detects an eventual battery voltage drop, but this is practically irrelevant for the ignition system.

The Pick-Up is connected to the control unit by a single cable; then, for the ground circuit, the control unit is connected to the Pick-Up by the chassis and the engine ground lead.

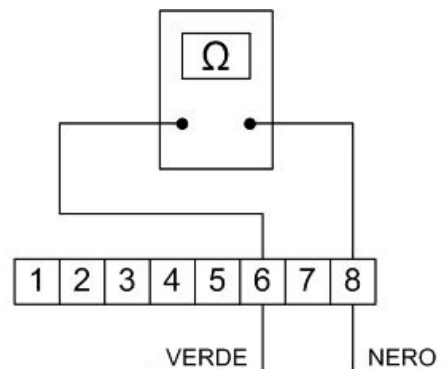
To avoid disturbances in the ignition system during start-up, it is very important that the engine-chassis ground connection bonding is efficient.

### No spark plug

If no current reaches the spark plug, proceed as follows:

- Pick-Up check.

Disconnect the control unit connector and check that the cable between terminal No. 6 (Green) and terminal No. 8 (Black) is not interrupted. Check the Pick-Up and its power line:



#### Electric characteristic

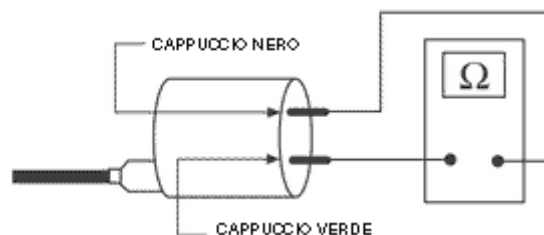
##### Pick-up resistance value

Pick-up resistance value:  $105 \div 124 \text{ Ohm}$

If a break in the circuit is found, check again the flywheel and the engine ground connectors (see engine manual). If non-conforming values are detected, replace the Pick-Up, otherwise check the cable harness and the connections. In case conforming values are measured and the wiring and connections check is OK, try replacing the control unit and make sure the failure has been solved by checking sparks are produced by the spark plug. If no sparks are produced with the new control unit, proceed as follows.

- HV primary coil check

Disconnect the two connectors on the HV coil and check continuity (see figure). If non-conforming values are measured, replace the HV coil. If conforming values are measured, check the wiring. If failures are detected, check the HV coil secondary.



#### Electric characteristic

**High voltage coil primary resistance value**

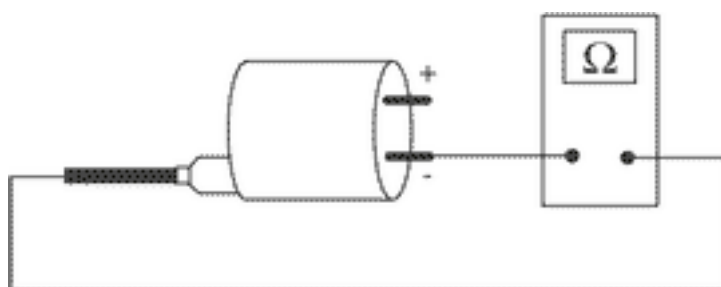
High voltage coil primary resistance value:  $0.4 \div 0.5 \text{ Ohm}$

**HV coil secondary check**

Disconnect the spark plug cap from the HV cable and measure the resistance between the HV cable terminal and the HV coil negative terminal (see figure). If non-conforming values are measured, replace the HV coil. To carry out a more complete diagnosis, check the peak voltage with the multimeter adaptor.

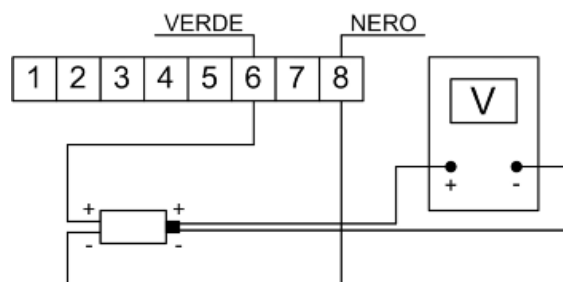
**Electric characteristic****High voltage coil secondary resistance value**

High voltage coil secondary resistance value:  $\sim 3000 \pm 300 \text{ Ohm}$

**- Pick-Up.**

Disconnect the control unit connector and connect the positive wire to connector No. 6 and the negative wire to connector No. 8 (see figure).

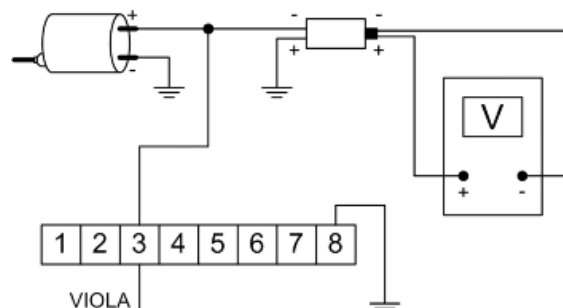
Use the start-up system to run the engine and measure the voltage produced by the Pick-Up. Replace Pick-Up if non-conforming values are measured.

**Electric characteristic****Pick-Up voltage value**

Pick-Up voltage value:  $> 2 \text{ Volt}$

**- HV coil**

With the control unit and HV coil connected, measure the voltage of the coil primary during the start-up test with the voltage peak adaptor and connecting the positive terminal to the ground one and the negative to the coil positive connector. If non-conforming values are measured, replace the control unit.



**N.B.**

THE PLASTIC CAP OF THE POSITIVE TERMINAL ON THE HV COIL PRIMARY IS BLACK AND THE NEGATIVE TERMINAL ONE IS GREEN.

### Electric characteristic

#### High voltage coil voltage value

High voltage coil voltage value: > 100 Volt

---

## Battery recharge circuit

The recharge system is provided with a three phase alternator with permanent flywheel.

The alternator is directly connected to the voltage regulator.

In turn, the latter is directly connected to earth and to the battery positive passing through the 15A safety fuse.

The three- phase generator provides good recharge power and at low revs a good compromise is achieved between generated power and idle stability.

---

## Stator check

Disconnect the connector from the voltage regulator and check there is continuity between any yellow cable and the other two cables.

### Electric characteristic

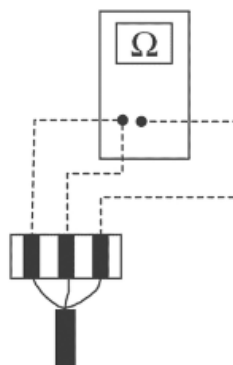
#### Ohm value:

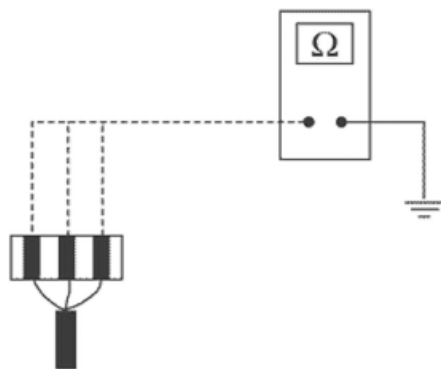
0.7 ÷ 0.9 Ohm



Also check that all yellow cables are insulated from the ground connection.

If non-conforming values are detected, repeat the checks directly to the stator. In case of further repetitions of incorrect values replace the stator or repair the wiring.





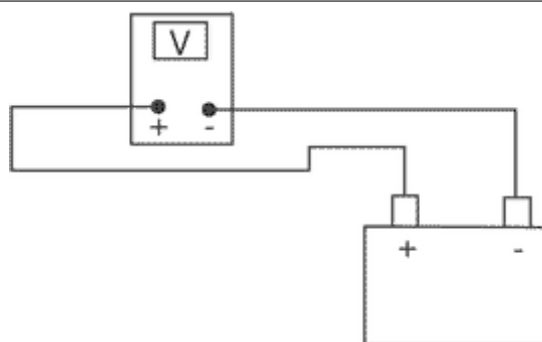
### Voltage regulator check

With a perfectly charged battery and lights off, measure voltage at the battery poles with a high running engine.

The voltage should not exceed 15.2 Volt.

In case higher voltages are detected, replace the regulator.

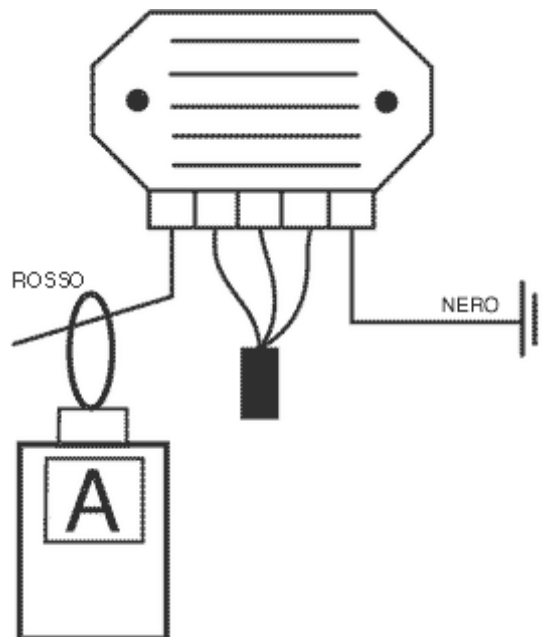
In case of voltage values lower than 14 Volt, check the stator and the corresponding cable harness.



### Recharge system voltage check

Connect an ammeter induction clamp to the voltage regulator positive terminal, measure the battery voltage and turning on the vehicles lights with engine off, wait for the voltage to set at about 12 V. Start the engine and measure the current generated by the system with lights on and a high running engine.

In case the generated current value is lower than 10A, repeat the test using a new regulator and/ stator alternatively.



## Choke Inspection

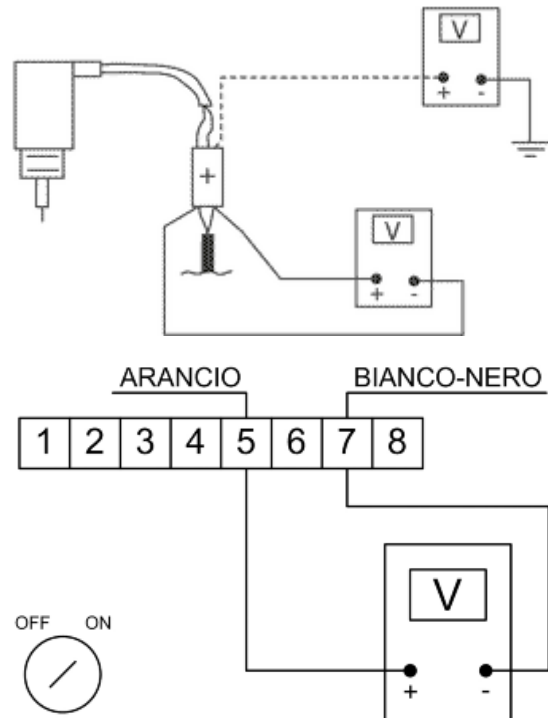
Refer to the engine section to check the resistance and operating conditions of the component. As regards voltage supply, keep the connector connected to the system and check that the two terminals receive battery voltage when the engine is on (see figure).

If voltage is detected, replace the automatic starter as it is surely failing.

If no voltage is detected, connect the multimeter negative terminal to the ground lead and the positive terminal to the automatic starter orange cable; with the key switch set to «ON» check whether there is battery voltage; if there is no voltage, check the wiring connections to the key switch and that the 15A fuse works properly.

If there is voltage, check again the ignition control unit connector. After disconnecting the starter, start the engine and keep it at idle speed. Check if there is voltage when the multimeter positive probe is connected to terminal No. 5 (Orange) and the negative one to terminal No. 7 (White/Black) (see figure).

Replace the control unit if there is no voltage; otherwise, check the wiring connections between the starter and the control unit.



## Turn signals system check

If it does not work, it is necessary to:

- Check light bulbs efficiency.
- Check if fuse No. 3 is in working order with the ignition switch key set to ON.
- Check for intermittent voltage on the Brown-Black cable of the turn indicator relay. If there is no voltage, check the wiring is not interrupted between relay and fuse No. 3; otherwise, replace the relay.
- Check the wiring is not interrupted between relay and the turn indicator switch.

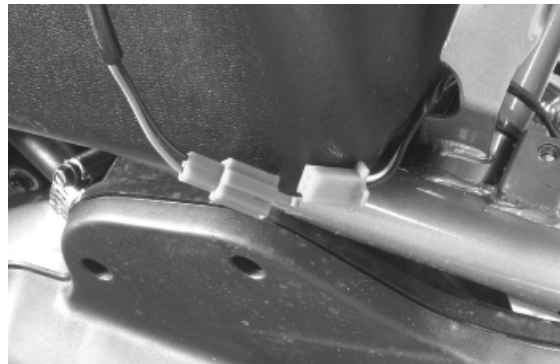


- Check the wiring is not interrupted, with turn indicator switch operated, between the cables coming out from the switch and the turn indicator bulb cables. If there is continuity but the bulbs do not turn on, replace the turn indicator switch because it is certainly inefficient.

## level indicators

### Fuel level transmitter

In case of failure, check that the 15A fuse is in working order and that there is battery voltage on terminal No. 5 of the instrument panel.



Using a multimeter check the resistance values between the 2 cables of the fuel level transmitter switch under the different conditions shown in the table.

### FUEL LEVEL - RESISTANCE VALUES (OHM)

|   | Specification | Desc./Quantity |
|---|---------------|----------------|
| 1 | Empty tank    | 87 ÷ 97 Ohm    |
| 2 | ½ Tank        | 34 ÷ 42 Ohm    |
| 3 | Full tank     | ~ 7 Ohm        |

## Lights list

### BULBS

|   | Specification                       | Desc./Quantity                                    |
|---|-------------------------------------|---------------------------------------------------|
| 1 | Low-beam and high-beam lights       | Type: Halogen with double filament, 12V - 35/35W  |
| 2 | Front parking light bulb            | Type: all glass, 12V - 5W                         |
| 3 | Turn indicator light bulb           | Type: spherical, 12V - 10W (amber)                |
| 4 | Stop light and rear tail light bulb | Type: Spherical with double filament, 12V - 5/21W |

## Fuses

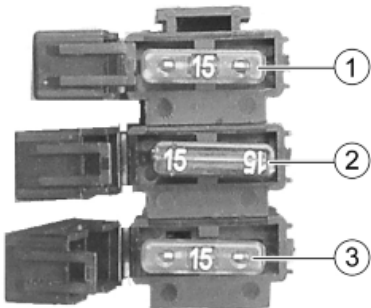
The fuse box placed under the saddle comprises three fuses to protect the following circuits.

The starter motor is controlled by a relay which is directly connected to the battery.



FUSES

|   | Specification | Desc./Quantity                                                                                                                    |
|---|---------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 1 | Fuse No. 1    | Capacity: <b>15 A</b><br>Protected circuits: <b>Live services</b>                                                                 |
| 2 | Fuse No. 2    | Capacity: <b>15 A</b><br>Protected circuits: <b>Engine cooling electric fan, Recharge circuit</b>                                 |
| 3 | Fuse No. 3    | Capacity: <b>15 A</b><br>Protected circuits: <b>Instrument panel, Emergency lights, Turn indicator lights, Horn, CDI ignition</b> |



Dashboard



- 1. Turn indicators warning lights and Emergency Lights:** the two warning lights turn on and flash, to the right or left respectively with the turn indicators on, or by pressing the Emergency light button (Green).
- 2.Reverse gear engaged warning light.**
- 3.Coolant temperature warning light:** this warning light turns on if the engine coolant temperature is too high.
- 4. Lights on warning light.**
- 5. Speedometer (KM/H):** indicates the vehicle speed.
- 6.Total odometer (KM):** indicates the total kilometres covered.
- 7."SET" button:** resets the trip odometer.
- 8. "MODE" button:** function not used.

**9. Trip odometer (KM):** measures the distance between two places or the kilometres covered between two full-tank refuellings. Press button «7» to reset it.

**10. Fuel gauge.**

---

## Sealed battery

If the vehicle is provided with a sealed battery, the only maintenance required is the check of its charge and recharging, if necessary.

These operations should be carried out before delivering the vehicle, and on a six-month basis while the vehicle is stored in open circuit.

Besides, upon pre-delivery it is therefore necessary to check the battery charge and recharge it, if required, before storing the vehicle and, afterwards, every six months.

### INSTRUCTIONS FOR THE BATTERY REFRESH AFTER OPEN-CIRCUIT STORAGE

#### 1) Voltage check

Before installing the battery on the vehicle, check the open circuit voltage with a regular tester.

- If voltage exceeds 12.60 V, the battery can be installed without any renewal recharge.
- If voltage is below 12.60 V, a renewal recharge is required as explained in 2).

#### 2) Constant voltage battery charge mode

- Constant voltage charge equal to 14.40 ÷ 14.70V
- Initial charge voltage equal to 0.3 ÷ 0.5 for Nominal capacity
- Charge time:

10 to 12 h recommended

Minimum 6 h

Maximum 24 h

#### 3) Constant current battery charge mode

- Charge current equal to 1/10 of the nominal capacity of the battery
- Charge time: 5 h

#### CAUTION

**NEVER USE FUSES WITH A CAPACITY HIGHER THAN THE RECOMMENDED CAPACITY. USING A FUSE OF UNSUITABLE RATING MAY SERIOUSLY DAMAGE THE VEHICLE OR EVEN CAUSE A FIRE.**

**CHARGE THE BATTERY BEFORE USE TO ENSURE OPTIMUM PERFORMANCE. INADEQUATE CHARGING OF THE BATTERY WITH A LOW ELECTROLYTE LEVEL BEFORE IT IS FIRST USED SHORTENS THE LIFE OF THE BATTERY.**

**IF THE VEHICLE IS NOT USED FOR SOME TIME (1 MONTH OR MORE) THE BATTERY NEEDS TO BE RECHARGED PERIODICALLY. THE BATTERY RUNS DOWN COMPLETELY IN THE COURSE OF THREE MONTHS. IF IT IS NECESSARY TO REFIT THE BATTERY IN THE VEHICLE, BE CAREFUL NOT TO REVERSE THE CONNECTIONS TAKING INTO ACCOUNT THAT THE GROUND WIRE (BLACK) MARKED (-) MUST BE CONNECTED TO THE - NEGATIVE TERMINAL WHILE THE OTHER TWO RED WIRES MARKED (+) MUST BE CONNECTED TO THE TERMINAL MARKED WITH THE +POSITIVE SIGN**

#### WARNING

**WHEN THE BATTERY IS REALLY FLAT (WELL BELOW 12.6V) IT MIGHT OCCUR THAT 5 HOURS OF RECHARGING ARE NOT ENOUGH TO ACHIEVE OPTIMAL PERFORMANCE.**

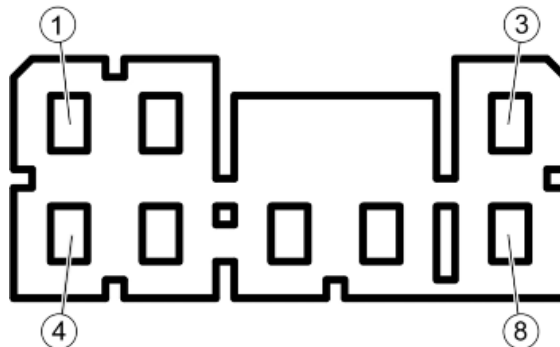
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**GIVEN THESE CONDITIONS IT IS HOWEVER ESSENTIAL NOT TO EXCEED 8 HOURS OF CONTINUOUS RECHARGING SO AS NOT TO DAMAGE THE BATTERY ITSELF.**

## Connectors

### CONTROL UNIT CONNECTOR

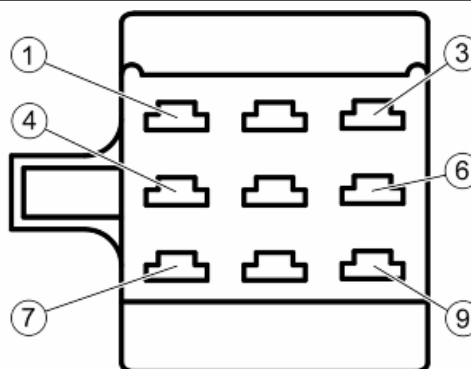
1. Not connected
3. HV coil (Purple)
4. Battery positive (Red-White)
5. Battery positive (Orange)
6. Pick-up (Green)
7. Automatic starter (White-Black)
8. Ground (Black)



### INSTRUMENT PANEL CONNECTORS

#### 9-way connector

1. Speed sensor (Red-Black)
2. Speed sensor (Red)
3. Speed sensor (Brown)
4. Fuel level transmitter (White-Green)
5. Battery positive (Orange)
6. Left turn indicators (Dark brown)
7. Reverse gear light button (Green)
8. High-beam light (Yellow)
9. Right turn indicators (Dark green)



#### Single connector

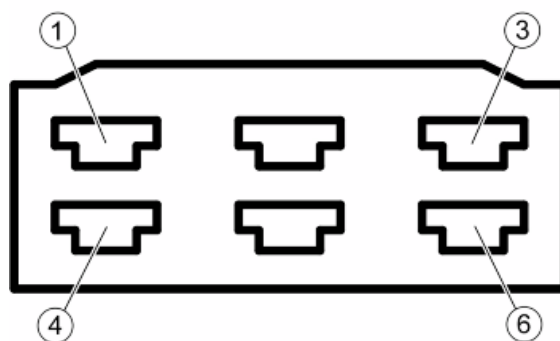
- Ground (Black)

#### Single connector

- Thermistor (Blue)

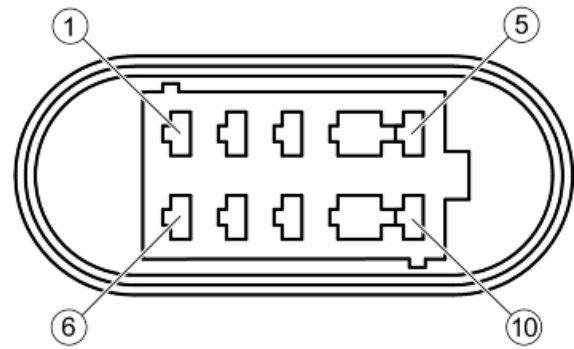
### VOLTAGE REGULATOR CONNECTOR

1. Ground (Black)
2. Not connected
3. Battery positive (Red-Blue)
4. Magneto flywheel (Yellow)
5. Magneto flywheel (Yellow)
6. Magneto flywheel (Yellow)



**MAGNETO FLYWHEEL CONNECTOR**

- 1. Voltage regulator (Yellow)
  - 2. Not connected
  - 3. Not connected
  - 4. Not connected
  - 5. Voltage regulator (Yellow)
  - 6. Not connected
  - 7. Not connected
  - 8. Voltage regulator (Yellow)
  - 9. Not connected
  - 10. Pick-up signal (Green)
- 



INDEX OF TOPICS

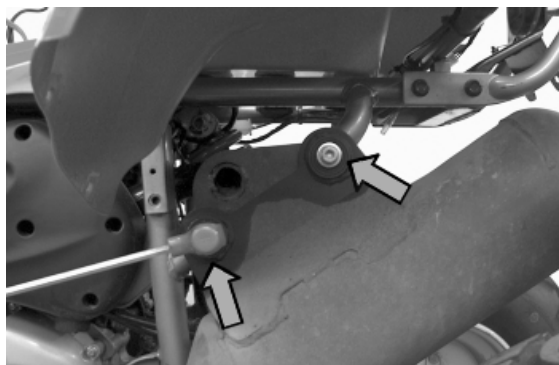
ENGINE FROM VEHICLE

ENG VE

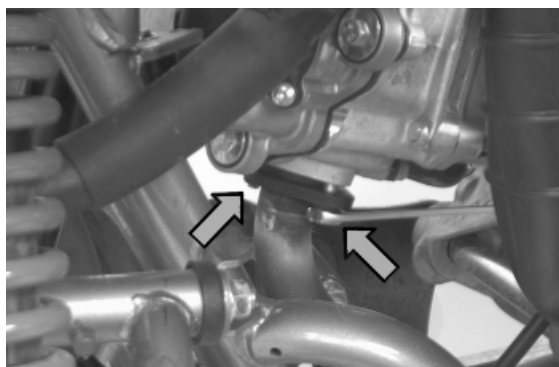
---

## Exhaust assy. Removal

- Remove the left footrest.
- Remove the two screws connecting it to the chassis.



- Unscrew the two nuts connecting it to the head. Remove the full muffler unit.



To refit, follow the removal steps but in reverse order; be careful to tighten to the prescribed torques.

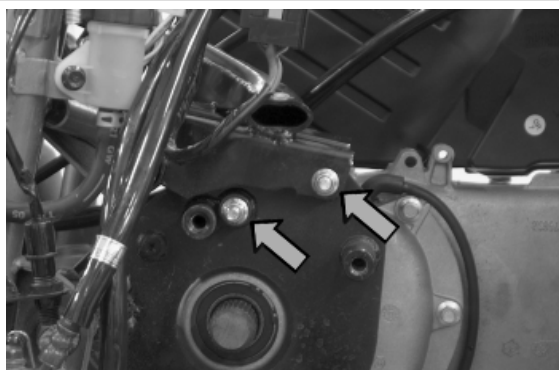
### Locking torques (N\*m)

**Nut fixing muffler to cylinder head 16 ÷ 18 Exhaust end/chassis fixing screws 25÷30**

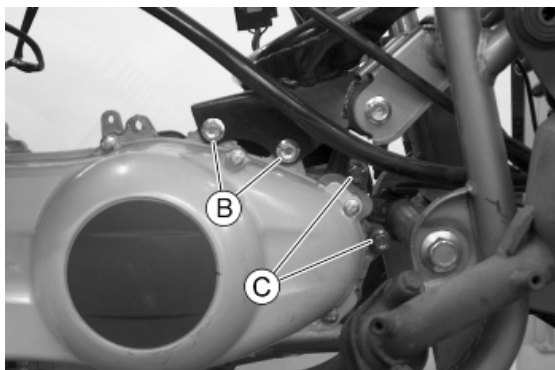
---

## Removal of the engine from the vehicle

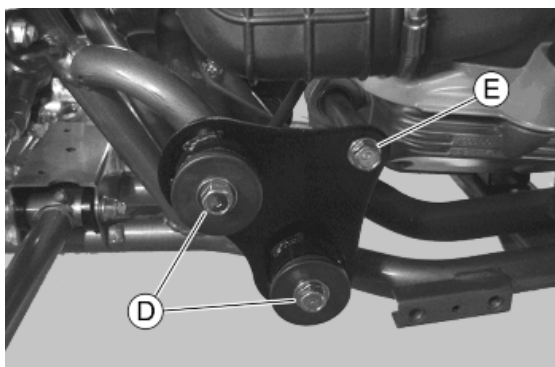
- Remove the full muffler unit.
- Remove the complete air filter.
  - Remove the whole reverser.
  - Detach the electrical connections from the engine: pick-up, start-up, spark plug, thermistor, starter motor, engine temperature sensor.
  - Detach the throttle control cable from the engine.
  - Detach the cooling system connections from the engine.
  - Unscrew the two nuts indicated.



- 
- Remove the pins «B» and the two clamps «C».



- 
- Release the clamps «D» from both sides and remove the pin «E».



- 
- Remove the pin «F» and remove the whole engine from the vehicle left-hand side.



Follow the removal steps but in reverse order; be careful to tighten to the prescribed torques.

### Locking torques (N\*m)

Engine - chassis lower retainer 44 Engine - chassis support front retainer 44 Engine - chassis front support retainer 44 Engine - engine rear support rear retainer 24 Engine rear support retainer 24

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INDEX OF TOPICS

ENGINE

ENG

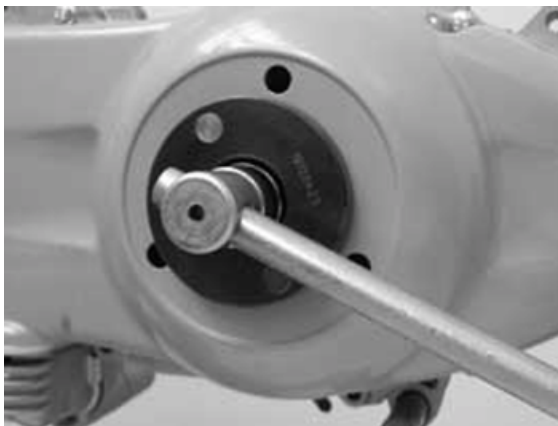
---

## Automatic transmission

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### Transmission cover

- To remove the transmission cover it is necessary to remove the plastic cover first, by inserting a screwdriver in the slotted holes. Using the clutch bell lock wrench shown in the figure, remove the driven pulley shaft locking nut and washer.



#### Specific tooling

**020423Y driven pulley lock wrench**

- Remove the cap/dipstick from the engine oil filling hole.
- Remove the ten screws.
- Remove the transmission cover.

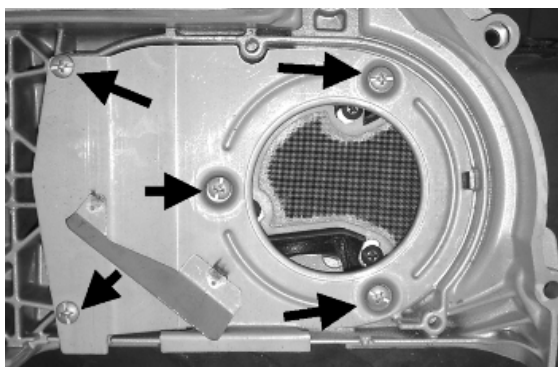
If this operation is carried out directly on the vehicle, remove the cooling air supply coupling of the transmission housing.



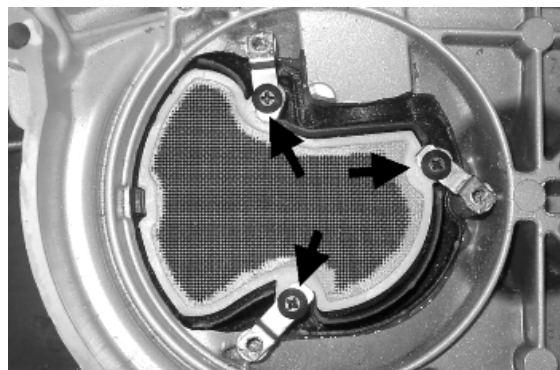
---

### Air duct

- Remove the five screws on two different levels as well as the small casing.



- To remove the intake throat on the transmission cover, just remove the 3 fixing screws indicated in the figure.



---

## Removing the driven pulley shaft bearing

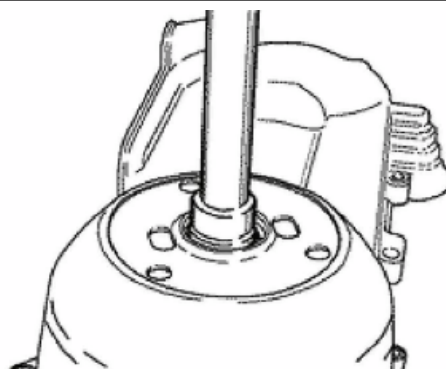
- Remove the clip from the inside of the cover.
- Remove the bearing from the crankcase by means of:

### Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

020412Y 15 mm guide



---

## Refitting the driven pulley shaft bearing

- Slightly heat the crankcase from the inside so as not to damage the painted surface.
- Insert the bearing in its seat.
- Refit the seeger ring.

### CAUTION

USE AN APPROPRIATE REST SURFACE TO AVOID DAMAGING THE COVER PAINT.

### N.B.

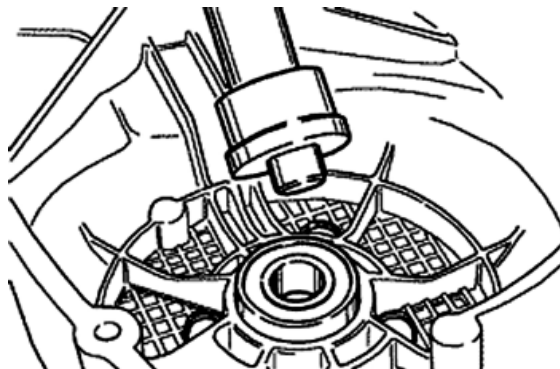
ALWAYS REPLACE THE BEARING WITH A NEW ONE UPON REFITTING.

### Specific tooling

020376Y Adaptor handle

020357Y 32 x 35 mm adaptor

020412Y 15 mm guide



---

## Baffle roller

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## Plastic roller

- Check that the roller does not show signs of wear and that it turns freely.
- Remove the special clamping screws as indicated in the photograph



- Check the outside diameter of the roller does not have defects that could jeopardise belt functioning
- For refitting, place the roller with the belt containment edge on the engine crankcase side
- Tighten the wrench to the prescribed torque.



### Locking torques (N\*m)

Anti-flapping roller 12 - 16

---

## CHAIN TENSIONER ROLLER

### REMOVAL:

- Remove the chain.
- Remove the benzing snap ring.



- Slide off the chain tensioner roller.

### FITTING:

Follow the removal steps but in reverse order; be careful to fit the chain adequately.



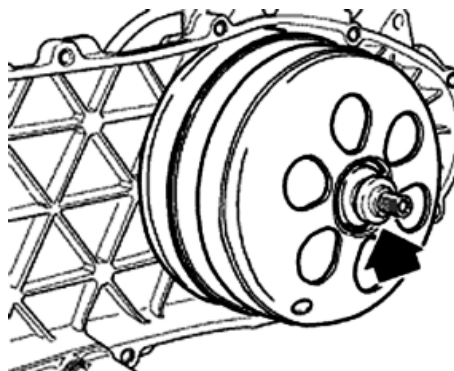
---

## Removing the driven pulley

- Remove the spacer, the clutch bell and the whole driven pulley unit.

**N.B.**

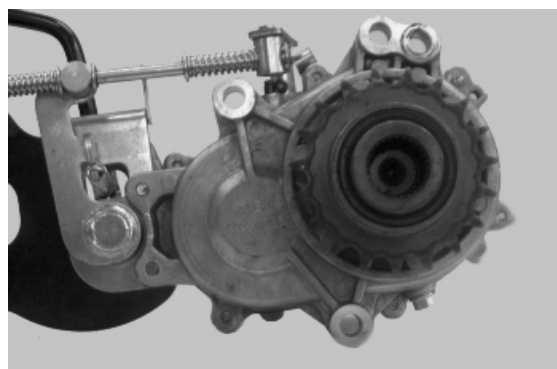
**THE UNIT CAN ALSO BE REMOVED WITH THE DRIVING PULLEY MOUNTED.**



---

## Removing the engine pinion

- The pinion is a component integrated in the reverser. To replace it, remove the reverser from the vehicle and dismantle the internal components.
- Proceed as indicated in the Engine/Reverser chapter



- To replace the transmission crown:
- Remove the right rear wheel with the wheel holder flange.
- Release the nuts from the safety plates.
- Unscrew the nuts and remove the transmission crown sliding it off the axle.

To refit, follow the removal steps but in reverse order; be careful to tighten to the prescribed torques.

### Locking torques (N\*m)

**Crown - crown holder flange locking screws 45**



## Inspecting the clutch drum

- Check that the clutch bell is not worn or damaged.
- Measure the clutch bell inside diameter.

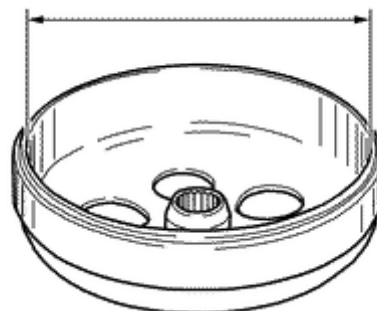
### Characteristic

#### Max. value clutch bell

Max. value:  $\varnothing$  134.5 mm

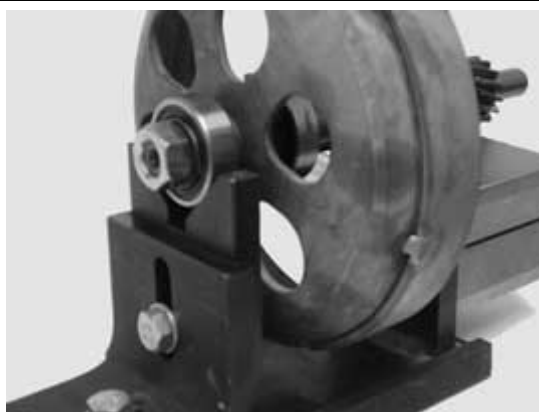
#### Clutch bell standard value

Standard value:  $\varnothing$  134 - 134.2 mm



### Checking the bell working surface eccentricity

- Install the bell on a driven pulley shaft using 2 bearings (inner diameter 15 and 17 mm).
- Lock with the original spacer and nut.
- Place the bell/shaft assembly on the support to check the crankshaft alignment.



- Using a feeler pin gauge and the magnetic base, measure the bell eccentricity.
- Repeat the measurement in 3 positions (Central, internal, external).
- If faults are found, replace the bell.

### Specific tooling

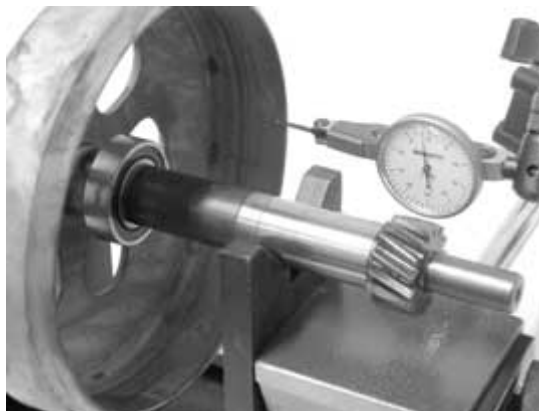
**020074Y Support base for checking crankshaft alignment**

**020335Y Magnetic support for dial gauge**

### Characteristic

**clutch bell inspection: Limit eccentricity.**

Admissible limit eccentricity: 0.15 mm



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## Removing the clutch

Fit the driven pulley spring compressor specific tool with medium length pins screwed in position «C» on the tool internal side.

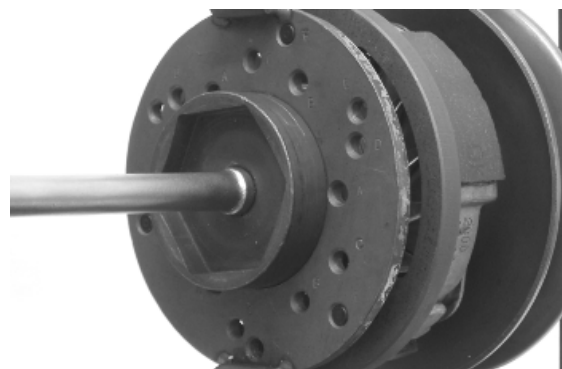
- Introduce the adapter ring No. 11 with the chamfering facing the inside of the tool.

- Fit the driven pulley unit on the tool with the insertion of the 3 pins in the ventilation holes in the mass holder support.

- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to loosen/tighten the clutch nut.

- Use the special 46x55 wrench component No. 9 to remove the nut fixing the clutch in place.

- Dismantle the driven pulley components (Clutch and spring with its plastic holder)



### CAUTION

THE TOOL MUST BE FIRMLY FIXED IN THE CLAMP AND THE CENTRAL SCREW MUST BE BROUGHT INTO CONTACT WITH THE TOOL. EXCESSIVE TORQUE CAN CAUSE THE SPECIFIC TOOL TO BUCKLE.

### Specific tooling

020444Y011 adapter ring

020444Y009 46x55 Wrench

020444Y Tool for fitting/ removing the driven pulley clutch

---

## Inspecting the clutch

- Check the thickness of the clutch mass friction material.

- The masses must not show traces of lubricants; otherwise, check the driven pulley unit seals.

### N.B.

UPON RUNNING-IN, THE MASSES MUST EXHIBIT A CENTRAL CONTACT SURFACE AND MUST NOT BE DIFFERENT FROM ONE ANOTHER.

VARIOUS CONDITIONS CAN CAUSE THE CLUTCH TO TEAR.

### CAUTION

DO NOT OPEN THE MASSES USING TOOLS TO PREVENT A VARIATION IN THE RETURN SPRING LOAD.



**Characteristic****Check minimum thickness**

1 mm

---

**Pin retaining collar**

- Simultaneously turn and pull the collar manually to remove it.

**N.B.**

USE TWO SCREWDRIVERS IF YOU HAVE DIFFICULTY.

**N.B.**

BE CAREFUL NOT TO PUSH THE SCREW DRIVERS IN TOO FAR TO AVOID DAMAGE THAT COULD ENDANGER THE O-RING SEAL.

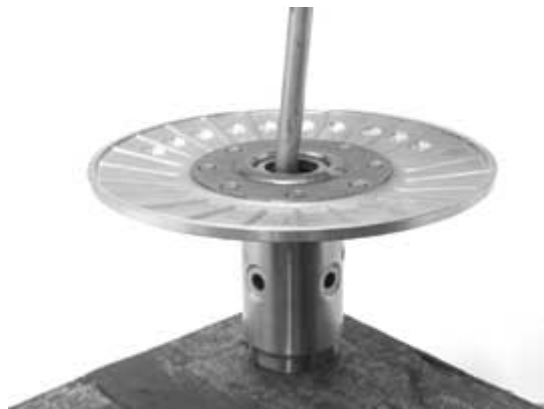


- Remove the four torque server pins and pull the pulley halves apart.

---

**Removing the driven half-pulley bearing**

- Check there are no signs of wear and/or noise; - Replace with a new one if there are.
- Remove the retaining ring using two flat blade screwdrivers.
- Support the pulley bushing adequately from the threaded side using a wooden surface.
- Using a hammer and pin, knock the ball bearing out as shown in the figure.





- Support the pulley properly using the bell as shown in the figure.

**Specific tooling**

001467Y035 Belle for OD 47-mm bearings



- Remove the roller bearing using the modular punch.

**Specific tooling**

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020363Y 20 mm guide

---

**Inspecting the driven fixed half-pulley**

- Measure the outer diameter of the pulley bushing.
- Check the contact surface with the belt to make sure there are no flaws.
- Check the riveted joints are functional.
- Check the evenness of the belt contact surface.

**Characteristic****Half-pulley minimum diameter**

Minimum admissible diameter Ø 40.96 mm

**Half-pulley standard diameter**

Standard diameter: Ø 40.985 mm

**Wear limit**

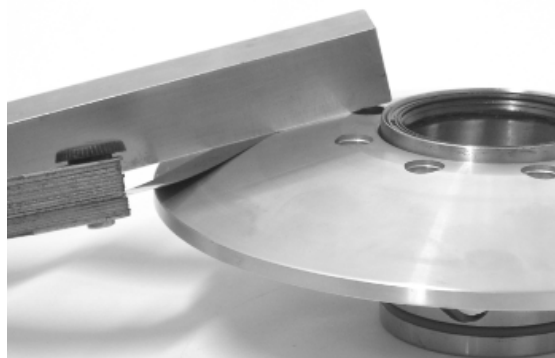
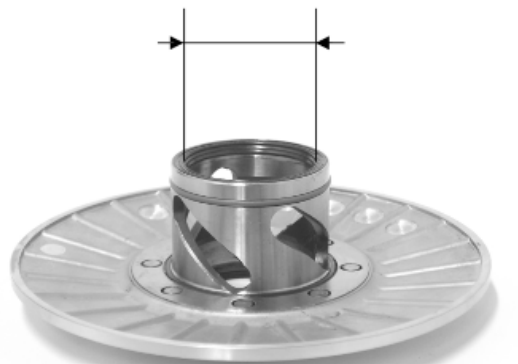
0.3 mm



## Inspecting the driven sliding half-pulley

- Remove the belt and slide the movable half-pulley with the relevant bush, taking care of the falling free assembled rollers.
- Remove the return rollers plate with the relative guide pads.

- Remove the two internal grommets and the two O-rings.
- Measure the movable half-pulley bushing inside diameter.
- Check the contact surface with the belt to make sure there are no flaws.
- Check the riveted joints are functional.
- Check the evenness of the belt faying surface.



### **MOVABLE DRIVEN HALF-PULLEY DIMENSIONS**

| Specification              | Desc./Quantity              |
|----------------------------|-----------------------------|
| Wear limit                 | 0.3 mm                      |
| standard diameter          | Diameter 41.000 - 41.035 mm |
| maximum allowable diameter | Ø 41.08 mm                  |

## Refitting the driven half-pulley bearing

- Support the pulley bushing adequately from the threaded side using a wooden surface.
- Fit a new roller sleeve as in the figure.
- For the fitting of the new ball bearing, follow the example in the figure using a modular punch.

Fit the snap ring

#### **WARNING**

**N.B.**

**FIT THE BALL BEARING WITH THE VISIBLE SHIELD**

#### **Specific tooling**



020376Y Adaptor handle

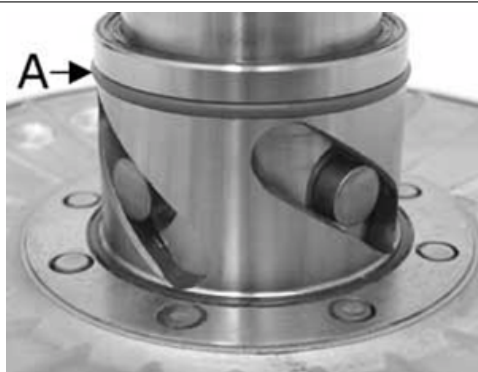
020375Y Adaptor 28 x 30 mm

020424Y Driven pulley roller casing fitting punch



## Refitting the driven pulley

- Insert the new oil guards and O-rings on the movable half-pulley.
- Lightly grease the O-rings «A» shown in the figure.
- Fit the half-pulley over the bushing using the specific tool.
- Check that the pins are not worn and proceed to refitting them in their slots.
- Refit the torque server closure collar.
- Using a curved-spout grease gun, lubricate the driven pulley unit with approximately 6 gr. of grease. Apply the grease through one of the holes in the bushing until it comes out through the hole on the opposite side. This operation is necessary to avoid the presence of grease beyond the O-rings.



### N.B.

THE TORQUE SERVER CAN BE GREASED WHETHER WITH BEARINGS FITTED OR WHEN THEY ARE BEING REPLACED; UNDERTAKING THE OPERATION WHEN THE BEARINGS ARE BEING SERVICED MIGHT BE EASIER.

### Specific tooling

020263Y Sheath for driven pulley fitting

### Recommended products

AGIP GREASE SM 2 Grease for the tone wheel revolving ring

Soap-based lithium grease containing NLGI 2 Molybdenum disulphide; ISO-L-XBCHB2, DIN KF2K-20

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## Inspecting the clutch spring

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Measure the length of the movable driven half-pulley spring when it is unloaded.

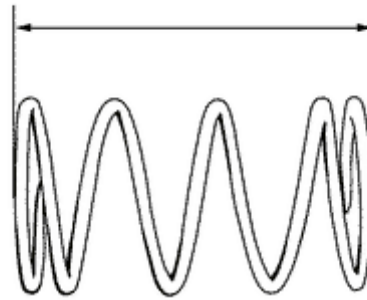
### Characteristic

#### Standard width

123 mm

#### acceptable limit after use:

118 mm



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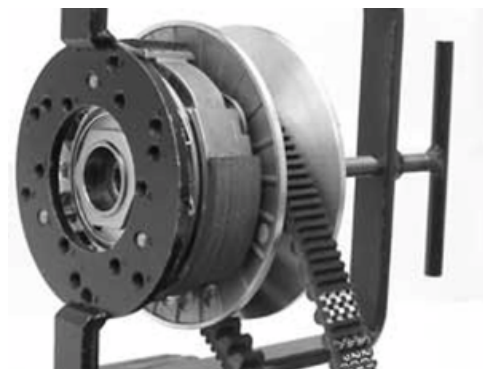
## Refitting the clutch

---

- Support the driven pulley spring compressor appropriate tool with the control screw in vertical axis.
- Arrange the tool with the medium length pins screwed in position "C" on the inside.
- Introduce the adapter ring 11 with the chamfering facing upwards.
- Insert the clutch on the adapter ring.
- Lubricate the end of the spring that abuts against the servo-system closing collar.
- Insert the spring with its plastic holder in contact with the clutch.
- Insert the driving belt into the pulley unit according to their direction of rotation.
- Insert the pulley unit with the belt into the tool.
- Slightly preload the spring.
- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to tighten the clutch nut.
- Place the tool in the clamp with the control screw on the horizontal axis.
- Fully preload the spring.



- Apply the clutch fixing nut and tighten it to the prescribed torque using the special 46x55 wrench.
- Loosen the tool clamp and insert the belt according to its direction of rotation.
- Lock the driven pulley again using the specific tool.
- Preload the clutch return spring with a traction/rotation combined action and place the belt in the smaller diameter rolling position.
- Remove the driven pulley /belt unit from the tool.

**N.B.**

DURING THE SPRING PRELOADING PHASE, BE CAREFUL NOT TO DAMAGE THE PLASTIC SPRING STOP AND THE BUSHING THREADING.

**N.B.**

FOR DESIGN REASONS, THE NUT IS SLIGHTLY ASYMMETRIC; THE FLATTEST SURFACE SHOULD BE MOUNTED IN CONTACT WITH THE CLUTCH.

**Specific tooling**

020444Y Tool for fitting/ removing the driven pulley clutch

020444Y011 adapter ring

020444Y009 46x55 Wrench

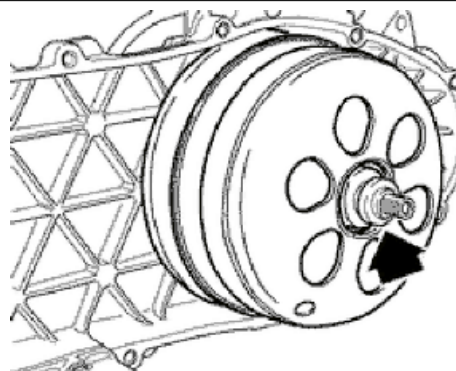
**Locking torques (N\*m)**

Nut locking clutch unit on pulley 55 ÷ 60 Nm

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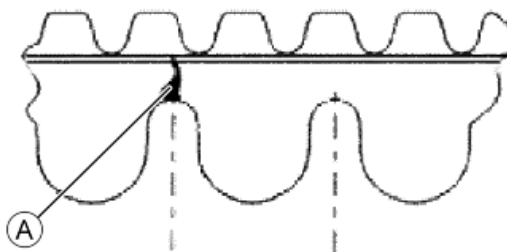
**Refitting the driven pulley**

- Reassemble the clutch bell and spacer.



## Drive-belt

When carrying out the wear checks foreseen in the scheduled maintenance for the services at 6,000 km; 18,000 km; etc., check that the rim bottom of the toothing does not show signs of scores or cracking (see figure): if it does, change the belt.



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

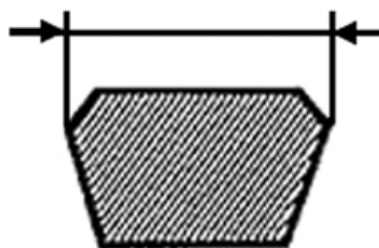
### Characteristic

#### Minimum width

19.5 mm

#### Standard width

$21.3 \pm 0.2$  mm

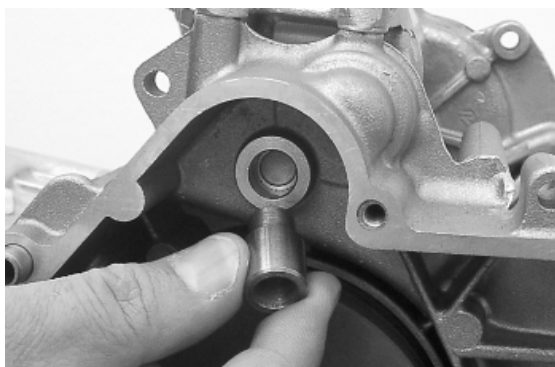


## Removing the driving pulley

- Turn the crankshaft until the ropes of the pulley are on a horizontal axis



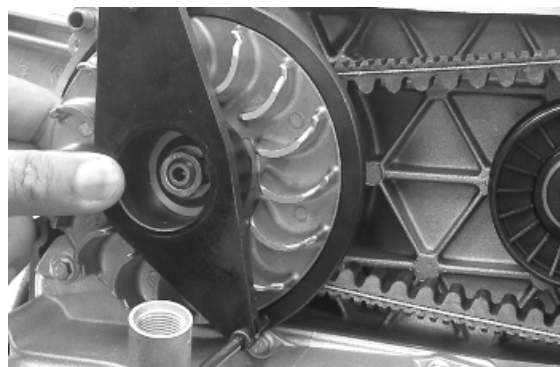
- Insert the adaptor sleeve of the appropriate tool in the hole shown in the photograph



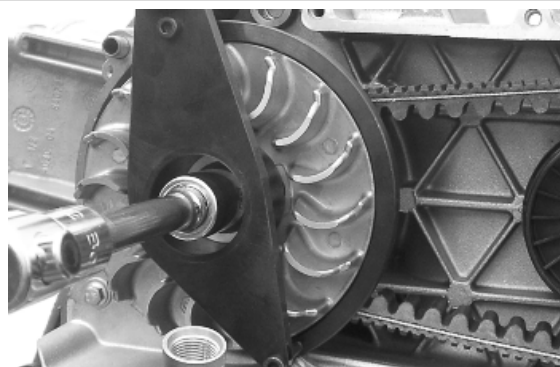
- Insert the tool in the hollows and apply the retention ring
- Bring in the ring's clamping screws while keeping the tool to support the pulley

### Specific tooling

**020626Y Driving pulley lock wrench**



- Remove the fixing nut and the washer
- Remove the stationary drive pulley half.



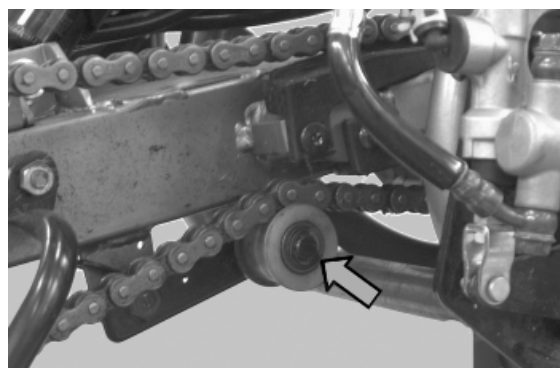
## Drive chain

### REMOVAL:

- Release the chain from the master link.
- Slide off the chain.

### FITTING:

- Lay the chain adequately through the chain tensioner roller.



- Refit the master link.
- Lubricate with the recommended product.

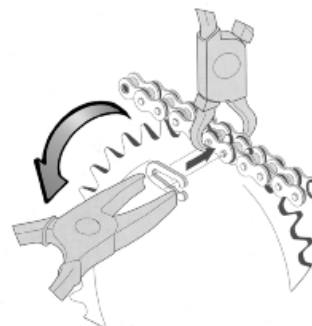
### N.B.

**PLACE THE MASTER LINK IN THE CORRECT DIRECTION, AS SHOWN IN THE FIGURE.**

### Recommended products

**AGIP CHAIN SPRAY** Spray lubricating grease

Spray lubricating grease for chains and gears



### - CHAIN ADJUSTMENT

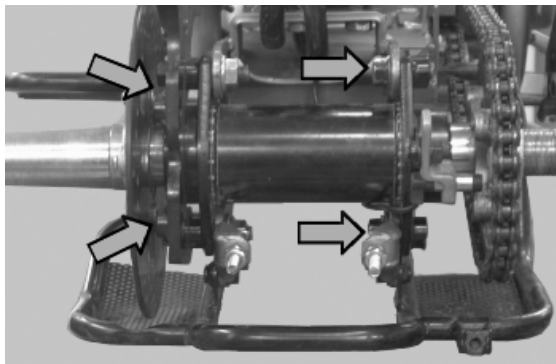
- Adjust the chain tension according to the prescribed limits.

### Characteristic

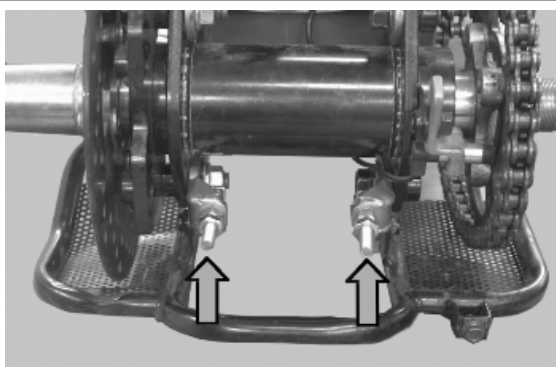
**Chain tension**

20 mm

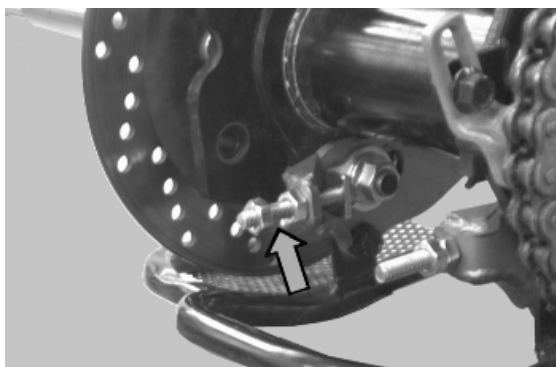
- To adjust the drive chain tension to the correct values, remove the two rear callipers and loosen the four screws indicated.



- There are two set screws for the chain backlash. The operations are described only once, but they are valid and should be carried out on both set screws.



- Loosen the lock nut.
- Operating on the indicated set screw, adjust the chain backlash.



- Once the correct backlash is obtained, check the wheel orthogonality.
- Having the two wheel axles as reference, measure the internal size of the two rims, from both sides.
- If the measurement is the same, the orthogonality is checked; otherwise, operate on the chain backlash set screws.

**N.B.**

INCORRECT ORTHOGONALITY IS CAUSED BY TRANSMISSION MALFUNCTION, RESULTS IN EXCESSIVE AND ABNORMAL WEAR OF THE CHAIN, THE CROWN AND THE TYRES.







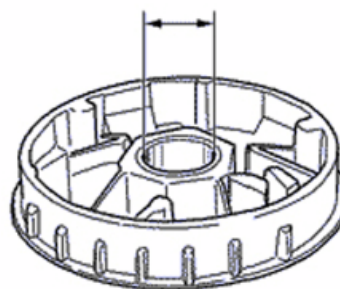
- After adjusting chain backlash and checking orthogonality, screw the lock nut of the chain backlash set screw.
- Tighten the previously loosened rear hub retainers to the prescribed torque.

### Locking torques (N\*m)

Rear hub - swinging arm retainers 140

## Inspecting the rollers case

- Check that the internal bushing shown in the figure is not abnormally worn and measure inner diameter.
- Measure outer diameter B of the pulley sliding bushing shown in the figure.
- Check that the rollers are not damaged or worn.
- Check the guide shoes for the variator back-plate are not worn.
- Check the wear of the roller housings and of the belt contact surfaces on both pulley halves.
- Check that stationary driving pulley does not show signs of abnormal wear on the grooved edge and on the surface in contact with the belt.
- Check that the O-ring is not pushed out of shape.



### CAUTION

DO NOT LUBRICATE OR CLEAN SINTERED BUSHINGS

### Characteristic

**Movable driving half-pulley bushing: Standard Diameter**

26.000 - 26.021 mm

**Movable driving half-pulley bushing: Maximum allowable diameter**

Ø 26.12 mm

**Sliding bushing: Standard Diameter**

Ø 25.959 ÷ 25.98 mm

**Sliding bushing: Minimum admissible diameter**

Ø 25.95 mm

**Roller: Standard Diameter**

Diameter 20.5 - 20.7 mm

**Roller: Minimum diameter permitted**

Ø 20 mm



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## Refitting the driving pulley

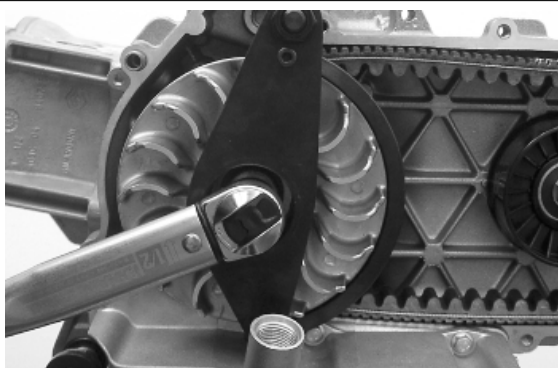
- Fit the steel shim in contact with the bushing and the stationary drive pulley.
- Install the appropriate tool as described in the removal phase.
- Tighten the nut with washer to the prescribed torque.

### Specific tooling

**020626Y Driving pulley lock wrench**

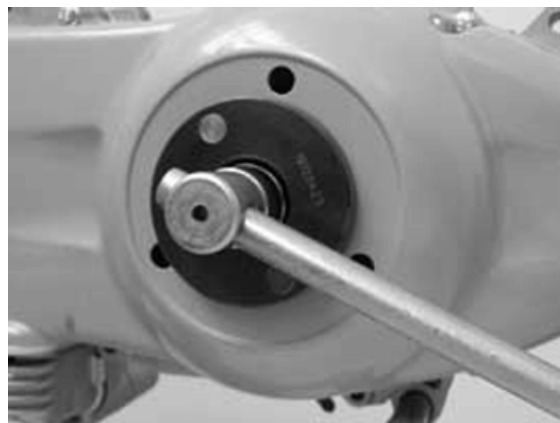
**Locking torques (N\*m)**

**Drive pulley nut 75 ÷ 83**



## Refitting the transmission cover

- Check the presence of the 2 centring dowels and the correct installation of the sealing gasket for the oil sump on the transmission cover.
- Replace the cover tightening the 10 screws at the specified torque.
- Refit the oil loading cap/bar.
- refit the steel washer and the driven pulley nut.
- Tighten the nut to the prescribed torque using the lock wrench and the torque wrench tools.
- Replace the plastic cover.



### Specific tooling

**020423Y driven pulley lock wrench**

### Locking torques (N\*m)

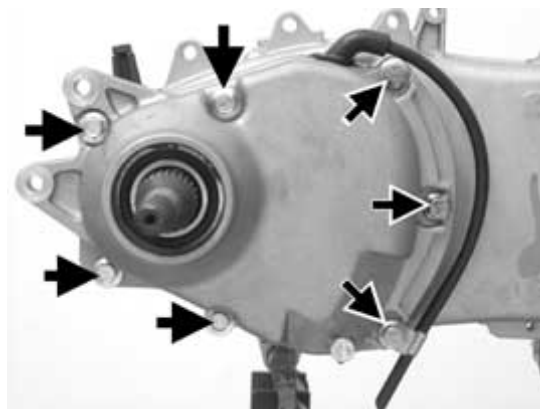
**Transmission cover screws 11 ÷ 13 Driven pulley shaft nut 54 ÷ 60**

---

## End gear

### Removing the hub cover

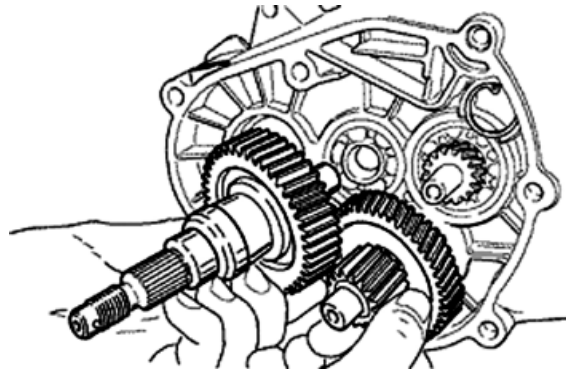
- Empty the rear hub through the oil drainage plug.
- Remove the 7 flanged screws indicated in the figure.
- Remove the hub cover and its gasket.



## Removing the wheel axle

---

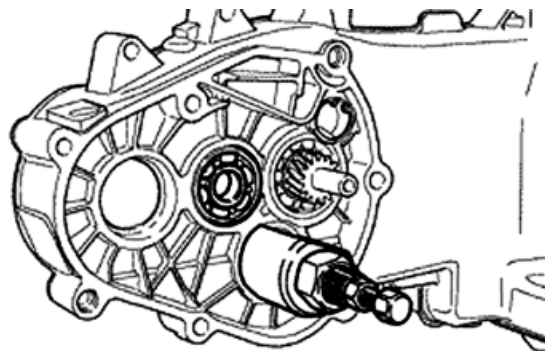
- Remove the wheel axis complete with gear.
- Remove the intermediate gear.



## Removing the hub bearings

---

- Check the state of the bearings being examined (wear, clearance and noisiness). If faults are detected, do the following.
- Use the specific bearing extractor to remove the three 15 mm bearings (2 in the crankcase and 1 in the hub cover).



### Specific tooling

**001467Y013 Pliers to extract ø 15-mm bearings**



## Removing the wheel axle bearings

---

- Take out the clip on the outside of the gearbox cover.
  - Support the hub cover and expel the bearing.
- By means of the appropriate tools, remove the oil guard as in the figure.

### Specific tooling

**020376Y Adaptor handle**

**020477Y Adaptor 37 mm**

**020483Y 30 mm guide**

**020359Y 42x47-mm adaptor**

**020489Y Hub cover support stud bolt set**



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## Removing the driven pulley shaft bearing

---

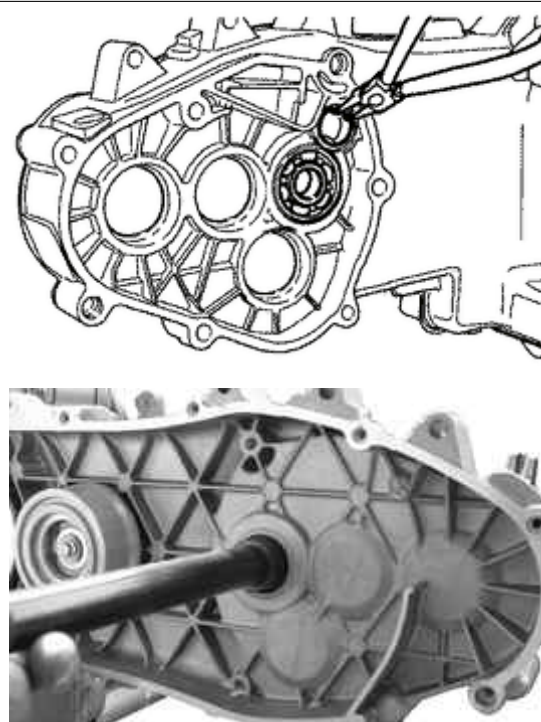
- As you need to remove the driven pulley shaft, its bearing and oil guard, remove the transmission cover as described above.
  - Extract the driven pulley shaft from its bearing.
  - Remove the oil guard using a screwdriver, working from inside the bearing and being careful not to damage the housing, make it come out of the belt transmission side.
  - Remove the seeger ring shown in the figure
- Remove the driven pulley shaft bearing using the modular punch.

### Specific tooling

**020376Y Adaptor handle**

**020375Y Adaptor 28 x 30 mm**

**020363Y 20 mm guide**



---

## Inspecting the hub shaft

- Check the three shafts for wear or distortion of the toothed surfaces, the bearing housings, and the oil seal housings.
- In case of anomalies, replace the damaged components.



---

## Inspecting the hub cover

- Check that the fitting surface is not dented or distorted.
- Check the bearing bearings.
- In case of anomalies, replace the damaged components.

---

## Refitting the wheel axle bearing

- Support the hub cover on a wooden surface.
- Heat the crankcase cover with the specific heat gun.
- Fit the wheel shaft bearing with a modular punch as shown in the figure.
- Fit the seeger ring.
- Fit the oil guard with seal lip towards the inside of the hub and place it flush with the internal surface by means of the appropriate tool used from the 52 mm side.

The 52 mm side of the adapter must be turned towards the bearing.

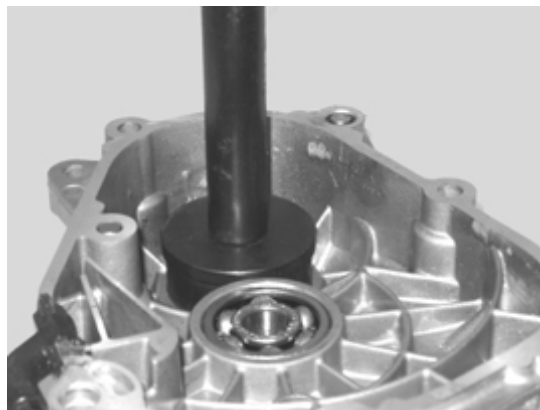
### Specific tooling

**020376Y Adaptor handle**

**020360Y Adaptor 52 x 55 mm**

**020483Y 30 mm guide**





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## Refitting the hub cover bearings

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- To fit the hub housing bearings, the engine crankcase and the cover must be heated with the special heat gun.

- The three 15 mm bearings must be fitted using the appropriate tools.

The 42 mm side of the adapter must be turned towards the bearing.

- Refit the driven pulley shaft bearing with a modular punch as shown in the figure.

- Refit the Seeger ring with the opening facing the bearing and the new oil guard flush with the crankcase on the pulley side.

**N.B.**

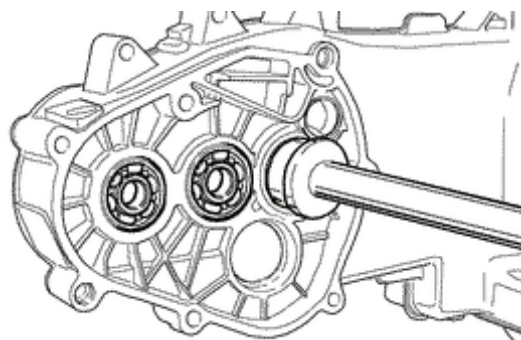
TO FIT THE BEARING ON THE COVER, SUPPORT THE COVER WITH THE STUD BOLT SET.

**N.B.**

IF THE BEARING HAS AN ASYMMETRICAL BALL RETAINER, PLACE IT SO THAT THE BALLS ARE VISIBLE FROM THE HUB INNER SIDE.

**N.B.**

WHEN FITTING THE BEARINGS ON THE ENGINE CRANKCASE, SUPPORT THE CRANKCASE PREFERABLY ON A SURFACE TO ALLOW THE BEARINGS TO BE DRIVEN VERTICALLY.



### Specific tooling

020150Y Air heater support

020151Y Air heater

020412Y 15 mm guide

020376Y Adaptor handle

020359Y 42x47-mm adaptor



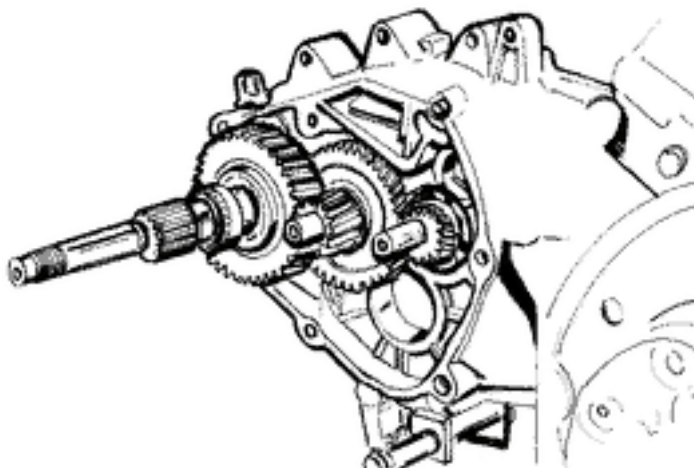
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020363Y 20 mm guide

---

**Refitting the hub bearings**

- Install the three shafts in the engine crankcase as shown in the figure.

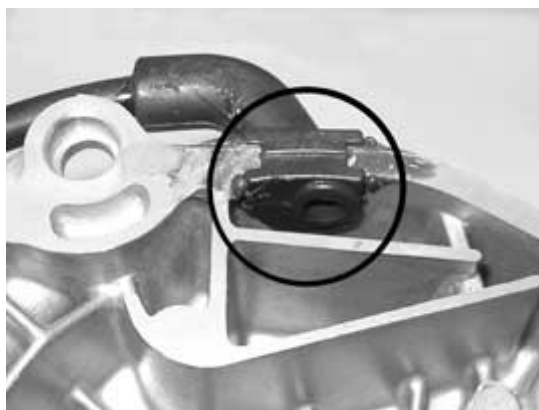


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**Refitting the ub cover**

---

- Fit a new gasket together with the centring dowels.
- Seal the gasket of the breather pipe using black silicone sealant.
- Fit the gearbox cover, making sure the breather pipe is in the correct position.
- Place the 3 shortest screws, identifiable by their different colour, as shown in the figure.
- Fasten the breather pipe support bracket with the lower short screw.
- Assemble the remaining 4 screws and tighten the 7 screws to the prescribed torque.

**Locking torques (N\*m)**

**Rear hub cover screws 24 ÷ 27**





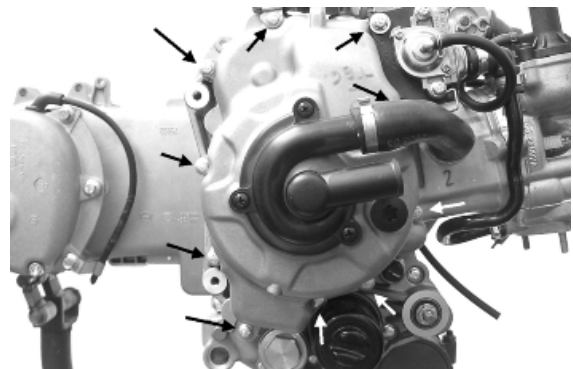
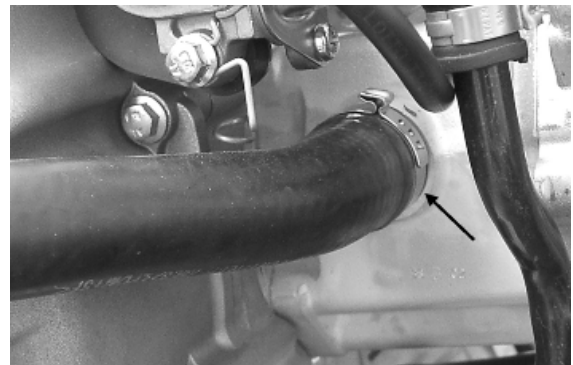
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## Flywheel cover

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### Removing the hub cover

- Remove the clip fixing the hose to the cylinder.
- Remove the 10 fixings
- Remove the flywheel cover.



## Removing the stator

- Remove the two pickup screws and the screw holding the wiring support and the three stator clamping screws shown in the figure.
- Remove the stator and its wiring.



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## Refitting the stator

- Refit the stator and flywheel carrying out the removal procedure in reverse, tightening the retainers to the specified torque.

### Locking torques (N\*m)

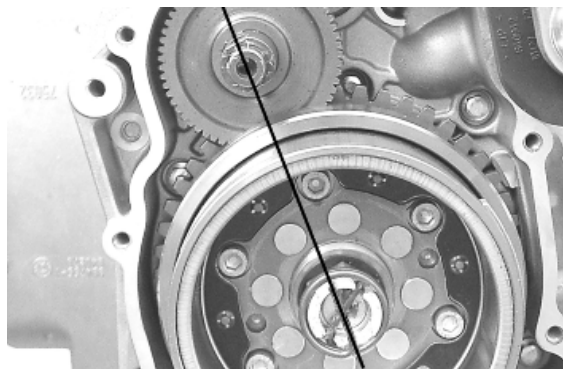
Stator assembly screws (°) 3 ÷ 4



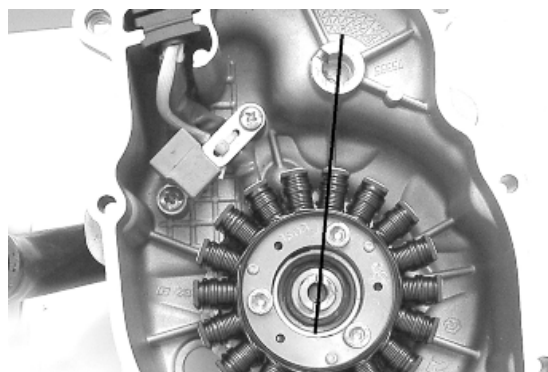
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## Refitting the flywheel cover

- Position the spline clip on the crankshaft and orient the end as shown in the figure.



- Orient the water pump shaft with reference to the transmission gear seat as shown in the photo.



- Refit the cover over the engine and tighten the screws to the prescribed torque.
- Carry out the steps in the reverse order from the dismantling procedure.

**CAUTION**

**TAKE CARE TO CORRECTLY POSITION THE FLYWHEEL CONNECTOR. MAKE SURE THE CENTRING DOWELS ARE PRESENT.**

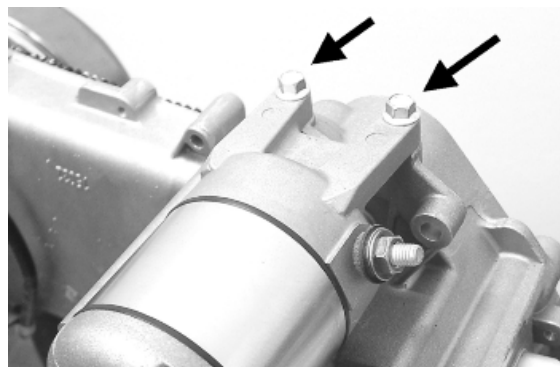
**Locking torques (N\*m)**

Flywheel cover screws 11 - 13

## Flywheel and starting

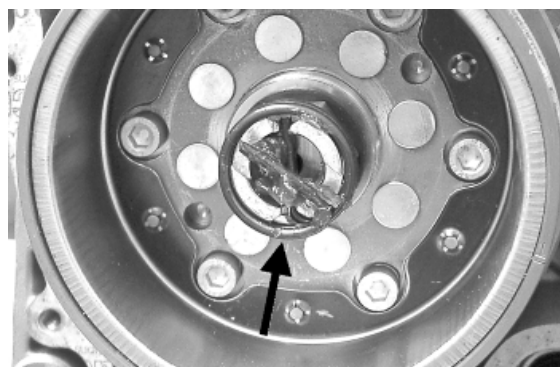
### Removing the starter motor

- Remove the two screws indicated in the figure.
- Take the starter motor out of its seat



### Removing the flywheel magneto

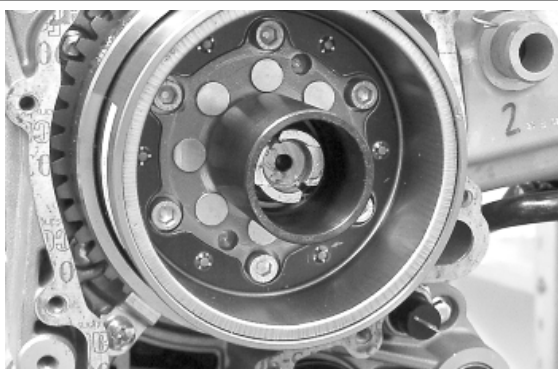
- Remove the water pump shaft and crankshaft spline clip



- Line up the two holes in the flywheel as shown in the photo



- Screw in the guide bushing that is part of the special flywheel stop tool on the flywheel as shown in the photo.



- Insert the special flywheel stop tool on the flywheel as shown in the photo



### **Specific tooling**

**020627Y Flywheel lock wrench**

- Remove the flywheel nut with its washer
- Do up the flywheel nut by three or four threads so that the flywheel does not fall accidentally on extraction
- Screw the extractor onto the flywheel and extract it as shown in the photograph



### **Specific tooling**

**020467Y Flywheel extractor**

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## **Refitting the free wheel**

- Make sure the freewheel faying surfaces are in good condition.
- Thoroughly clean the free wheel to remove LOCTITE residue.
- Degrease the threading of the holes in the free wheel and the clamping screws.

- Apply the recommended product to the end of the screws.

**Recommended products****Loctite 243 Medium strength threadlock**

Loctite 243 medium-strength threadlock

- Fit the freewheel on the magneto flywheel making sure that the ground side is in contact with the flywheel itself, i.e. with wheel seeger ring visible.
- Lock the six clamping screws in criss-cross fashion to the prescribed torque.

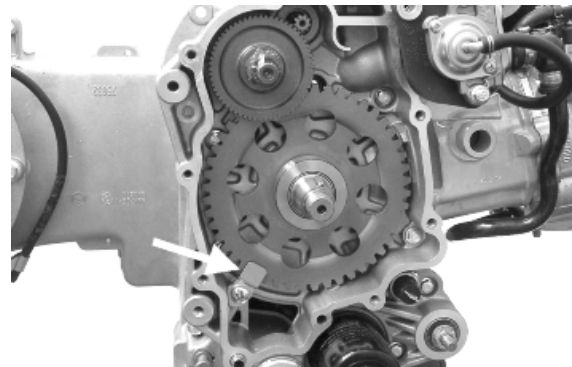
**Locking torques (N\*m)**

**Screw fixing freewheel to flywheel  $13 \div 15$**

- Oil the free wheel "rollers".

**Refitting the flywheel magneto**

- Remove the freewheel retaining plate indicated in the photograph
- Remove the transmission gear and the freewheel



- Insert the free wheel on the flywheel as shown in the photo
- Then refit the flywheel with free wheel and transmission gear



- Using the special flywheel stop tool, tighten up the flywheel fixing nut to the prescribed torque
- Refit the retention plate



### Specific tooling

020627Y Flywheel lock wrench

### Locking torques (N\*m)

Flywheel nut  $94 \div 102$

## Refitting the starter motor

- Fit a new O-ring on the starter motor and lubricate it.
- Fit the starter on the crankcase, locking the two screws to the prescribed torque.

### Locking torques (N\*m)

Starter motor screws  $11 \div 13$

## Cylinder assy. and timing system

### Removing the intake manifold

- Loosen the 3 screws and remove the intake manifold.



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## Removing the rocker-arms cover

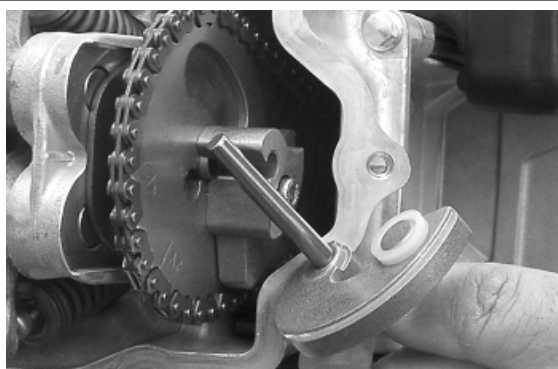
- Remove the 5 screws indicated in the figure



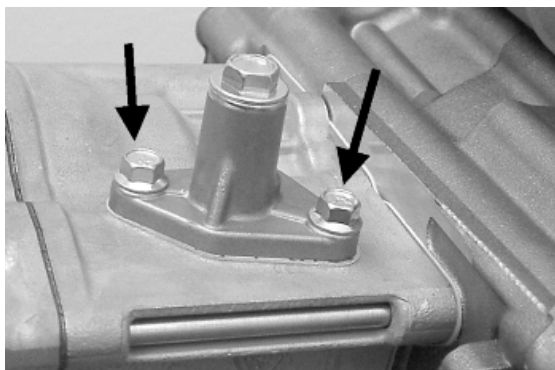
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## Removing the timing system drive

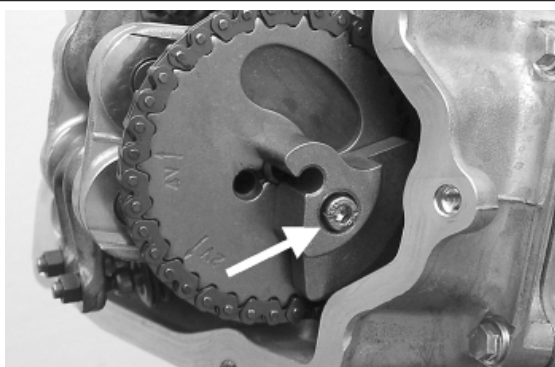
- Remove the parts listed below first: transmission cover, drive pulley with belt, oil sump with spring and by-pass piston, oil pump pulley cover, O-ring on the crankshaft and the sprocket wheel separation washer.
  - Remove the tappet cover.
  - Remove the central screw fastener and the automatic valve-lifter retaining cover, as shown in the figure.
- 
- Remove the return spring of the automatic valve lifter unit and the automatic valve lifter unit and its end of stroke washer.



- Loosen the central screw on the tensioner first.
- Remove the two fixings shown in the figure.
- Remove the tensioner with its gasket.



- Remove the internal hex screw and the counter-weight shown in the figure.



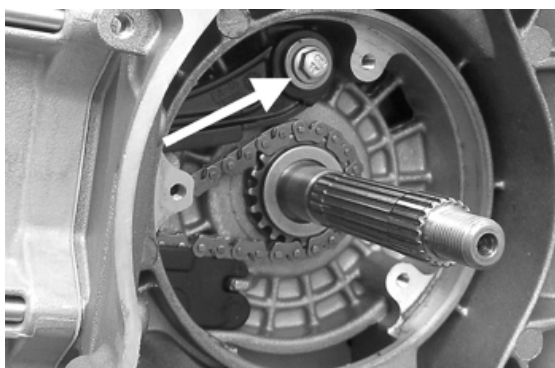
- Remove the camshaft control pulley with its washer.



- Remove the command sprocket wheel and the timing chain.

- Remove the screws indicated in the figure, the spacer bar and the tensioner slider.

The chain tensioning pad must be removed from the transmission side. As regards the lower chain guide pad, it may only be removed after the head has been removed.



**N.B.**

IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

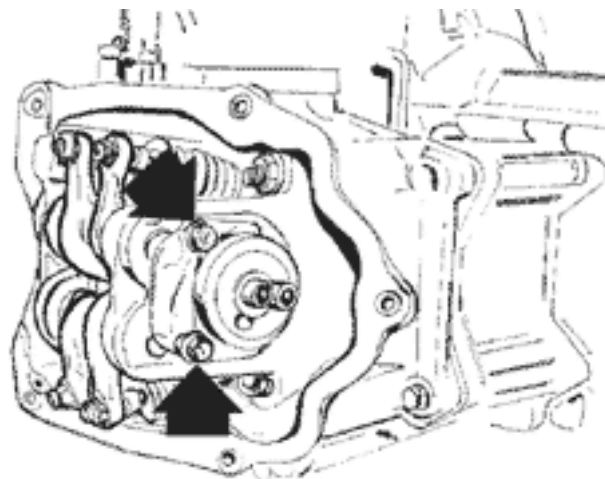
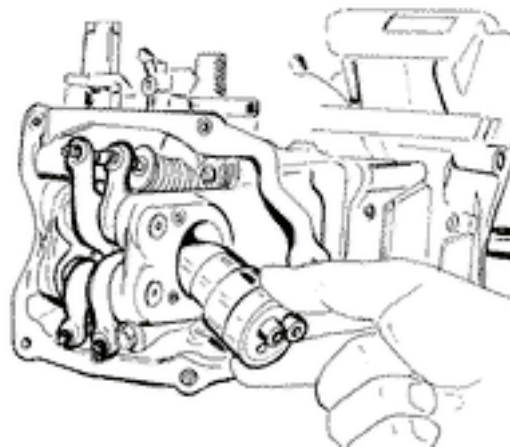
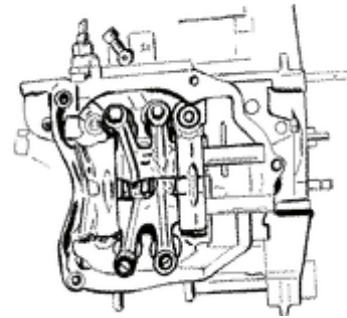


## Removing the cam shaft

- Remove the two screws and the cam shaft re-tainer shown in the diagram.
- Remove the cam shaft.
- Remove the pins and the rocker arms from the flywheel side holes.

**N.B.**

IN CASE OF NEED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, PINS, ROCKING LEVERS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT REMOVING THE CHAIN AND THE DRIVING SHAFT CHAIN TIGHTENER.



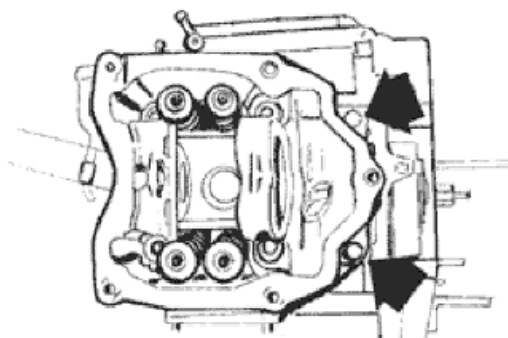
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## Removing the cylinder head

- Remove the spark plug.
- Remove the 2 side fixings shown in the figure.
- Loosen the 4 head-cylinder fastening nuts in two or three stages and in criss-cross fashion.
- Remove the head, the two centring dowels and the gasket.

**N.B.**

IN CASE OF NEED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, PINS, ROCKING LEVERS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT REMOVING THE CHAIN AND THE DRIVING SHAFT CHAIN TIGHTENER.



---

## Removing the valves

- Using the appropriate tool fitted with an adaptor, remove the cotters, caps, springs and valves.
- Remove the oil guards with the appropriate tool.
- Remove the lower spring supports.

**CAUTION**

REPLACE THE VALVES IN SUCH A WAY AS TO RECOGNISE THEIR ORIGINAL POSITION ON THE HEAD.

### Specific tooling

020382Y011 adapter for valve removal tool

020382Y Valve cotters equipped with part 012 removal tool

020306Y Punch for assembling valve seal rings



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## Removing the cylinder - piston assy.

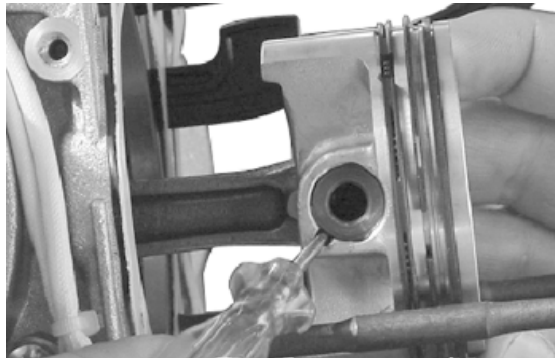
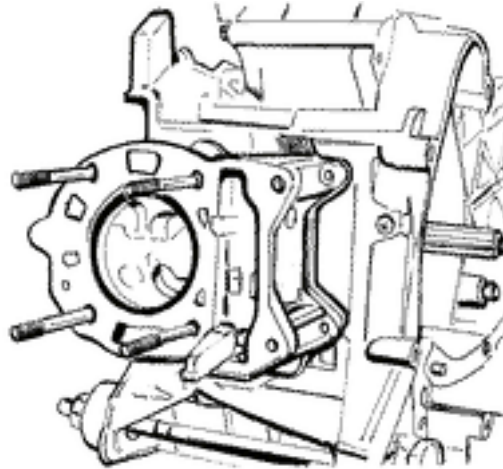
- Remove the chain guide pad.
- Pull out the cylinder.
- Remove the cylinder base gasket.
- Remove the two stop rings, the wrist pin and the piston.
- Remove the piston seals.

**CAUTION**

TO AVOID DAMAGING THE PISTON, SUPPORT IT WHILE REMOVING THE CYLINDER.

N.B.

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.



## Inspecting the small end

- Measure the internal diameter of the small end using an internal micrometer.

N.B.

REPLACE THE CRANKSHAFT IF THE DIAMETER OF THE ROD SMALL END EXCEEDS THE STANDARD DIAMETER OR IT SHOWS SIGNS OF WEAR OR OVERHEATING.

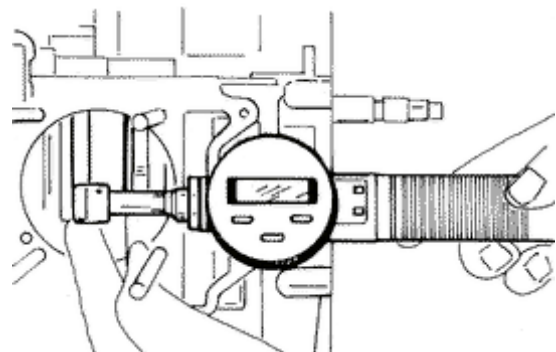
### Characteristic

**Rod small end check-up: Maximum diameter**

15.030 mm

**Rod small end check-up: Standard diameter**

15 +0.015+0.025 mm



## Inspecting the wrist pin

- Measure the outside diameter of the gudgeon pin.
- Calculate the coupling clearance between pin and connecting rod end.

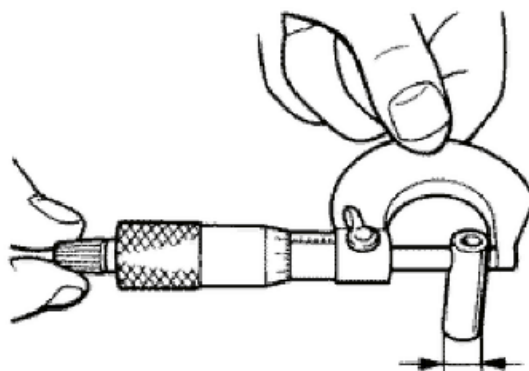
### Characteristic

#### Pin diameter: Standard clearance

0.015 ÷ 0.029 mm

#### Pin diameter Standard diameter

14.996 - 15.000 mm



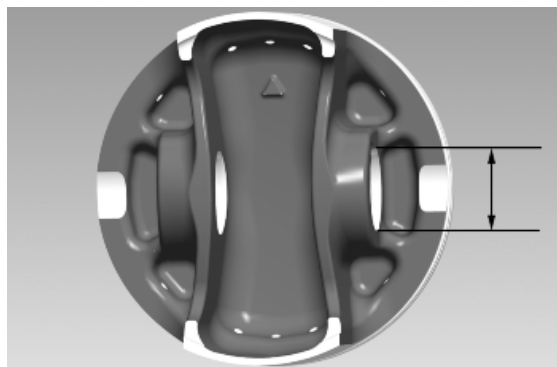
## Inspecting the piston

- Measure the capacity diameter on the piston.

### Characteristic

#### Standard diameter:

15 + 0.006 + 0.001mm



- Calculate the piston pin coupling clearance.

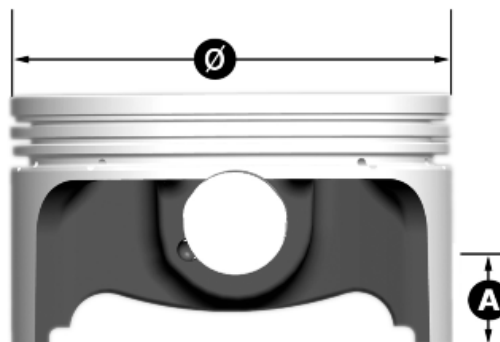
#### N.B.

THE PIN HOUSINGS HAVE 2 LUBRICATION CHANNELS. FOR THIS REASON, MEASUREMENT MUST BE MADE ACCORDING TO THE PISTON AXIS.

### Characteristic

#### Standard clearance:

0.001 ÷ 0.010 mm



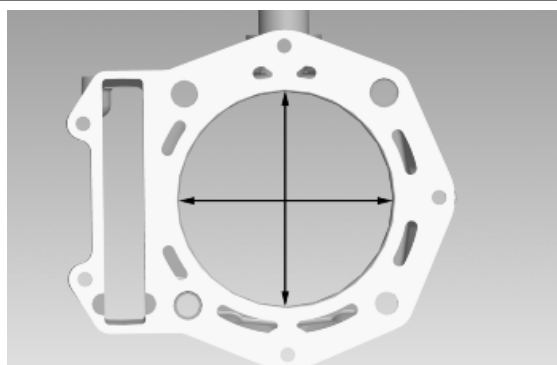
- Measure the outside diameter of the piston, perpendicular to the gudgeon pin axis.
- Take the measurement in the position shown in the figure.

#### N.B.

REFER TO THE «SPECIFICATIONS» SECTION FOR THE SIZES OF THE PISTON AND THE CYLINDER-PISTON COUPLING CLEARANCES.

### Characteristic

#### A:

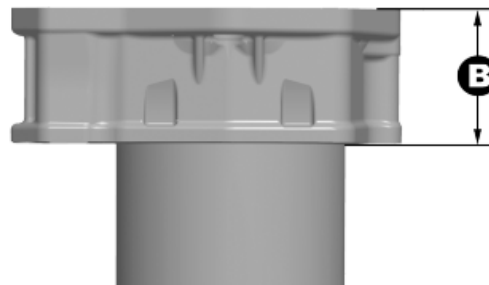


5 mm

**Piston diameter:**

72 mm nominal value

- Using a bore meter, measure the cylinder inner diameter at a given height according to the directions shown in the figure.



**Characteristic**

**B:**

33 mm

**Standard diameter:**

72 mm nominal value

- Check that coating is free from flakes.
- Check that the head matching surface exhibits no deformations or wear.

**Characteristic**

**Maximum allowable run-out:**

0.05 mm

- Pistons and cylinders are classified into categories based on their diameter. The coupling is carried out in pairs (A-A, B-B, C-C, D-D).

**N.B.**

**REFER TO THE «SPECIFICATIONS» SECTION FOR THE SIZES OF THE CYLINDER AND THE CYLINDER-PISTON COUPLING CLEARANCES.**

## Inspecting the piston rings

- Alternately insert the three sealing rings into the cylinder, in the area where it retains its original diameter. Using the piston, insert the rings perpendicularly to the cylinder axis.
- Make sure that each single sealing ring evenly adheres to the cylinder liner. If it does not, this means the ring is worn. Replace it.
- Measure the opening (see figure) of the sealing rings using a feeler gauge.
- If higher values than those prescribed are measured, replace the linings.



**Check the size of the sealing ring opening:**

**Compression ring:** 0.15 ÷ 0.30 mm. Max. value: 0.45 mm

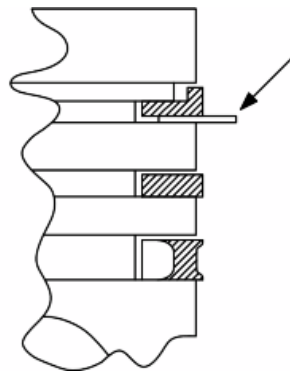
**Scraper ring:** 0.20 ÷ 0.40 mm. Max. value: 0.55 mm

**Scraper ring:** 0.20 ÷ 0.40 mm. Max. value: 0.55 mm

**Rings/housing coupling clearances:**

Carefully clean the sealing ring housings.

Place a thickness gauge between the ring and the housing as shown in the drawing and check the coupling clearance.

**First ring**

**Standard coupling clearance:**  $0.015 \div 0.06$  mm

**Maximum clearances allowed after use:** 0.07 mm

**Second ring**

**Standard coupling clearance:**  $0.015 \div 0.06$  mm

**Maximum clearances allowed after use:** 0.07 mm

**Oil scraper**

**Standard coupling clearance:**  $0.015 \div 0.06$  mm

**Maximum clearances allowed after use:** 0.07 mm

If clearances exceed the maximum limits specified in the table, the piston should be replaced by a new one.

---

**Removing the piston**

- Install piston and wrist pin onto the connecting rod, aligning the piston arrow the arrow facing towards the exhaust.
- Fit the wrist pin stop ring onto the appropriate tool
- With opening in the position indicated on the tool
- S = left
- D= right
- Place the wrist pin stop ring into position using a punch
- Fit the wrist pin stop using the plug as shown in the figure

**N.B.**

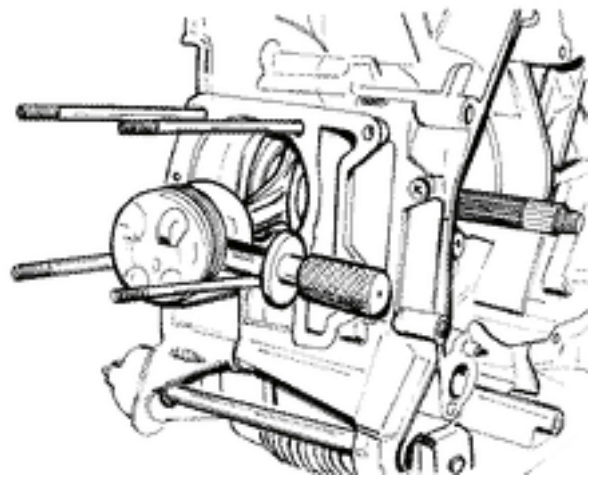
**THE TOOL FOR INSTALLING THE STOP RINGS MUST BE USED MANUALLY.**

**CAUTION**

**USING A HAMMER MIGHT DAMAGE THE STOPS' HOUSING.**

Specific tooling

020454Y Tool for fitting piston pin stops (200 - 250)



Choosing the gasket

- Provisionally fit the piston into the cylinder, without any base gasket.
- Assemble a dial gauge on the specific tool
- Set the dial gauge to zero placing the tool on a contrasting surface. Keeping the zero position, assemble the tool on the cylinder and lock it with 2 supplied nuts as shown in the figure.
- Rotate the crankshaft until TDC (the inverted point of the dial gauge rotation)
- Position the dial gauge on the piston as shown in the figure and measure how much the piston protrudes.
- Identify the thickness of the cylinder base gasket to be used for reassembly by the table below. Correctly identify the cylinder base gasket thickness to keep the correct compression ratio.
- Remove the special tool and the cylinder.

N.B.

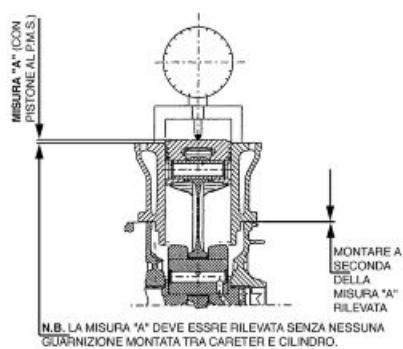
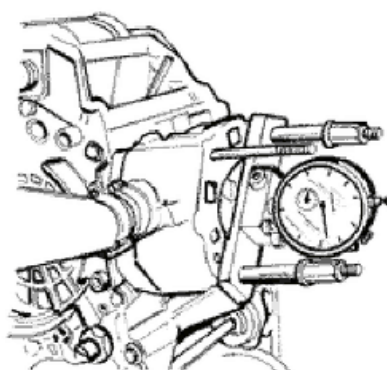
MEASUREMENT "A" TO BE TAKEN IS A VALUE OF PISTON RE-ENTRY, IT INDICATES BY HOW MUCH THE PLANE FORMED BY THE PISTON CROWN FALLS BELOW THE PLANE FORMED BY THE TOP OF THE CYLINDER. THE FURTHER THE PISTON FALLS INSIDE THE CYLINDER, THE LESS THE BASE GASKET IS TO BE APPLIED (TO RECOVER THE COMPRESSION RATIO) AND VICE VERSA.

Specific tooling

020428Y Piston position check support

ENGINE 250 SHIMMING

| Name     | Measure A   | Thickness  |
|----------|-------------|------------|
| shimming | 3.70 - 3.60 | 0.4 ± 0.05 |
| shimming | 3.60 - 3.40 | 0.6 ± 0.05 |
| shimming | 3.40 - 3.30 | 0.8 ± 0.05 |





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## Refitting the piston rings

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### Fitting the sealing rings

- Place the oil scraper spring on the piston.
- Refit the oil scraper ring with the join of spring ends on the opposite side from the ring gap and the word 'TOP' towards the crown of the piston. The chamfered side of the oil scraper ring should always be facing the piston crown.
- Fit the middle piston ring with the identification letter facing the crown of the piston. In any case, the step must be facing opposite the piston top.
- Fit the top piston ring with the word 'TOP' or the reference mark facing the crown of the piston.
- Offset the piston ring gaps on the three rings by 120° to each other as shown in the figure.
- Lubricate the components with engine oil.
- The top piston ring on the 250 engine has an L cross section.

### N.B.

THE TWO PISTON RINGS ARE MADE WITH A TAPERED CYLINDRICAL CONTACT CROSS-SECTION. THIS IS TO ACHIEVE A BETTER BEDDING.



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## Refitting the cylinder

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- Insert the cylinder base gasket with the thickness determined above.
- Using the fork support and the piston ring retaining band, refit the cylinder as shown in the figure.

### N.B.

BEFORE FITTING THE CYLINDER, CAREFULLY BLOW OUT THE LUBRICATION DUCT AND OIL THE CYLINDER BARREL.

### Specific tooling

020426Y Piston fitting fork

020393Y Piston fitting band



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## Inspecting the cylinder head

- Using a trued bar and feeler gauge check that the cylinder head surface is not worn or distorted.  
Maximum allowable run-out: 0.05 mm
- Check that the camshaft and the rocker pin capacities exhibit no wear.
- Check that the cylinder head cover surface, the intake manifold and the exhaust manifold are not worn.



### Characteristic bearing «A»

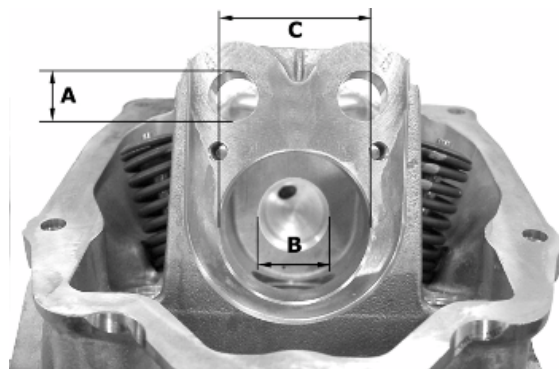
Ø 12.000 - 12.018 mm

### bearing «B»

Ø 20.000 ÷ 20.021 mm

### bearing «C»

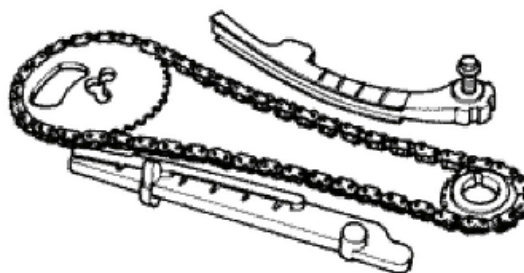
Ø 37.000 - 37.025 mm



## Inspecting the timing system components

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- Check that the guide shoe and the tensioner shoe are not worn out.
- Ensure that the camshaft control pulley chain assembly and the sprocket wheel are not worn.
- If you encounter wear, replace the parts or, if the chain, sprocket wheel and pulley are worn replace the whole assembly.
- Remove the centre screw with the washer and the tensioner spring. Check that the one-way mechanism is not worn.
- Check the condition of the tensioner spring.
- If examples of wear are found, replace the whole assembly.

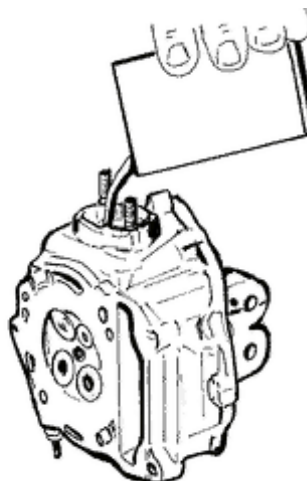


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## Inspecting the valve sealings

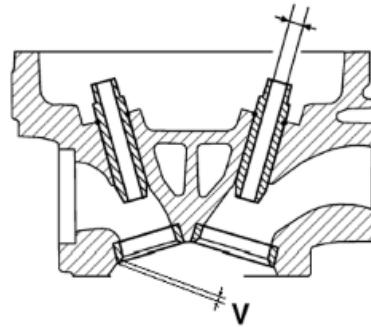
---

- Insert the valves into the cylinder head.
- Alternatively check the intake and exhaust valves.
- The test is carried out by filling the manifold with petrol and checking that the head does not ooze through the valves when these are just pressed with the fingers.



## Inspecting the valve housings

- Check the width of the imprint on the valve seat «V» wear limit max. 1.6 mm.
- Remove any carbon formation from the valve guides.
- Measure the inside diameter of each valve guide.
- Take the measurement at three different heights in the rocker arm push direction.
- If the width of the impression on the valve seat or the diameter of the valve guide exceed the specified limits, replace the cylinder head.



### Characteristic

#### Valve seat wear Intake guide

limit accepted: 5.022

#### Valve seat wear Intake guide

Standard diameter: 5.000 ÷ 5.012 mm

#### Valve seat wear Exhaust guide

Accepted limit 5.022

#### Valve seat wear Exhaust guide

Standard diameter: 5.000 ÷ 5.012 mm

## Inspecting the valves

- Measure the diameter of the valve stems in the three positions indicated in the diagram.
- Calculate the clearance between valve and valve guide.
- Check that there are no signs of wear on the surface of contact with the articulated register terminal.
- If the checks above give no failures, you can use the same valves. For best sealing results, it is advisable to grind the valves. Grind the valves gently with a fine-grained lapping compound. During the grinding, keep the cylinder head with the valve axes in a horizontal position. This will prevent the lapping compound residues from penetrating between the valve stem and the guide (see figure).

### CAUTION

**TO AVOID SCORING THE FAYING SURFACE, DO NOT KEEP ROTATING THE VALVE WHEN NO LAPPING COMPOUND IS LEFT. CAREFULLY WASH THE CYLINDER HEAD AND THE VALVES WITH A SUITABLE PRODUCT FOR THE TYPE OF LAPPING COMPOUND BEING USED.**

### N.B.

**DO NOT CHANGE THE POSITIONS THE VALVES ARE FITTED IN**

### Characteristic

#### Valve check standard length

Outlet: 94.4 mm

#### Valve check standard length

Inlet: 94.6 mm

**Valve check Maximum admissible clearance**

Outlet: 0.072 mm

**Valve check Maximum admissible clearance**

Inlet: 0.062 mm

**Valve check standard clearance**

Outlet: 0.025 ÷ 0.052 mm

**Valve check standard clearance**

Inlet: 0.013 ÷ 0.040 mm

**Valve check Minimum admissible diameter**

Outlet: 4.95 mm

**Valve check Minimum admissible diameter**

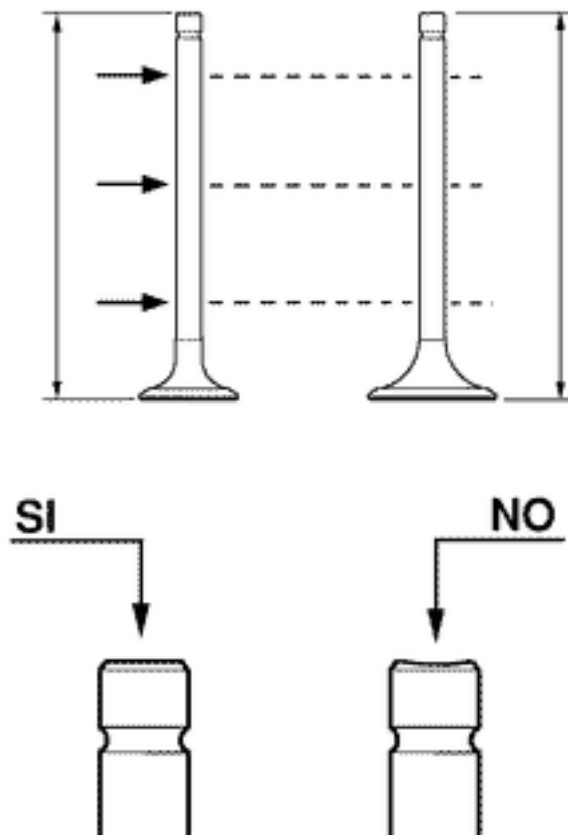
Inlet: 4.96 mm

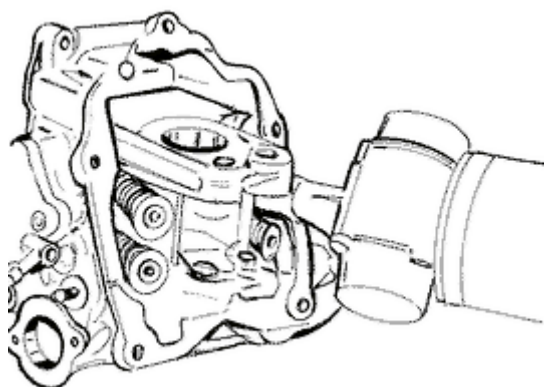
**Valve check Standard diameter:**

Inlet: 4.972 ÷ 4.987 mm

**Valve check Standard diameter:**

Outlet: 4.96 ÷ 4.975 mm

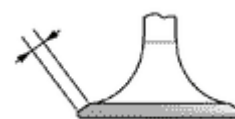
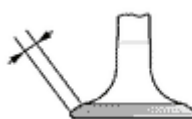




- Measure the width of the sealing surface on the valve seats and on the valves.

Sealing surface width: After use: Intake and exhaust: 1.6 mm

- If any of the sealing surfaces on the valves is wider than the specified limit or is damaged in one or more points, or curved, replace the valve with a new one.



#### CAUTION

DO NOT REVERSE THE FITTING POSITIONS OF THE VALVES (RIGHT - LEFT).

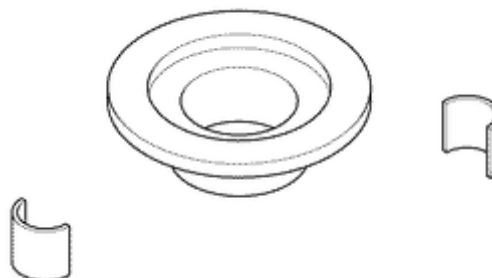
#### Characteristic

**Valve wear check Standard: Intake and exhaust:**

0.99 - 1.27 mm

## Inspecting the springs and half-cones

- Check that the upper and lower spring supporting caps, the cotters and the oil seal show no sign of abnormal wear. Replace them when worn.



## Refitting the valves

- Lubricate the valve guides with engine oil.
- Place the valve spring supports on the head.
- Using the special punch, fit the four valve seals.
- Fit the valves, the springs and the caps. Using the appropriate tool with adapter, compress the springs and insert the cotters in their seats.

**N.B.**

**DO NOT CHANGE THE VALVE FITTING POSITION. FIT THE VALVE SPRINGS WITH THE REFERENCE COLOUR ON COTTER SIDE (TURNS WITH GREATER PITCH).**

### Specific tooling

**020306Y Punch for assembling valve seal rings**

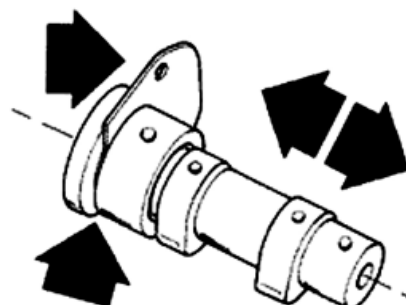
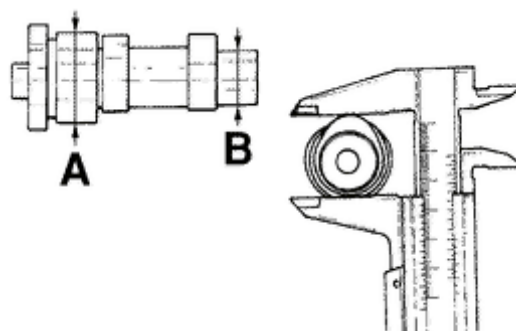
**020382Y Valve cotters equipped with part 012 removal tool**

**020382Y011 adapter for valve removal tool**



## Inspecting the cam shaft

- Inspect the cam shaft for signs of abnormal wear on the cams.
- Check the cam height.
- Check there is no wear on the cam shaft retaining plate and its associated groove on the cam shaft.
- If any of the above dimensions are outside the specified limits, or there are signs of excessive wear, replace the defective components with new ones.
- Check there are no signs of wear on the automatic valve-lifter cam, or the end-of stroke roller, or the rubber buffer on the automatic valve-lifter retaining cover.
- Check that the valve lifting spring has not yielded.
- Replace any defective or worn components.
- Check the rocker pins do not show signs of wear or scoring.



- Measure the internal diameter of each rocker arm.

Check there are no signs of wear on the pad from contact with the cam and on the jointed adjustment plate.

### Characteristic

**Internal rocker arm diameter: Standard diameter**

Diameter 12.000 - 12.011 mm

**Rocking lever pin diameter: Standard diameter**

Diameter 11.977 - 11.985 mm

**Cam shaft check: Maximum admissible axial clearance**

0.42 mm

**Cam shaft check: Standard axial clearance:**

0.11 - 0.41 mm

**Cam shaft check: Standard height**

Outlet: 29.209 mm

**Cam shaft check: Standard height**

Inlet: 30.285 mm

**Cam shaft check: Minimum admissible diameter**

Bearing B diameter: 19.950 mm

**Cam shaft check: Minimum admissible diameter**

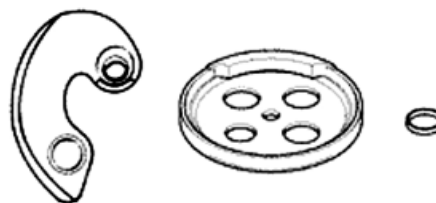
Bearing A Ø: 36.94 mm

**Cam shaft check: Standard diameter**

Bearing B diameter: 19.959 ÷ 19.98 mm

**Cam shaft check: Standard diameter**

Bearing A Ø: 36.95 ÷ 36.975 mm





## Refitting the head and timing system components

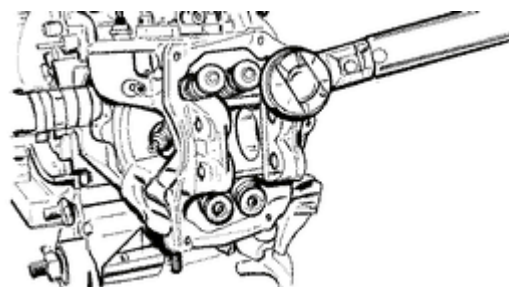
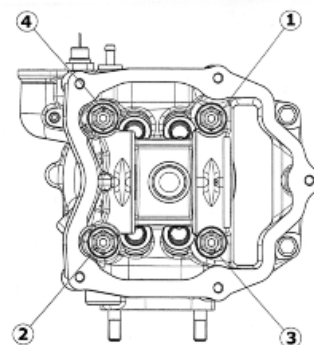
- Fit the timing chain guide pad.
- Insert the centring dowel between the cylinder head to the cylinder, fit the cylinder head gasket and the cylinder head.
- Lubricate the stud bolt threading.
- Tighten up the nuts to an initial pre-torque of  $7 \pm 1$  N·m
- Tighten up the nuts to a second pre-torque of  $10 \pm 1$  N·m
- Rotate by an angle of  $270^\circ$
- To carry out the operations described above, follow the tightening sequence in the figure.
- Fit the two screws on the outside of the timing chain side and tighten them to the specified torque.

**N.B.**

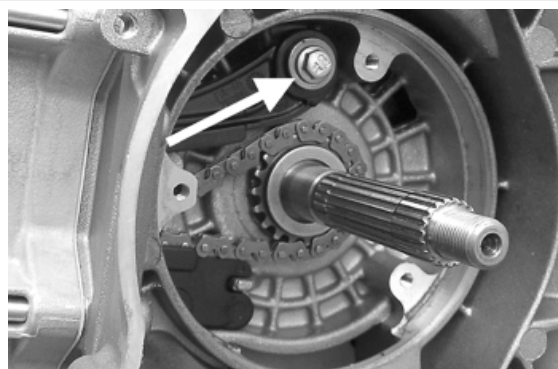
**BEFORE INSTALLING THE HEAD, MAKE SURE THAT THE LUBRICATION CHANNEL IS CLEAN USING A COMPRESSED AIR JET.**

### Locking torques (N\*m)

**Timing chain tensioner support screw  $11 \div 13$**



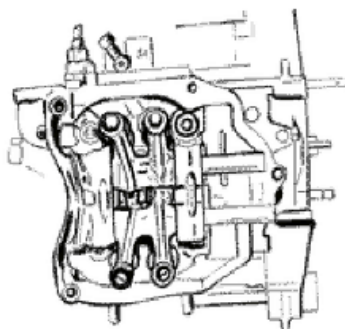
- Refit the lower timing chain sprocket wheel on the crankshaft, with the chamfer facing the insertion side.
- Loop the timing chain around the sprocket on the crankshaft.
- Fit the chain tensioner slider from the cylinder head side.
- Fit the spacer and the screw fastener.
- Tighten the screws to the prescribed torque.
- Fit the pins and rocker arms.
- Lubricate the two rocking levers through the holes at the top.



- Lubricate the 2 bearings and insert the cam shaft in the cylinder head with the cams corresponding to the rockers.
- Insert the retention plate and tighten the two screws shown in the figure to the prescribed torque.
- Refit the spacer on the cam shaft.
- Rotate the engine so that the piston is at top dead centre, using the reference marks on the flywheel and the crankcase.
- Holding this position insert the chain on the cam-shaft control pulley.
- Insert the pulley on the cam shaft while keeping the reference **4V** in correspondence with the reference mark on the head.
- Fit the counterweight and tighten the fixing screw to the prescribed torque.
- Fit the end-stop ring on the automatic valve-lifter cam and fit the automatic valve-lifter cam to the cam shaft.
- Fit the automatic valve-lifter return spring.
- During this operation the spring must be loaded by approximately 180°.
- Fit the automatic valve-lifter retaining dish, using the counterweight screw fastener as a reference.
- Tighten the clamping screw to the prescribed torque.
- Set the tensioner cursor in the rest position.
- Fit the chain tensioner on the cylinder, using a new gasket, and tight the two screws to the prescribed torque.
- Insert the chain tensioning screw, together with the spring and washer, tightening it to the prescribed torque.
- Adjust the valve clearance.
- Fit the spark plug.

Electrode distance 0.8 mm

**N.B.**



GREASE THE END STOP RING TO PREVENT IT COMING OUT AND FALLING INTO THE ENGINE.

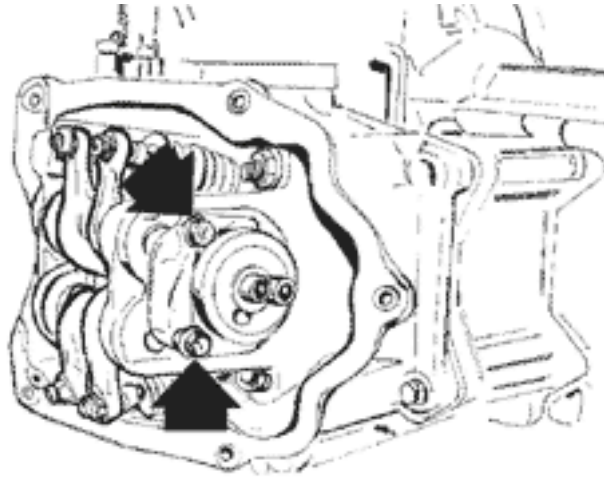
### Locking torques (N\*m)

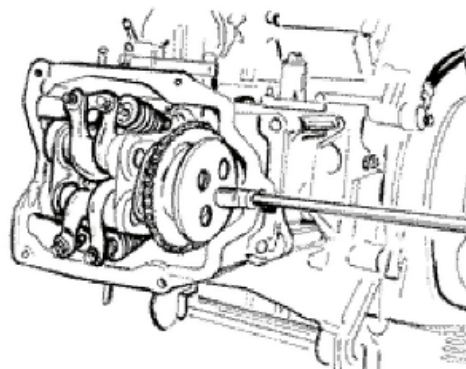
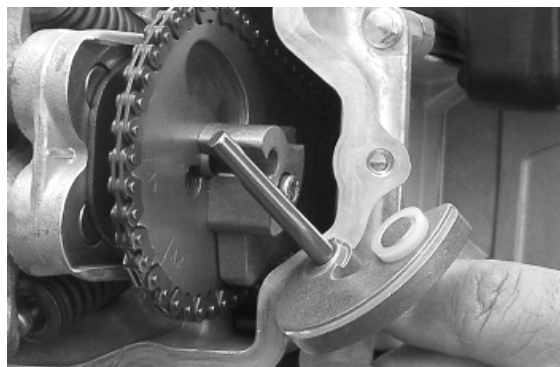
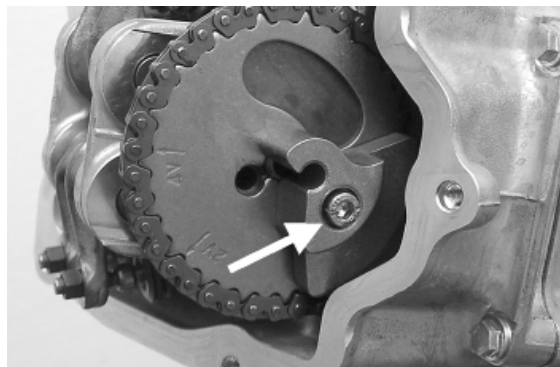
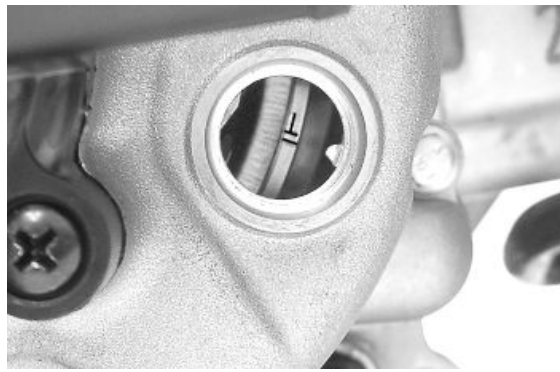
Timing chain tensioner support screw  $11 \div 13$

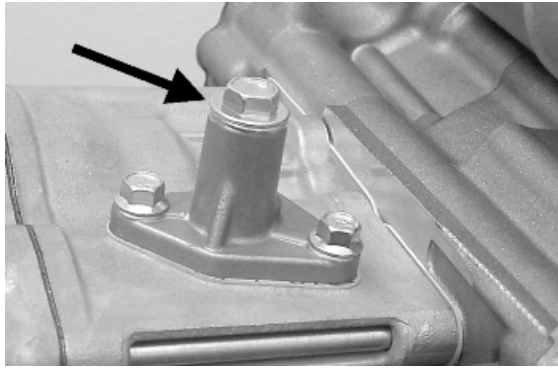
Spark plug  $12 \div 14$  Starter ground screw  $7 \div 8.5$

Timing chain tensioner slider screw  $10 \div 14$

Starter ground support screw  $11 \div 15$  Timing chain tensioner central screw  $5 - 6$  Camshaft retention plate screw  $4 \div 6$







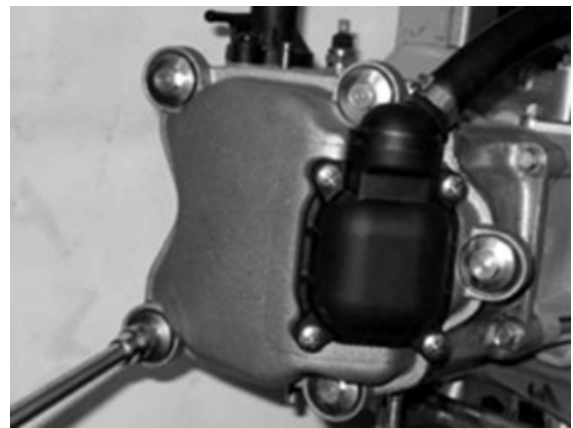
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### Refitting the rocker-arms cover

- Refit the cylinder head cover, tightening the 5 clamping screws to the prescribed torque.
- Make sure the gasket is positioned properly.

#### Locking torques (N\*m)

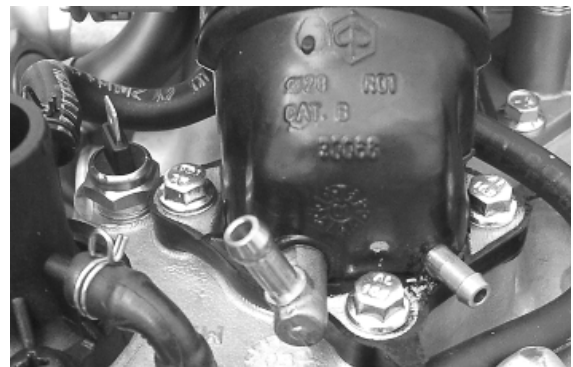
Tapet cover screws 6 - 7 Nm



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### Refitting the intake manifold

Fit the intake manifold and do up the three screws.



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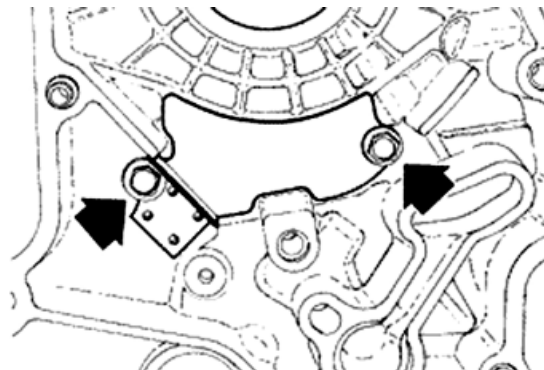
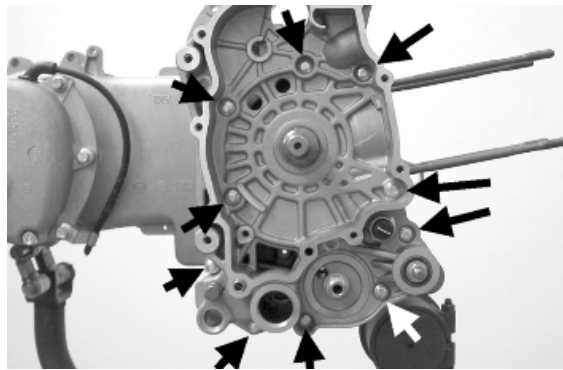
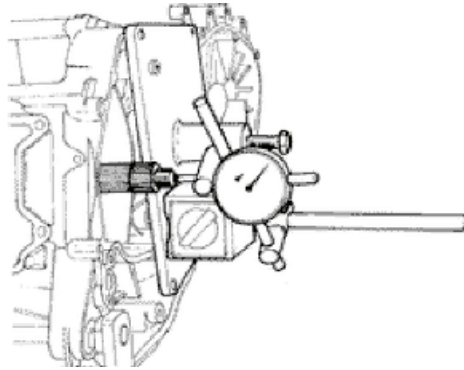
### Crankcase - crankshaft

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## Splitting the crankcase halves

- Before opening the crankcase, it is advisable to check the axial clearance of the crankshaft. To do this, use a plate and a support with appropriate tool dial gauge.
- Upper clearances are an indication of wear on the surfaces of the crankshaft casing support.
- Remove the 10 crankshaft coupling screws.
- Separate the crankcase while keeping the crankshaft in one of the two halves of the crankcase.
- Remove the crankshaft.
- Remove the half crankcase coupling gasket.
- Remove the two screws and the internal cover shown in the diagram.
- Remove the oil guard on the flywheel side.
- Remove the oil filter fitting shown in the diagram.
- Check the axial clearance on the connecting rod.
- Check the radial clearance on the connecting rod.
- Check the surfaces that limit the axial free-play are not scored and measure the width of the crankshaft between these surfaces, as shown in the diagram.
- If the axial clearance between crankshaft and crankcase is exceeding and the crankshaft does not have any defect, the problem must be due to either excessive wear or wrong machining on the crankcase.
- Check the diameters of both the bearings of the crankshaft in accordance with the axes and surfaces shown in the figure. The half-shafts are classified in two categories Cat. 1 and Cat. 2 as shown the chart below.



### CAUTION

THE CRANKSHAFT CAN BE REUSED WHEN THE WIDTH IS WITHIN THE STANDARD VALUES AND THE SURFACES SHOW NO SIGNS OF SCORING.

### CAUTION

WHILE OPENING THE CRANKCASES AND REMOVING THE DRIVING SHAFT, CHECK THAT THE THREADED SHAFT ENDS DO NOT INTERFERE WITH THE MAIN BUSH-

INGS. FAILURE TO OBSERVE THIS PRECAUTION CAN DAMAGE THE MAIN BUSHINGS.

#### CAUTION

KEEP THE CRANKSHAFT IN ONE OF THE TWO HALVES OF THE CRANKCASE WHEN SEPARATING IT. IF YOU FAIL TO DO THIS, THE CRANKSHAFT MIGHT ACCIDENTALLY FALL.

#### N.B.

WHEN MEASURING THE WIDTH OF THE CRANKSHAFT, MAKE SURE THAT THE MEASUREMENTS ARE NOT MODIFIED BY THE RADIUS OF FITTINGS WITH THE CRANKSHAFT BEARINGS.

### Specific tooling

020262Y Crankcase splitting strip

020335Y Magnetic support for dial gauge

### Characteristic

**Axial crankshaft/crankcase clearance: Standard clearance**

0.15 - 0.40 mm (when cold)

**Axial connecting rod - crankshaft clearance  
Standard clearance**

0.20 ÷ 0.50 mm

**Radial connecting rod - crankshaft clearance  
Standard clearance**

0.036 ÷ 0.054 mm

**Width of crankshaft with integral washers:  
standard measurements**

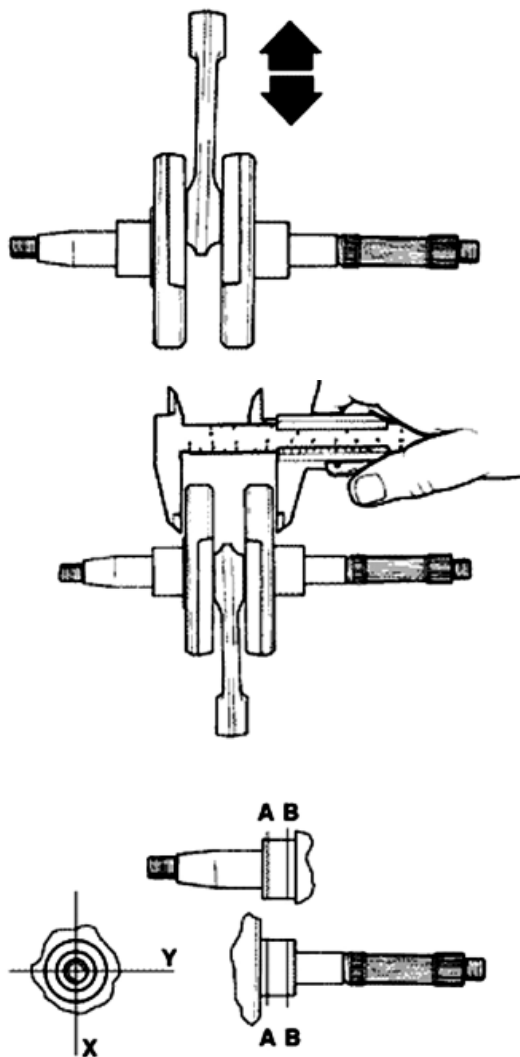
55.67 ÷ 55.85 mm

**Crankshaft bearings: Standard diameter: Cat.  
1**

28.994 ÷ 29.000

**Crankshaft bearings: Standard diameter: Cat.  
2**

29.000 ÷ 29.006



## Inspecting the crankshaft alignment

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To install the drive shaft on the support and to measure the misalignment in the 4 points indicated in figure.

- Check that the driving shaft cone, the tab seat, the oil seal capacity, the toothed gear and the threaded tangs are in good working order.
- In case of failures, replace the crankshaft.

The connecting rod head bushings cannot be replaced. For the same reason, the connecting rod may not be replaced and, when cleaning the crankshaft, be very careful that no impurities get in through the shaft's lubrication holes.

In order to prevent damaging the connecting rod bushings, do not attempt cleaning the lubrication duct with compressed air.

- Make sure that the 2 caps on the crankpin are properly fitted.
- A wrong installation of a cap can seriously affect the bushing lubrication pressure.

**N.B.**

**THE MAIN BEARINGS ARE NOT GRINDABLE**

### Specific tooling

**020074Y Support base for checking crankshaft alignment**

### Characteristic

#### Off-line maximum admitted

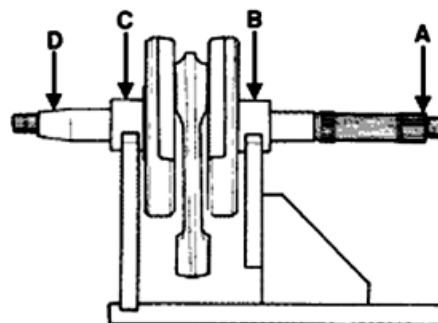
**A** = 0.15 mm

**B** = 0.01 mm

**C** = 0.01 mm

**D** = 0.10 mm

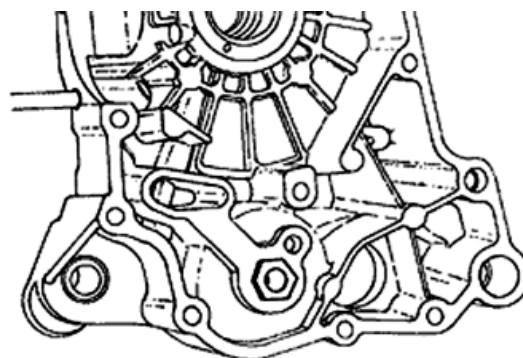
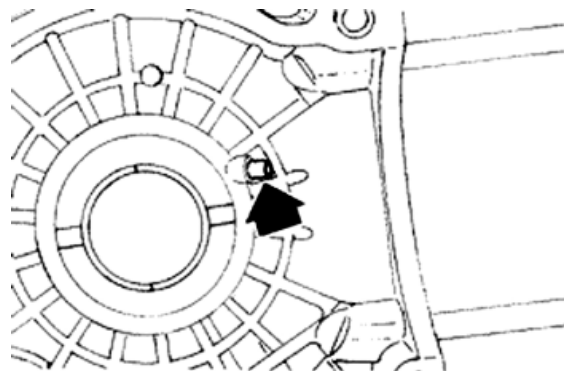
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## Inspecting the crankcase halves

- Before proceeding to check the crankcase halves, thoroughly clean all surfaces and oil ducts.
- On the transmission-side crankcase half, take particular care when handling the oil pump compartment and the oil ducts, the by-pass duct, the main bushings and the cooling jet on the transmission side (see diagram).
- Take particular care, also, that there are no signs wear in the oil by-pass valve housing (see Chapter Lubrication), as this could prevent a good seal in the valve, which regulates the oil pressure.
- On the flywheel side crankcase half, take particular care cleaning the oil ducts for the main bushings, the oil duct for the jet that lubricates the cylinder head and the oil drainage duct at the flywheel side oil seal.
- Inspect the coupling surfaces on the crankcase halves for scratches or deformation, taking particular care with the cylinder/crankcase surfaces and the crankcase halves surfaces.
- Defects in the crankcase coupling gasket between the crankcase halves or the mating surfaces shown in the diagram, could cause a drop in the oil pressure lubricating the main bearings and connection rod.
- Check the main bearing seats that limit axial clearance in the crankshaft show no signs of wear. The dimension between these seats is measured by way of the procedure described previously for measuring the crankshaft axial clearance and dimensions.



### N.B.

THE JET IS FED THROUGH THE MAIN BUSHINGS. PROPER OPERATION OF THIS COMPONENT IMPROVES THE PISTON TOP COOLING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAK CAN CONSIDERABLY DECREASE THE MAIN BUSHING AND CONNECTING ROD LUBRICATION PRESSURE.

### N.B.

THE HEAD LUBRICATION CHANNEL IS PROVIDED WITH A SHUTTER JET; THIS GIVES A "LOW PRESSURE" HEAD LUBRICATION; THIS CHOICE WAS MADE TO REDUCE THE OIL TEMPERATURE IN THE SUMP. THE JET CLOGGING IMPAIRS THE HEAD LUBRICATION AND THE TIMING MECHANISMS. A JET FAILURE CAUSES A DECREASE OF THE MAIN BUSHING AND CONNECTING ROD LUBRICATION PRESSURE.

## Inspecting the crankshaft plain bearings

- T

o obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure (3,2 bar) and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.

- The main bushings are comprised of two half-bearings, one with holes and channels for lubrication whereas the other is solid.

- The solid half-bearing is intended to stand the thrusts caused by combustion, and for this reason it is arranged opposite the cylinder.

- To prevent obstructions in the oil feeding channels, the matching surface of the two half-bearings must be perfectly perpendicular to the cylinder axis, as shown in the figure.

- The oil feeding channel section is also affected by the bushings driving depth compared with the crankshaft axial clearance of the limiting surface.

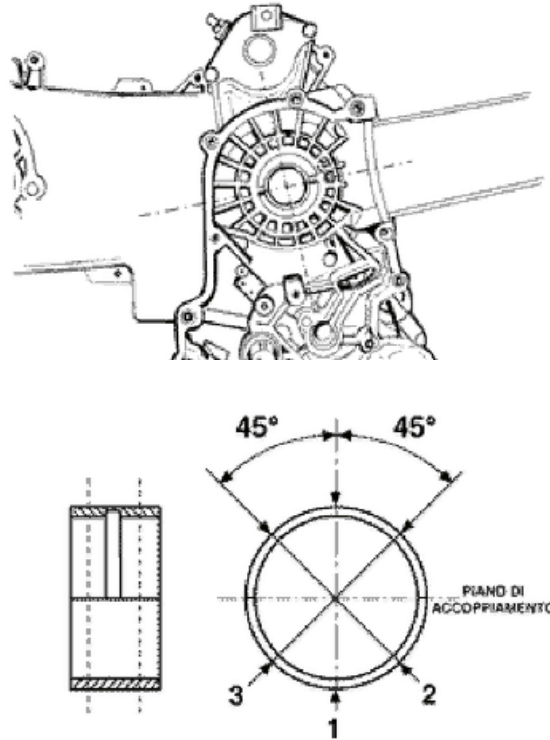
- Check the inside diameter of the main bushings in the three directions indicated in the diagram.

- Repeat the measurements for the other bushing half. see diagram.

- There are three crankcase versions: with RED main bushings, with BLUE main bushings and with YELLOW main bushings.

- There is only one type of main bushing housing hole in the crankcase

The standard bushing diameter after driving is variable on the basis of a coupling selection.



- The bushing housings in the crankcase are available in two categories, Cat. 1 and Cat. 2, as are the crankshafts.
- The main bushings are available in three thickness categories, identified by colour markings, as shown in the table below.

| TYPE                       |                          | IDENTIFICATION                                  |                           |
|----------------------------|--------------------------|-------------------------------------------------|---------------------------|
| A                          |                          | RED                                             |                           |
| B                          |                          | BLUE                                            |                           |
| C                          |                          | YELLOW                                          |                           |
|                            |                          | Type "A"<br>- RED                               | Type "B"<br>- BLUE        |
|                            |                          |                                                 | Type "C"<br>- YEL-<br>LOW |
| Crankshaft<br>half-bearing |                          | 1.970 ÷                                         | 1.9703 ÷                  |
|                            |                          | 1.973                                           | 1.976                     |
| Bush-<br>ing cat-<br>egory | Crank-<br>case<br>halves | Internal bush-<br>ing diameter<br>after fitting | Possible<br>fitting       |
|                            | category                 |                                                 |                           |
| A                          | 1                        | 29.025 ÷<br>29.040                              | Original                  |
| B                          | 1                        | 29.019 ÷<br>29.034                              | Original<br>and spare     |
|                            | 2                        | 29.028 ÷<br>29.043                              |                           |
| C                          | 2                        | 29.022 ÷<br>29.037                              | Original                  |

Match the shaft with two category 1 crank webs with the category 1 crankcase (or cat. 2 with cat.

2) Furthermore a spare crankcase cannot be matched with a crankshaft with mixed categories. The spare crankshaft has half shafts of the same category.

| <b>Crankcase</b> | <b>Engine half</b> | <b>Bushing</b> |
|------------------|--------------------|----------------|
| <b>halves</b>    | <b>shaft</b>       |                |
| <b>Cat. 1</b>    | Cat. 1             | B              |
| <b>Cat. 2</b>    | Cat. 2             | B              |

|               |        |   |
|---------------|--------|---|
| <b>Cat. 1</b> | Cat. 2 | A |
| <b>Cat. 2</b> | Cat. 1 | C |

**N.B.**

TO KEEP THIS POSITION OF THE BUSHINGS ON THE CRANKCASE, FITTING IS FORCED ON STEEL RINGS INSERTED IN THE CASTING OF BOTH CRANKCASE HALVES.

**N.B.**

DO NOT TAKE THE MEASUREMENT ON THE TWO HALF-SHELL COUPLING SURFACE SINCE THE ENDS ARE RELIEVED TO ALLOW BENDING DURING THE DRIVING OPERATION.

**N.B.**

CRANKCASES FOR REPLACEMENTS ARE SELECTED WITH CRANKCASE HALVES OF THE SAME CATEGORY AND ARE FITTED WITH CATEGORY B BUSHINGS (BLUE)

**Characteristic****Standard driving depth**

1.35 ÷ 1.6

**Diameter of crankcase without bushing**

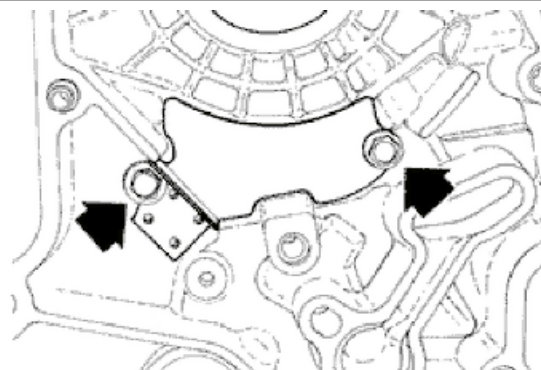
32.953 ÷ 32.963

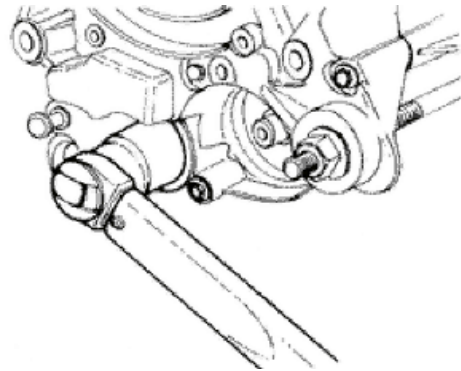
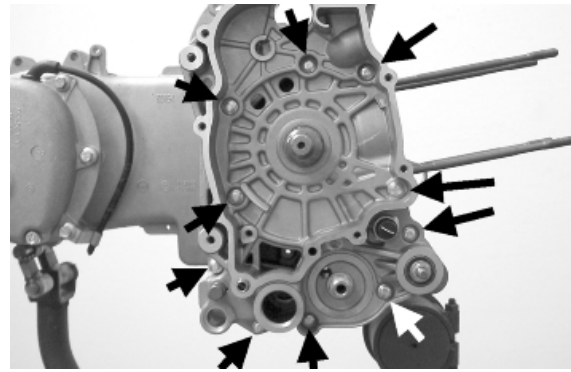
## Refitting the crankcase halves

- Fit the internal bulkhead by locking the two screws to the prescribed torque.
- Fit the oil filter fitting and tighten it to the specified torque.
- Place a new gasket on one of the crankcase halves, preferably on the transmission side, together with the locating dowels.
- Lubricate the main bushings and insert the crankshaft in the transmission side crankcase half.
- Reassemble the two crankcase halves.
- Fit the 10 screws and tighten them to the prescribed torque.
- Fit a new O-ring on the pre-filter and lubricate it.
- Insert the filter on the engine with the relative cap. Tighten to the prescribed torque.

**Locking torques (N\*m)**

**Internal engine crankcase bulkhead (transmission-side half shaft) screws 4 ÷ 6 Engine-crankcase coupling screws 11 ÷ 13 Oil filter on crankcase fitting 27 ÷ 33 Engine oil drainage plug/mesh filter 24 ÷ 30**





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## Lubrication

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## Crankshaft oil seals

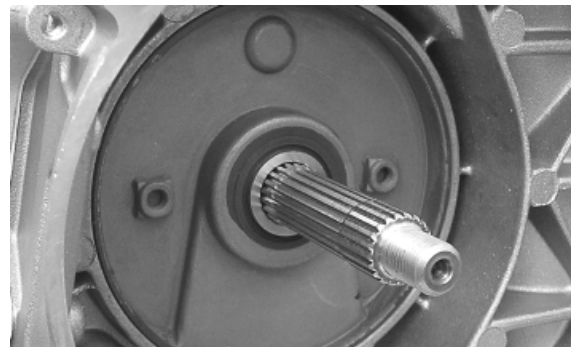
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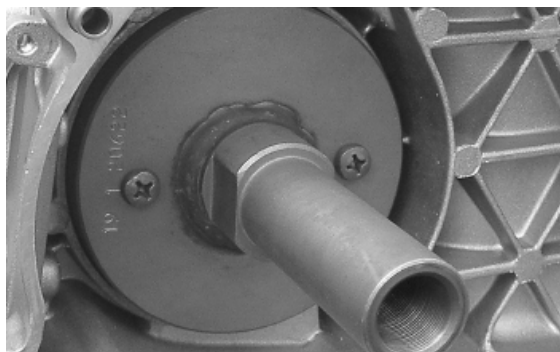
## Removal

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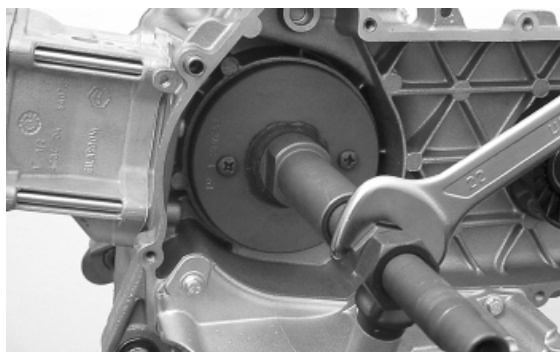
- First remove the transmission cover and the complete driving pulley



- Install the base of the appropriate tool on the oil guard using the screws provided.

**Specific tooling****020622Y Transmission-side oil guard punch**

- Screw the threaded bar onto the base of the tool and extract the oil guard.

**Specific tooling****020622Y Transmission-side oil guard punch****Refitting**

- Use a new oil seal upon refitting.
- Prepare the new oil seal, lubricating the sealing lip.
- Preassemble the oil seal with the specific tool, positioning the screws.
- Place the sheath over the crankshaft.
- Insert the tool with the oil seal on the crankshaft until it comes into contact with the crankcase.
- Orientate the oil seal by inserting the bracket which is part of the specific tool.
- Tighten the threaded bar onto the crankshaft as far as it will go.
- Use the nut to move the base of the tool until you can feel the end of the oil seal driving stroke.
- Remove all of the tool components following the inverse procedure

**CAUTION****DO NOT LUBRICATE THE SURFACE FOR KEYING ONTO THE ENGINE CRANKCASE.****CAUTION****ORIENT THE OIL GUARD BY POSITIONING THE CHAIN HOUSING CHANNEL FACING DOWNWARDS. WHEN THE POSITION IS REACHED, DO NOT RETRACT THE OIL**

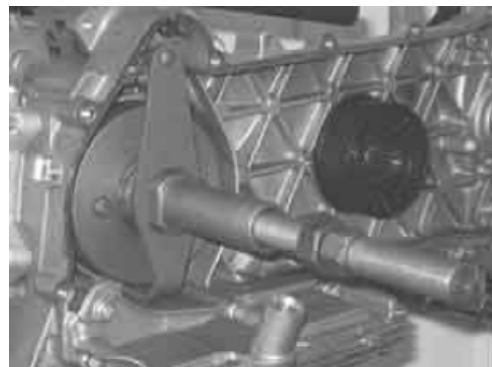
GUARD. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE A WRONG POSITIONING OF THE OIL GUARD SHEATH.

**CAUTION**

FAILURE TO COMPLY WITH THIS ASSEMBLY PROCEDURE CAN SERIOUSLY DAMAGE THE ENGINE DUE TO THE WRONG TENSIONING OF THE OIL PUMP CONTROL CHAIN.

**Specific tooling**

020622Y Transmission-side oil guard punch



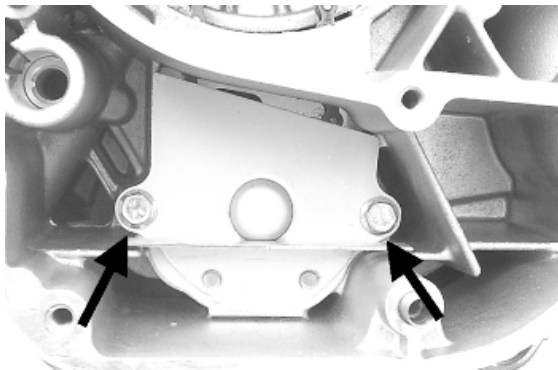
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## Oil pump

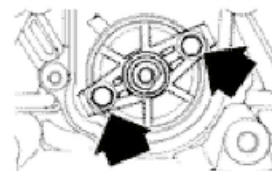
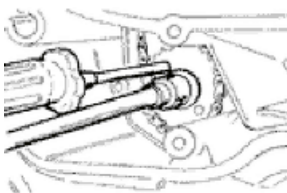
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## Removal

- Undo the two clamping screws in the figure and remove the cover over the pump control crown.



- Block the rotation of the oil pump control pulley with a screwdriver inserted through one of its two holes.
- Remove the central screw with Belleville washer, as shown in the diagram.
- Remove the chain with the crown.
- Remove the control sprocket with relative O-ring.
- Remove the oil pump by undoing the two screws in the figure.
- Remove the oil pump seal.



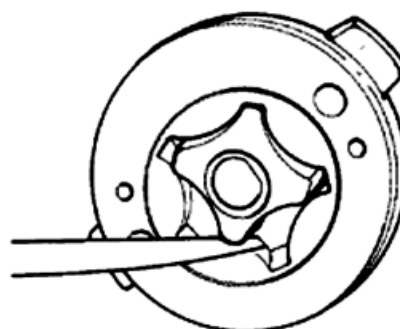
### N.B.

IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

## Inspection

- Remove the two screws and the oil pump cover.
- Remove the clip retaining the innermost rotor.
- Remove and wash the rotors thoroughly with petrol and compressed air.
- Reassemble the rotors in the pump body, keeping the two reference marks visible. Replace the snap ring.
- Check the clearance between the rotors in the position shown in the diagram using a thickness gauge.

Measure the distance between the outer rotor and the pump body (see figure).





- Check the axial clearance of the rotors using a trued bar as shown in the figure.

**Characteristic****Axial rotor clearance**

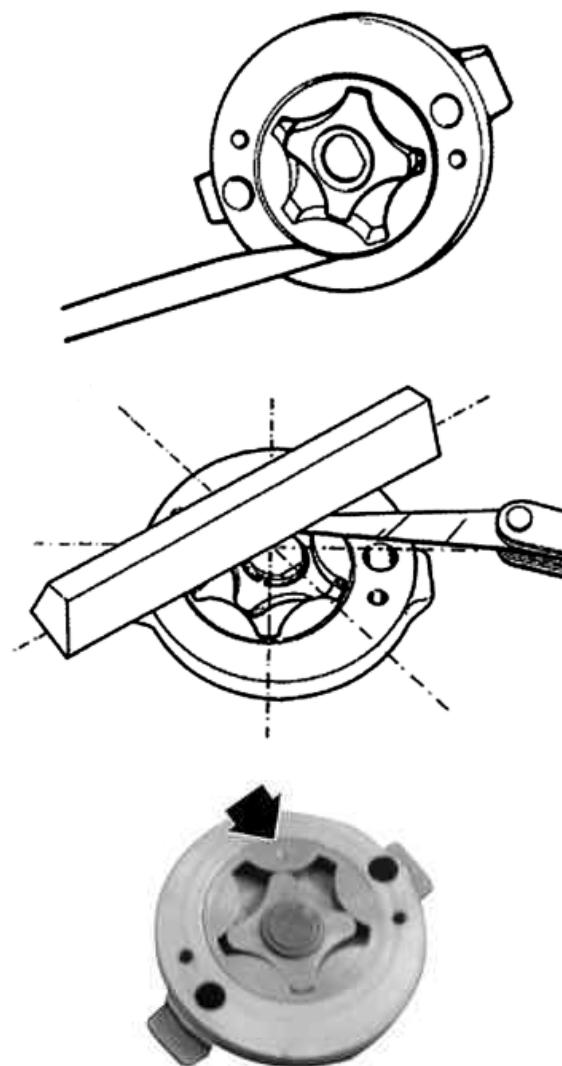
Limit values admitted: 0.09 mm

**Distance between the outer rotor and the pump body**

Admissible limit clearance: 0.20 mm

**Distance between the rotors**

Admissible limit clearance: 0.12 mm



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**Refitting**

- Check there are no signs of wear on the oil pump shaft or body.
- Check there are no signs of scoring or wear on the oil pump cover.
- If you detect non-conforming measurements or scoring, replace the faulty parts or the unit.
- Fit the pump cover in the position that permits the crankcase fixing screws to be aligned.
- Make sure the gasket is positioned properly and refit the pump on the engine crankcase. The pump can only be fitted in one position. - Tighten the screws to the prescribed torque.
- Fit the sprocket wheel with a new O-ring.
- Fit the chain.
- Fit the central screw and the belleville washer. Tighten to the prescribed torque.
- Fit the oil pump cover by tightening the two screws to the prescribed torque.

**N.B.**

**FIT THE BELLEVILLE WASHER SO THAT ITS OUTER RIM TOUCHES THE PULLEY. MAKE SURE THAT THE PUMP TURNS FREELY.**

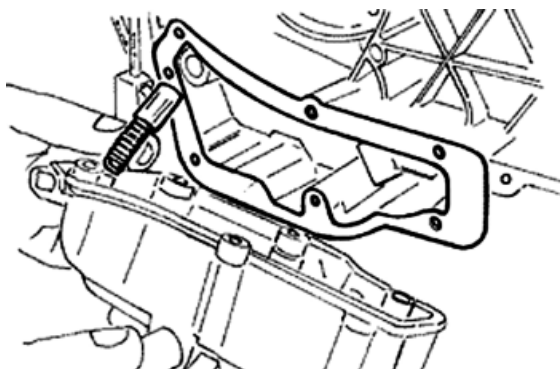
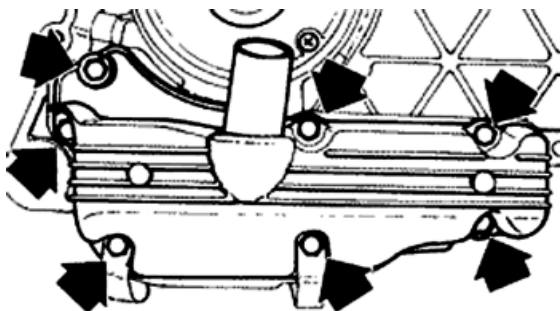
**Locking torques (N\*m)**

**Screws fixing oil pump to crankcase 5 - 6 Oil pump control crown screw 10 ÷ 14 Oil pump cover screws 0.7 ÷ 0.9**

---

**Removing the oil sump**

- Remove the oil filler plug, the transmission cover, the complete driving pulley assembly with belt and the sprocket wheel, as described in the "Transmission" chapter.
- Drain the oil as described previously.
- Remove the seven screws, shown in the diagram, and the two rear brake fluid pipe fixing brackets.
- Remove the screw, the by-pass piston, the gasket and centring dowels shown in the figure.

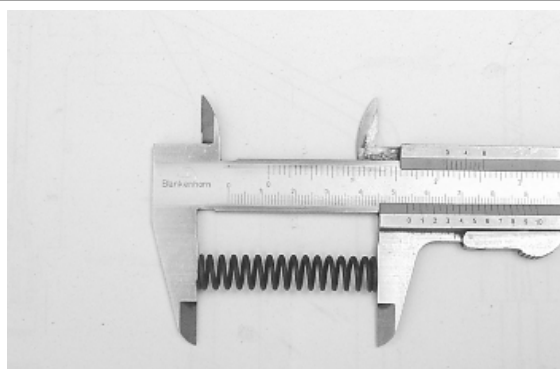
**Inspecting the by-pass valve**

- Check the unloaded spring length.
- Check that the small piston is not scored.
- Ensure that it slides freely on the crankcase and that it guarantees a good seal.
- If not, eliminate any impurities or replace defective parts.

**Characteristic**

**By-pass check up: Standard length**

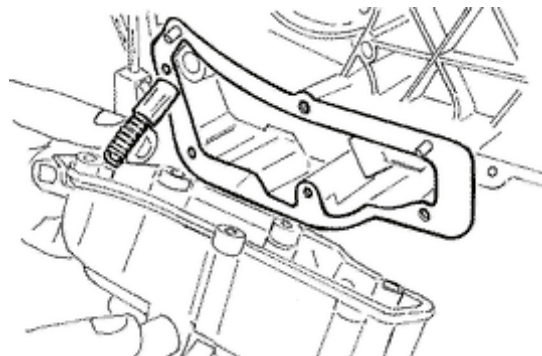
54.2 mm



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## Refitting the oil sump

- Refit the by-pass valve plunger in its housing.
- Insert the pressure-regulating spring.
- Fit a new sump seal.
- Refit the two centring dowels.
- Refit the sump, taking care to locate the spring in the appropriate recess machined into the inside of the sump.
- Refit the rear brake cable brackets and the screws in the reverse order from which they were removed.
- Tighten the screws to the prescribed torque.
- Refit the drive pulley assembly, the drive belt, the sprocket wheel and the transmission cover, as described in the "Transmissions" chapter.
- **When testing the lubrication system, refer to chapter "Crankcase and Crankshaft", regarding lubrication of the crankshaft and connecting rod**



### Locking torques (N\*m)

Oil sump screws 10 ÷ 14

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## SAS valve

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### Inspecting the one-way valve

- Remove the SAS valve.
- Provisionally assemble the rubber coupling of the SAS valve outlet to ensure tightness.
- Connect the MITYVAC vacuum pump to the rubber coupling as shown in the photograph.
- Set the pump to the low-pressure position (VACUUM).
- Operate the pump slowly.
- Check that the one way valve allows the air to pass through causing a slight vibration.



- Switch the pump to pressure mode (PRESSURE).
- Operate the pump slowly and check if there is an increase of pressure. A small leakage is considered to be normal.

If anomalies are detected, replace the pump.

**N.B.**

**A MALFUNCTIONING ONE-WAY VALVE CAN RESULT IN RUBBER COUPLING AND FILTER OVERHEATING**

**N.B.**

**ABSENCE OF VIBRATION INDICATES INEFFICIENT SEALING**

### **Specific tooling**

#### **020329Y MityVac vacuum-operated pump**

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### **Inspecting the cut-off**

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- Remove the SAS valve.
- Connect the MITYVAC pump in low-pressure mode (VACUUM) to the CUT-OFF valve vacuum intake.
- Apply a vacuum value higher than 0.5 BAR.
- Check that this value is kept all the time.
- If a worn seal is detected, replace it.
- With a "T" bypass and flexible rubber hoses make a parallel connection between the rubber coupling and the vacuum intake of the CUT-OFF valve.
- Connect the bypass to the MITYVAC pump.
- Set the pump set to the low-pressure mode (VACUUM).
- Using a pair of long flat pliers, choke the rubber hose next to the valve.
- Operate the pump until vacuum is higher than 0.5 BAR.
- Release the hose and check how the vacuum reacts. - Under normal functioning conditions the vacuum undergoes a slight fall and then readjusts. There follows a slow and continuous loss of depression up to approximately 0.4 BAR. At this point



the valve opens and the depression is suddenly set to zero.

Lack of tightness or the fact that the valve opens at different vacuum values should be regarded as anomalies. In this case, replace it.

**N.B.**

**LACK OF TIGHTNESS IN THE CUT-OFF VALVE RESULTS IN EXHAUST NOISE (EXPLOSIONS IN THE MUFFLER). INCORRECT CUT-OFF VALVE CALIBRATION CAN RESULT IN CATALYTIC CONVERTER MALFUNCTIONING**

**N.B.**

**A FAULTY CUT-OFF VALVE DIAPHRAGM, BESIDES JEOPARDISING THE CORRECT OPERATION OF THE CUT-OFF VALVE, ALSO DAMAGES IDLE FUNCTIONING**

### Specific tooling

**020329Y MityVac vacuum-operated pump**



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## Fuel supply

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### Removing the carburettor

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#### Kehin

- To detach the carburettor from the engine, it is necessary to move the air filter and remove the transmission throttle control, the automatic starter connection, the clamps anchoring the carburettor to the filter housing and to the inlet manifold, the air delivery pipe to the diaphragm, and the intake fitting.

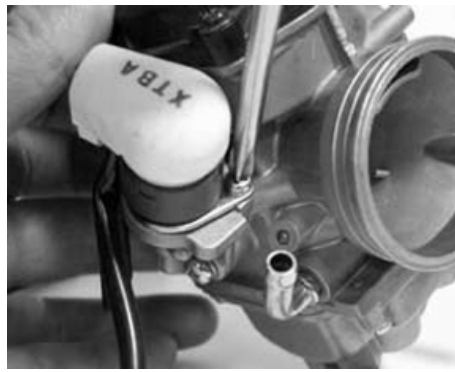
- Take out the carburettor and rotate it so as to remove the screw with the water joint and the pipes.

**N.B.**

**THIS LAST OPERATION IS NECESSARY SO AS NOT TO EMPTY THE COOLING SYSTEM.**



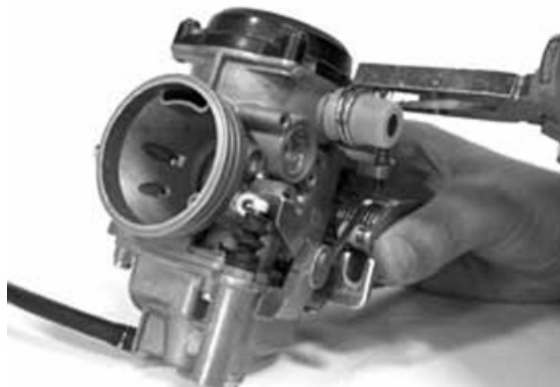
- Remove the protection, the bracket and the starter acting on the screw shown in the figure.



- Remove the 2 screws and the starter support with the gasket.



- Remove the clamp and cover with the airing filter of the diaphragm chamber.



- Remove the 4 fixing screws shown in the figure and the vacuum chamber cover.

**WARNING**

**DURING THE REMOVAL OF THE CARBURETTOR COVER  
TAKE SPECIAL CARE NOT TO RELEASE THE SPRING  
ACCIDENTALLY.**





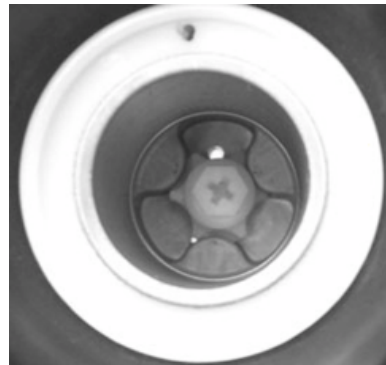
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- Remove the vacuum valve together with the diaphragm.



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- Unscrew the bayonet joint 1/8 of a turn and remove, take out the spring and vacuum valve needle



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- Remove the 4 screws indicated in the figure.



- Remove the chamber with the accelerating pump, its control and gasket.



- Remove the oil pump seal.
- Remove the intake and outlet valves of the intake pump from the tank

**N.B.**

**CAUTION, THE ACCELERATION PUMP VALVES ARE MADE UP OF NOZZLES, SPRING AND BALL.**

**N.B.**

**AVOID REMOVING THE PISTON OF THE PUMP AND ITS CONTROL.**



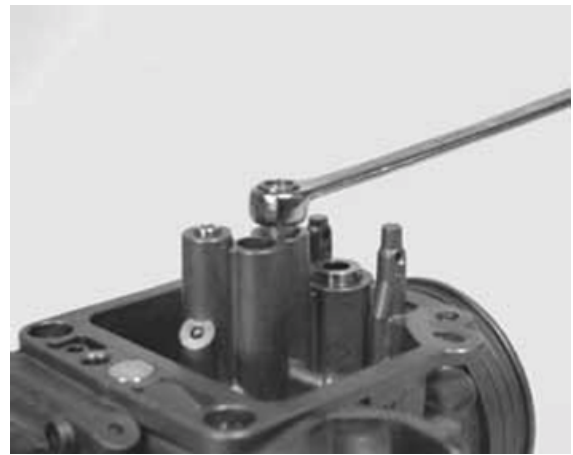
Adequately support the carburettor and using a rod and hammer remove the float pin acting from the throttle control side.

- Remove the float and the plunger.

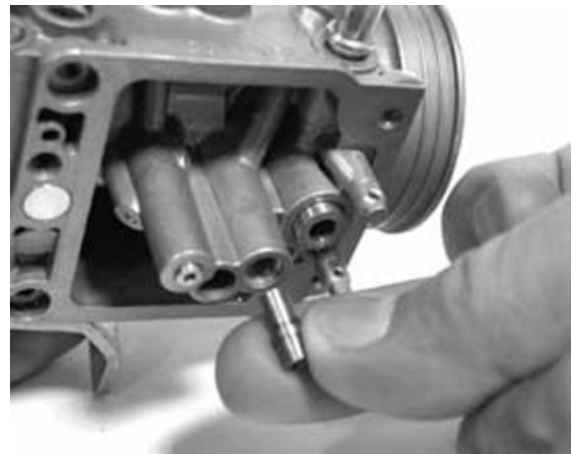




-Remove the maximum nozzle.



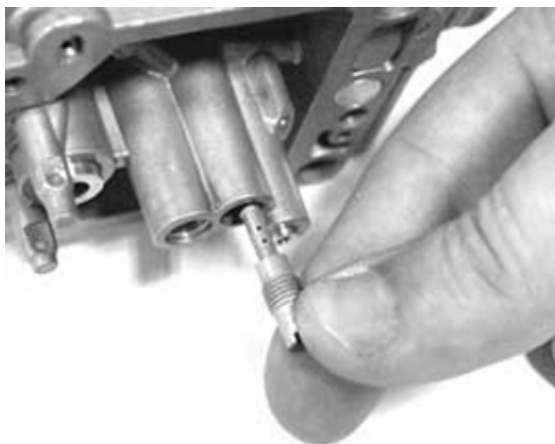
-Remove diffuser.



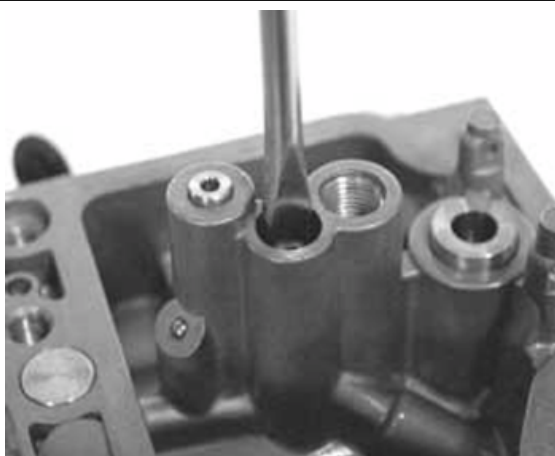
- Remove the sprayer.

**N.B.**

WHEN CLEANING THE CARBURETTOR BODY REMOVE THE SPRAYER TO AVOID LOSING PARTS. IF THE SPRAYER IS FORCED IN ITS HOUSING DO NOT ATTEMPT TO REMOVE IT AS THIS WILL ONLY DAMAGE IT.



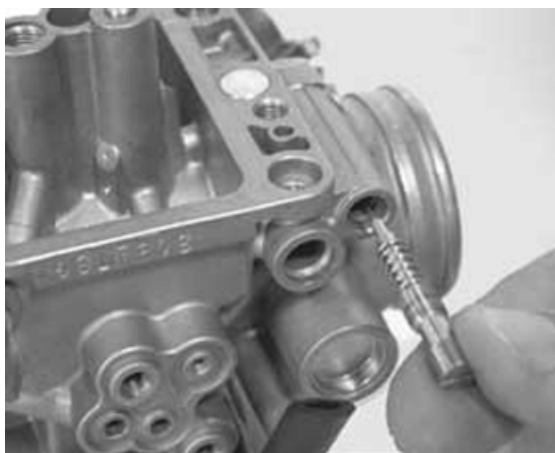
- Remove the minimum nozzle.



- Remove the minimum flow set screw and the spring.

**CAUTION**

DO NOT ATTEMPT REMOVING PARTS EMBEDDED IN THE CARBURETTOR BODY SUCH AS: FUEL SUPPLY PIPE, PLUNGER HOUSING, STARTER NOZZLE, PIT COVER FOR PROGRESSIONS AND INLET NOZZLE, MINIMUM AND MAXIMUM AIR GAUGE, THROTTLE VALVE CONTROL SHAFT. DO NOT REMOVE THROTTLE-SHAFT CONNECTION SCREWS. THE FIXING SCREWS ARE CAULKED AFTER ASSEMBLY AND THEIR REMOVAL DAMAGES THE SHAFT.



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## Refitting the carburettor

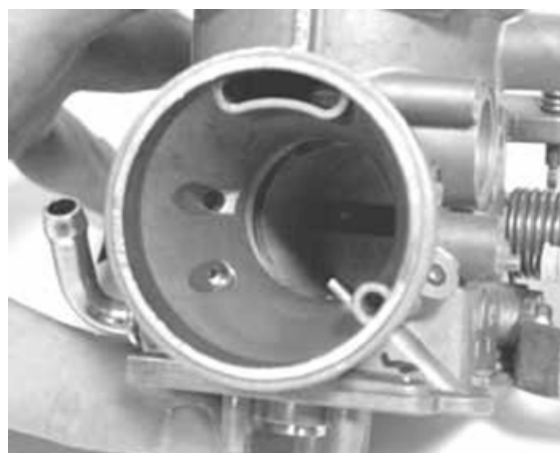
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## Kehin

- Before refitting, wash the carburettor body accurately with petrol and compressed air.
- Pay special attention to the fuel supply pipe and the plunger seat.



- For maximum circuit, check the air adjustment is correct as shown in the figure.



- For the minimum circuit, make sure the following points are properly cleaned: air gauging, outlet section controlled by flow screw, progression holes near the throttle valve.



- For the starter circuit, blow the connection pipe properly with the jet. This is necessary because the nozzle support hides other inaccessible internal calibrations.
- Blow the intake nozzle properly.

### N.B.

**THE ACCELERATION NOZZLE OUTLET IS EXTREMELY SMALL AND IS ORIENTED TO THE THROTTLE VALVE. NOZZLE INCORRECT ORIENTATION RESULTS IN INADEQUATE SPRAYING.**

- Check that there are 5 closing ball joints for the operating pipes on the carburettor body.

- Check that the coupling surfaces, the tank and the diaphragm are not dented.
- Check that the depression valve housing pipe is not scratched.
- Check that the throttle valve and the shaft do not show abnormal wear.
- Check that the plunger seat does not show abnormal wear.
- Replace the carburettor in case of irregularities.
- Check that the return spring of the accelerating pump rocking lever is not deformed by over-stretching.

**N.B.**

**TO AVOID DAMAGES, DO NOT INTRODUCE METAL OBJECTS IN THE ADJUSTED SECTIONS.**

- Wash and blow the minimum nozzle properly and reassemble it.



- Properly wash and blow the components of the sprayer maximum circuit, the diffuser and the nozzle.
- Introduce the sprayer in the carburettor body with the shortest cylindrical part directed to the diffuser.
- Assemble the diffuser making sure the sprayer is being adequately inserted and lock it.
- Assemble the maximum nozzle.



- Check that the tapered pin does not show signs of wear on the sealing surfaces of the shock absorber pin and the return clamp.
- Replace the rod if worn out.



- Check that the float is not worn on the pin housing or on the contact plate with the plunger and that there are no fuel infiltration.
- Replace it in case of anomalies.

- Introduce the float with the rod on the fuel feeding tube side.

**N.B.**

#### **INTRODUCE THE RETURN SPRING ON THE FLOAT PLATE ADEQUATELY**

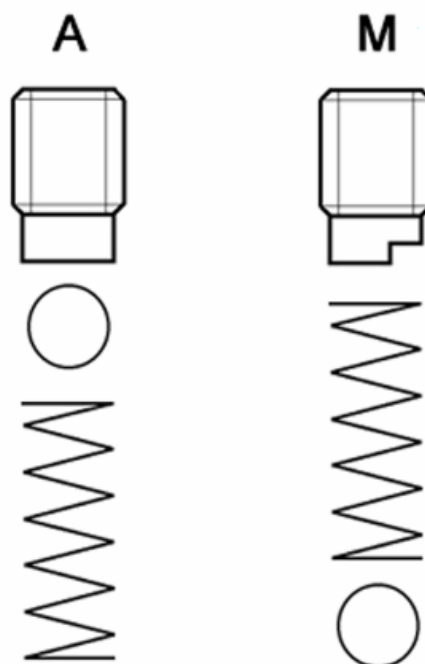
- Remove the drainage screw from the tank, wash and blow it properly and make sure the acceleration pump pipes are clean.
- Operate the acceleration pump piston repeatedly and blow with compressed air.
- Reassemble the acceleration pump valves following this order:

##### **INTAKE VALVE (A)**

- Spring
- Ball
- Nozzle

##### **IN VALVE (M)**

- Ball
- Spring
- Nozzle



**N.B.**

**THE IN VALVE NOZZLE, CORRESPONDING TO THE ACCELERATION PUMP, IS MILLED.**

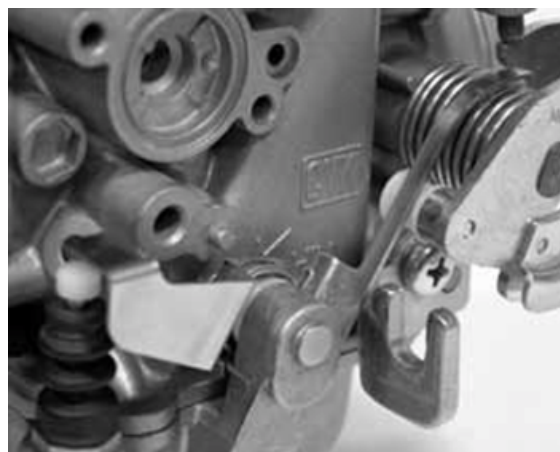
- Check the screw tightness introducing a small amount of fuel in the tank.
- Assemble a new gasket on the tank.
- Assemble the tank on the carburettor body fastening the 4 screws.
- Check that the control roller is free to rotate in its own seat.

**N.B.**

**MAKE SURE THE TANK GASKET IS CORRECTLY INTRODUCED**

**N.B.**

**AVOID DEFORMING THE ACCELERATION PUMP CONTROL ROCKING LEVER.**



- Wash and blow the flow screw properly.
- Check that screw is not deformed and/or rusty.
- Assemble the spring on the screw.
- Screw the flow screw on the carburettor body.



- The screw final position should be determined by an exhaust fume analysis.
  - Adjust the carburettor by turning the screw twice from the close position.
- 

## Level check

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### Kehin

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- Place the carburettor inclined as shown in the figure.



- Check that the float reference is parallel to the tank coupling surface
  - If different positions are detected, change the plunger control metal plate direction to obtain the position described above.
- 

## Inspecting the valve and needle

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### Kehin

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- Check that the tapered pin of the vacuum valve does not show wear.
- Check that the depression valve does not show threads on the external surfaces.
- Check that the vacuum intake hole is not clogged.
- Check that the diaphragm is not damaged or has hardened, otherwise replacement the whole valve.
- Insert the tapered pin into the vacuum valve housing.
- Reassemble the vacuum valve on the carburettor body taking care that the tapered pin is inserted into the sprayer.



**N.B.**

**THE VALVE CAN BE INSERTED IN ONLY ONE POSSIBLE POSITION.**

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- 
- Reassemble the spring with the pin lock.
  - Remove the cover of the vacuum chamber being careful to correctly insert the spring in its place on the cover.
  - Tighten the screws.



- 
- Wash and blow dry the filter sponge of the ambient pressure intake.



- Reassemble the filter with its clamp.



- Wash and blow dry the starter support.
- Assemble a new gasket on the carburettor body and tighten the 2 fixing screws.



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## Inspecting the automatic choke device

---

### Kehin

- Check that the automatic starter piston is not deformed or rusty.
- Check that the piston slides freely from the seat to the support.
- Check that the piston sealing gasket is not deformed.
- The starter must be more or less functional depending on the ambient temperature.
- Measure the protrusion of the piston as shown in the figure and check its corresponding value.
- Make sure that the starter is adjusted for the ambient temperature.
- The starter should disconnect progressively by means of electric heating.





- Check the starter resistance when adjusted to the ambient temperature.

With a 12V battery power the automatic starter and check that the piston protrudes as much as possible.

- The correct warm up time depends on the ambient temperature.

- If protrusion, resistance or timing values are different from the ones prescribed, replace the starter.

- Assemble the starter to the carburettor being careful to position the O-Ring correctly, insert the plate with the machined side contacting the starter, tighten the fixing screws.

- Position the starter as shown in the figure.

- Assemble the protection casing.

**N.B.**

TO CARRY OUT THIS CHECK PAY SPECIAL ATTENTION NOT TO GENERATE SHORT CIRCUITS USE A CABLE SECTION WITH A TERMINAL SUITABLE TO BE CONNECTED TO THE STARTER.

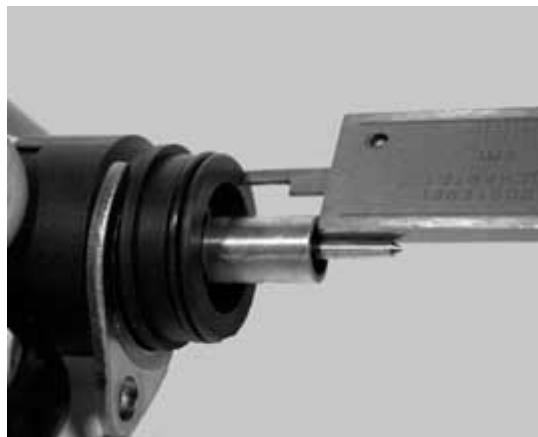
**Characteristic**

**Check the automatic starter: Keihin maximum time**

5 min

**Check the automatic starter: Keihin: Protrusion value**

10 mm at about 20°C



## Adjusting the idle

- Start and warm up the engine:
- Rotate the carburettor set screw «1» until the prescribed idle speed is obtained.
- Adjust the throttle grip transmission by operating the two set nuts: «2» close to the carburettor and «3» on the right handlebar; make sure the minimum clearance is as prescribed.
- Now, adjust the end of stroke screw «5» until it stops at the control sector of the throttle grip lever «4».
- Once the operation is finished, tighten the lock nut and the idle speed will be adequately adjusted.

### WARNING

TAKE YOUR VEHICLE TO AN AUTHORISED SERVICE CENTRE TO HAVE THESE OPERATIONS DONE.

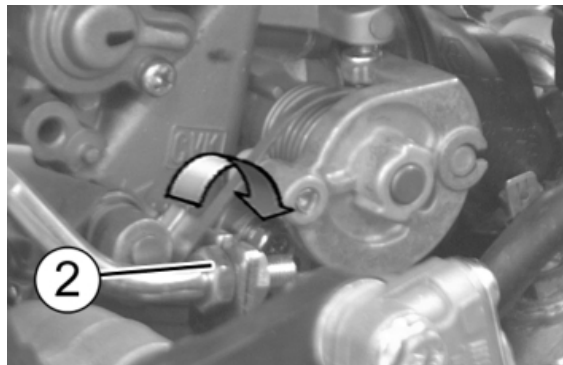
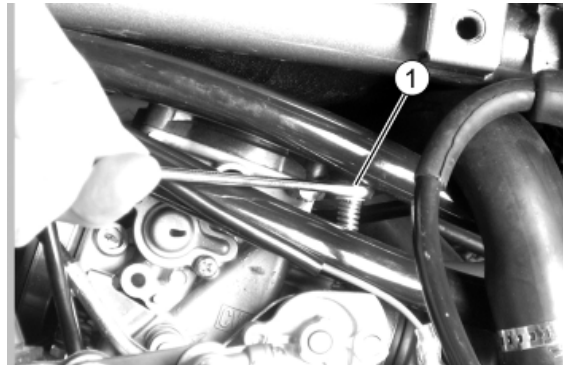
### Characteristic

#### Idle speed

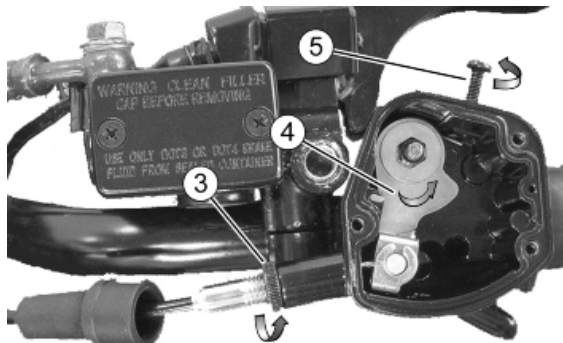
1650 ÷ 1700 rpm

#### Throttle transmission clearance

3.0 ÷ 6.0 mm



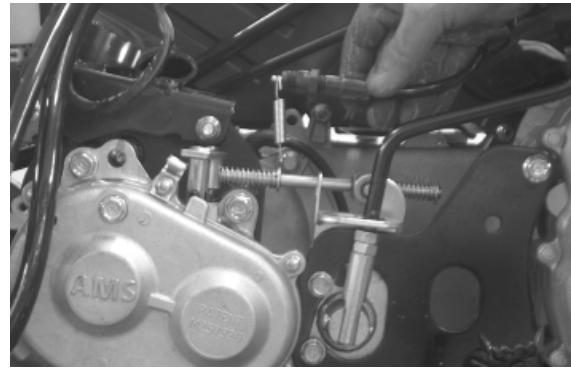
- To correctly adjust the throttle grip transmission on the right handlebar:
- Remove the rubber protection.
- Unscrew the tightening lock nut «3» and rotate the regulating element to get the prescribed throttle grip transmission clearance.
- Tighten the knurled nut against the regulating element and cover it with the rubber protection.
- To limit the throttle grip transmission stroke and not to damage the carburettor components, there is a mechanical device that, if it is correctly adjusted, prevents the throttle grip lever «5» sector to transmit an excessive rotation to the carburettor throttle, thus avoiding potential damage.



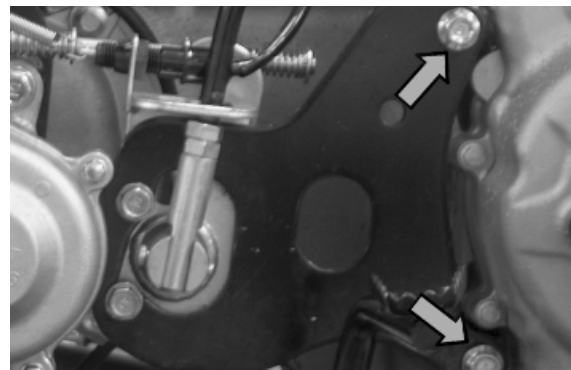
## Rotation inverter

## Removal

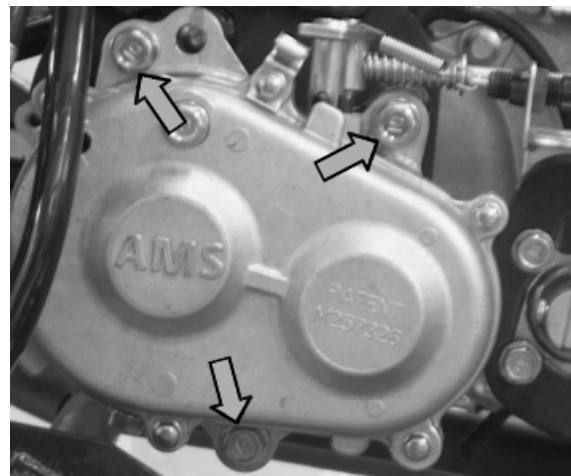
- Detach the spring and unscrew the reverse gear engaged signal switch.



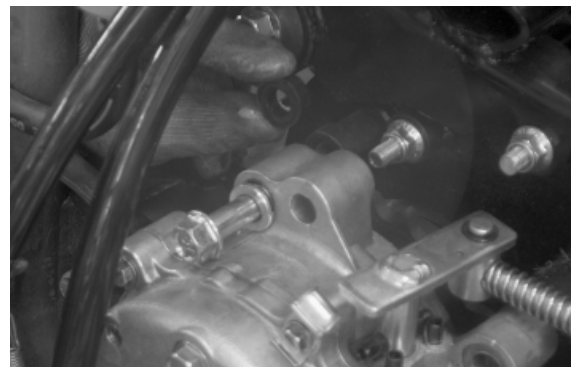
- Remove the screws connecting it to the crank-case.



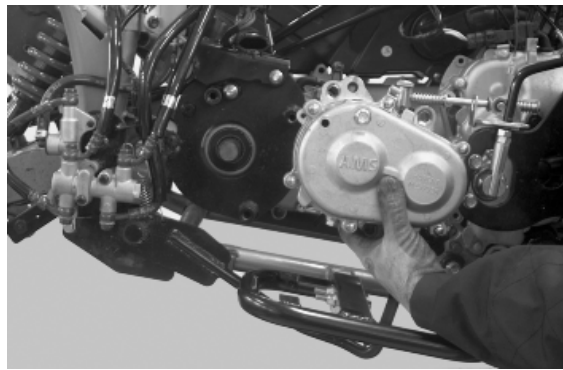
- Unscrew the fixing screws to the chassis connecting bracket.



- Collect the spacers.

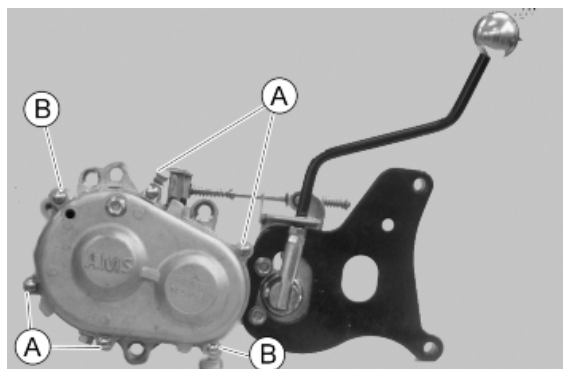


- Remove the whole reverser unit.

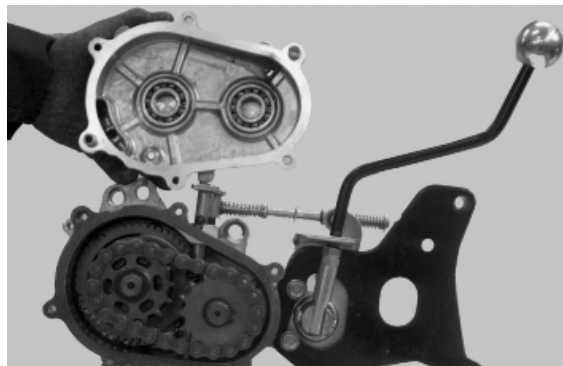


## service

- Drain the oil before any maintenance operation.
- Undo the four screws «A» and the two screws «B».



- Remove the reverser housing cover.



- Take out the bearings using the specific tools.

### Specific tooling

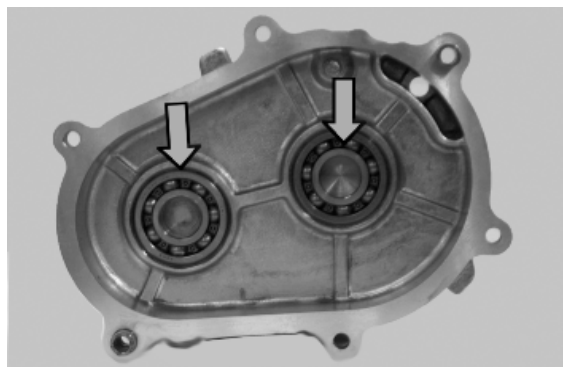
001467Y004 Lug / Taper pin

001467Y005 Screw

001467Y003 Nut

001467Y006 Pliers to extract 20 mm bearings

001467Y017 Ø 35 Bell



- To refit, warm the crankcase with the appropriate tool and then, insert the bearings.

### Specific tooling

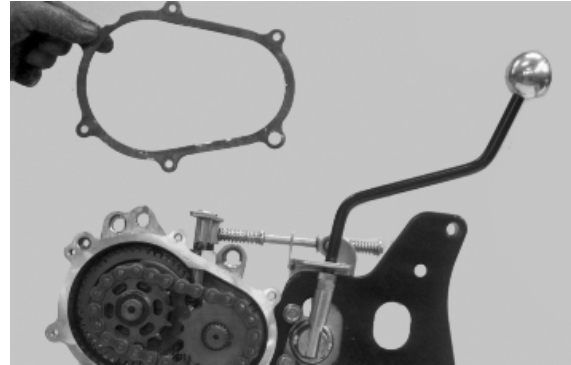
020151Y Air heater

020376Y Adaptor handle

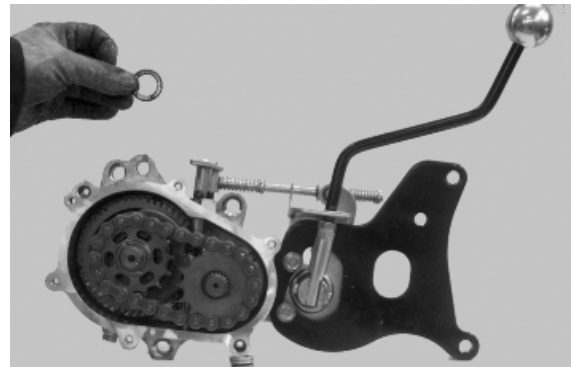
020357Y 32 x 35 mm adaptor

020439Y 17 mm guide

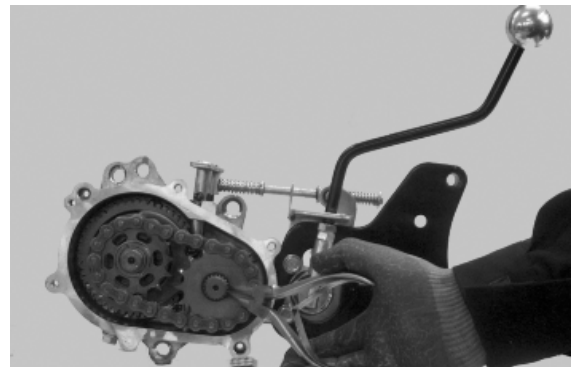
- Remove the gasket.



- Remove the washer.



- Remove the Seeger ring.

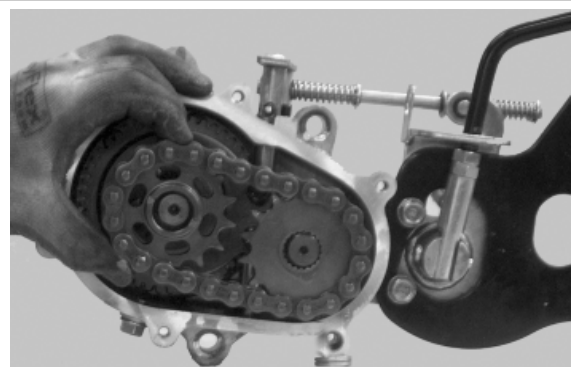


- Slide off the two reels with the chain.

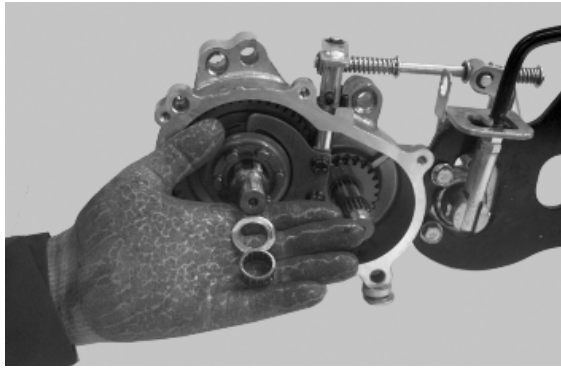
**Characteristic**

**Nominal diameter - bearings capacity**

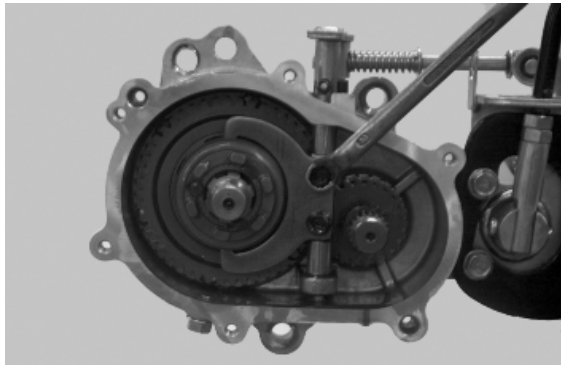
Ø17mm



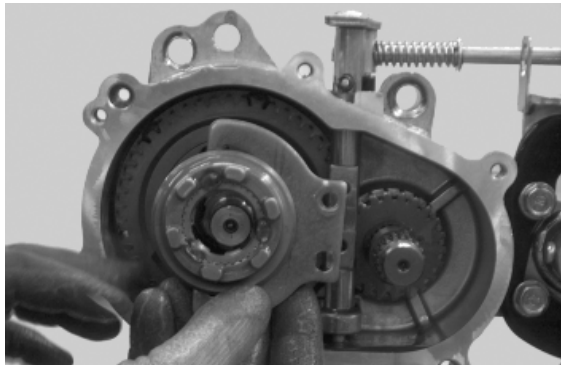
- Slide off the ball retainer and the thrust washer.



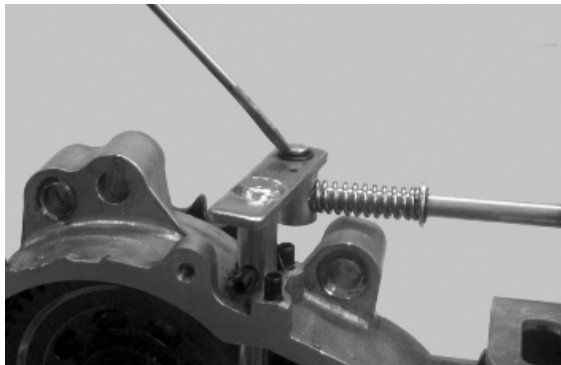
- Unscrew the two screws connecting the fork of the control shaft of the fork.



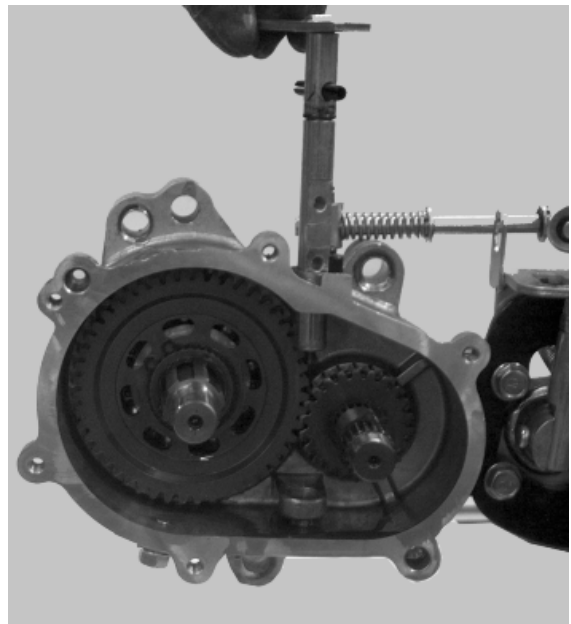
- Remove the slider with the fork.



- Remove the benzing snap ring and release the lever transmission shaft.



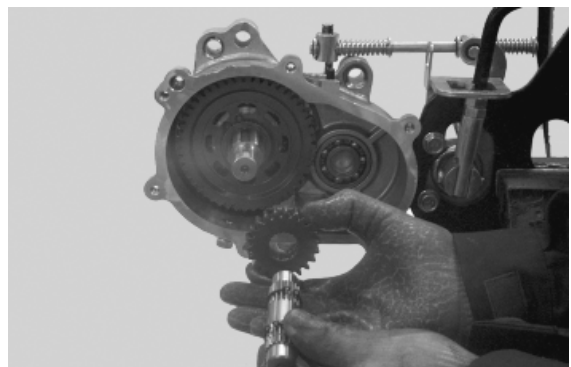
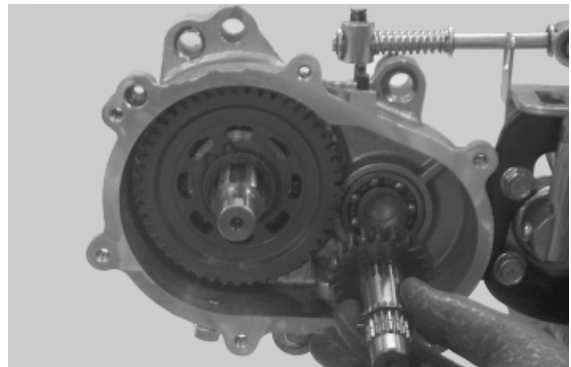
- Slide off the shaft.



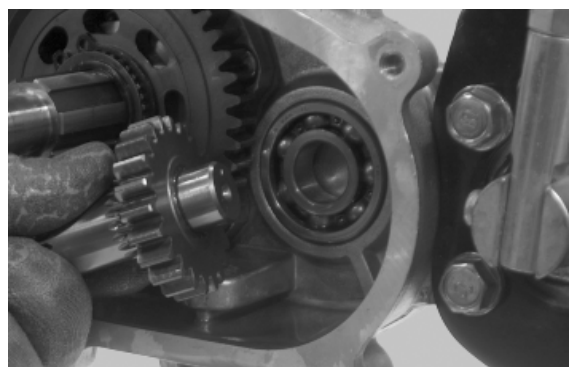
- Slide off the axle with reel.

**Characteristic****Nominal diameter - bearings capacity**

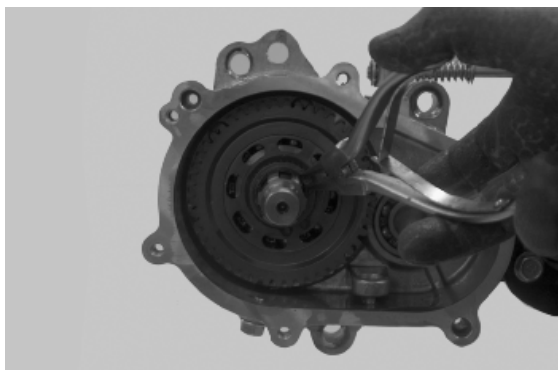
Ø17mm

**N.B.**

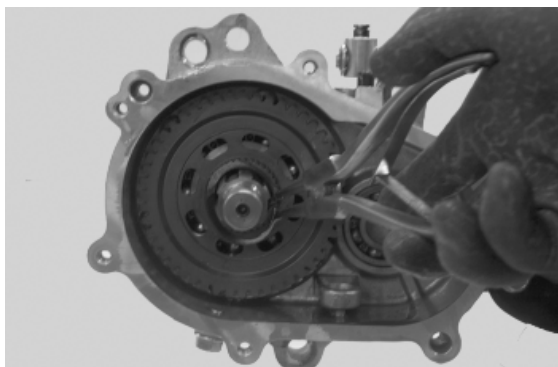
TO REFIT, INSERT THE REEL WITH THE RAISED SURFACE TOWARDS THE BEARING SIDE AS SHOWN IN THE PHOTOGRAPH.



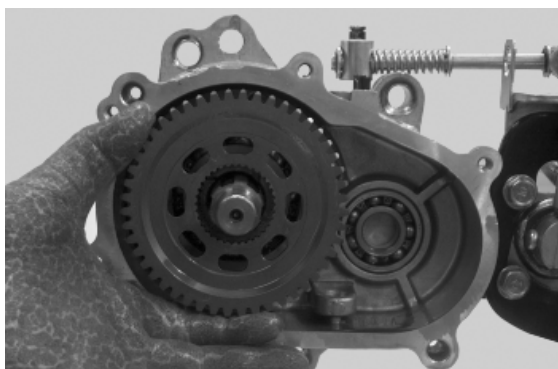
- Remove the Seeger ring and the washer.



- Remove the seeger ring.

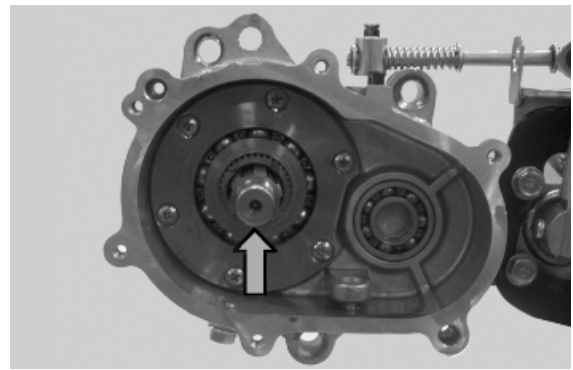


- Slide off the gear.

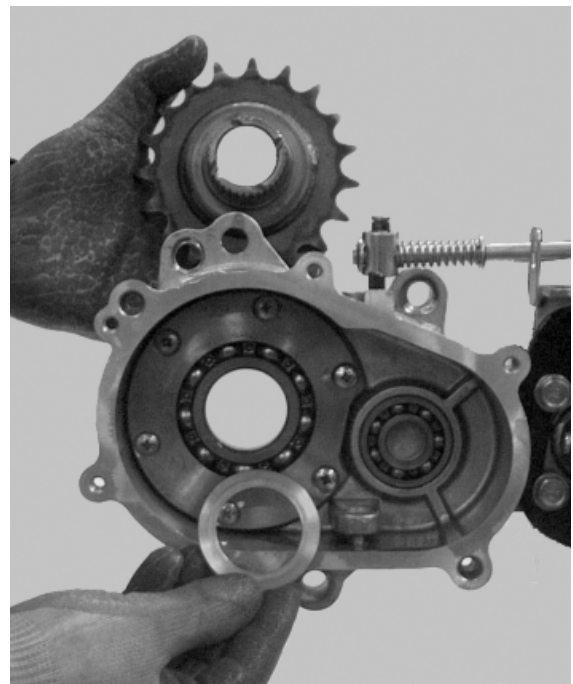




- Push the axle and slide it off from the motion transmission pinion side to the rear wheel axle.



- Remove the spacer ring and remove the pinion.



- Remove the internal oil seal of the pinion and remove the ball retainer.



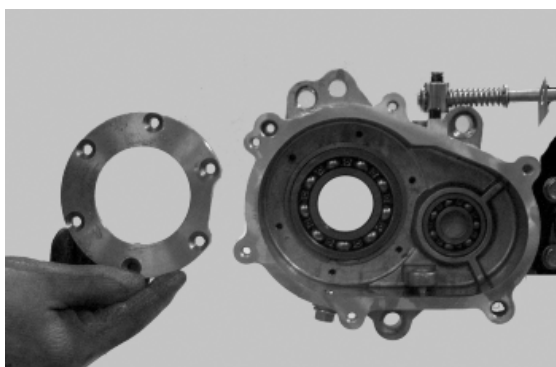
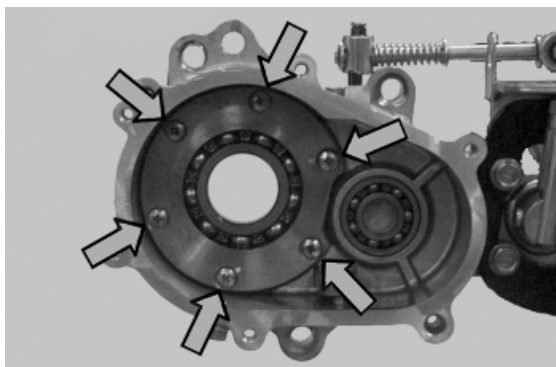
- Undo the six screws indicated and remove bearing retaining flange.
- Upon fitting, tighten to the prescribed torque and apply the recommended product.

**Recommended products****Loctite 243 Medium strength threadlock**

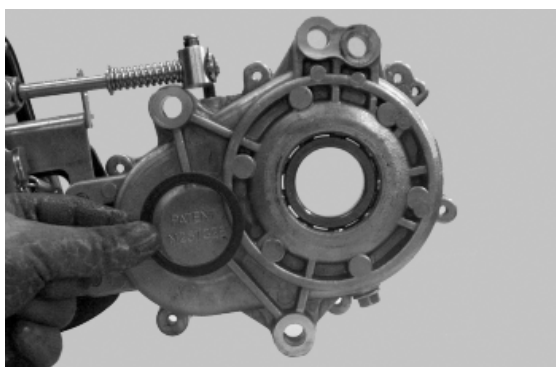
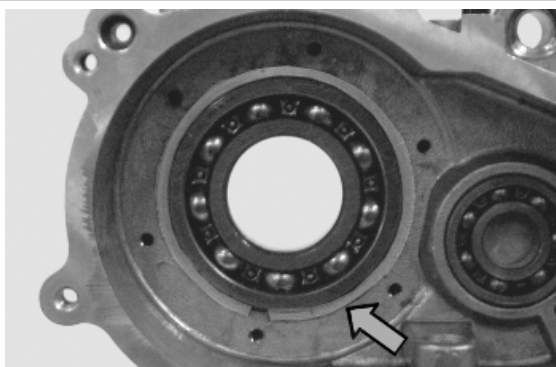
Loctite 243 medium-strength threadlock

**Locking torques (N\*m)**

Bearing retention flange screws 5 (°)



- Remove the lock ring from one side and the oil seal from the other.



- Take out the bearing of the secondary shaft with the specific tool.

**Specific tooling**

001467Y004 Lug / Taper pin

001467Y005 Screw

001467Y003 Nut

001467Y006 Pliers to extract 20 mm bearings

**001467Y017 Ø 35 Bell**

- Take out the bearing of the main shaft with the specific tool.

**Specific tooling****020376Y Adaptor handle****020359Y 42x47-mm adaptor****020654Y 35 mm guide**

- To refit, warm the reverser housing with the specific tool and then, insert the bearings.

**N.B.****INSERT THE BEARING LOCK RING IN THE EXTERNAL RING BEFORE FITTING THE MAIN SHAFT BEARING.****Specific tooling****020151Y Air heater****020376Y Adaptor handle****020357Y 32 x 35 mm adaptor****020439Y 17 mm guide****020654Y 35 mm guide****020408Y 72x75 adaptor**

- Visually check the grooved profiles.
- Replace the damaged components.
- Replace the abnormally worn components.
- Lubricate the parts requiring greasing with the recommended product.

**Recommended products****AGIP GREASE PV2 Grease for steering bearings and spindle seats**

Soap-based lithium and zinc oxide grease containing NLGI 2; ISO-L-XBCIB2 of the swinging arm

- Before riding again, refill with oil following to the procedure indicated in the Maintenance/oil change chapter.

---

**Assembly**

Follow the removal steps but in reverse order; be careful to tighten to the prescribed torques.

**Locking torques (N\*m)****Bearing retention flange screws 5 (°) Fork - fork control shaft connecting screws 10 Reverser housing cover closing screws 10 Bracket - crankcase connecting screws 28÷32 Reverser unit connecting screws to chassis connecting bracket 50**

---

INDEX OF TOPICS

|             |      |
|-------------|------|
| SUSPENSIONS | SUSP |
|-------------|------|

This section is devoted to operations that can be carried out on the suspension.

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## Front

---

### Removing the front wheel

---

The operations are described only once but they apply to both front wheels.

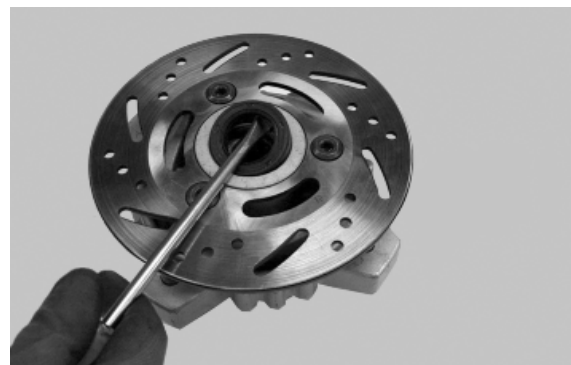
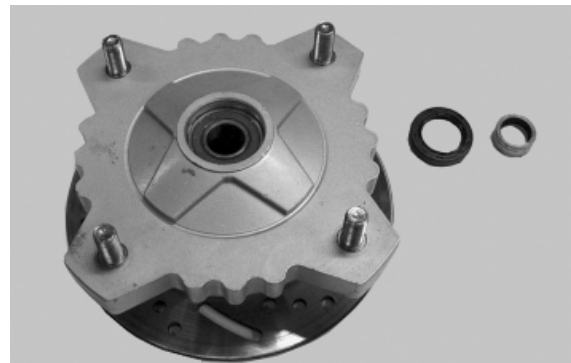
- Support the scooter adequately.
- Unscrew the four fixing nuts to the wheel hub.



### Front wheel hub overhaul

---

- Remove the oil seal from both sides.



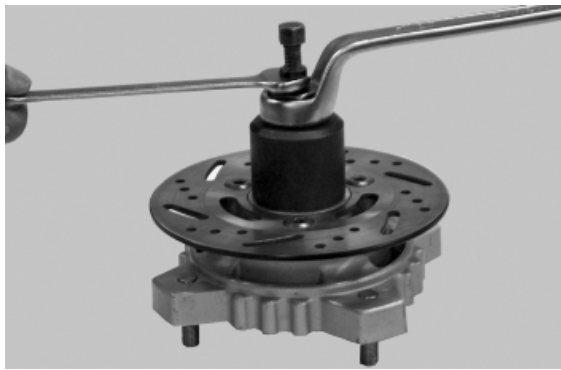
- Get the specific tools to remove the bearings.

**Specific tooling**

001467Y004 Lug / Taper pin

001467Y005 Screw

001467Y003 Nut



- Using the specific tools remove the vehicle internal bearing.

**Specific tooling**

001467Y006 Pliers to extract 20 mm bearings

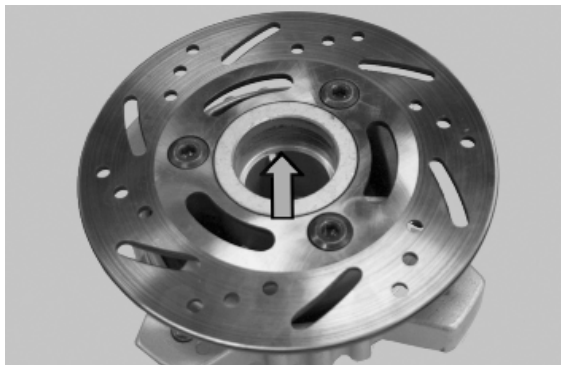
001467Y035 Belle for OD 47-mm bearings

- Repeat the operation for the vehicle external bearing.

**Specific tooling**

001467Y006 Pliers to extract 20 mm bearings

001467Y017 Ø 35 Bell



- Remove the internal spacer.
- Check on both sides that the bearings are not abnormally worn.

- Using the specific tool warm the hub wheel and fit the bearings, taking care to:
- Refit the bearings with the shielded section facing outwards.
- Insert the internal spacer with the smaller on the stud bolts section.

**Specific tooling****020151Y Air heater**

- Fit the bearings.

**Specific tooling****020376Y Adaptor handle****020357Y 32 x 35 mm adaptor****020439Y 17 mm guide****020359Y 42x47-mm adaptor****020363Y 20 mm guide**

- Use the specific tool to refit the oil seal.

**Specific tooling****020357Y 32 x 35 mm adaptor****020359Y 42x47-mm adaptor**

---

**Refitting the front wheel**

- Follow the removal steps but in reverse order; be careful to tighten to the prescribed torque.

**Locking torques (N\*m)****Wheel hub nut 60÷70 Wheel nuts 70÷80**

---

**Handlebar**

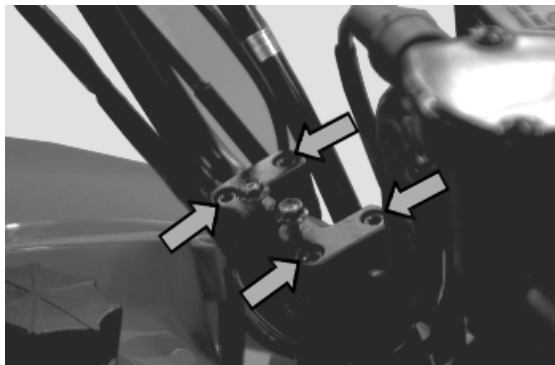
---

## Removal

- Remove the instrument panel.
- Remove the components fitted on the handlebar
- Undo the four fixing screws.

**N.B.**

IF THE HANDLEBAR IS BEING REMOVED TO REMOVE THE STEERING, TILT THE HANDLEBAR FORWARD TO AVOIDING DAMAGING THE TRANSMISSIONS.



---

## Refitting

Carry out the above operations by working in the reverse order from those of the removal.

**Locking torques (N\*m)**

Handlebar fixing screw 10



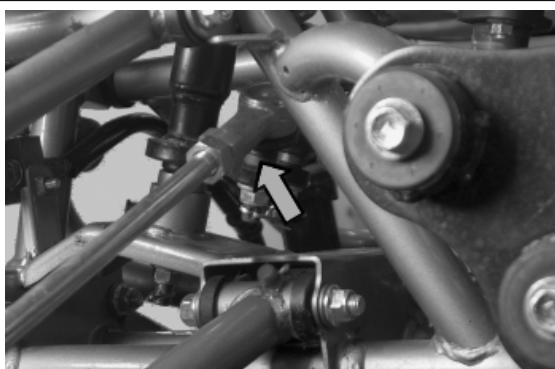
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## Steering column

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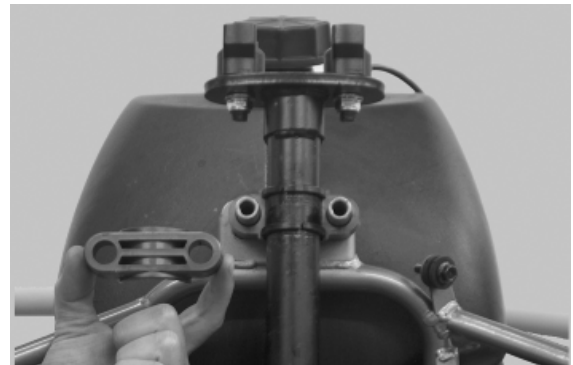
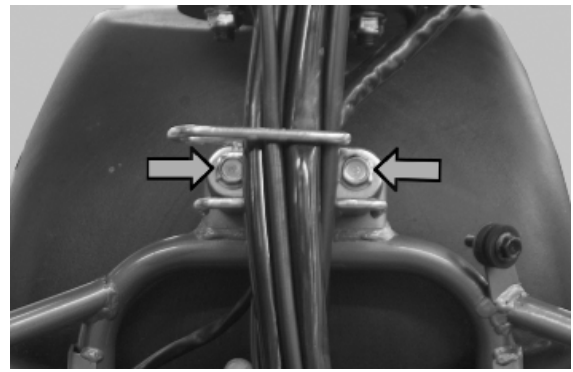
### Removal

- Remove the handlebar.
- Remove the steering arms from the steering tube seats.

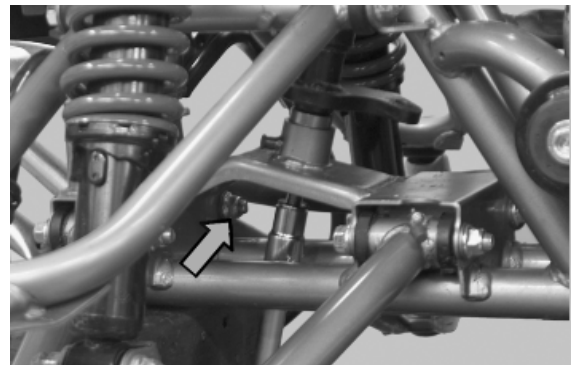




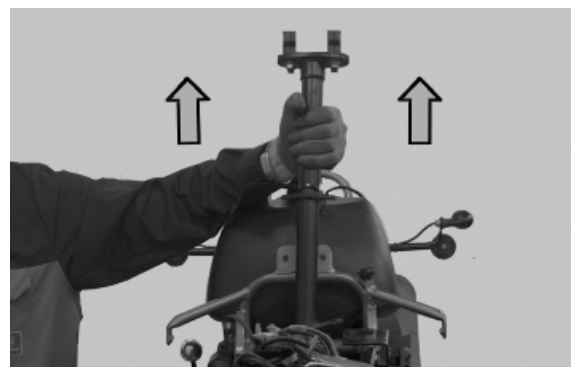
- Release the screws from the safety plate.
- Undo and remove the two screws indicated on the vertical fixing u-bolt to the chassis and collect the two internal sealing rings.



- Remove the cotter pin and unscrew the fixing nut to the lower section of the chassis.



- Slide the steering tube off and upwards .



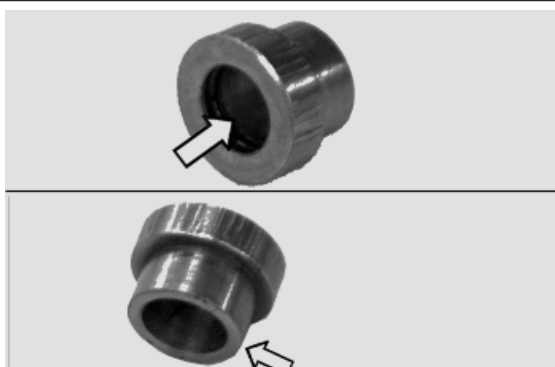
- Remove the bushing from the seat welded to the chassis.



- Visually check the internal O-ring is in good conditions.

**Characteristic****Nominal diameter**

20.6 mm



- Repeat the operation for the lower bushing.

## Refitting

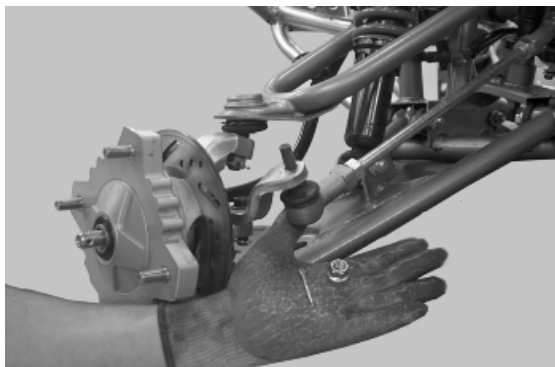
- Follow the removal steps but in reverse order; be careful to tighten to the prescribed torque.

**Locking torques (N\*m)****Steering tube - chassis fixing nut 55÷58 Vertical u-bolt - chassis screws 27÷30**

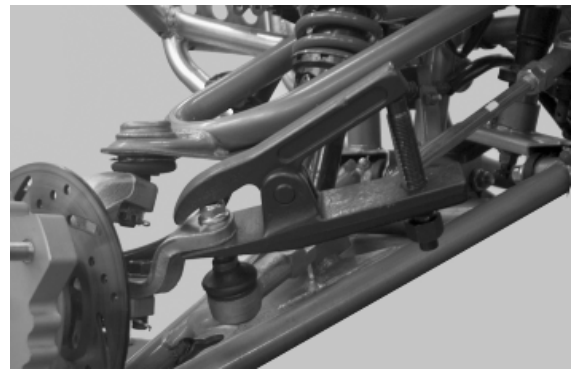
## Toe-in steering arm

## Removal

- Support the scooter adequately.
- The operations are described only once, but they apply to both arms.
- Remove the wheel.
- Mark the contact point between the tightening nut and the arm so as to keep the original positions.
- Remove the cotter pin and loosen the fixing nut to the wheel joint up to the threaded end.

**N.B.****THE NUT SERVES TO PREVENT THREADS DEFORMATION DURING REMOVAL.**

- Use the specific tools to remove the connecting ball head to the wheel joint.

**Specific tooling****020231Y Extractor for articulated heads**

- Unscrew the nut and remove the ball head from the seat.



- Remove the cotter pin and unscrew the connecting nut to the steering tube.
- Use the specific tools to remove the connecting ball head to the steering tube.
- Remove the arm.

**Specific tooling****020231Y Extractor for articulated heads**

---

**Assembly**

- Adjust according to the instructions.

**Characteristic****Standard reference measure**

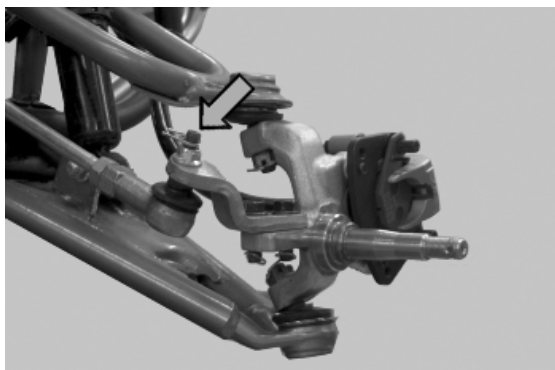
325 mm



- Insert the ball heads of the arm in their seats and tighten to the prescribed torque.
- Insert the cotter pin.

### Locking torques (N\*m)

Steering arms fixing nuts 50



## Wheel alignment

- Check the wheel toe-in.



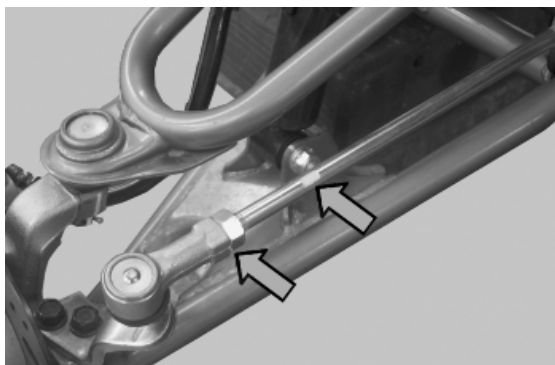
### Characteristic

#### Toe-in value

0 ÷ -1 mm



- To adjust toe-in operate on the steering arms where indicated.



## Rear

---

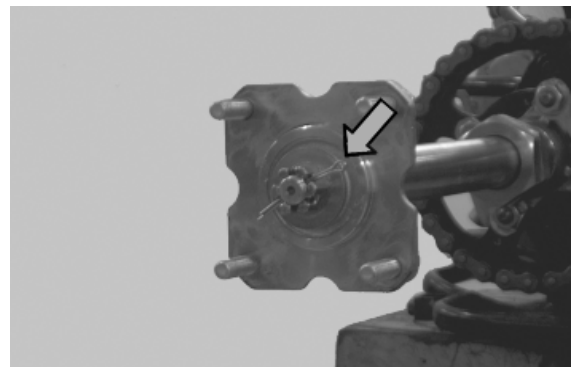
### Removing the rear wheel

The operations are described only once but they apply to both rear wheels.

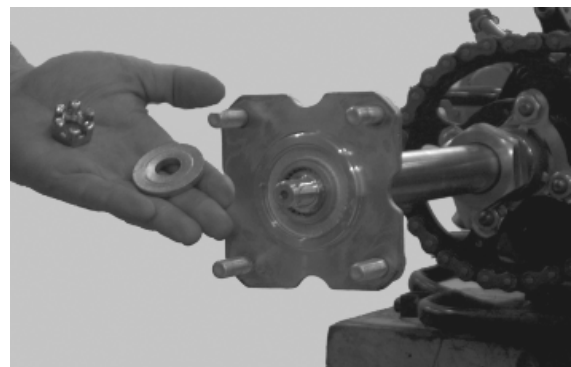
- Properly support the vehicle from the lower bumpers.
- Unscrew the four fixing nuts to the wheel holder flange.



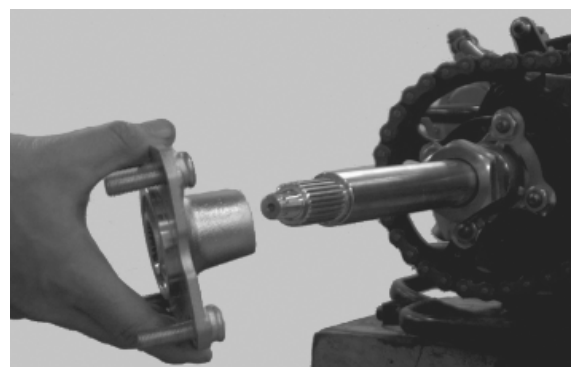
- 
- Remove the wheel.
  - Remove the cotter pin.



- 
- Unscrew the fixing nut to the rear axle and collect the washer.



- 
- Slide off the wheel holder flange from the grooved profile.



## Refitting the rear wheel

- Follow the removal steps but in reverse order; be careful to tighten to the prescribed torque.

### Locking torques (N\*m)

Wheel holder flange nut 60÷70 Wheel nuts 70÷80

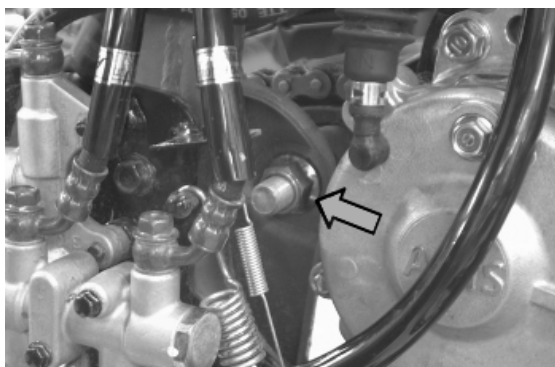
---

## Swing-arm

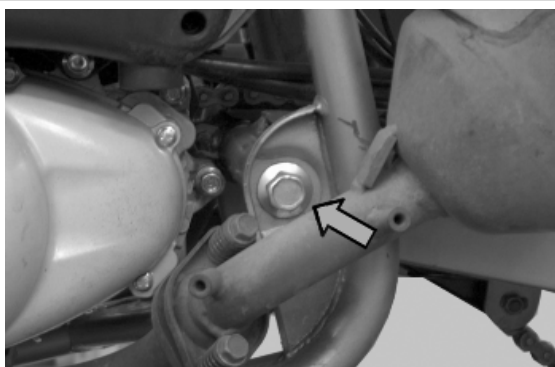
---

### Removal

- Properly support the rear chassis.
- Release the swinging arm from the callipers connections and from the speed sensor.
- Unscrew the rear shock absorber lower retainer.
- Unscrew the tightening nut of the connecting pin to the chassis.



- Unscrew the pin.
- Disconnect the swinging arm from the chassis.



---

### Refitting

- Follow the removal steps but in reverse order; be careful to tighten the components to the prescribed torque.

### Locking torques (N\*m)

Swinging arm - chassis pin nut 132

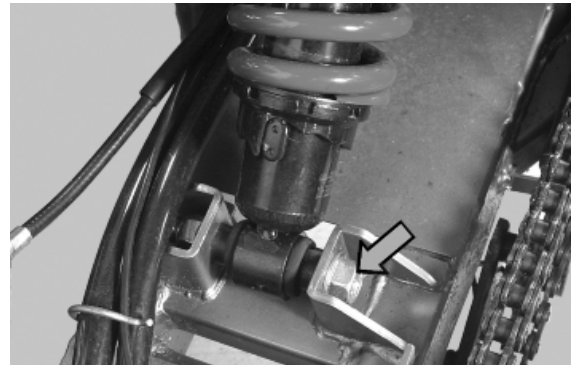
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## Shock absorbers

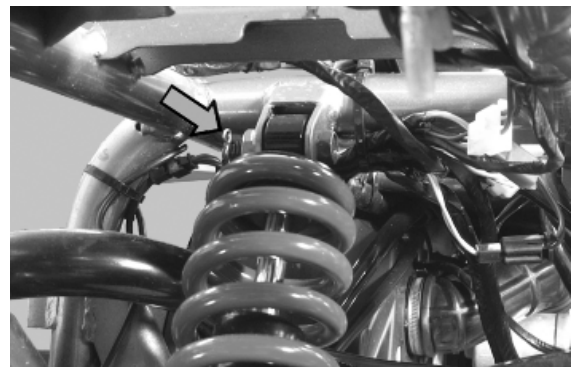
---

## Removal

- Properly support the upper part of the vehicle.
- Unscrew the lower retainer of the shock absorber to the swinging arm.



- Remove the cotter pin and unscrew the upper retainer of the shock absorber to the chassis.



---

## Refitting

- Follow the removal steps but in reverse order; be careful to tighten the components to the prescribed torque.

### Locking torques (N\*m)

Rear shock absorber - chassis 44 Rear shock absorber - swinging arm 80

---

## Rear wheel axle

---

## Removal

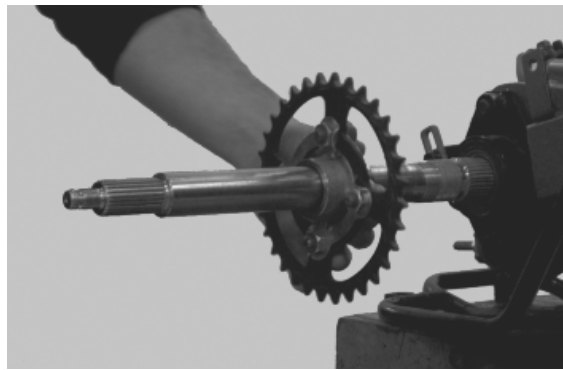
- Properly support the vehicle from the lower bumpers.
- Remove the rear wheels with the flange.
- Release the safety washer placed between the two nuts, unscrew the axle fixing nuts.

### CAUTION

THE THREAD IS ANTICLOCKWISE.



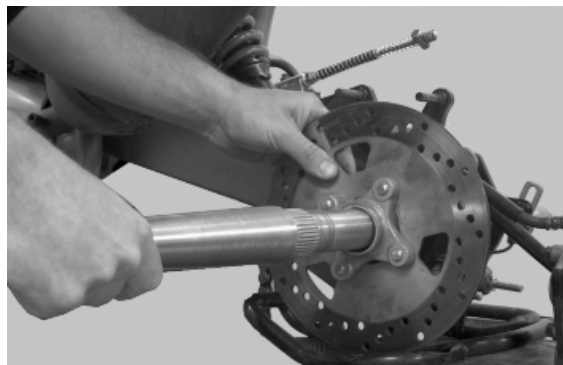
- Release the chain from the crown.
- Slide off the crown holder flange from the grooved profile.



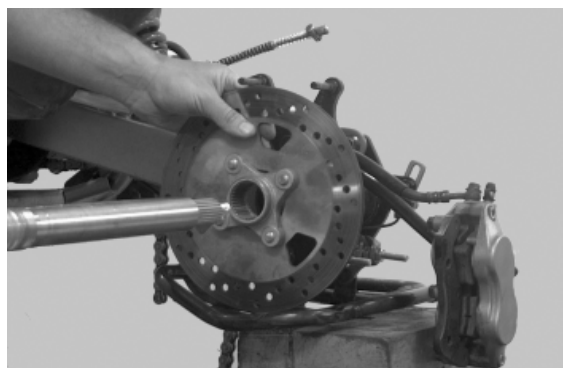
- Remove the rear calliper and the parking calliper.
- Slide the rear disc holder flange from the grooved profile keeping it inside the bumper placed in the lower part.

**CAUTION**

REMOVE THE FLANGE ONCE THE REAR AXLE HAS BEEN REMOVED.



- Pull out the rear axle.



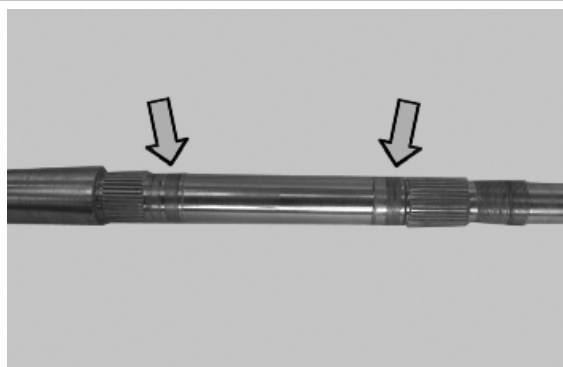
## revisione

- Check that the bearings on the axle are not abnormally worn.

**Characteristic**

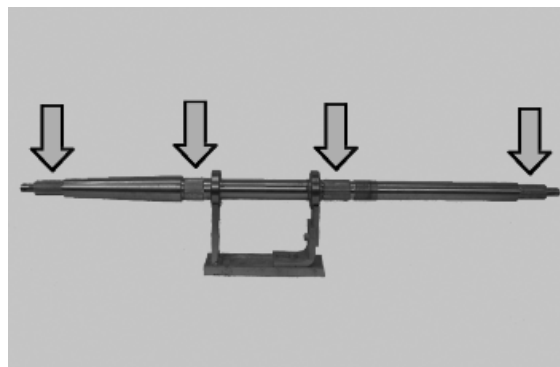
**Nominal diameter**

35 mm

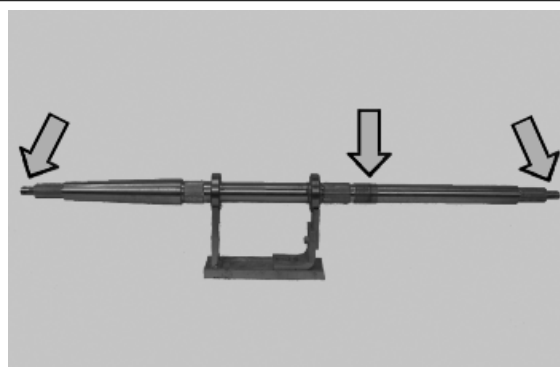




- Check that the grooved profiles, (wheel flange seats, rear disc flange and crown holder flange) are not abnormally worn.



- Check that the threads (wheel nuts and axle nuts) are not abnormally worn.



- Place the rear axle with the bearings on the specific support and check eccentricity using the specific tool. Repeat the operation for both ends.

### Specific tooling

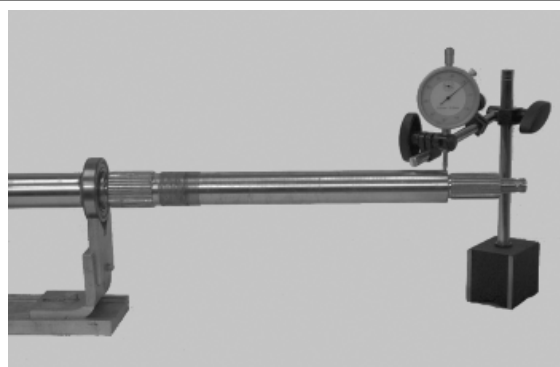
**020074Y Support base for checking crankshaft alignment**

**020335Y Magnetic support for dial gauge**

### Characteristic

**Eccentricity limit**

0.5 mm



## Assembly

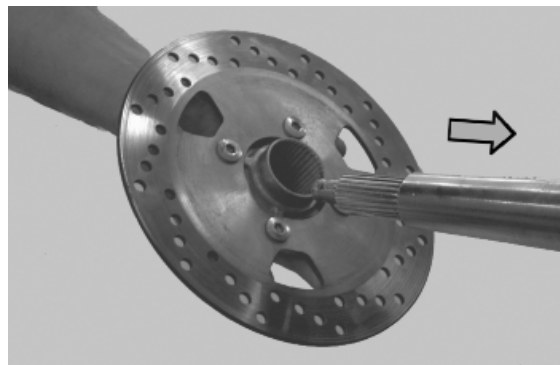
- Follow the removal steps but in reverse order; be careful to tighten the components to the prescribed torque.

### CAUTION

THE DISC HOLDER FLANGE SHOULD BE FITTED WITH THE CLAMPS ON THE INTERNAL SIDE.

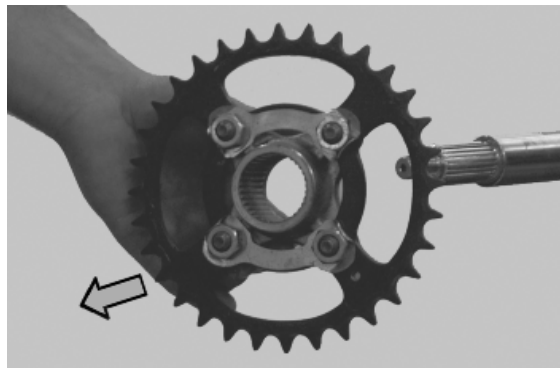
### Locking torques (N\*m)

**Rear brake calliper - support bracket 40÷45 Rear axle tightening nut 200 Wheel holder flange nut 60÷70 Wheel nuts 70÷80**



**CAUTION**

THE CROWN HOLDER FLANGE SHOULD BE FITTED WITH THE CLAMPS ON THE EXTERNAL SIDE.

**smontaggio**

- Remove the rear axle.
- Remove the internal spacer from both sides.



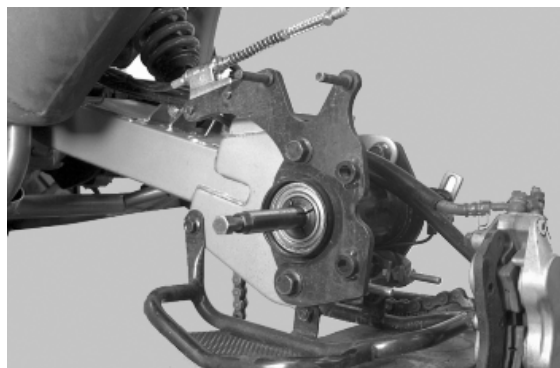
- Remove the sealing ring from both sides.



- Get the specific tool to remove the left bearing.

**Specific tooling**

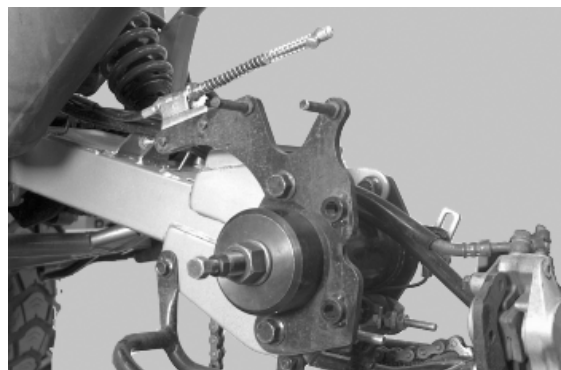
001467Y028 Pliers to extract bearings, 35-mm diam.



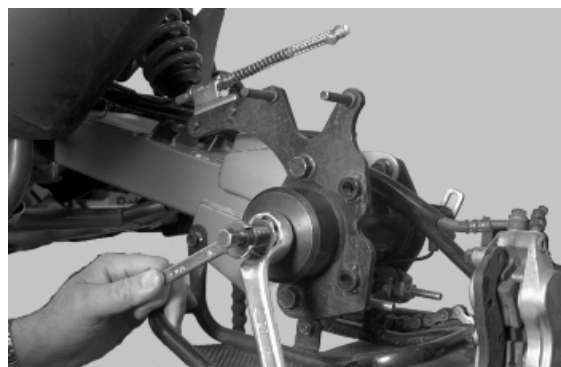
- Insert the specific tool.

**Specific tooling**

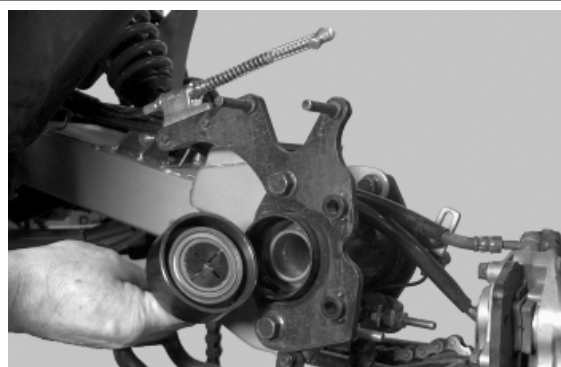
001467Y002 Driver for OD 73 mm bearing



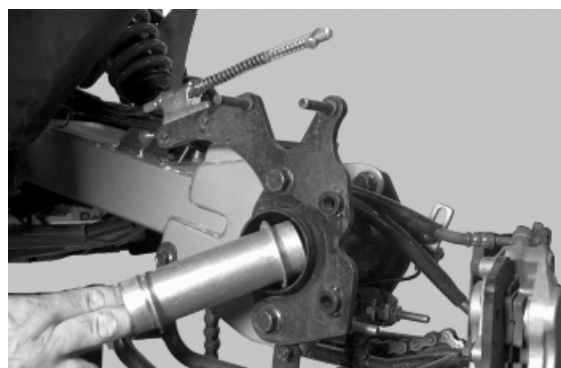
- Operate on the tool.



- Take out the bearing.



- Remove the internal spacer.



- 
- Take out the right bearing with the specific tool.

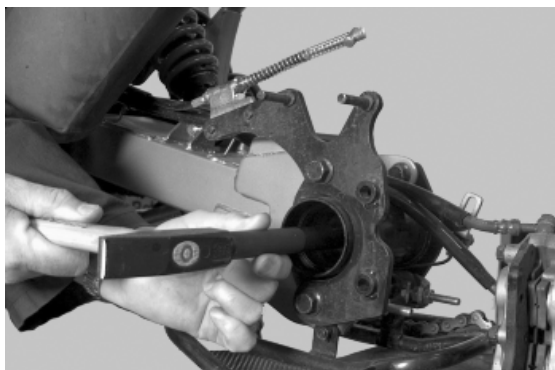
**Specific tooling**

020376Y Adaptor handle

020360Y Adaptor 52 x 55 mm

020654Y 35 mm guide

020655Y Adaptor 62x68 mm



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**montaggio**

- Check that the bearings are not abnormally worn.

**Characteristic****Nominal diameter**

60.9 mm

- 
- Follow the removal steps but in reverse order; be careful to lubricate with the recommended product the sealing rings, on the inside and on the lip side.

**Specific tooling**

020376Y Adaptor handle

020655Y Adaptor 62x68 mm

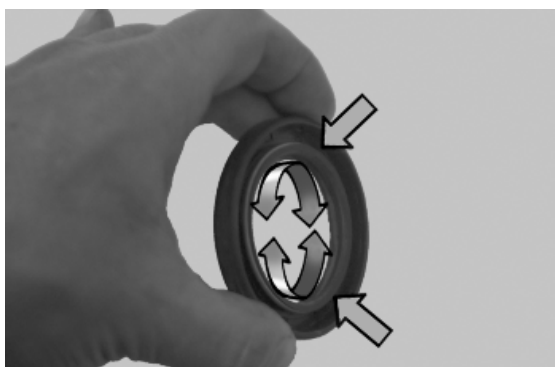
020654Y 35 mm guide

**Recommended products**

**AGIP GREASE PV2 Grease for steering bearings and spindle seats**

Soap-based lithium and zinc oxide grease containing NLGI 2; ISO-L-XBCIB2 of the swinging arm

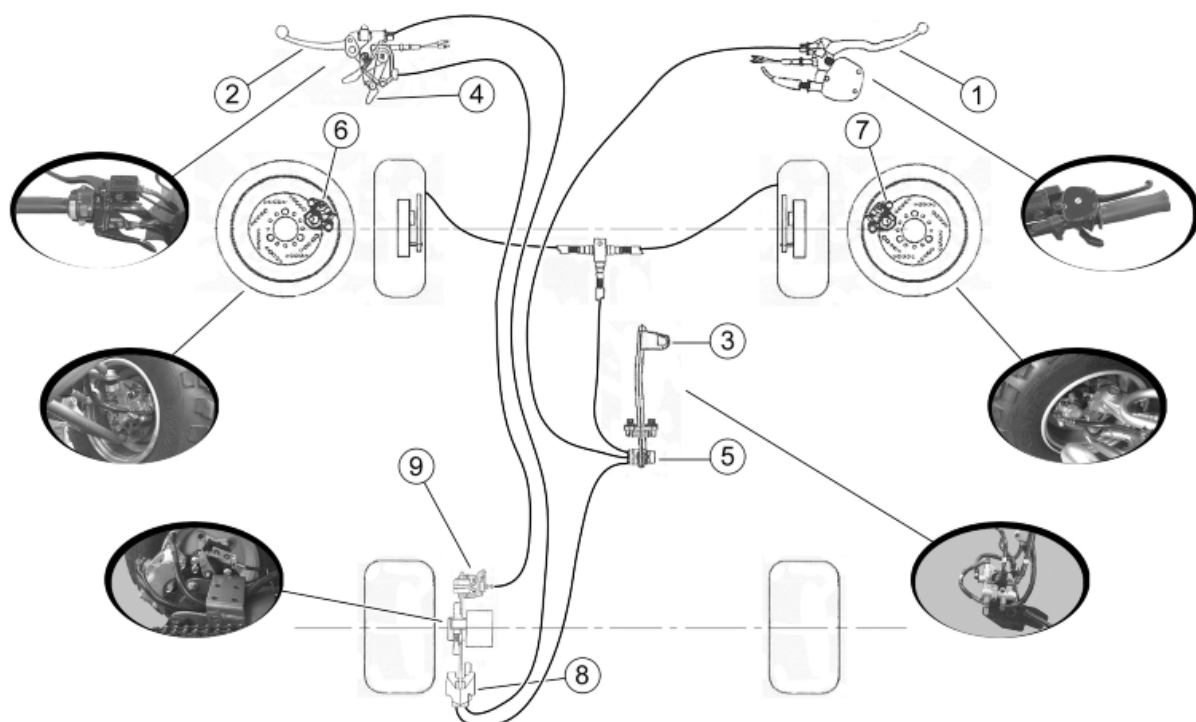
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## INDEX OF TOPICS

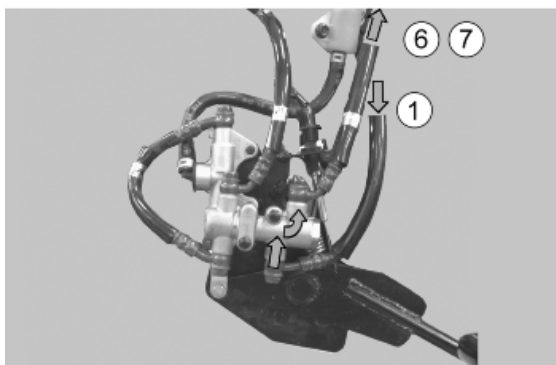
**B**RAKING SYSTEM

**BRAK SYS**

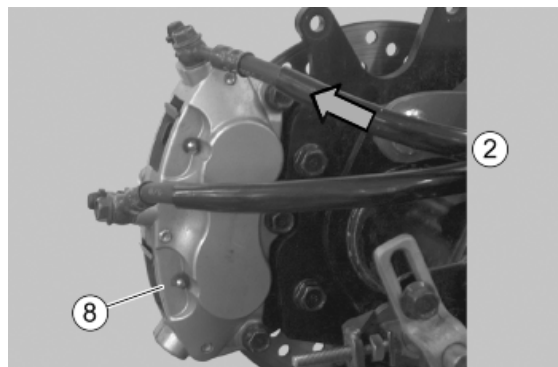


The braking system has four brake controls:

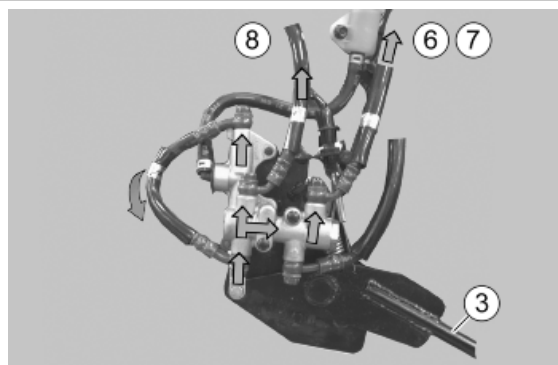
- The front braking control «1».
  - The rear braking control «2».
  - The foot brake «3» (integral braking).
  - The parking brake «4».
  - The brake distributor «5».
- Operating the control «1», through the brake distributor «5», the front brake callipers «6» and «7» are activated.



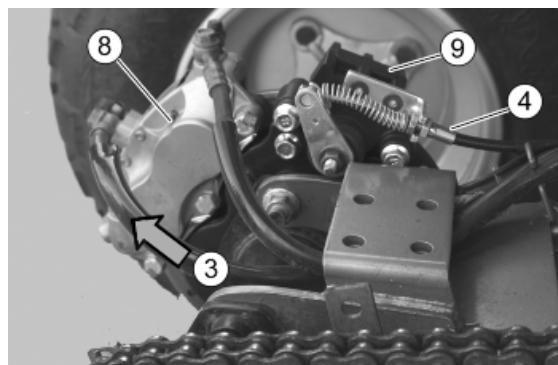
- Operating the control «2», the rear calliper «8» is directly activated.



- Operating the control «3», through the brake distributor «5», the front brake callipers «6» and «7» and the rear brake calliper «8» are activated.



- Operating the parking brake «4», by mechanical action, the parking calliper «9» is activated.



## Interventions rules

General rules for maintenance operations on the hydraulic braking system.

### WARNING

**HYDRAULIC OIL IS CORROSIVE: ALWAYS WEAR PROTECTIVE GLOVES.**

**IN THE EVENT OF ACCIDENTAL CONTACT WITH THE EYES, RINSE THE CONTACT AREA WELL WITH COPIOUS AMOUNTS OF WATER.**

**USED HYDRAULIC OIL CAN HARM THE ENVIRONMENT. COLLECTION AND DISPOSAL SHOULD BE CARRIED OUT IN COMPLIANCE WITH CURRENT REGULATIONS.**

### N.B.

**FOR TOPPING UP AND CHANGE, USE ONLY BRAKE FLUID DOT4 - NHTSA 116.**

**OBSERVE THE MAXIMUM DEGREE OF CLEANLINESS. HYDRAULIC FLUID IS EXTREMELY CORROSIVE FOR PAINTED SURFACES.**

**BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR.**

**IF THE MOISTURE CONTENT IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, IT WILL RESULT IN POOR BRAKING EFFICIENCY DUE TO A LOW BOILING POINT OF THE FLUID.**

### N.B.

**ALWAYS STORE THE FLUID IN SEALED CONTAINERS.**

**UNDER NORMAL DRIVING AND CLIMATIC CONDITIONS YOU SHOULD CHANGE THE FLUID EVERY TWO YEARS. IF THE BRAKES ARE USED INTENSELY AND/OR IN HARSH CONDITIONS, CHANGE THE FLUID MORE FREQUENTLY.**

**DURING INSTALLATION, THE PARTS TO BE REUSED MUST BE ABSOLUTELY CLEAN AND FREE FROM ANY TRACES OF OIL, FUEL AND GREASE: IT IS THEREFORE NECESSARY TO CLEAN THOROUGHLY WITH DENATURED ALCOHOL.**

**N.B.**

**RUBBER PARTS SHOULD NEVER BE LEFT IN ALCOHOL LONGER THAN 20 SECONDS. AFTER WASHING, THE PIECES MUST BE DRIED WITH A BLAST OF COMPRESSED AIR AND A CLEAN CLOTH.**

**THE SEAL RINGS MUST BE IMMERSSED IN THE OPERATING FLUID; THE USE OF PRF1 PROTECTIVE DEVICE IS ALLOWED.**

**WARNING**

**THE PRESENCE OF BRAKE FLUID ON THE DISC OR BRAKE PADS REDUCES BRAKING EFFICIENCY.**

**IN THIS CASE, REPLACE THE PADS AND CLEAN THE DISC WITH A HIGH-QUALITY SOLVENT.**

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## Rear brake calliper

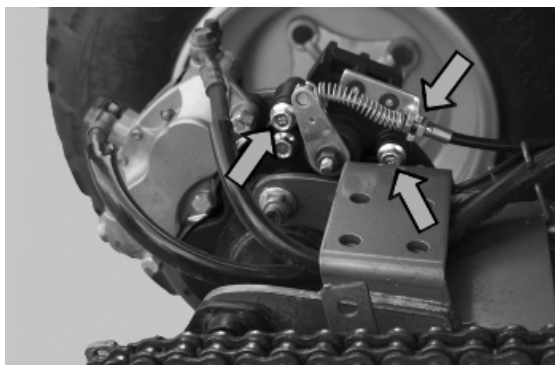
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### Removal

#### **PARKING CALLIPER:**

To remove the floating single-plunger calliper:

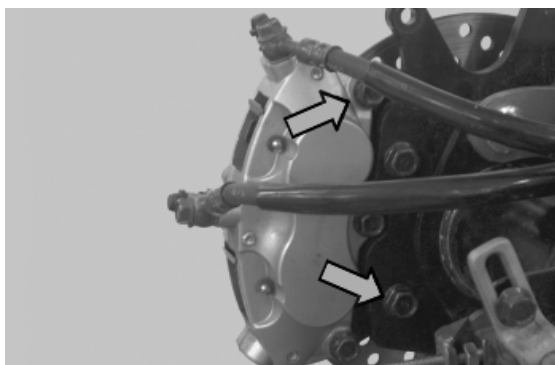
- Loosen the nuts and release the cable.
- Unscrew the two retainers to the support bracket.



#### **REAR CALLIPER:**

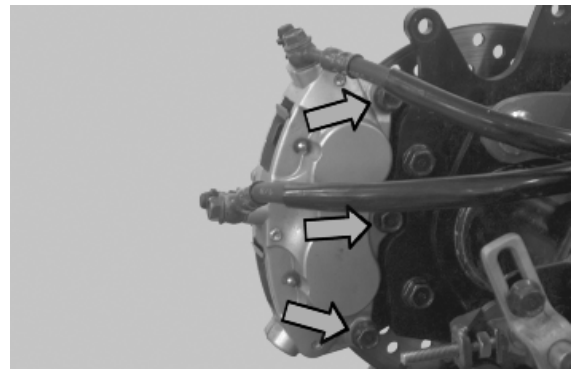
To remove the four counteracting plunger calliper:

- Unscrew the two clamps and remove the calliper and collect the spacer washers.





- To remove the calliper from the connecting bracket to the rear hub, undo the three screws indicated.

**Characteristic****Minimum value**1.5 mm

---

**Refitting****PARKING CALLIPER:**

- Follow the removal steps but in reverse order; be careful to tighten to the prescribed torque.

**Locking torques (N\*m)****Parking calliper - support bracket 28÷30**

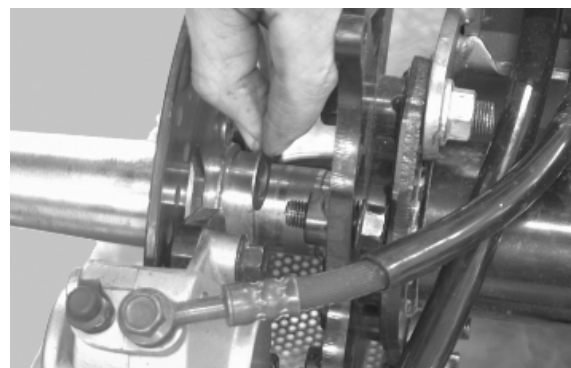
---

**REAR CALLIPER:**

- Follow the removal steps but in reverse order; be careful to tighten to the prescribed torque.

**CAUTION****ADEQUATELY INSERT THE SPACER WASHER BETWEEN THE CALLIPER SUPPORT BRACKET AND THE REAR HUB.****Locking torques (N\*m)****Rear brake calliper - support bracket 40÷45 Sup-  
port bracket - rear hub 28÷30**

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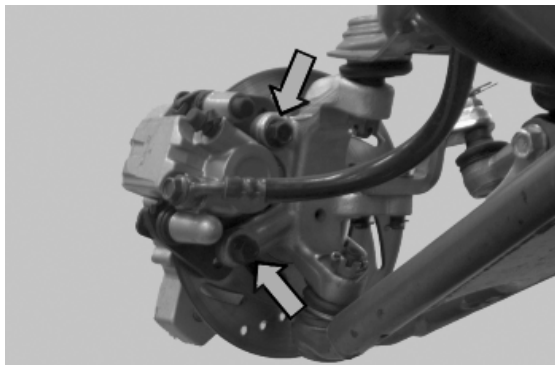
**Front brake calliper**

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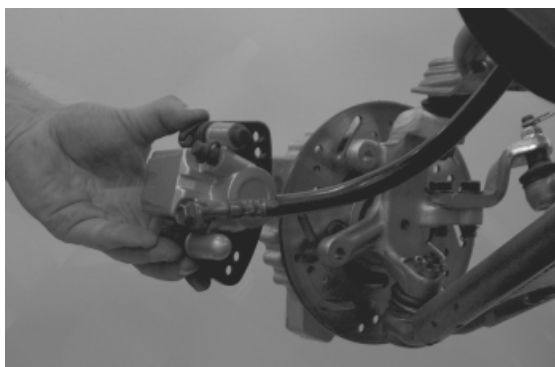
## Removal

The operations are described only once but they apply to both callipers.

- Remove the wheel.
- Remove the two fixing screws.



- Remove the calliper.



---

## Refitting

- Follow the removal steps but in reverse order; be careful to tighten to the prescribed torque.

### Locking torques (N\*m)

Front calliper - hub 38÷40 Brake fluid pipe-calliper fitting 18÷22

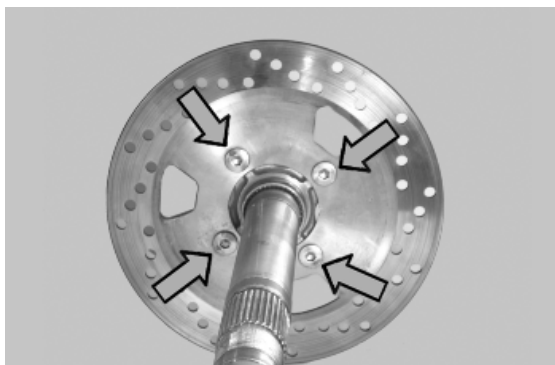
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## Rear brake disc

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## Removal

- Remove the disc holder flange following to the procedures indicated in the Suspensions/Rear/Rear wheel axle/Removal chapter.
- Once the disc holder flange has been removed, undo the four fixing screws.



## Refitting

- To refit, follow the removal steps but in reverse order; using the recommended product and be careful to tighten to the prescribed torque.

### Recommended products

(°) Loctite 243 Medium-strength threadlock

Apply LOCTITE 243 medium-strength threadlock

### Locking torques (N\*m)

Disc - flange coupling screws 18÷22 (°)

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## Disc Inspection

Checking the disc is important; it must be perfectly clean, with no sign of rust, oil or grease or any other dirt, and must show no signs of deep scoring.

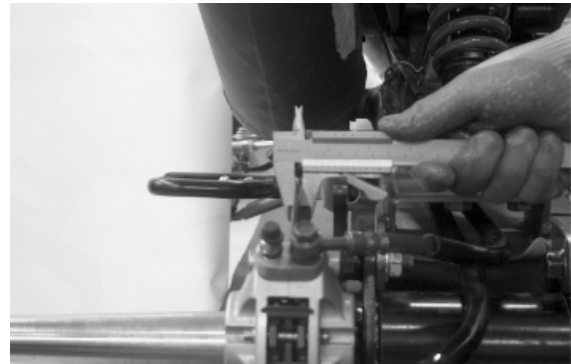
### Characteristic

#### New rear disc thickness

4.0 mm

#### Disc thickness at wear limit (rear)

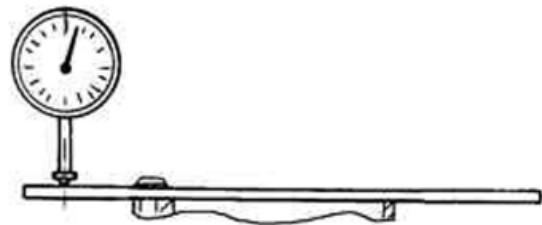
3.5 mm



- Remove the calliper and use the specific tool to check that the axial deviation of the braking surface is within the prescribed limits.

- If this is not the case, replace the disc and repeat the test.

**WHEN INSTALLING, THOROUGHLY CLEAN THE DISC AND ITS SEAT ON THE HUB.**



### Characteristic

#### Max. axial run-out

0.1 mm

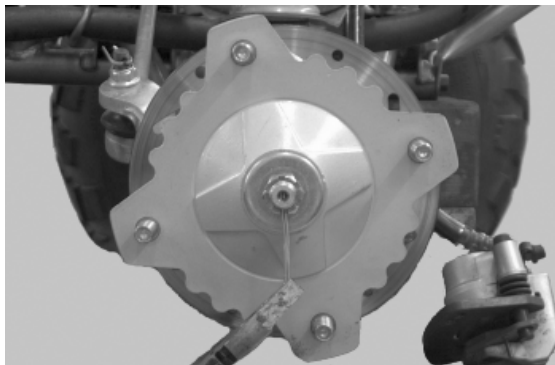
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## Front brake disc

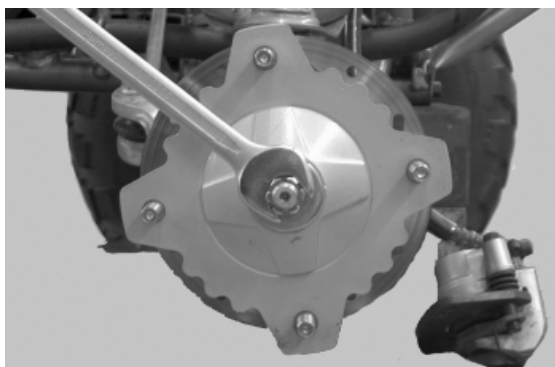
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## Removal

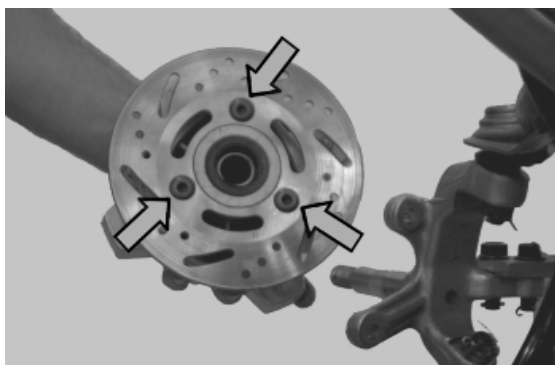
- The operations are described only once, but they apply to both discs.
- Remove the wheel.
- Remove the brake calliper.
- Remove the cotter pin.



- Unscrew the nut and collect the washer.



- Slide off the wheel hub.
- Undo the three screws fixing the hub and remove the disc.



## Refitting

Follow the removal steps but in reverse order; use the recommended product and be careful to tighten to the prescribed torque.

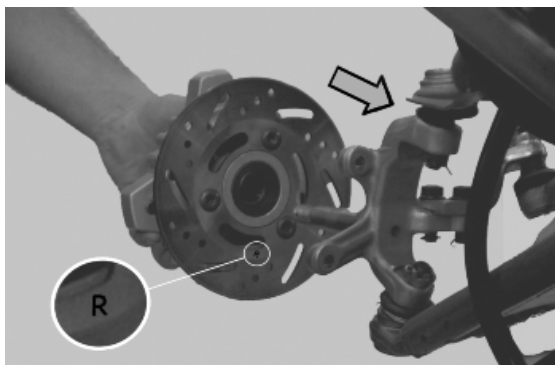
**WHEN INSTALLING, THOROUGHLY CLEAN THE DISC AND ITS SEAT ON THE HUB.**

**N.B.**

**THE BRAKE DISCS ARE MARKED WITH THE LETTER «R» FOR THE RIGHT HUB AND WITH LETTER «L» FOR THE LEFT HUB. REFIT EACH DISC ON THE CORRESPONDING HUB ACCORDING TO THE LETTER PRINTED INSIDE.**

### Recommended products

**Loctite 243 Medium strength threadlock**



Loctite 243 medium-strength threadlock

**Locking torques (N\*m)**

Disc - hub coupling screws 18÷22 (°)

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**Disc Inspection**

- The operations are described only once, but they apply to both discs.
- Check disc thickness; replace the disc if it is not within the admissible limits.

**Characteristic****Disc thickness**

3.5 mm

**Thickness**

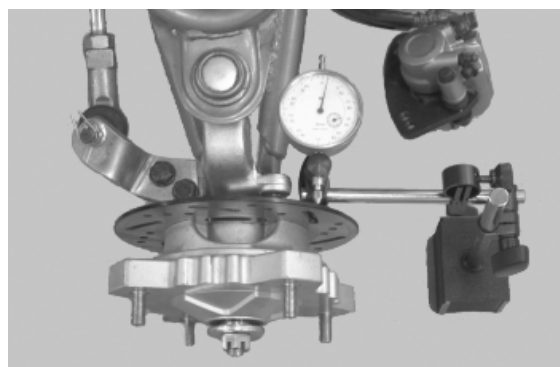
3.0 mm



- If the disc is within the admissible limits, check axial deviation. Replace it if it is not.

**Characteristic****Max. axial run-out**

0.1 mm



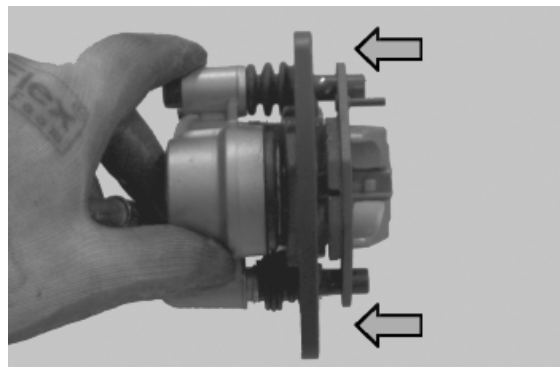
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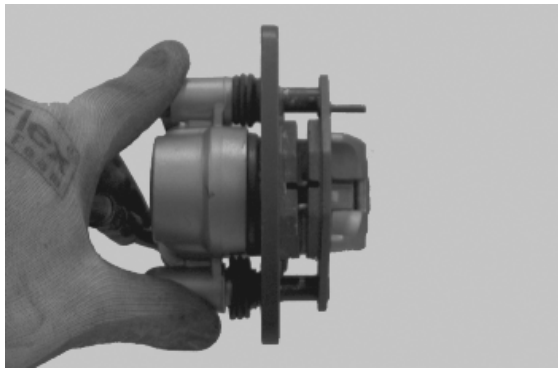
**Front brake pads**

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**Removal**

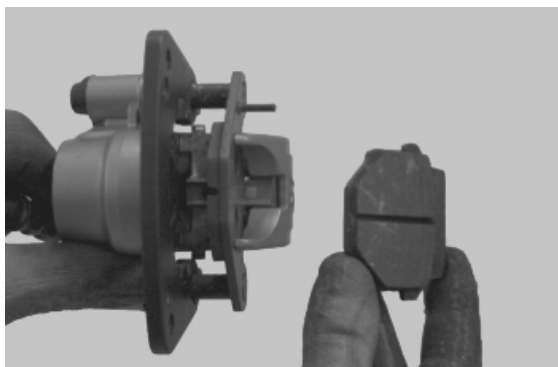
- The operations are described only once but they apply to both callipers.
- Remove the calliper.
  - Take the floating pad as far as it will go.





---

- Remove the brake pad.



---

- Release and remove the brake pad from the guide.



### **Characteristic**

#### **Minimum value**

1.5 mm

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### **Refitting**

- Carry out the removal operations but in reverse order.

---

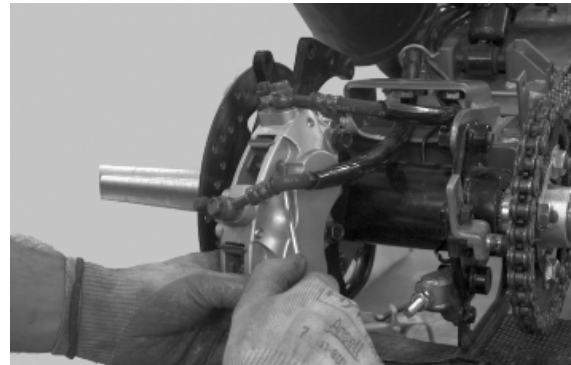
### **Rear brake pads**

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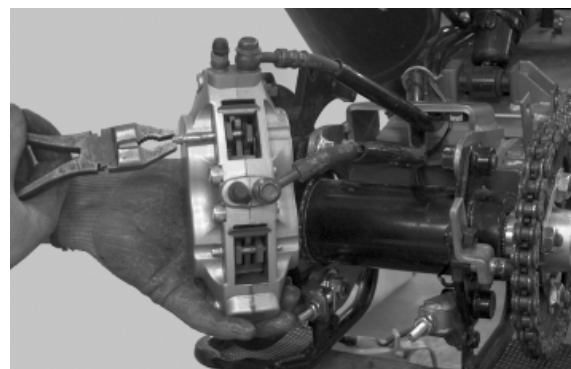
## Removal

### REAR BRAKE CALLIPER

- Remove the brake calliper.
- Remove the benzing snap ring of the pad pin.



- Slide off the pin paying attention to collect the retaining spring of the pads.

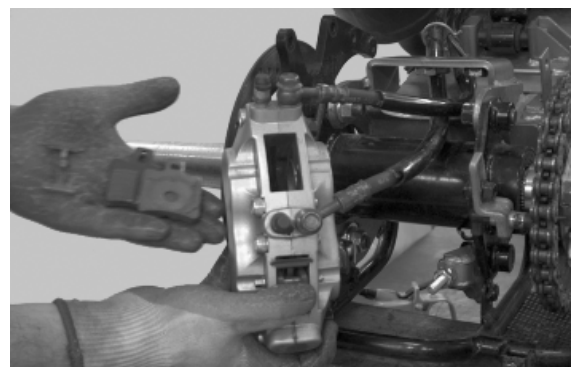


- Remove the pads.

### Characteristic

#### Minimum value

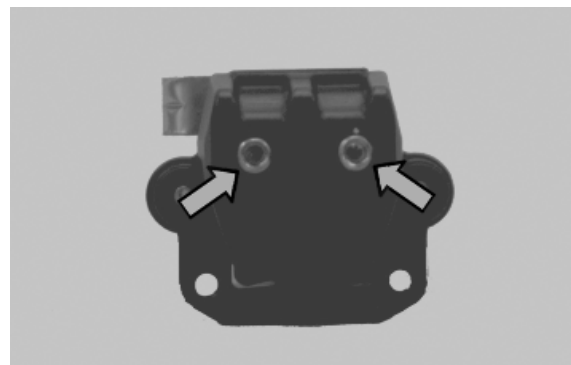
1.5 mm



The operations are described only once but they apply to both pad pairs.

### PARKING CALLIPER

- Remove the calliper.
- Undo the screws indicated.



- Remove the pads.

**Characteristic****Minimum value**

1.5 mm

---

**Refitting****REAR BRAKE CALLIPER**

Follow the removal steps but in reverse order; check that the benzing snap ring of the pad pin is in good conditions.

**Locking torques (N\*m)**

**Screws tightening the pad fixing pin 20 ÷ 25 Nm**

**PARKING CALLIPER**

Follow the removal steps but in reverse order; use the recommended product and be careful to tighten to the prescribed torque.

**Recommended products****Loctite 243 Medium strength threadlock**

Loctite 243 medium-strength threadlock

**Locking torques (N\*m)**

**Calliper screws 18÷22 (°)**

---

**Fill**

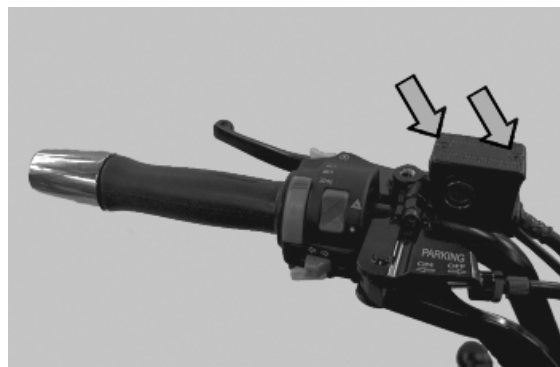
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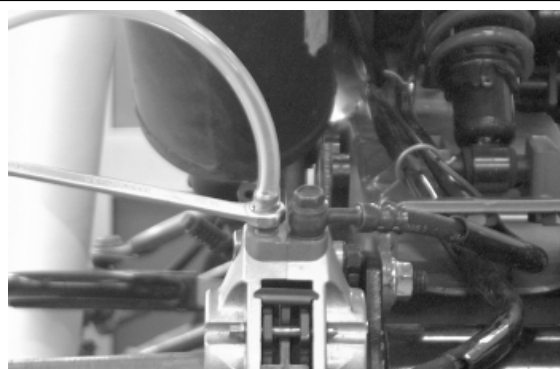
## Rear - combined

To bleed the rear braking system proceed as follows:

- Loosen the two screws shown in the figure and open the rear brake fluid reservoir.



- Through the bleed screw on the brake calliper, bleed the system using a hose of adequate diameter.
- Collect the used fluid in a container.



- Pump on the brake lever to completely drain the system of all used fluid.
- Tighten the bleed valve.
- Refill the brake system tank up to the maximum level with the prescribed fluid.
- Attach the tube of the special tool to the bleed fitting.
- Actuate the tool at the bleed fitting, at the same time constantly topping up the brake system tank to prevent air being drawn into the system, until no more air escapes at the bleed fitting. The operation is finished when only brake fluid comes out of the bleed screw.
- Close the bleed screw and tighten to the prescribed torque.
- Close the brake system tank.

### **N.B.**

**IF AIR CONTINUES TO COME OUT DURING THE BLEED OPERATION, EXAMINE ALL THE FITTINGS. IF SAID FITTINGS DO NOT SHOW SIGNS OF BEING FAULTY, LOOK FOR THE AIR INPUT AMONG THE VARIOUS SEALS ON THE PUMP AND CALLIPER PISTONS. WHEN CARRYING OUT THE OPERATION, BRAKE FLUID MAY LEAK FROM THE BLEED SCREW ON THE CALLIPER AND ON THE DISC. IN THIS CASE; CAREFULLY CLEAN THE CALLIPER AND DEGREASE THE BRAKE DISC.**

### **Specific tooling**

**020329Y MityVac vacuum-operated pump**

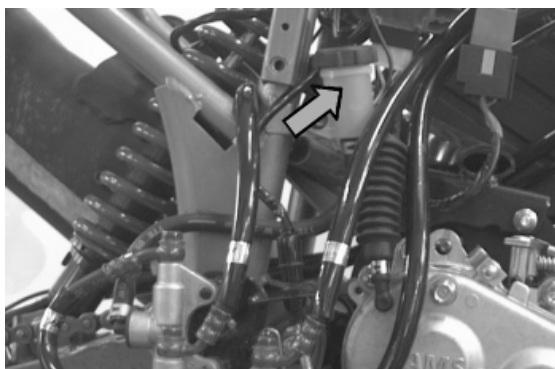
### **Locking torques (N\*m)**

**Oil bleed screw 12 - 16**

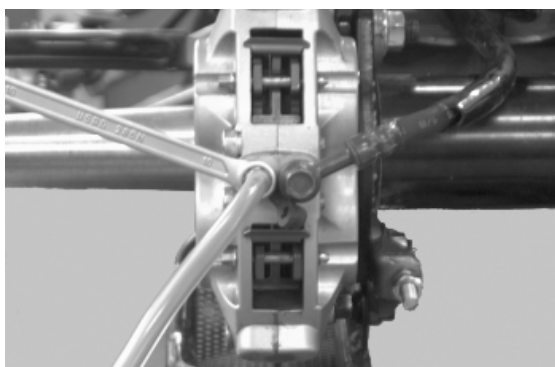
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To bleed the integral braking system proceed as follows:

- Carry out a front bleeding.
- Carry out a rear bleeding.
- Unscrew the plug and open the brake fluid reservoir.



- Through the bleed screw on the brake calliper, bleed the system using a hose of adequate diameter.
- Collect the used fluid in a container.



- Pump on the brake lever to completely drain the system of all used fluid.
- Tighten the bleed valve.
- Refill the brake system tank up to the maximum level with the prescribed fluid.
- Attach the tube of the special tool to the bleed fitting.
- Actuate the tool at the bleed fitting, at the same time constantly topping up the brake system tank to prevent air being drawn into the system, until no more air escapes at the bleed fitting. The operation is finished when only brake fluid comes out of the bleed screw.
- Close the bleed screw and tighten to the prescribed torque.
- Close the brake system tank.

N.B.

**IF AIR CONTINUES TO COME OUT DURING THE BLEED OPERATION, EXAMINE ALL THE FITTINGS. IF SAID FITTINGS DO NOT SHOW SIGNS OF BEING FAULTY, LOOK FOR THE AIR INPUT AMONG THE VARIOUS SEALS ON THE PUMP AND CALLIPER PISTONS. WHEN CARRYING OUT THE OPERATION, BRAKE FLUID MAY LEAK FROM THE BLEED SCREW ON THE CALLIPER AND ON THE DISC. IN THIS CASE; CAREFULLY CLEAN THE CALLIPER AND DEGREASE THE BRAKE DISC.**

### Specific tooling

020329Y MityVac vacuum-operated pump

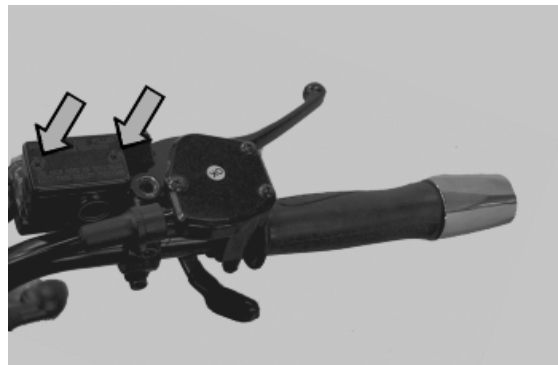
### Locking torques (N\*m)

Oil bleed screw 12 - 16

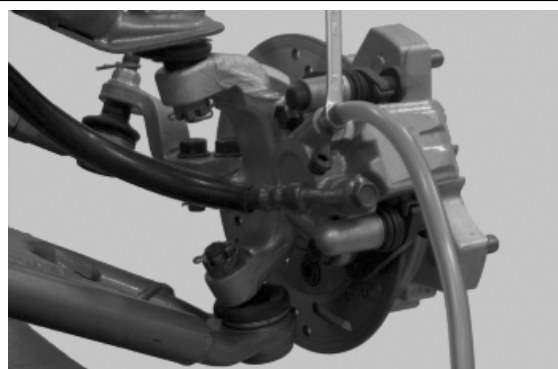
## Front

To bleed the front braking system proceed as follows:

- Loosen the two screws shown in the figure and open the front brake fluid reservoir.



- Through the bleed screw on the brake calliper, bleed the system using a hose of adequate diameter.
- Collect the used fluid in a container.



- Pump on the brake lever to completely drain the system of all used fluid.
- Tighten the bleed valve.
- Refill the braking system reservoir up to the maximum level with the prescribed fluid.
- Attach the tube of the special tool to the bleed fitting.
- Actuate the tool at the bleed fitting, at the same time constantly topping up the braking system reservoir to prevent air being drawn into the system, until no more air escapes at the bleed fitting. The operation is finished when only brake fluid comes out of the bleed screw.
- Close the bleed screw and tighten to the prescribed torque.
- Close the brake system reservoir.

### N.B.

**IF AIR CONTINUES TO COME OUT DURING THE BLEED OPERATION, EXAMINE ALL THE FITTINGS. IF SAID FITTINGS DO NOT SHOW SIGNS OF BEING FAULTY, LOOK FOR THE AIR INPUT AMONG THE VARIOUS SEALS ON THE PUMP AND CALLIPER PISTONS. WHEN CARRYING OUT THE OPERATION, BRAKE FLUID MAY LEAK FROM THE BLEED SCREW ON THE CALLIPER AND ON THE DISC. IN THIS CASE; CAREFULLY CLEAN THE CALLIPER AND DEGREASE THE BRAKE DISC.**

### Specific tooling

020329Y MityVac vacuum-operated pump

### Locking torques (N\*m)

Oil bleed screw 8÷12

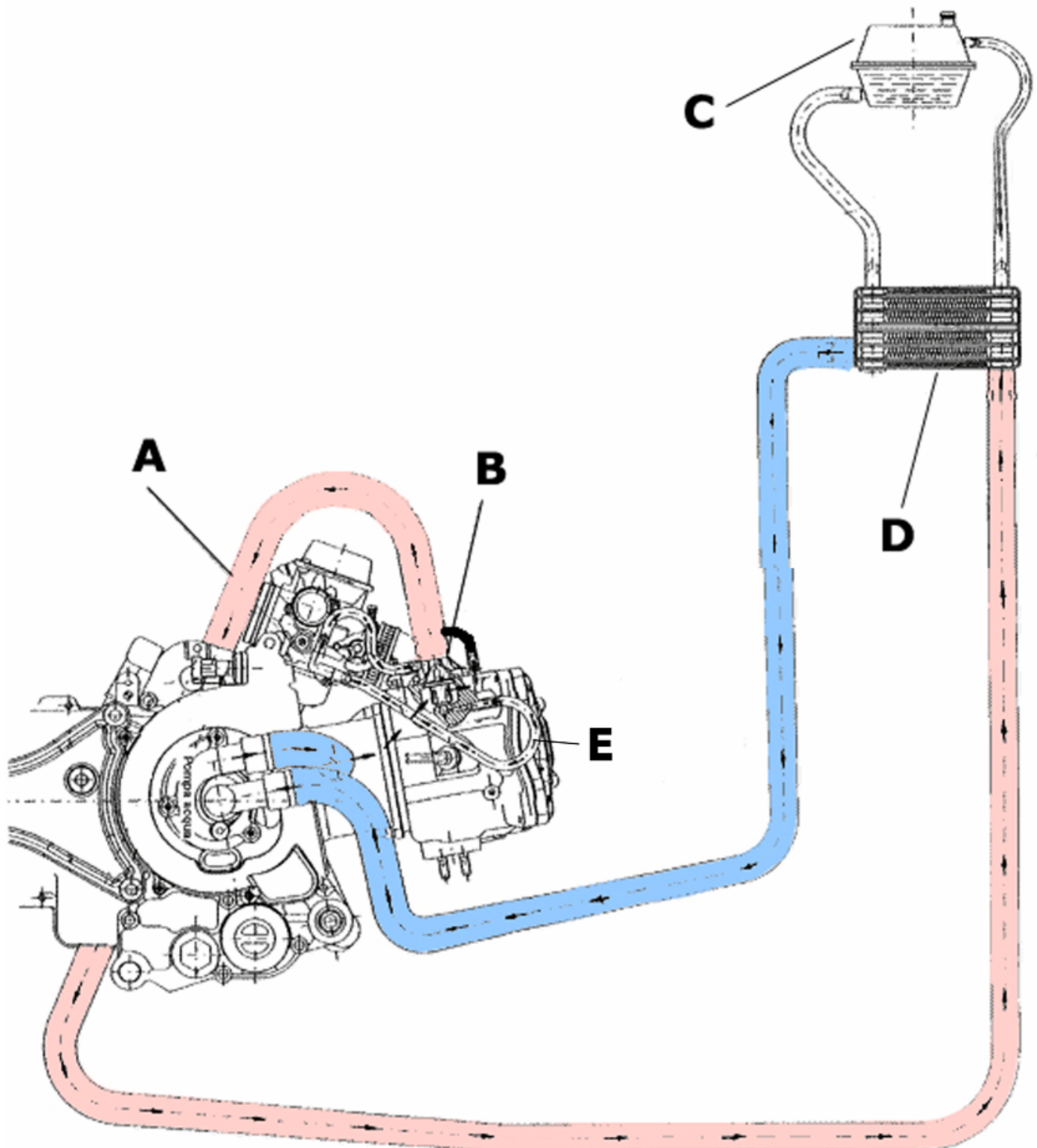
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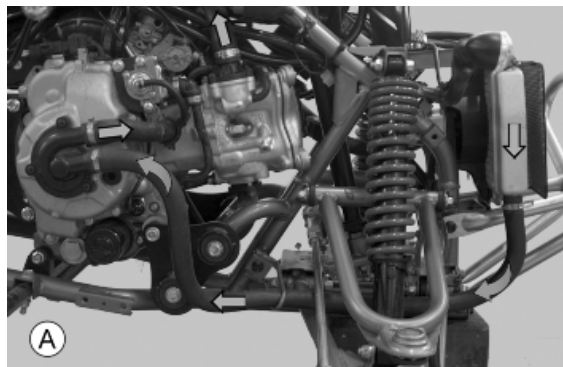
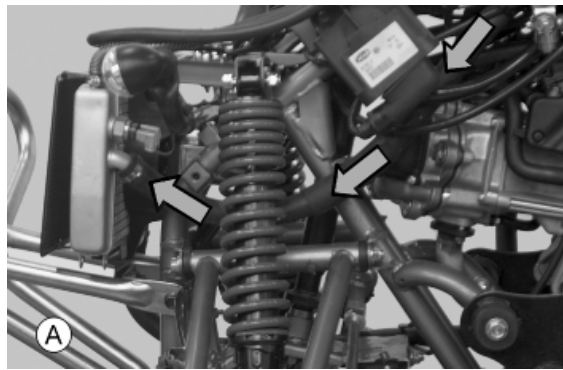
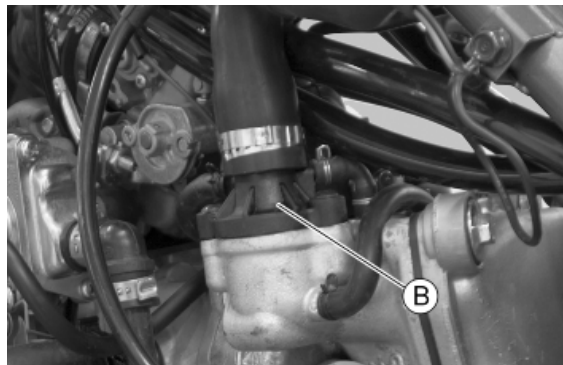
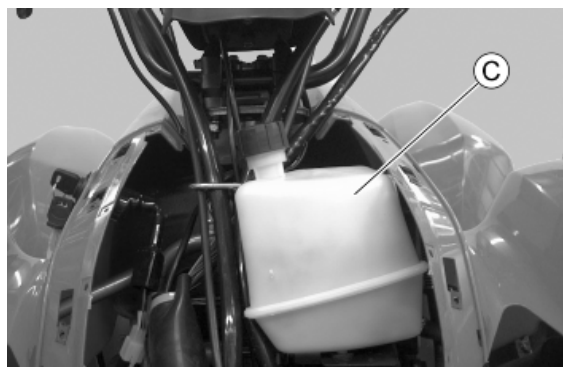
**INDEX OF TOPICS**

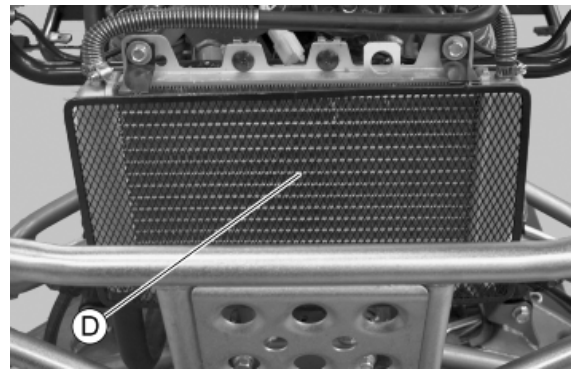
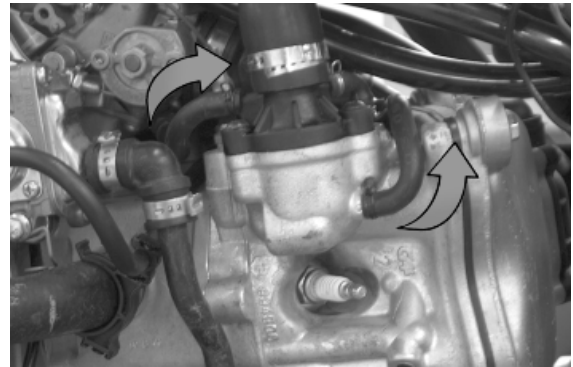
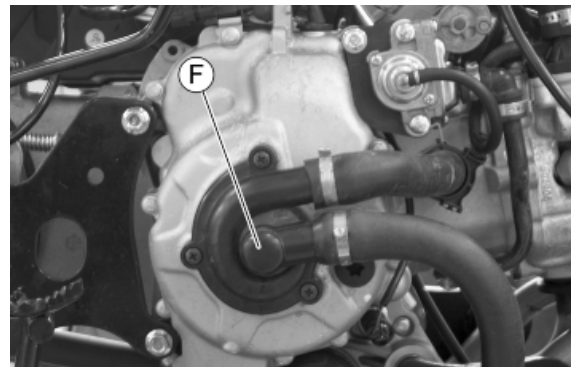
**COOLING SYSTEM**

**COOL SYS**

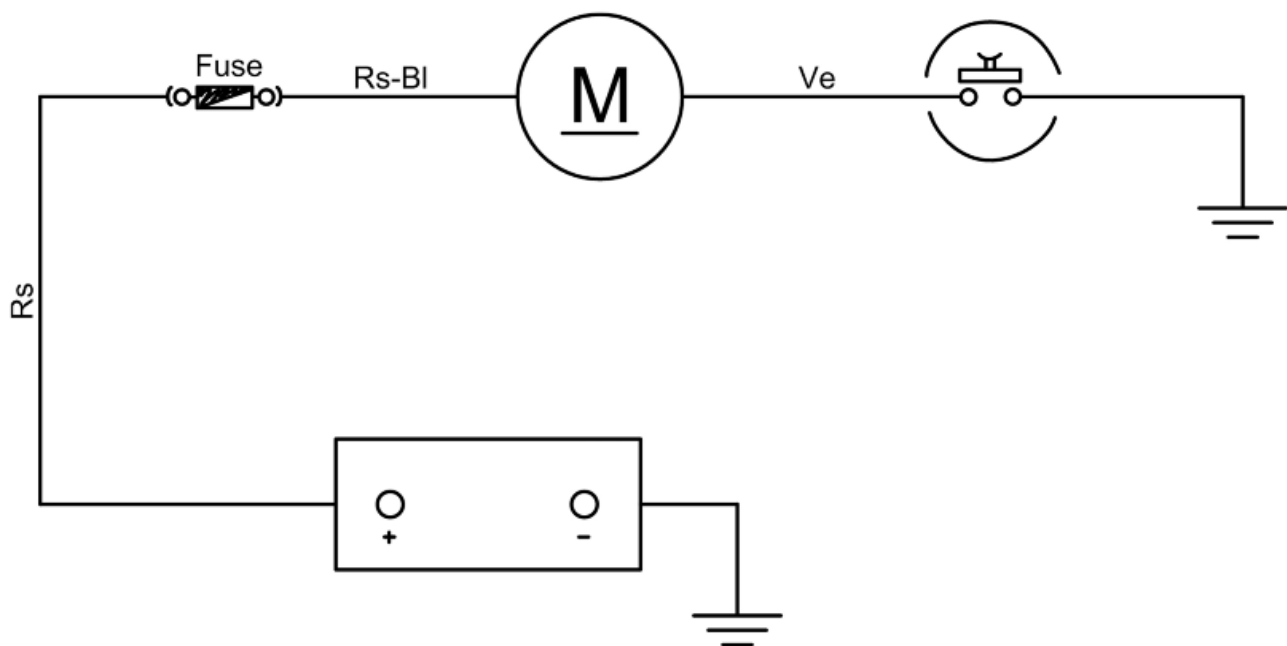
## Circuit diagram



**A. Cooling circuit fluid****B. Thermostat with By-Pass****C. Expansion tank**

**D. Radiator****E. Carburettor heating circuit****F. Water pump**

## Electric fan check

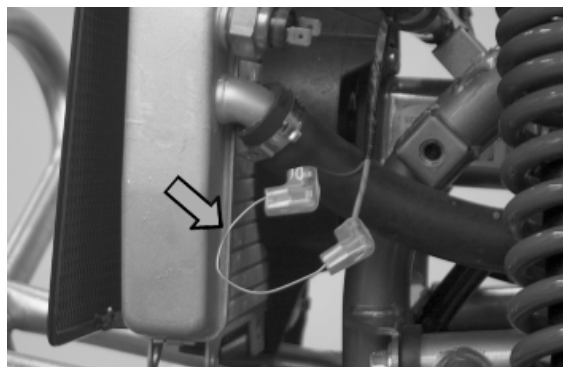
**KEY:**

- 5. Fuse unit
- 11. Battery
- 31. Thermoswitch
- 32. Electric fan

**Electric fan operation check**

To carry out the electric fan operation check, proceed as follows:

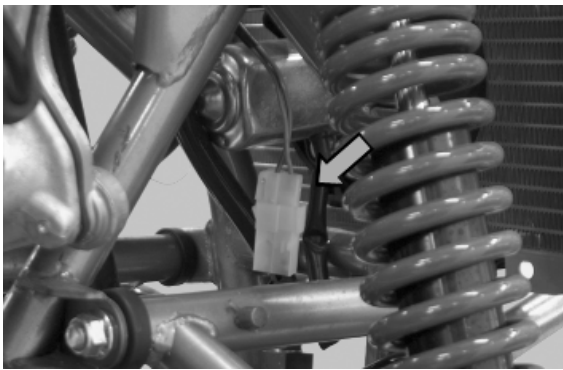
- Remove the front shield.
- Disconnect the two electric terminals from the thermoswitch and connect them together.





If it does not work:

- Make sure the connector is properly inserted.



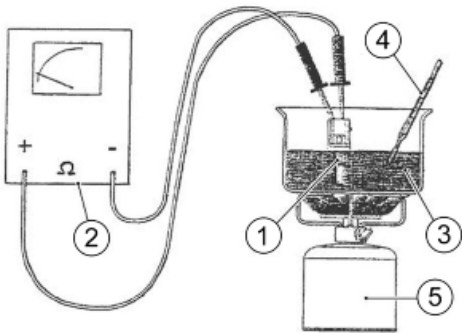
- Rotate the fan manually and check that the blades do not touch the support.

If the fan rotates freely:

- Check the battery recharge system and the main fuse.

**Thermoswitch operation check:**

- Remove the front shield.
- Remove the thermoswitch «1».
- Connect a tester «2» (set as ohmmeter) to the thermoswitch «1» as shown in the figure.
- Immerse the thermoswitch in a container «3» with coolant.



- In the same container, immerse a thermometer «4» with a temperature range of 0°÷150° (32° ÷302°F).
- Place the container on a stove «5» and warm up the coolant slowly.
  - Check that the temperature indicated on the thermometer and the thermoswitch value indicated on the tester correspond to the data on the table.

**COOLANT TEMPERATURE °C (°F) / RESISTANCE VALUES (OHM)**

| Specification        | Desc./Quantity |
|----------------------|----------------|
| Less than 90° (194°) | Unlimited      |
| More than 90° (194°) | 0              |

**Thermostat**

---

## Removal

- Loosen the two screws indicated in the figure and remove the thermostat cover.
- Remove the thermostat with its gasket.



---

## Check

- Visually check that the thermostat is not damaged.
- Prepare a metal container with approx. 1 litre of water.
- Immerse the thermostat, keeping it in the centre of the container.
- Immerse the multimeter temperature probe, near the thermostat.
- Warm up the container using the heat gun.
- Check the temperature when the thermostat starts to open:
- Warm up until the thermostat opens completely.
- Replace the thermostat if it does not work properly.



### CAUTION

TO EXECUTE THE TEST CORRECTLY, MAKE SURE NEITHER THE THERMOSTAT NOR THE THERMOMETER TOUCHES THE CONTAINER.

### Specific tooling

020331Y Digital multimeter

020151Y Air heater

### Characteristic

**Thermostat check: opening travel**

3.5 mm at 80°C

**Thermostat check: Opening start temperature**

69.5 ÷ 72.5°C

## Refitting

- Place the thermostat with the bleeding hole at the highest point.
- Make sure that the rubber gasket is positioned properly.
- Fit the thermostat cover with the connection for the carburettor heating pipe facing the flywheel.
- Tighten the two screw to the torque indicated below.



### Locking torques (N\*m)

Thermostat cover screws 3 ÷ 4

---

INDEX OF TOPICS

CHASSIS

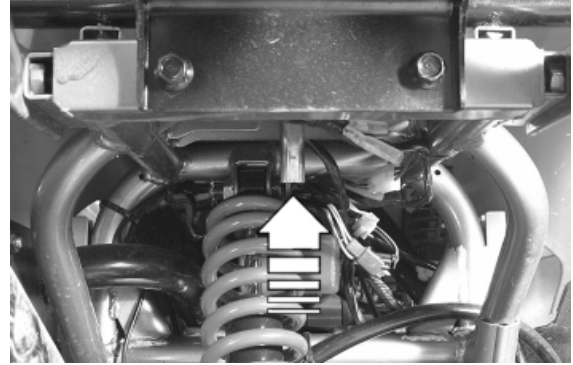
CHAS

This section è is devoted to the operations that can be carried out on the vehicle's bodywork.

---

## Seat

- Push the hook placed near the rear shock absorber.



- Remove the saddle.



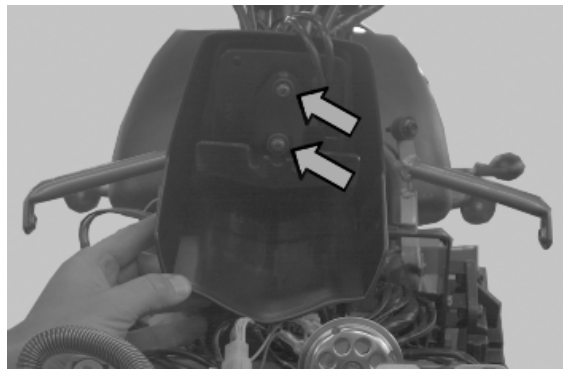
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## Instrument panel

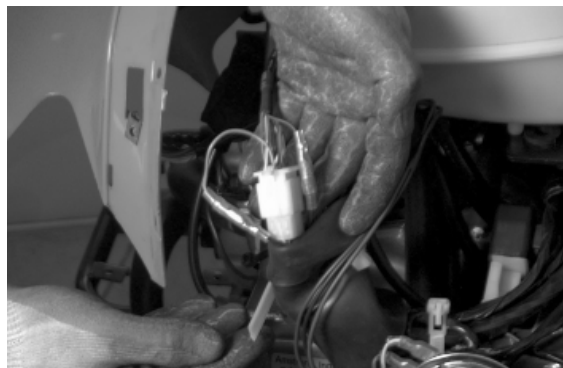
- Remove the front shield.
- Loosen the two screws indicated and slide off the bracket with the instrument panel.



- Undo the two screws and disconnect the instrument panel from the supporting bracket.



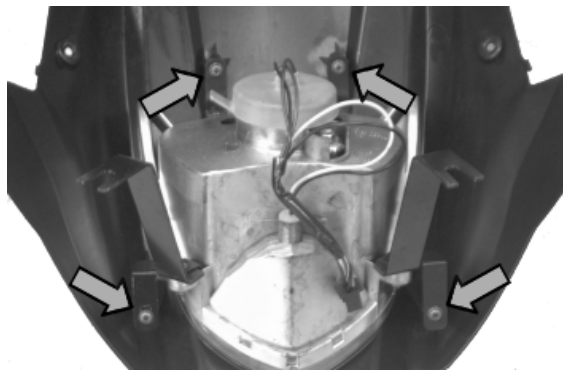
- Disconnect the connector.



---

## Headlight assy.

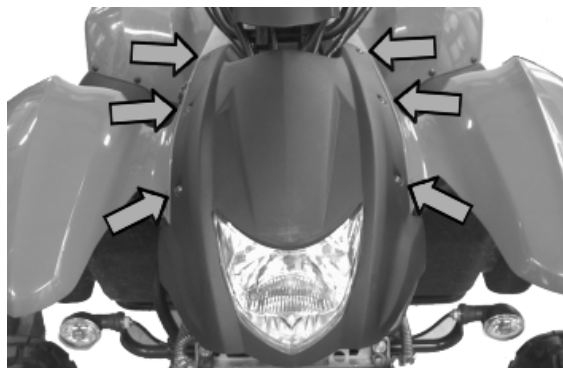
- Remove the front shield.
- Undo the four screws indicated.



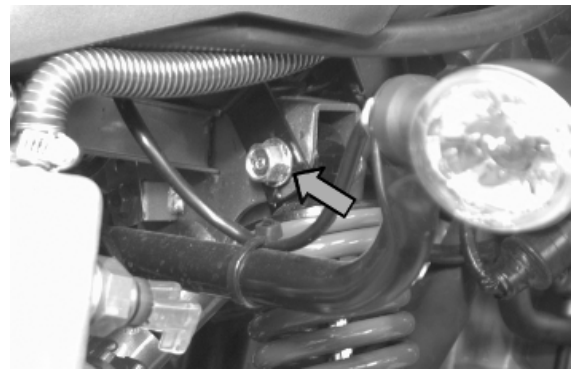
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## Legshield

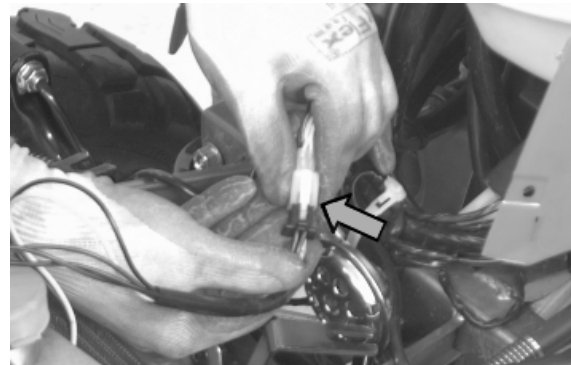
- Undo the six screws indicated.



- Loosen both upper screws of the front shock absorbers so as to disconnect the lower supporting brackets of the front shield.



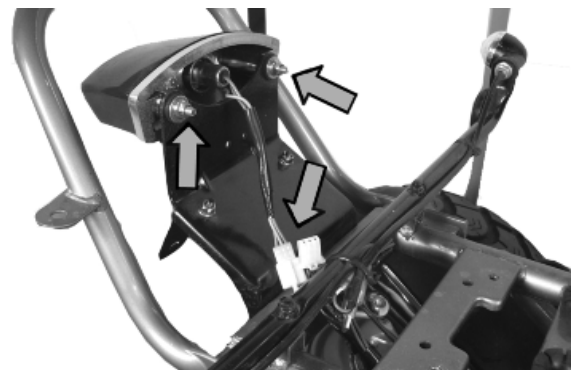
- Disconnect the front headlight assembly connector and remove the front shield.



---

### Taillight assy.

- Remove the rear mudguard.
- Disconnect the connector indicated.
- Undo the two connecting screws to the chassis.
- Remove the rear light assembly.

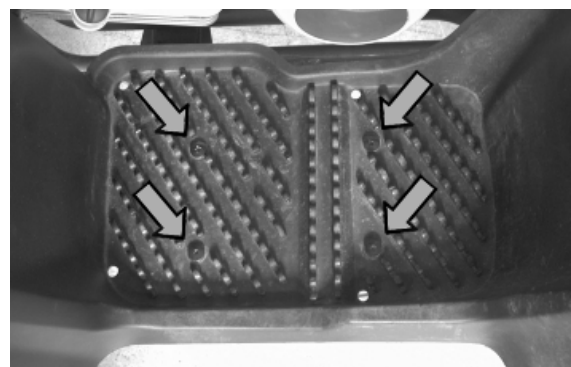


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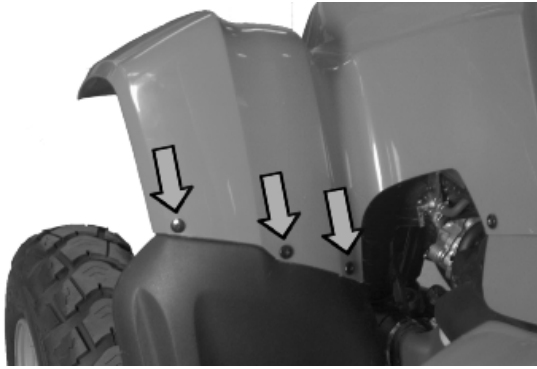
### Footrest

The operations are described only once but they apply to both footrests.

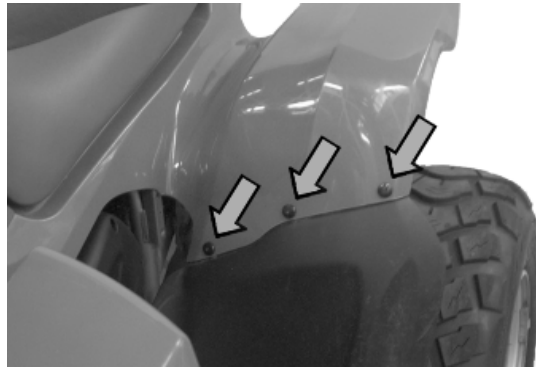
- Undo the four screws indicated.



- Undo the three connecting screws to the front mudguard.



- Undo the three connecting screws to the rear mudguard.



- Remove the left footrest and collect the rubber spacers underneath.



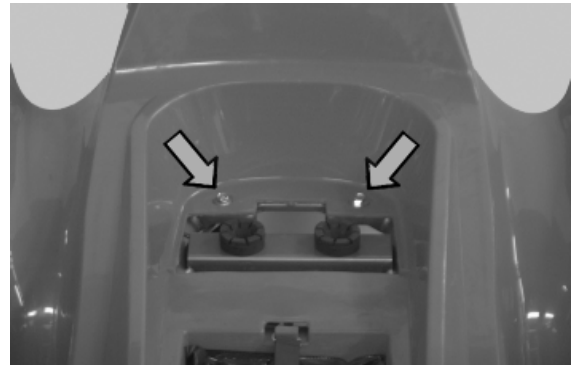
- To remove the footrest support, undo the three connecting screws to the chassis.



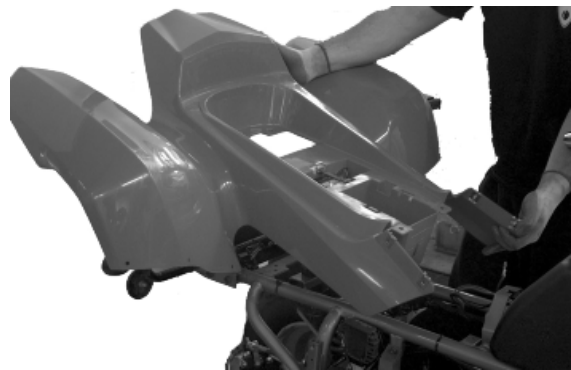


## Rear mudguard

- Remove the front mudguard
- Remove the battery.
- Remove the two screws connecting it to the chassis.



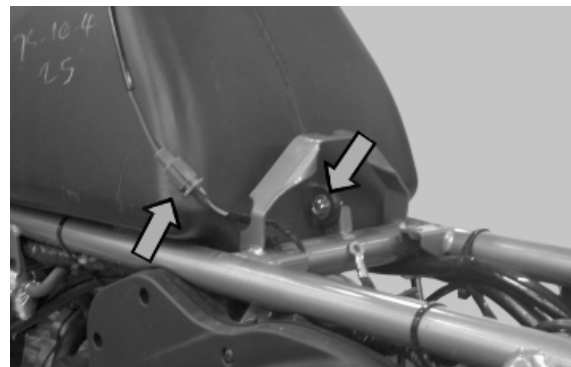
- Remove the rear mudguard.



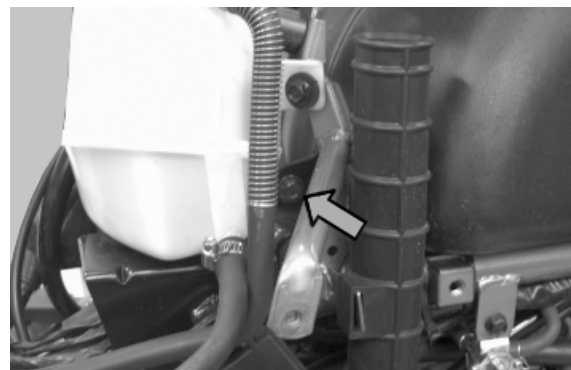
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## Fuel tank

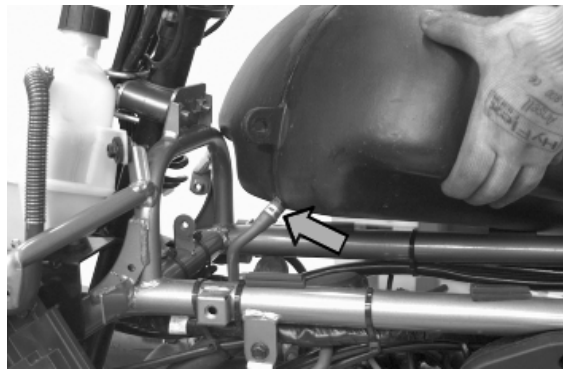
- Remove the front mudguard
- Remove the rear mudguard.
- Disconnect the float connector.
- Undo the connecting screw to the chassis placed in the rear side of the tank.



- Undo the connecting screw to the chassis placed in the front side of the tank.

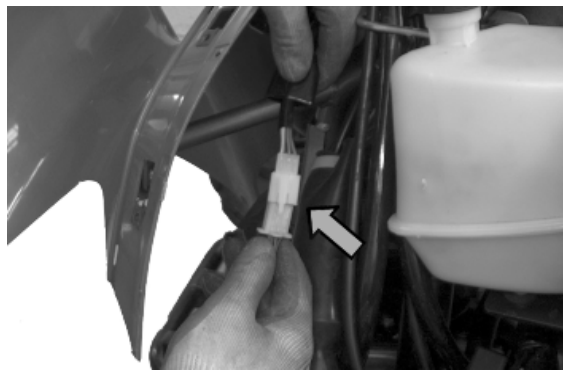


- Disconnect the delivery fuel pipes and remove the tank.

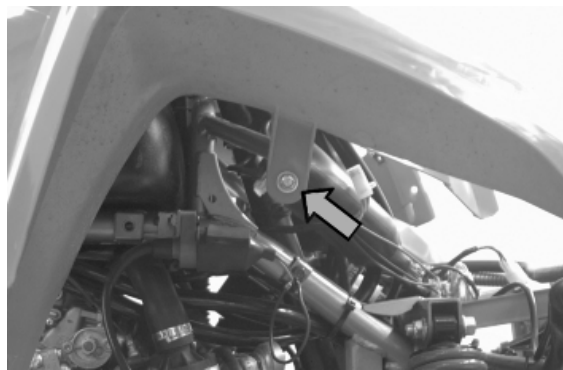


## Front mudguard

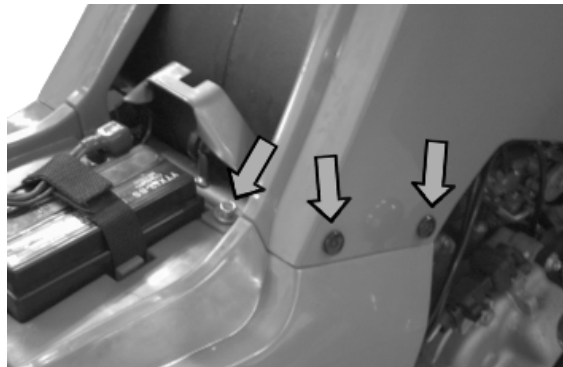
- Remove the saddle.
- Remove the footrests.
- Remove the front shield.
- Disconnect the start-up lock connector.



- Undo the connecting screw to the chassis inside the mudguard from both sides.



- Undo the three screws indicated from both sides.

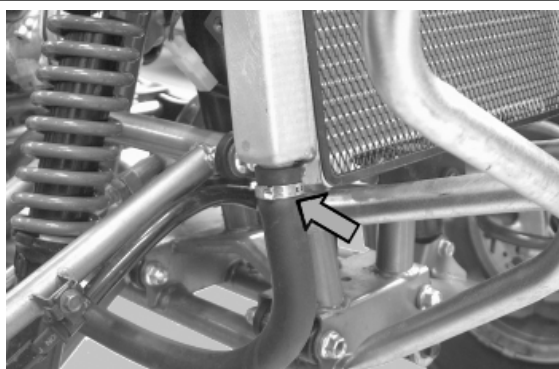


- Remove the fuel tank cap.
- Remove the front mudguard

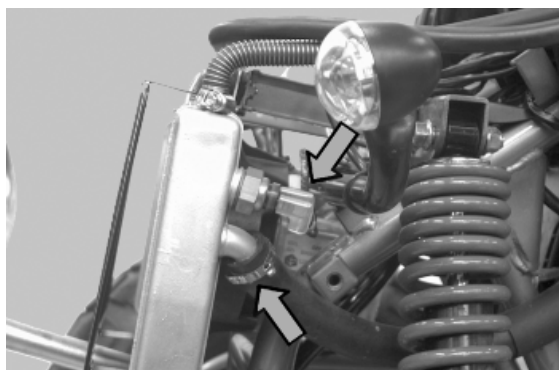


## Radiator fan

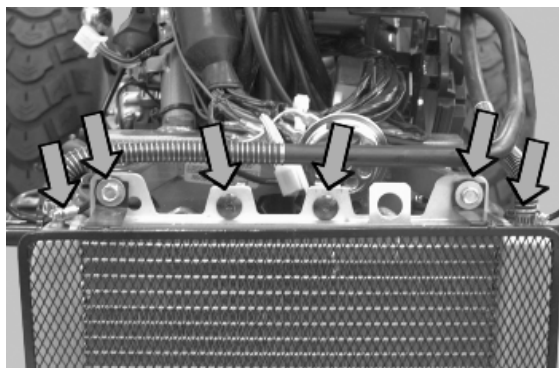
- Remove the front mudguard
- Place a container of suitable capacity to collect the coolant.
- Unscrew the expansion tank cap to facilitate coolant drainage.
- Disconnect the outlet pipes to the radiator.



- Disconnect the electrical terminals of the thermostat.
- Disconnect the delivery pipes to the radiator and collect the coolant.



- Disconnect the two delivery and outlet pipes of the expansion tank and the four connecting screws to the chassis placed in the upper section.



- Release the radiator from the lower fittings and remove the radiator with the protection grille.
- To refit, follow the removal steps but in reverse order; be careful to refill and purge the cooling system.

### CAUTION



**STARTING THE ENGINE WITHOUT HAVING PURGED IT MAY CAUSE SERIOUS DAMAGE.**

---

## Battery

- Remove the saddle.
- Disconnect both leads, the negative (-) first, then the positive (+).
- Remove the battery by pulling it upwards, using the velcro strap.



INDEX OF TOPICS

PRE-DELIVERY

PRE DE

Carry out the listed tests before delivering the vehicle.

Warning- be very careful when handling fuel.

---

## Aesthetic inspection

### Appearance check:

- Paintwork
- Fitting of plastics
- Scratches
- Dirt

---

## Tightening torques inspection

### Lock check

- Safety locks
- clamping screws

### Safety locks

---

Rear shock absorber upper fixing

---

Rear shock absorber lower fixing

---

Front wheel axle nut

---

Wheel hub nut

---

Frame - swinging arm bolt \*

---

Swinging arm bolt - Engine

---

Engine arm pin - Frame arm

---

Handlebar lock nut

---

Steering lower ring nut

---

Upper steering ring nut

---

## Electrical system

Electrical system:

- Main switch
  - Headlamps: high beam, low beam, position and parking lights and the respective warning lights
  - Adjusting the headlights according to the regulations currently in force
  - Rear light, parking light, stop light
  - Front and rear stop light switches
  - Turn indicators and their warning lights
  - Instrument panel lights
  - Instrument panel: fuel and temperature indicator
  - Instrument panel warning lights
-

- Horn
- Starter

**CAUTION**

TO ENSURE MAXIMUM PERFORMANCE, THE BATTERY MUST BE CHARGED BEFORE USE. INADEQUATE CHARGING OF THE BATTERY WITH A LOW LEVEL OF ELECTROLYTE BEFORE IT IS FIRST USED SHORTENS BATTERY LIFE.

**WARNING**

BEFORE RECHARGING THE BATTERY, REMOVE THE CAPS OF EACH CELL. KEEP THE BATTERY AWAY FROM NAKED FLAMES OR SPARKS WHILE IT IS CHARGED. REMOVE THE BATTERY FROM THE SCOOTER, DISCONNECTING THE NEGATIVE TERMINAL FIRST.

**CAUTION**

WHEN INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEGATIVE LEAD.

**WARNING**

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH EYES, SKIN AND CLOTHING.

IN CASE OF CONTACT WITH EYES OR SKIN, RINSE WITH ABUNDANT WATER FOR ABOUT 15 MINUTES AND SEEK MEDICAL ATTENTION AT ONCE.

IF IT IS SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.

BATTERIES PRODUCE EXPLOSIVE GAS; KEEP THEM AWAY FROM NAKED FLAMES, SPARKS AND CIGARETTES. IF THE BATTERY IS CHARGED IN A CLOSED PLACE, TAKE CARE TO ENSURE ADEQUATE VENTILATION. ALWAYS PROTECT YOUR EYES WHEN WORKING CLOSE TO BATTERIES.

KEEP OUT OF THE REACH OF CHILDREN

**CAUTION**

NEVER USE FUSES WITH A CAPACITY HIGHER THAN THE RECOMMENDED CAPACITY. USING A FUSE OF UNSUITABLE RATING MAY SERIOUSLY DAMAGE THE VEHICLE OR EVEN CAUSE A FIRE.

---

## Levels check

Level check:

- Hydraulic braking system fluid level.
  - Rear hub oil level
  - Engine coolant level.
- 

## Road test

**Test ride**

- Cold start
  - Instrument operations
  - Response to the throttle control
  - Stability on acceleration and braking
  - Rear and front brake efficiency
  - Rear and front suspension efficiency
-

- Abnormal noise
- 

## Static test

Static control after the test ride:

- Starting when warm
- Starter operation
- Minimum hold (turning the handlebar)
- Uniform turning of the steering
- Possible leaks

### CAUTION

**CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.**

### CAUTION

**NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.**

---

## Functional inspection

Functional check up:

Braking system (hydraulic)

- Lever travel

Braking system (mechanical)

- Lever travel

Clutch

- Proper functioning check

Engine

- Throttle travel check

Others

- Check documentation
  - Check the frame and engine numbers
  - Tool kit
  - License plate fitting
  - Check locks
  - Check tyre pressures
  - Installation of mirrors and any accessories
-



INDEX OF TOPICS

TIME

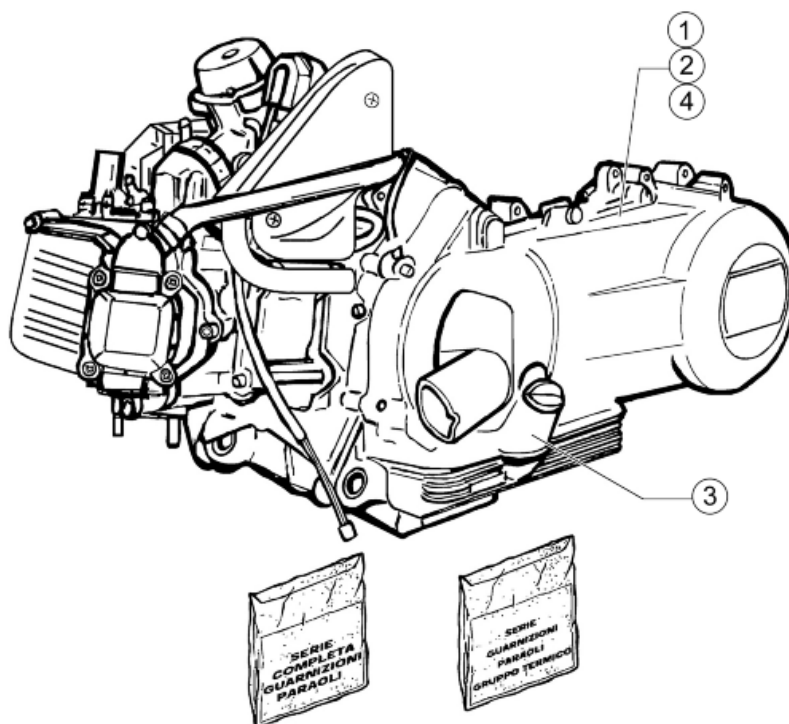
TIME

This section is devoted to the time necessary to carry out repairs.

For each operation, the description, code and time envisages are specified.

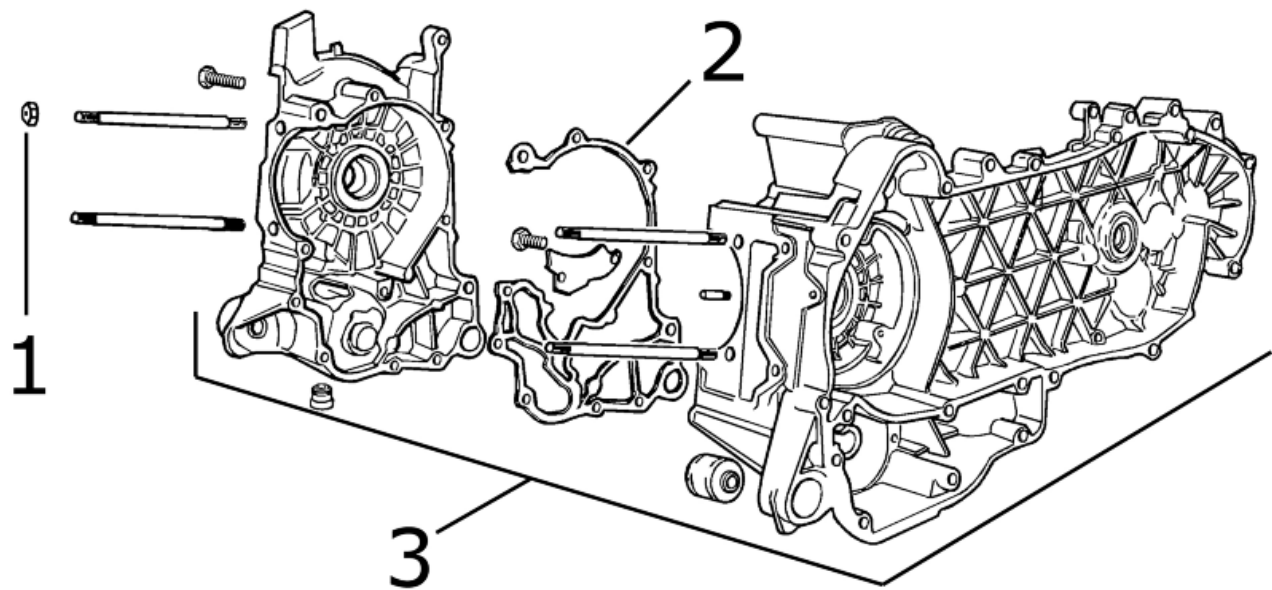
## Engine

| <u>ENGINE</u> |        |                                   |          |
|---------------|--------|-----------------------------------|----------|
|               | Code   | Action                            | Duration |
| 1             | 001001 | Engine from chassis - replacement |          |
| 2             | 001127 | Engine - Complete service         |          |
| 3             | 003064 | Engine oil - Change               |          |
| 4             | 003057 | Engine retainer - Tighten nuts    |          |



## Crankcase

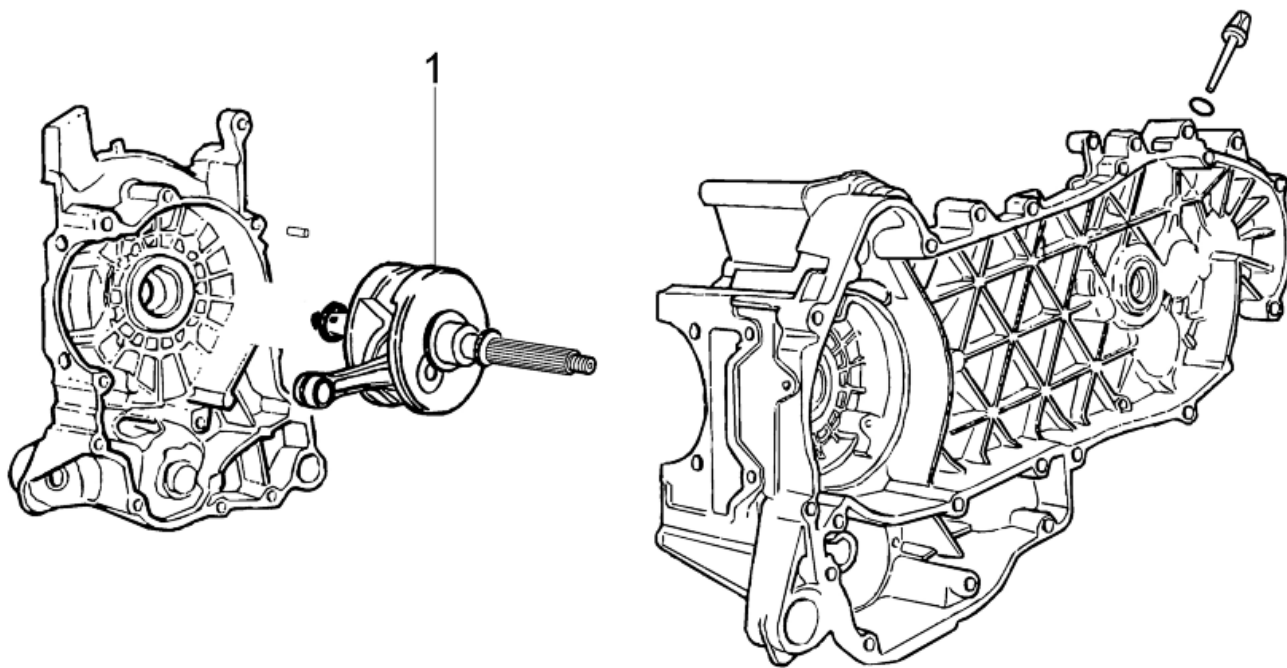
| <u>CRANKCASE</u> |        |                                       |          |
|------------------|--------|---------------------------------------|----------|
|                  | Code   | Action                                | Duration |
| 1                | 003056 | Head/Cylinder - Nut tightening        |          |
| 2                | 001153 | Crankcase halves gasket - Replacement |          |
| 3                | 001133 | Engine crankcase - replace            |          |



Crankshaft

CRANKSHAFT

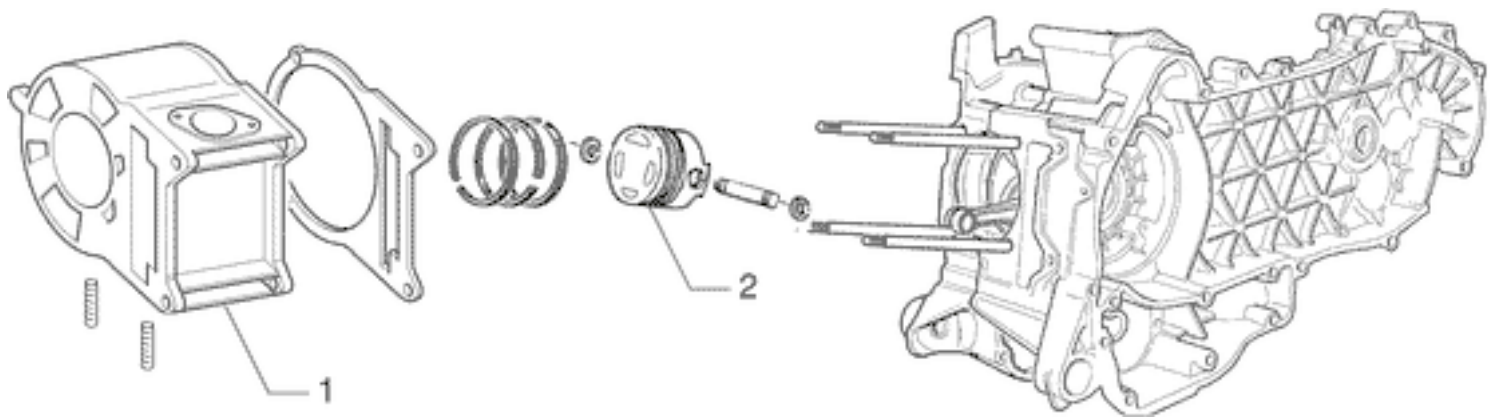
|   | Code   | Action                   | Duration |
|---|--------|--------------------------|----------|
| 1 | 001117 | Crankshaft - Replacement |          |



Cylinder assy.

CYLINDER - PISTON - PIN UNIT

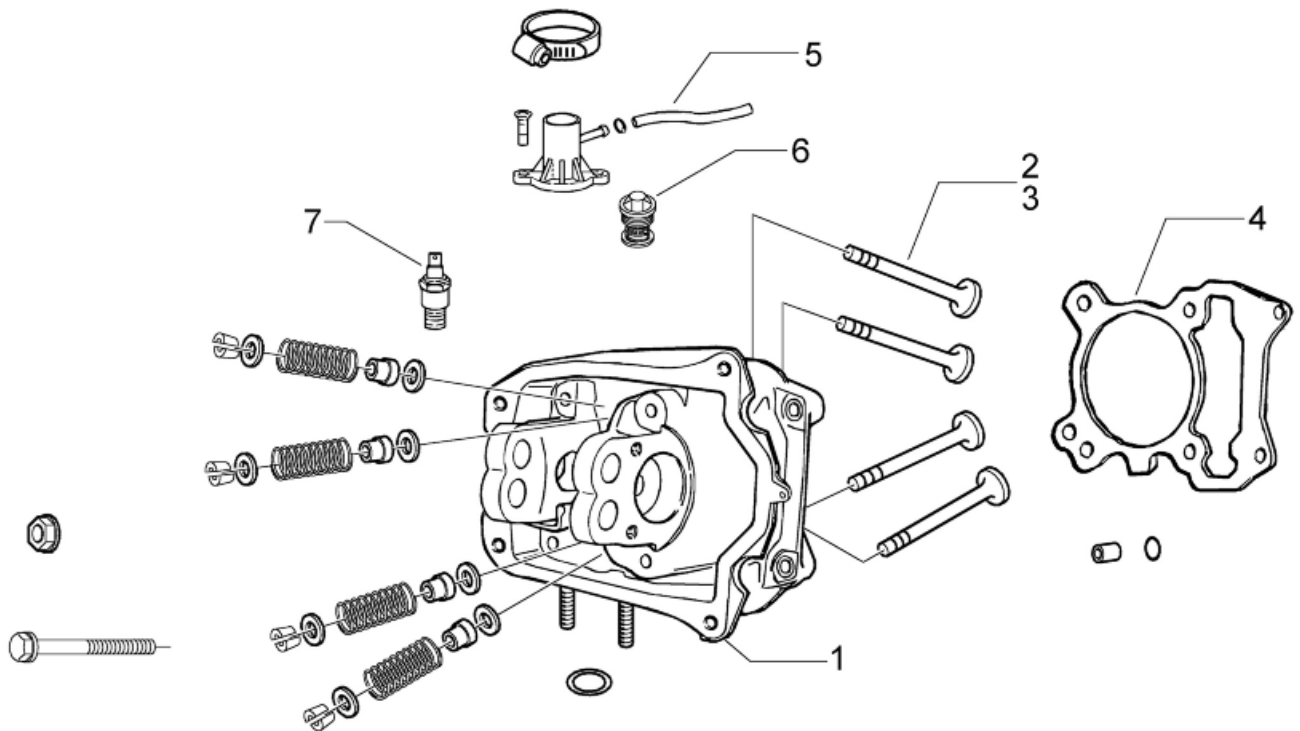
|   | Code   | Action                         | Duration |
|---|--------|--------------------------------|----------|
| 1 | 001002 | Cylinder-Piston - Replacement  |          |
| 2 | 001154 | Pin ring piston unit - Service |          |



Cylinder head assy.

HEAD - VALVE UNIT

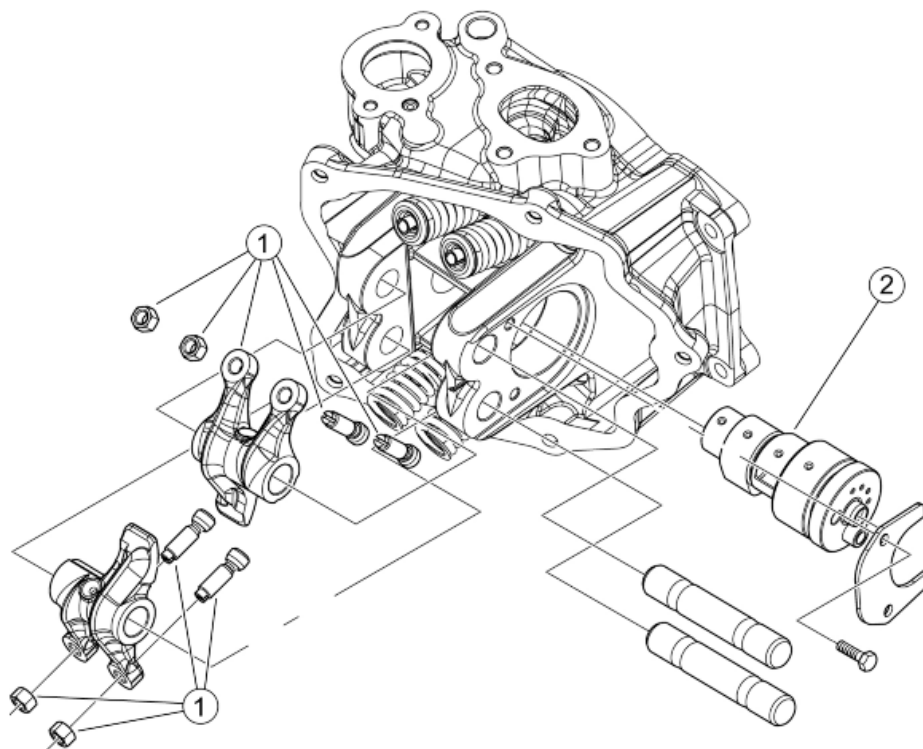
|   | Code   | Action                                                | Duration |
|---|--------|-------------------------------------------------------|----------|
| 1 | 001126 | Head - Replacement                                    |          |
| 2 | 001045 | Valves - Replacement                                  |          |
| 3 | 001049 | Valves - Adjustment                                   |          |
| 4 | 001056 | Head gasket - change                                  |          |
| 5 | 007008 | Cylinder head outlet rubber coupling<br>- Replacement |          |
| 6 | 001057 | Thermostat - Replacement                              |          |
| 7 | 001083 | Thermistor - Replacement                              |          |



### Rocker arms support assy.

## ROCKING LEVER SUPPORT UNIT

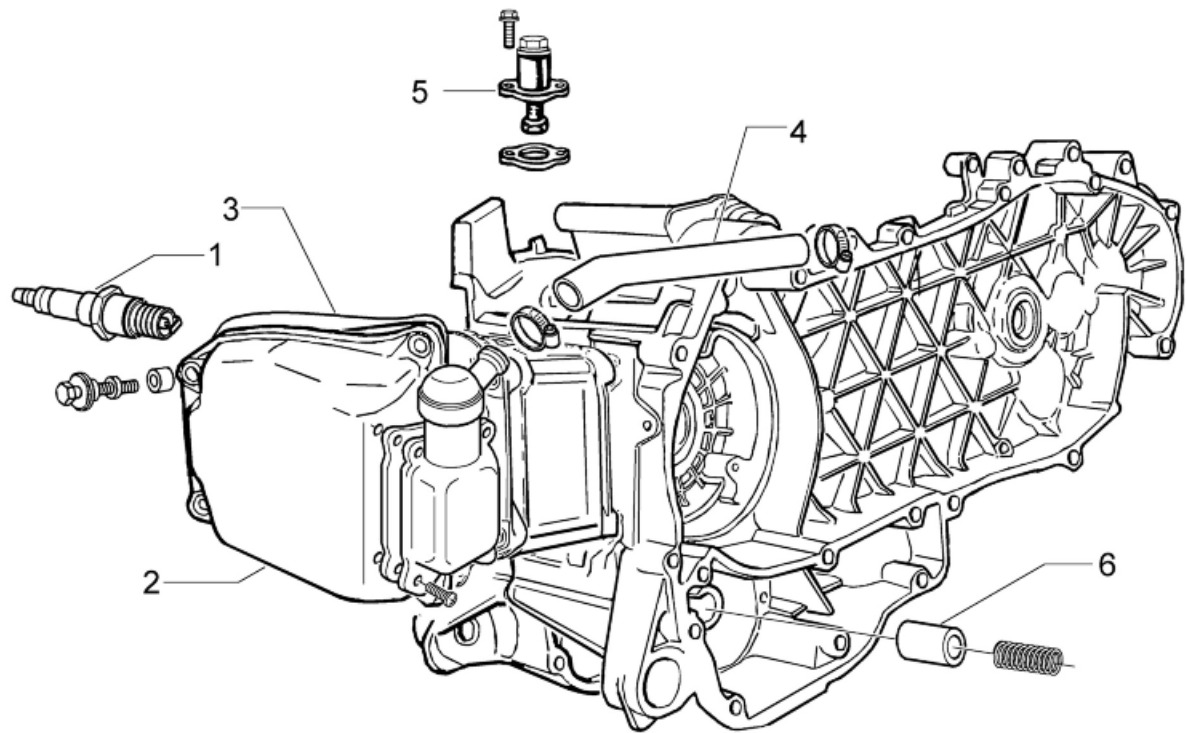
|   | Code   | Action                             | Duration |
|---|--------|------------------------------------|----------|
| 1 | 001148 | Valve rocking levers - Replacement |          |
| 2 | 001044 | Camshaft - Replacement             |          |



Cylinder head cover

HEAD COVER - CHAIN TENSIONER - BY-PASS LUBRICATION

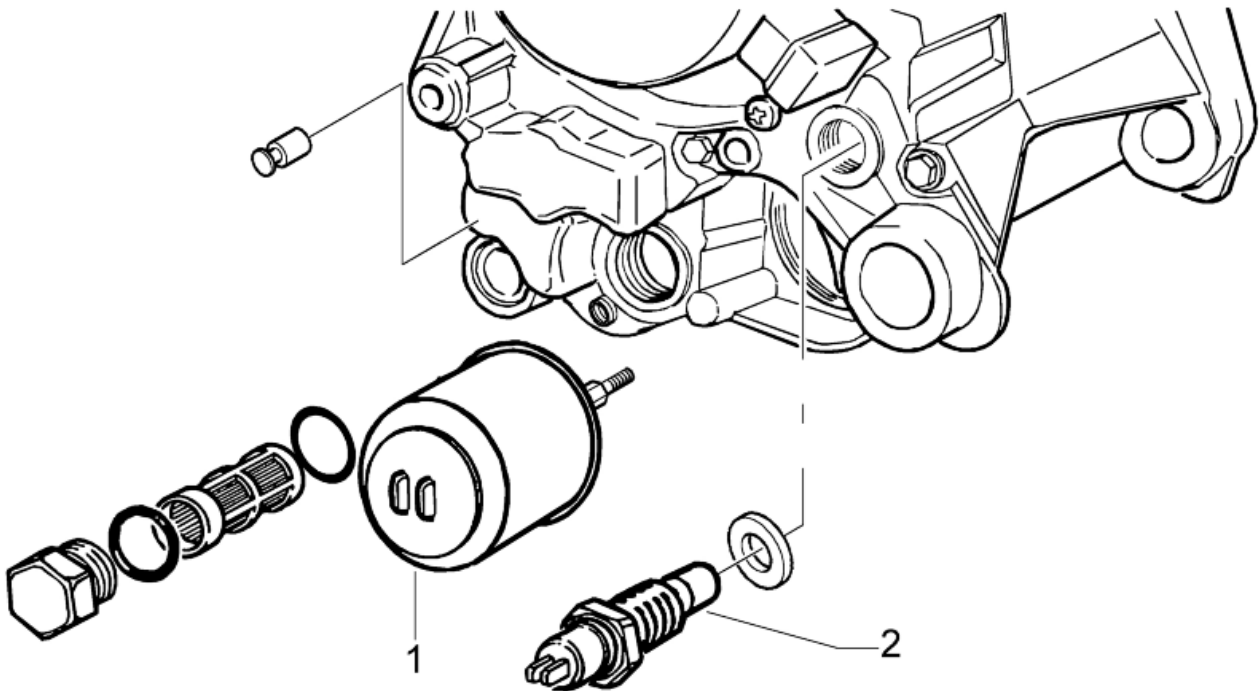
|   | Code   | Action                                     | Duration |
|---|--------|--------------------------------------------|----------|
| 1 | 001093 | Spark plug - Replacement                   |          |
| 2 | 001089 | Head cover - Replacement                   |          |
| 3 | 001088 | Head cover gasket - Replacement            |          |
| 4 | 001074 | Oil vapour recovery pipe - Replacement     |          |
| 5 | 001129 | Chain tightener - Overhaul and replacement |          |
| 6 | 001124 | By pass lubrication - Replacement          |          |



Oil filter

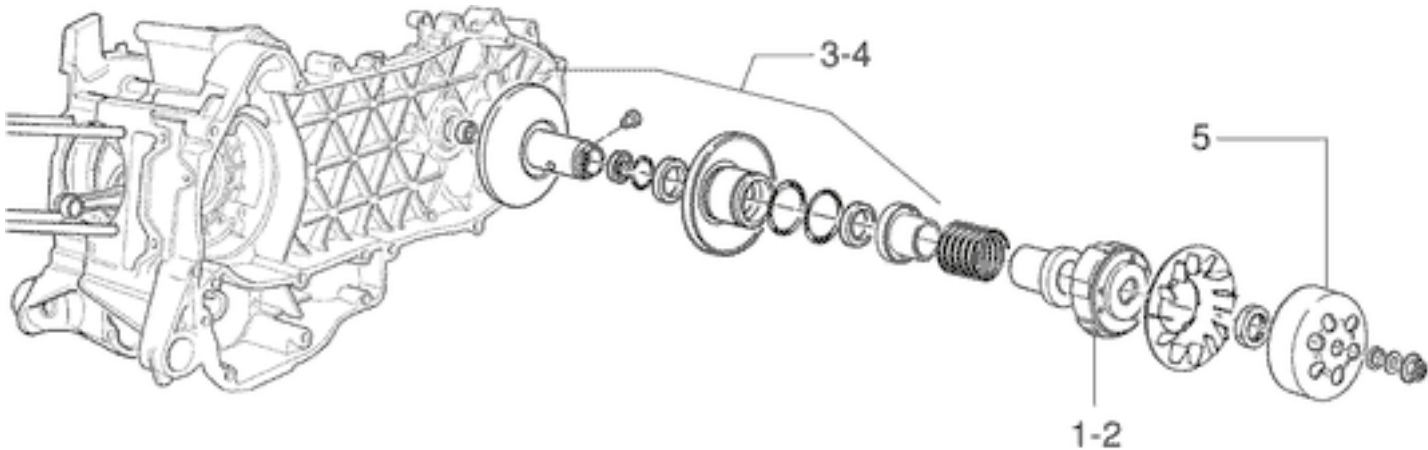
OIL FILTER

|   | Code   | Action                            | Duration |
|---|--------|-----------------------------------|----------|
| 1 | 001123 | Oil filter - Replacement          |          |
| 2 | 001160 | Oil pressure sensor - Replacement |          |



Driven pulley

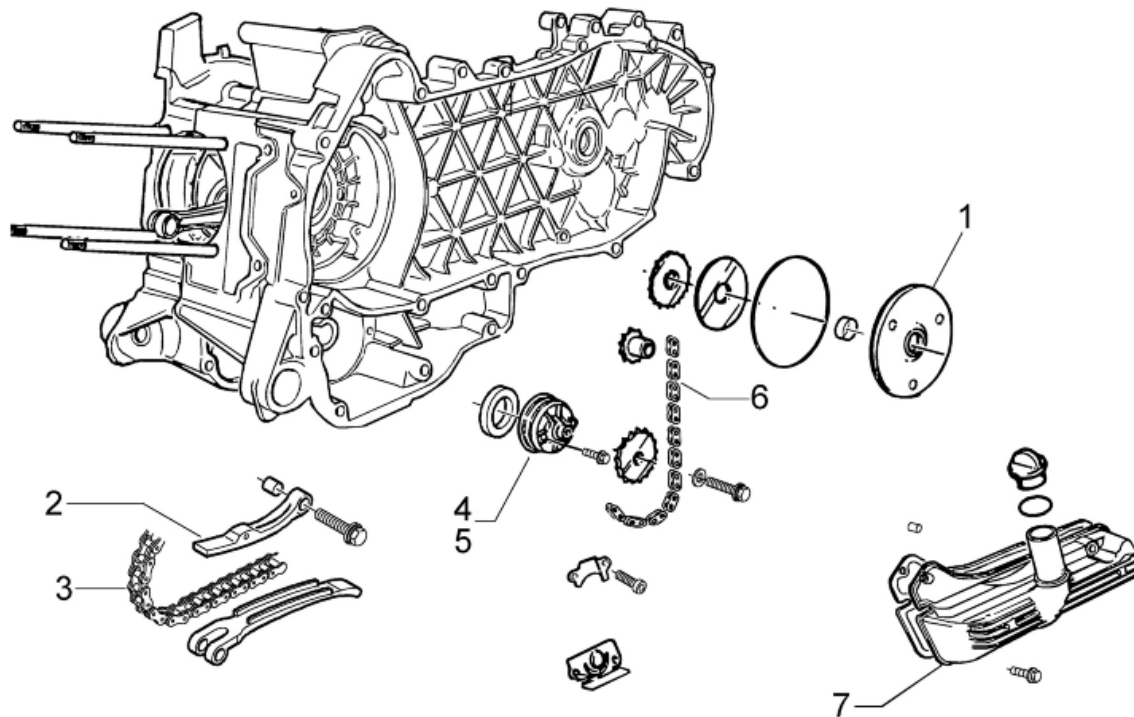
| DRIVEN PULLEY |        |                                                   |
|---------------|--------|---------------------------------------------------|
|               | Code   | Action                                            |
| 1             | 001022 | Clutch - Replacement                              |
| 2             | 003072 | Clutch - replacement Clutch assembly - Wear check |
| 3             | 001012 | Driven pulley - Service                           |
| 4             | 001110 | Driven pulley - Replacement                       |
| 5             | 001155 | Clutch bell housing - Replacement                 |



## Oil pump

### OIL PUMP

|   | Code   | Action                              | Duration |
|---|--------|-------------------------------------|----------|
| 1 | 001100 | Oil seal, clutch side - Replacement |          |
| 2 | 001125 | Chain guide pads - Replacement      |          |
| 3 | 001051 | Belt/ Timing chain - Replacement    |          |
| 4 | 001042 | Oil pump - Service                  |          |
| 5 | 001112 | Oil pump - change                   |          |
| 6 | 001122 | Oil pump chain - Replacement        |          |
| 7 | 001130 | Oil sump - Replacement              |          |

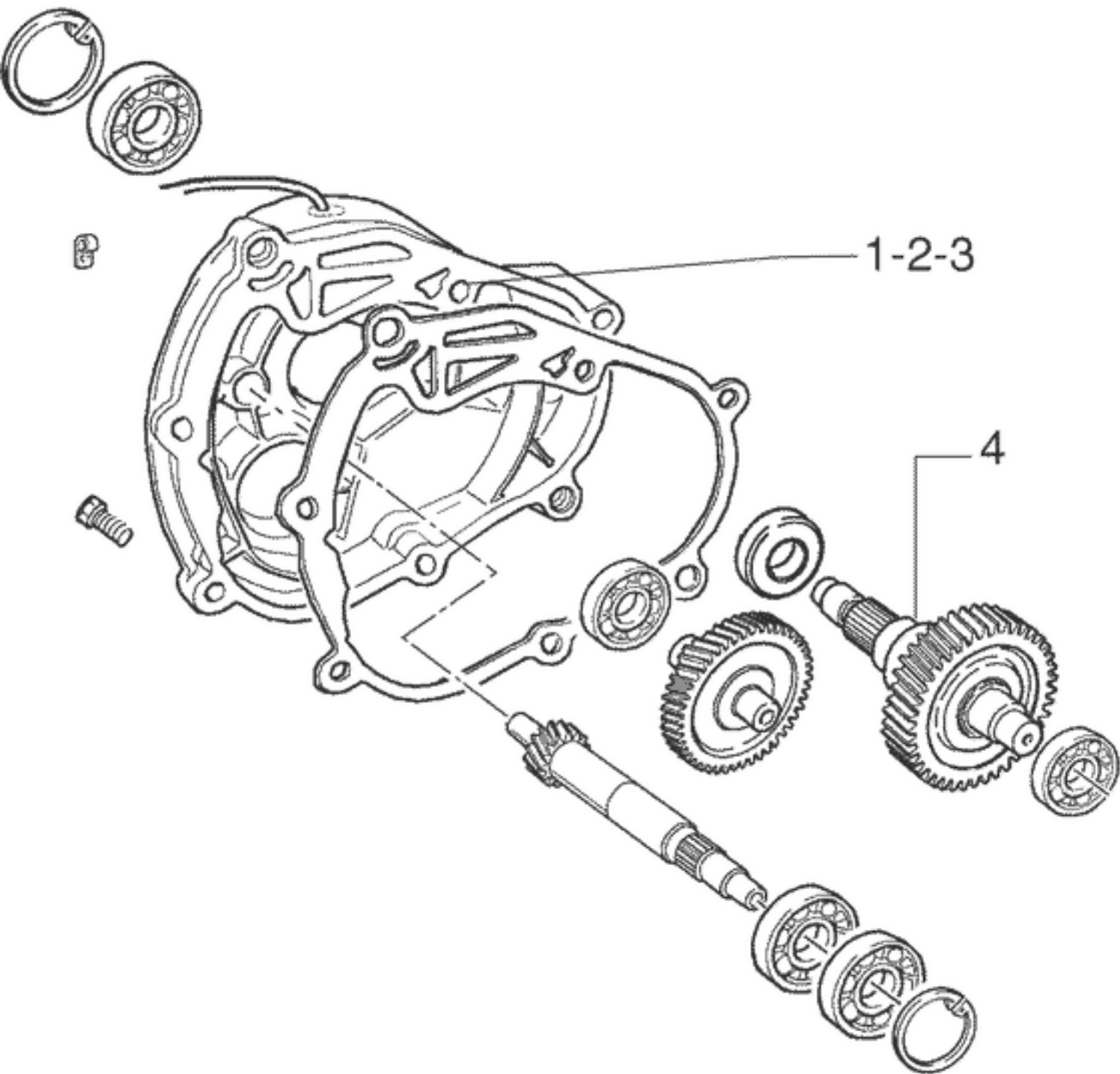


## Final gear assy.

### FINAL REDUCTION GEAR

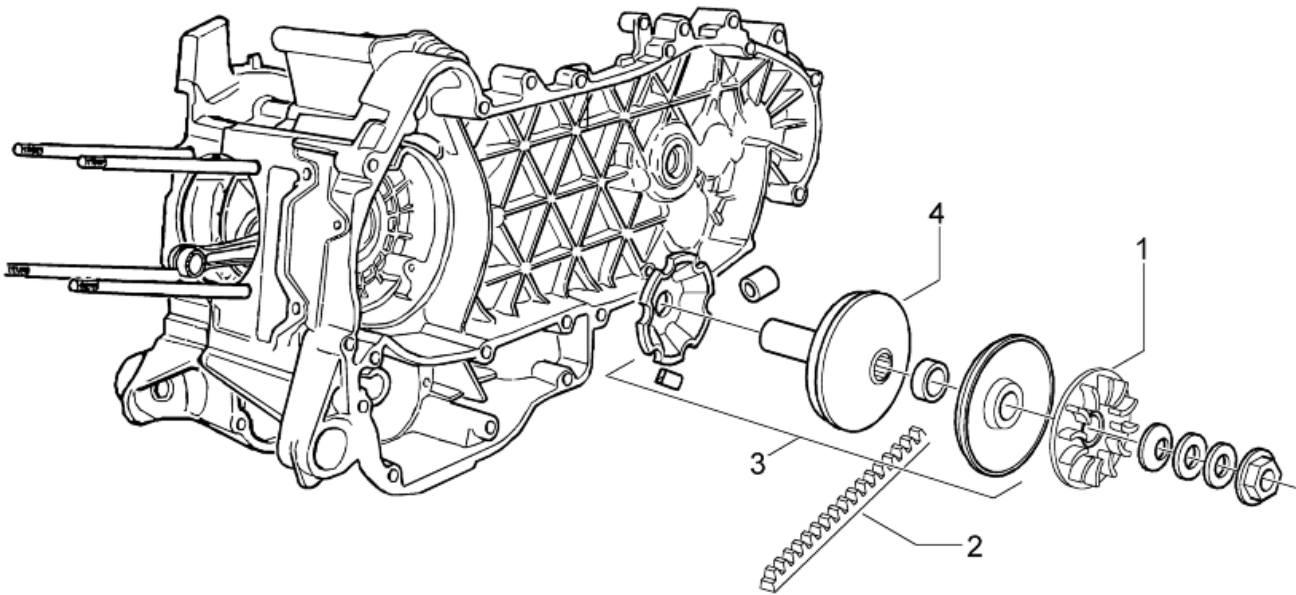
|   | Code   | Action                                  | Duration |
|---|--------|-----------------------------------------|----------|
| 1 | 001010 | Gear reduction unit - Inspection        |          |
| 2 | 001156 | Gear reduction unit cover - Replacement |          |
| 3 | 003065 | Gear box oil - Replacement              |          |
| 4 | 004125 | Rear wheel axle - Replacement           |          |





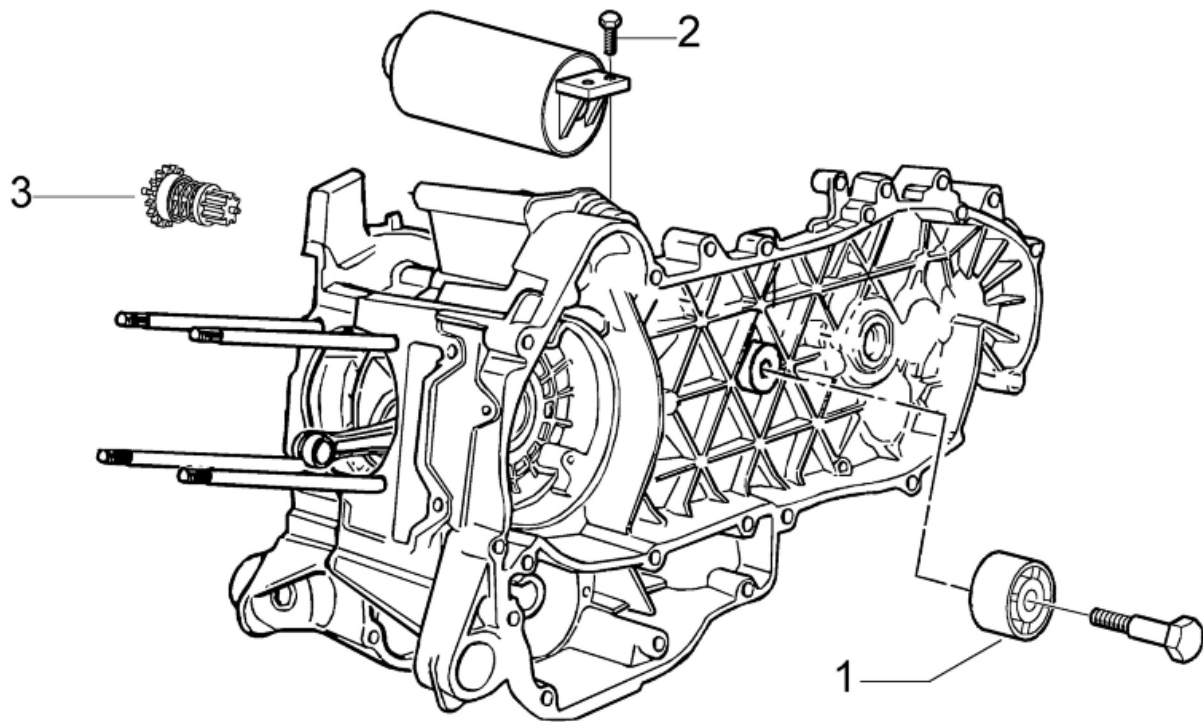
Driving pulley

| DRIVING PULLEY |        |                                   |          |
|----------------|--------|-----------------------------------|----------|
|                | Code   | Action                            | Duration |
| 1              | 001086 | Driving half-pulley - Replacement |          |
| 2              | 001011 | Driving belt - Replacement        |          |
| 3              | 001006 | rear-view pulley - Service        |          |
| 4              | 001066 | driving pulley - Replacement      |          |



Starter motor

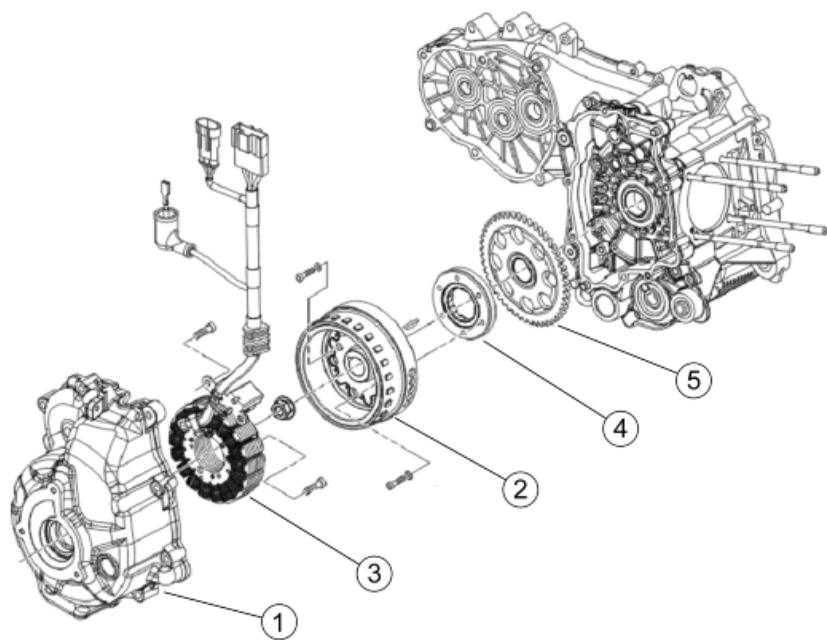
| ELECTRICAL START UP |        |                                          |          |
|---------------------|--------|------------------------------------------|----------|
|                     | Code   | Action                                   | Duration |
| 1                   | 001141 | Belt anti-vibration roller - Replacement |          |
| 2                   | 001020 | Starter motor - Replacement              |          |
| 3                   | 001017 | Starter sprocket wheel - Replacement     |          |



Flywheel magneto

MAGNETO FLYWHEEL

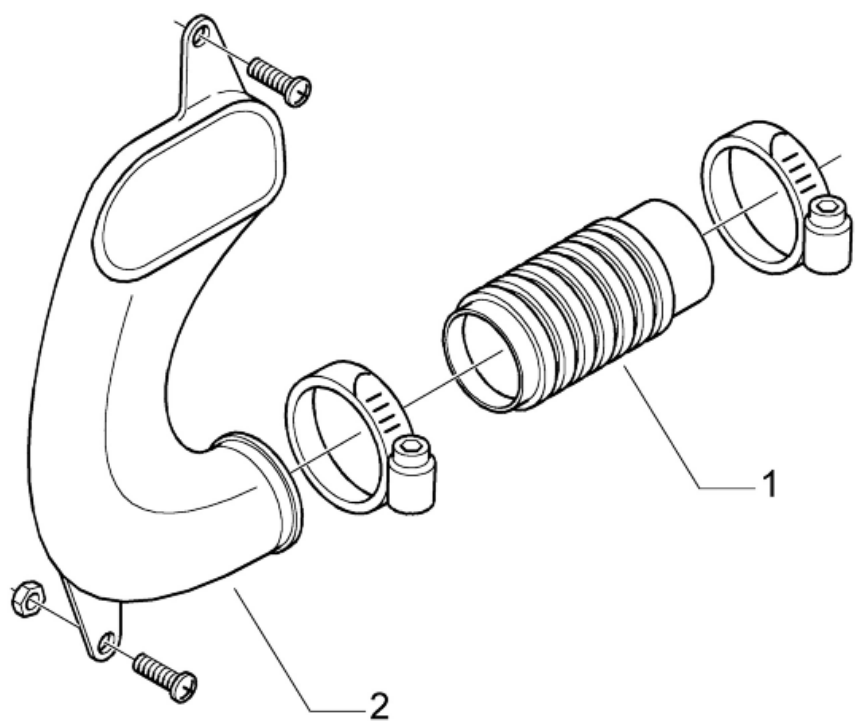
|   | Code   | Action                                | Duration |
|---|--------|---------------------------------------|----------|
| 1 | 001087 | Flywheel cover - replace              |          |
| 2 | 001173 | Rotor - replace                       |          |
| 3 | 001067 | Stator - Replacement                  |          |
| 4 | 001104 | Start-up freewheel - Replacement      |          |
| 5 | 001151 | Start-up driven gearing - Replacement |          |



Belt cooling duct

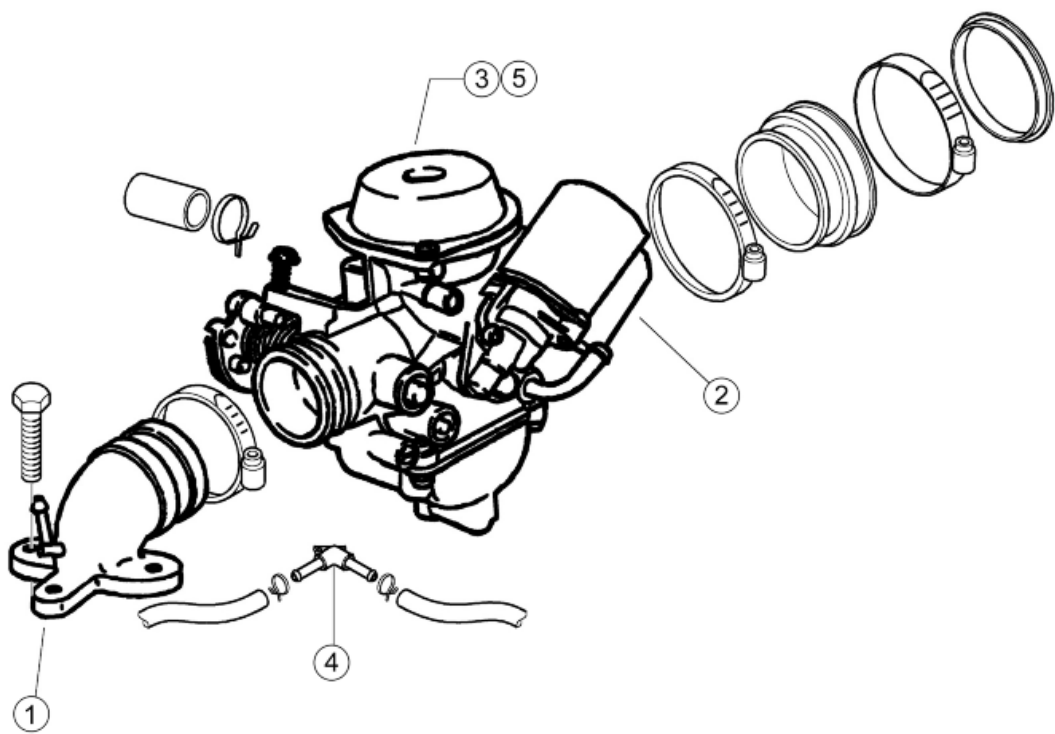
BELT COOLING TUBE

|   | Code   | Action                                    | Duration |
|---|--------|-------------------------------------------|----------|
| 1 | 001132 | Transmission air inlet pipe - Replacement |          |
| 2 | 001131 | Transmission air intake - Replacement     |          |



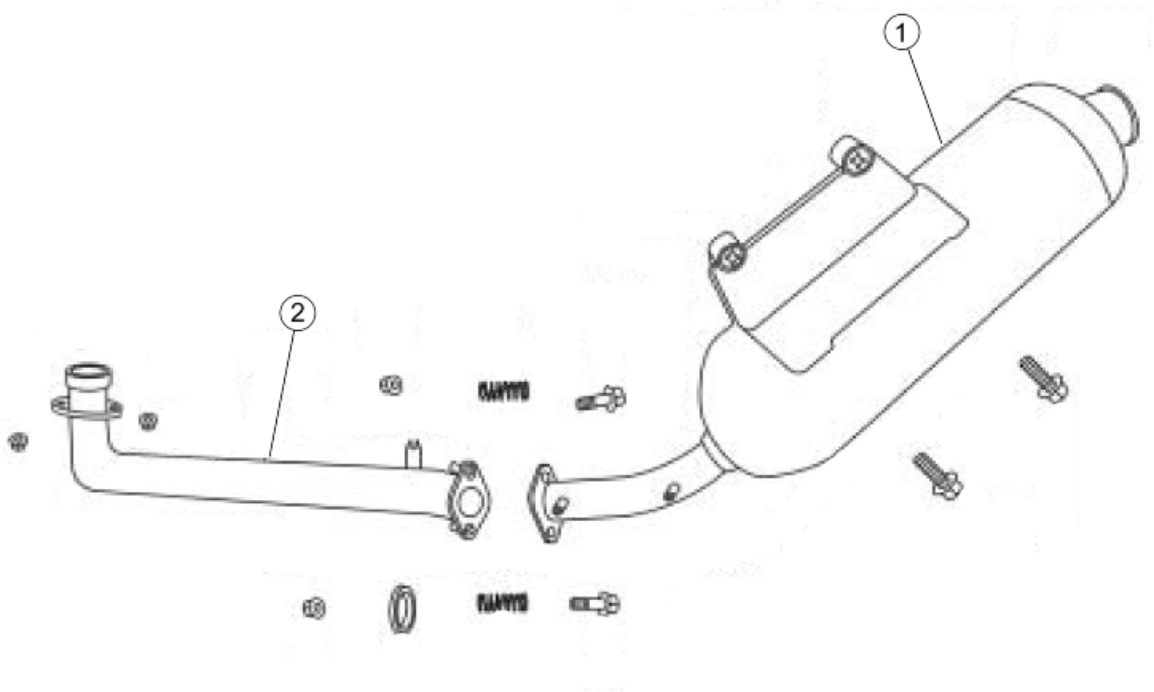
Carburettor

| CARBURETTOR |        |                                             |          |
|-------------|--------|---------------------------------------------|----------|
|             | Code   | Action                                      | Duration |
| 1           | 001013 | Intake manifold - change                    |          |
| 2           | 001081 | Automatic choke - Replacement               |          |
| 3           | 001063 | Carburettor - Replacement                   |          |
| 4           | 007020 | Carburettor heat piping. - Replace-<br>ment |          |
| 5           | 003058 | Carburettor - Adjustment                    |          |



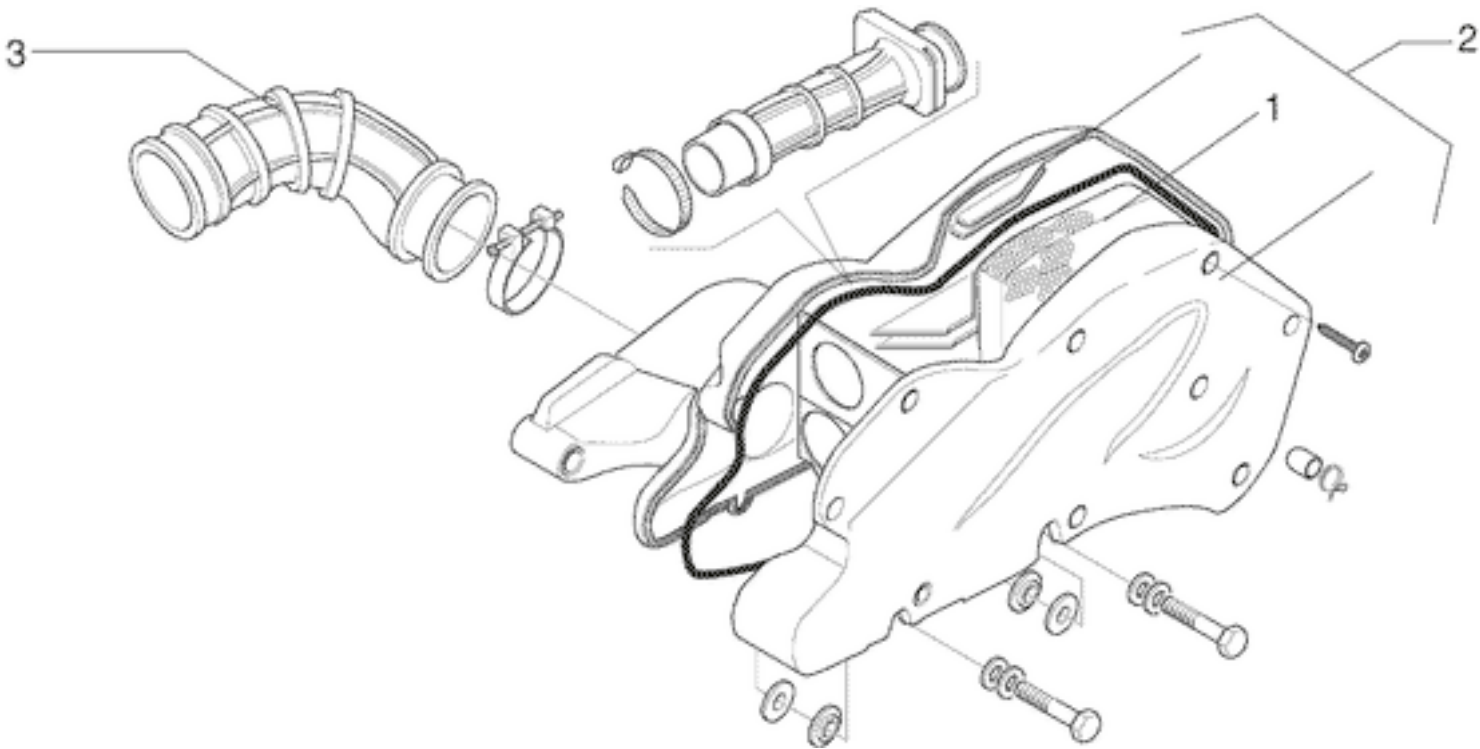
Exhaust pipe

| MUFFLER |        |                                |          |
|---------|--------|--------------------------------|----------|
|         | Code   | Action                         | Duration |
| 1       | 001009 | Muffler - Replacement          |          |
| 2       | 001092 | Exhaust manifold - Replacement |          |



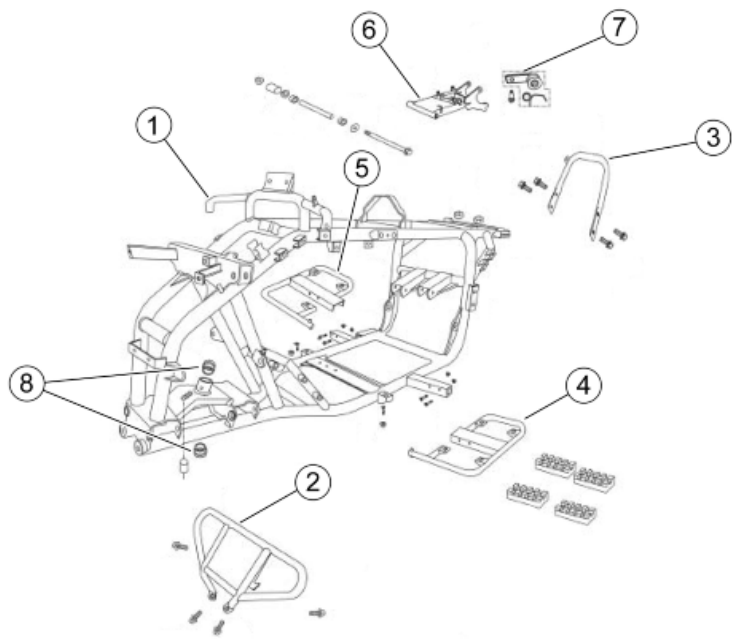
Air cleaner

| AIR CLEANER |        |                                               |          |
|-------------|--------|-----------------------------------------------|----------|
|             | Code   | Action                                        | Duration |
| 1           | 001014 | Air filter - Replacement/Cleaning             |          |
| 2           | 001015 | Air filter box - Replacement                  |          |
| 3           | 004122 | Air cleaner carburettor fitting - Replacement |          |



Frame

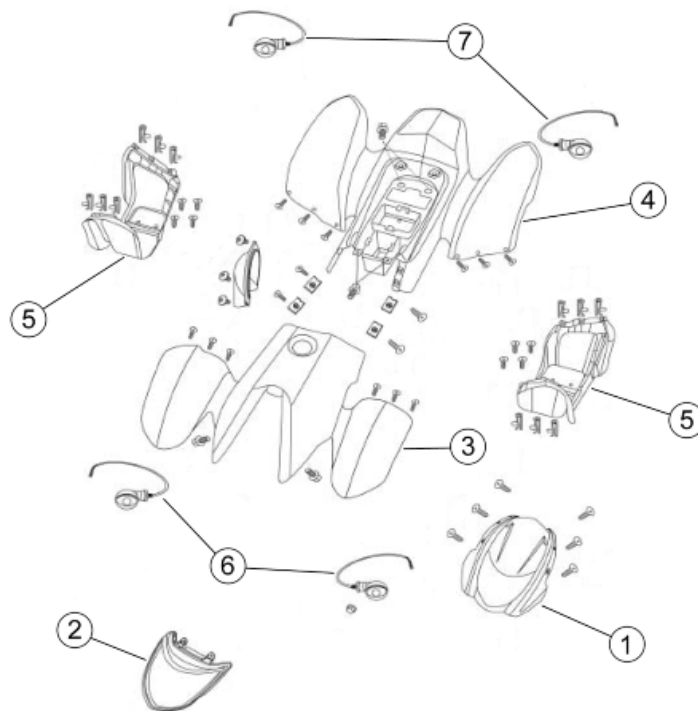
| CHASSIS |        |                                                   |          |
|---------|--------|---------------------------------------------------|----------|
|         | Code   | Action                                            | Duration |
| 1       | 004001 | Frame - replace                                   |          |
| 2       | 004146 | Front frame - Replacement                         |          |
| 3       | 004116 | Rear frame - Replacement                          |          |
| 4       | 004147 | footboard support bracket one side - Replacement  |          |
| 5       | 004148 | footboard support bracket two sides - Replacement |          |
| 6       | 003080 | Swinging arm on frame - Replacement               |          |
| 7       | 002111 | Chain tensioner - Service and Replacement         |          |
| 8       | 003002 | Steering fifth wheel - Replacement                |          |



Mudguard

| MUDGUARDS |        |                                        |          |
|-----------|--------|----------------------------------------|----------|
|           | Code   | Action                                 | Duration |
| 1         | 004064 | Legshield, front section - Replacement |          |
| 2         | 005002 | Front headlamp - Replacement           |          |
| 3         | 004002 | Front mudguard - Replacement           |          |
| 4         | 004009 | Rear mudguard - Replacement            |          |
| 5         | 004178 | Footrest - Replacement                 |          |
| 6         | 005012 | Front turn indicator - Replacement     |          |
| 7         | 005022 | Rear turn indicators - Replacement     |          |

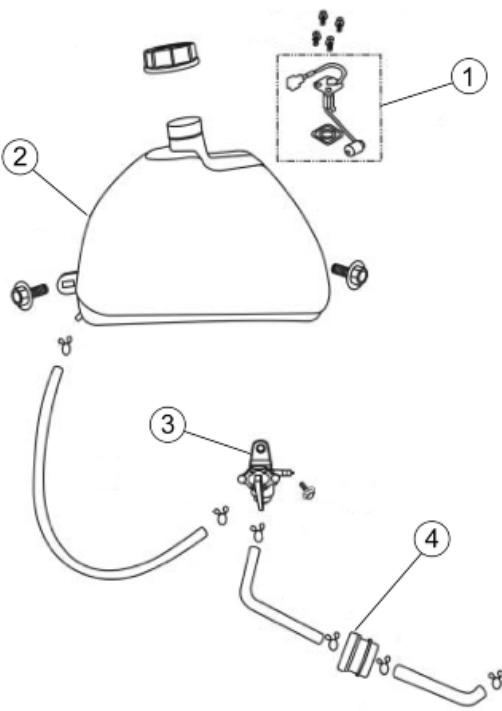




## Fuel tank

## FUEL TANK

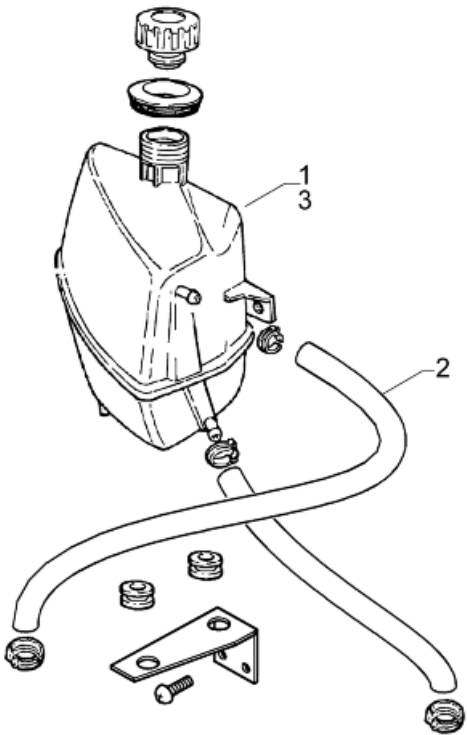
|   | Code   | Action                    | Duration |
|---|--------|---------------------------|----------|
| 1 | 005010 | Tank float - Replacement  |          |
| 2 | 004005 | Fuel tank - replace       |          |
| 3 | 000414 | Petrol cock - Replacement |          |
| 4 | 004072 | Fuel filter - Replacement |          |



Expansion tank

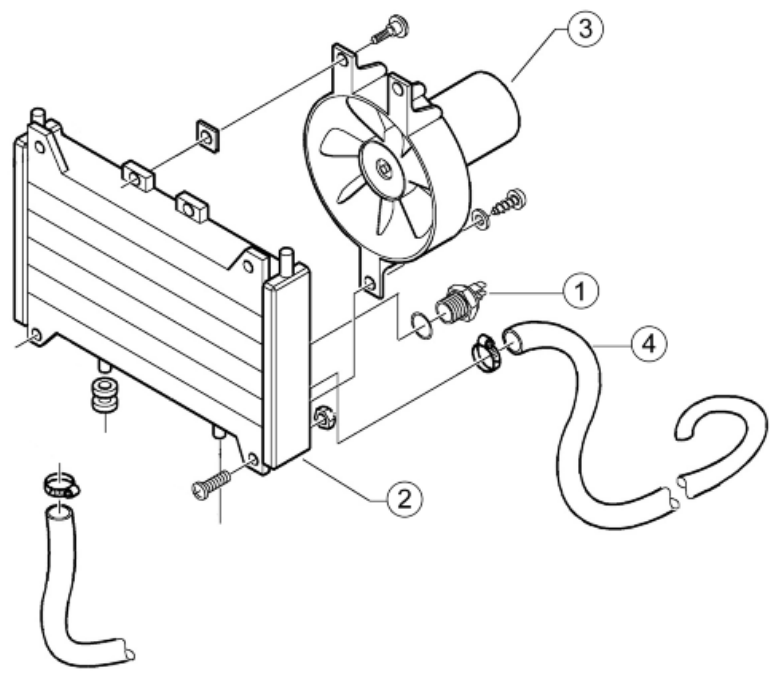
EXPANSION TANK

|   | Code   | Action                                       | Duration |
|---|--------|----------------------------------------------|----------|
| 1 | 007001 | Expansion tank - Replacement                 |          |
| 2 | 007013 | Expansion tank connection pipe - Replacement |          |
| 3 | 001052 | Coolant and air bleed - Replacement          |          |



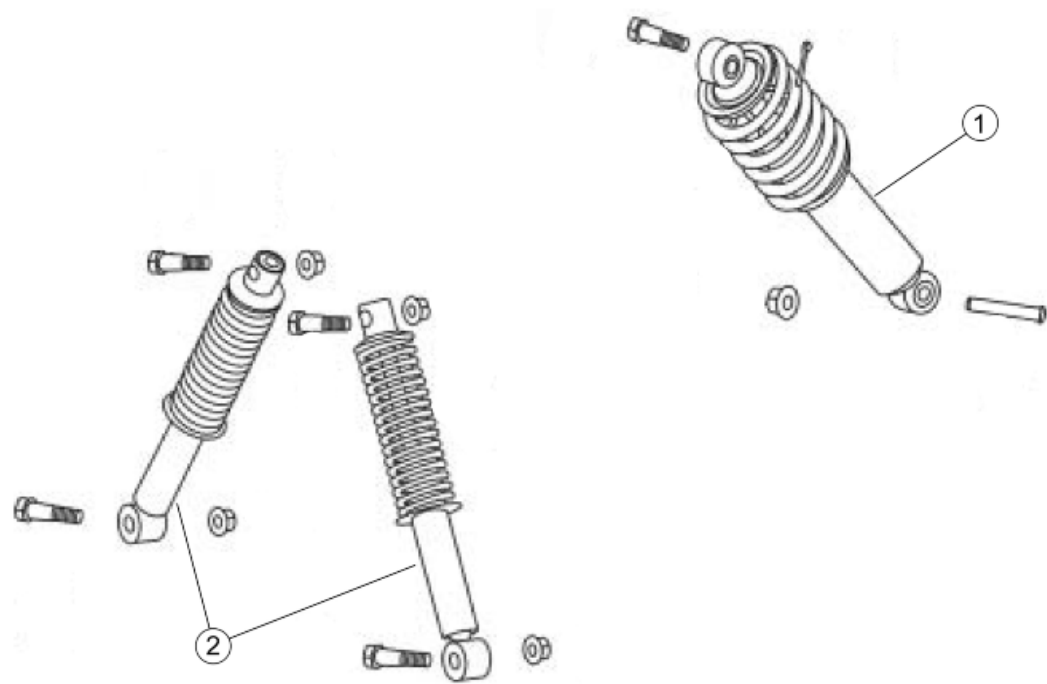
Radiator

| RADIATOR |        |                                                |          |
|----------|--------|------------------------------------------------|----------|
|          | Code   | Action                                         | Duration |
| 1        | 007014 | Radiator thermal switch - Replacement          |          |
| 2        | 007002 | Radiator - Replacement                         |          |
| 3        | 007016 | Fan with support - replace                     |          |
| 4        | 007003 | Coolant delivery and return pipe - Replacement |          |



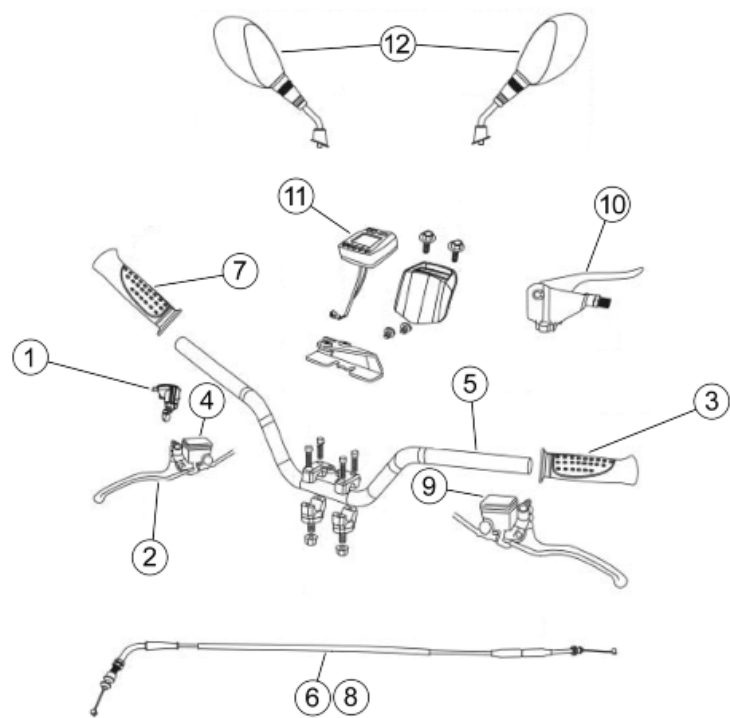
Rear shock-absorber

| SHOCK ABSORBERS |        |                                                |          |
|-----------------|--------|------------------------------------------------|----------|
|                 | Code   | Action                                         | Duration |
| 1               | 003007 | Rear shock absorber - Removal and Refitting    |          |
| 2               | 431161 | Front shock absorber - two sides - Replacement |          |



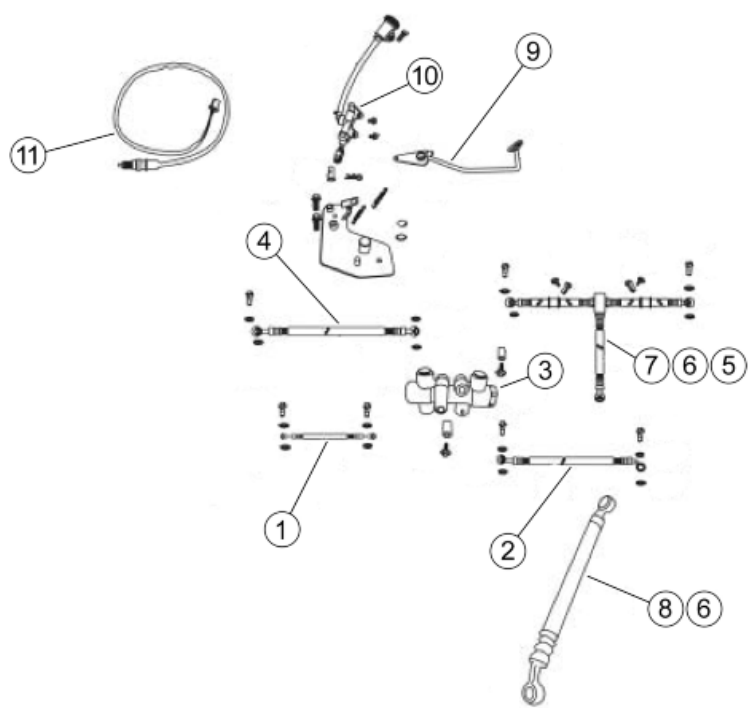
Handlebar components

| HANDLEBAR COMPONENTS |        |                                             |          |
|----------------------|--------|---------------------------------------------|----------|
|                      | Code   | Action                                      | Duration |
| 1                    | 002060 | Complete gas command - Replacement          |          |
| 2                    | 002037 | Brake or clutch lever - Replacement         |          |
| 3                    | 002071 | Left hand grip - Replacement                |          |
| 4                    | 002024 | Front brake pump - replace                  |          |
| 5                    | 003001 | Handlebar - Removal and refitting           |          |
| 6                    | 002063 | Throttle control transmission - Replacement |          |
| 7                    | 002059 | Right hand grip - Replacement               |          |
| 8                    | 003061 | Accelerator transmission - Adjustment       |          |
| 9                    | 002067 | Brake pump - Replacement                    |          |
| 10                   | 465021 | Parking brake control lever - Replacement   |          |
| 11                   | 005014 | Odometer - Replacement                      |          |
| 12                   | 004066 | Driving mirror - Replacement                |          |



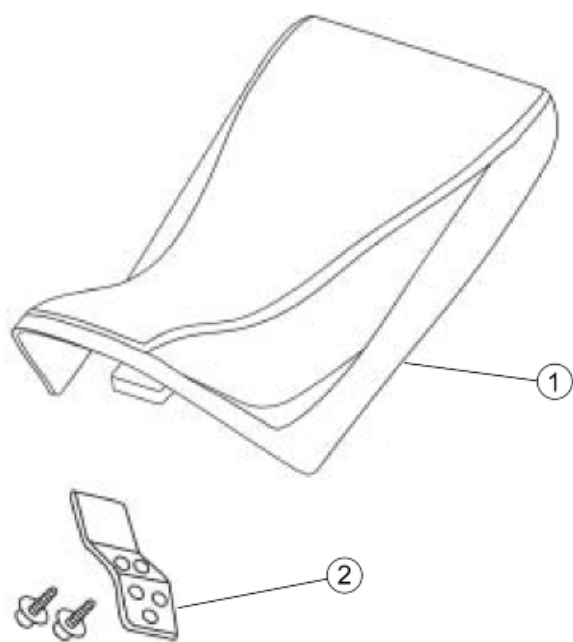
Brake hoses

| BRAKE PIPING |        |                                                         |          |
|--------------|--------|---------------------------------------------------------|----------|
|              | Code   | Action                                                  | Duration |
| 1            | 002084 | Integral break pump pipe, device - Replacement          |          |
| 2            | 002085 | Integral brake device pipe- front caliper - Replacement |          |
| 3            | 002089 | Integral breaking device - Replacement                  |          |
| 4            | 002087 | Integral brake rear rigid pipe- Replacement             |          |
| 5            | 002086 | Integral brake front rigid pipe- Replacement            |          |
| 6            | 002090 | Integral brake fluid and bleeding system - Replacement  |          |
| 7            | 002021 | Front brake piping - Replacement                        |          |
| 8            | 002020 | Rear brake disc piping - Replacement                    |          |
| 9            | 721006 | Brake pump rod                                          |          |
| 10           | 002088 | Integral brake pump - Replacement                       |          |
| 11           | 005017 | Stop switch - Replacement                               |          |



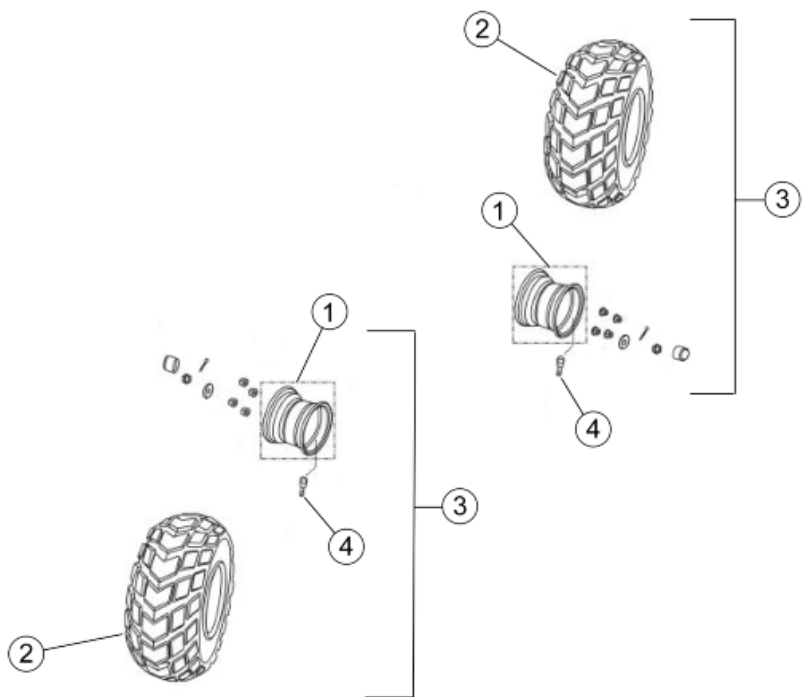
Seat

| SADDLE |        |                                 |          |
|--------|--------|---------------------------------|----------|
|        | Code   | Action                          | Duration |
| 1      | 004003 | Saddle - Replacement            |          |
| 2      | 004054 | Saddle lock catch - Replacement |          |



Front wheel

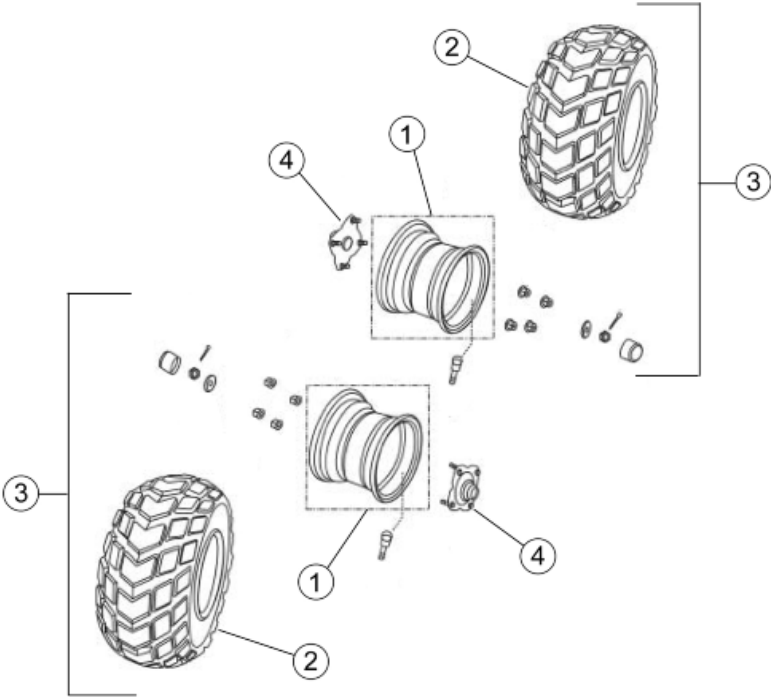
| FRONT WHEEL |        |                              |          |
|-------------|--------|------------------------------|----------|
|             | Code   | Action                       | Duration |
| 1           | 003037 | Front wheel rim- Replacement |          |
| 2           | 003047 | Front tyre - Replacement     |          |
| 3           | 004123 | Front wheel - Replacement    |          |
| 4           | 003040 | Tyre pressure - Check        |          |



Rear wheel

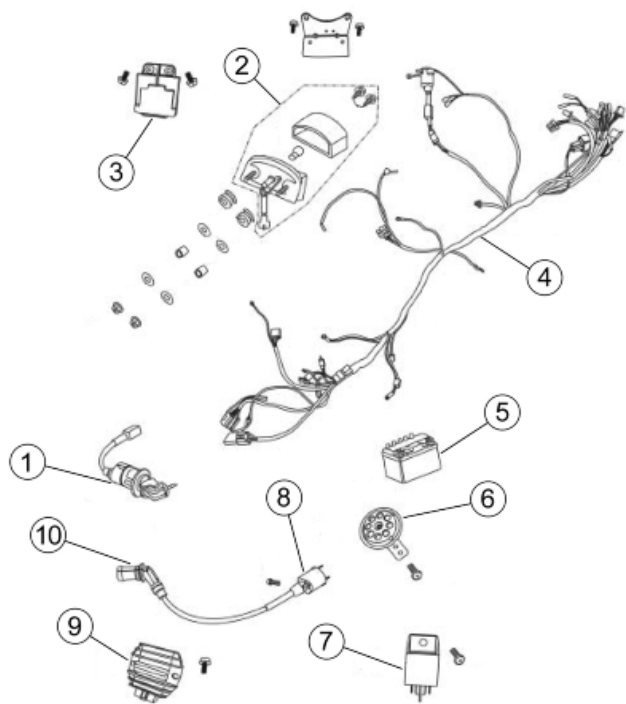
| REAR WHEEL |        |                                 |          |
|------------|--------|---------------------------------|----------|
|            | Code   | Action                          | Duration |
| 1          | 001071 | Rear wheel rim - Replacement    |          |
| 2          | 004126 | Rear wheel tyre - Replacement   |          |
| 3          | 001016 | Rear wheel - Replacement        |          |
| 4          | 002005 | Rear wheel flange - Replacement |          |





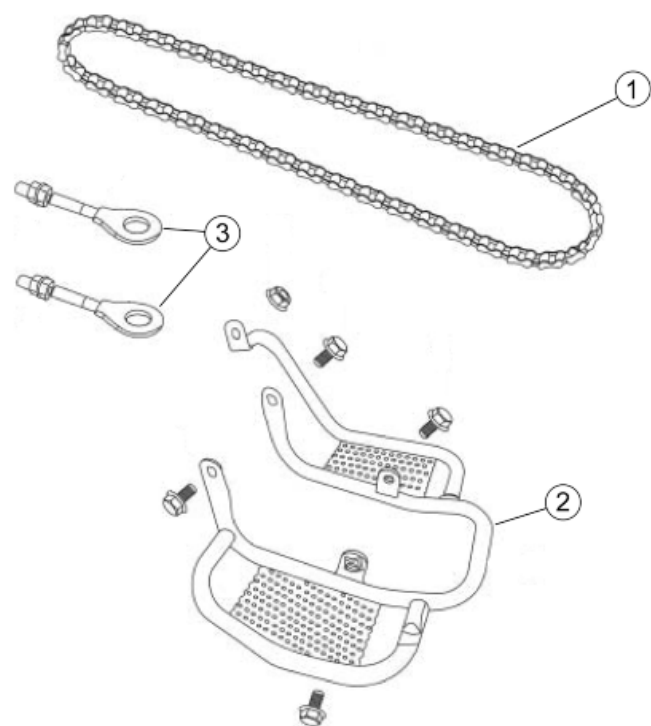
Electric devices

| ELECTRICAL DEVICES |        |                                            |          |
|--------------------|--------|--------------------------------------------|----------|
|                    | Code   | Action                                     | Duration |
| 1                  | 005016 | Key switch - Replacement                   |          |
| 2                  | 005005 | Taillight - Replacement                    |          |
| 3                  | 001023 | Control unit - Replacement                 |          |
| 4                  | 005001 | Electrical system - Removal and re-fitting |          |
| 5                  | 005007 | Battery - Replacement                      |          |
| 6                  | 005003 | Horn - Replacement                         |          |
| 7                  | 832311 | Turn indicator flash - Replacement         |          |
| 8                  | 001069 | HV coil - Replacement                      |          |
| 9                  | 005009 | Voltage regulator - Replacement            |          |
| 10                 | 001094 | Spark plug cap - Replacement               |          |



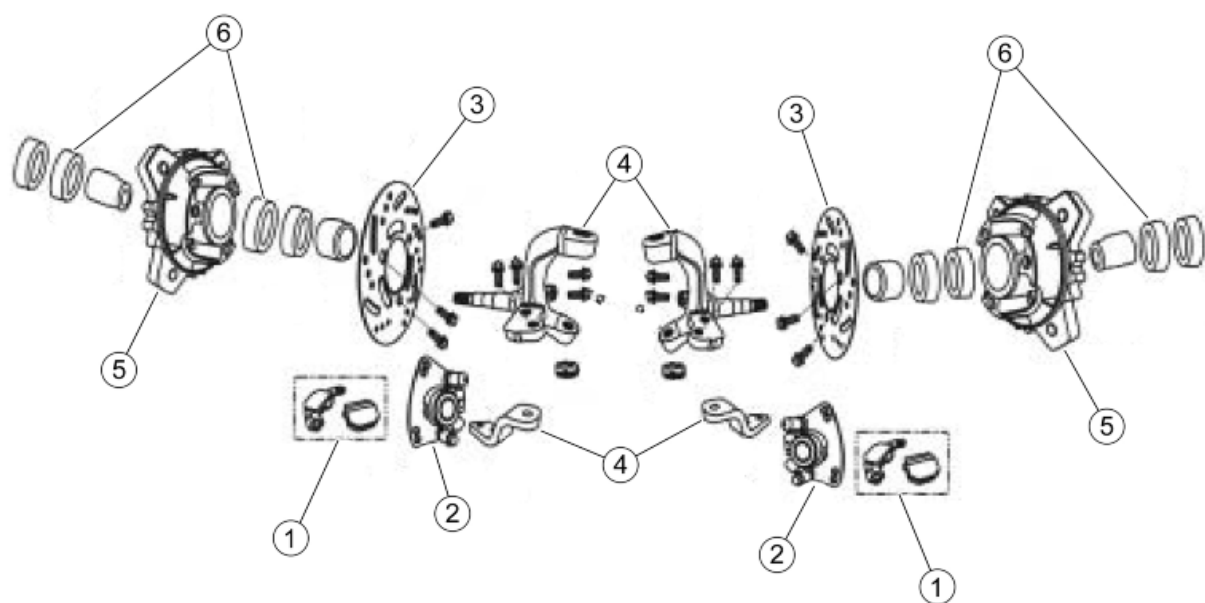
Transmissions

| TRANSMISSIONS |        |                                      |          |
|---------------|--------|--------------------------------------|----------|
|               | Code   | Action                               | Duration |
| 1             | 002077 | Final drive chain - Replacement      |          |
| 2             | 004013 | Side/rear bumper pipes - Replacement |          |
| 3             | 003062 | Final drive chain - Adjustment       |          |



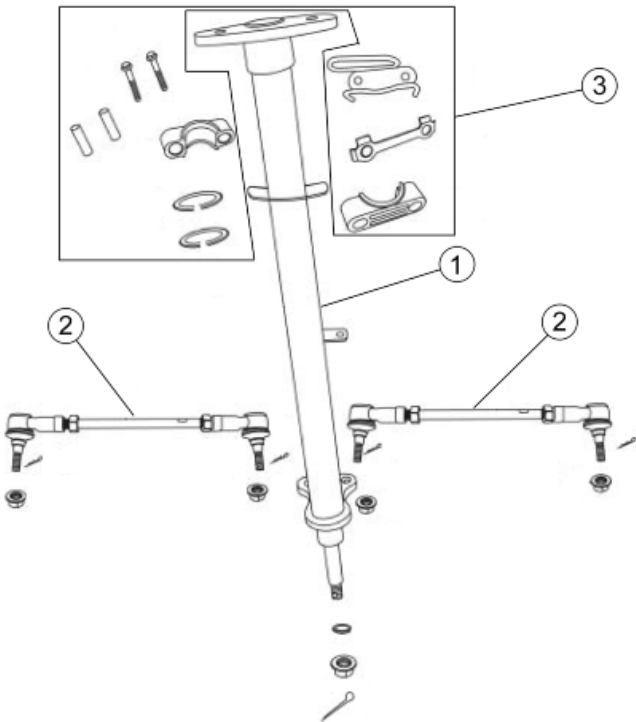
Brake callipers

| PINZE FRENO |        |                                                    |          |
|-------------|--------|----------------------------------------------------|----------|
|             | Code   | Action                                             | Duration |
| 1           | 002007 | Front brake pads - replace                         |          |
| 2           | 002039 | Front brake calliper - Replacement                 |          |
| 3           | 002041 | Front brake disc - Replacement                     |          |
| 4           | 442861 | Articolazione mozzo ruota anteriore - Sostituzione |          |
| 5           | 003033 | Front wheel hub- Replacement                       |          |
| 6           | 003030 | Cuscinetti mozzo ruota anteriore - Sostituzione    |          |



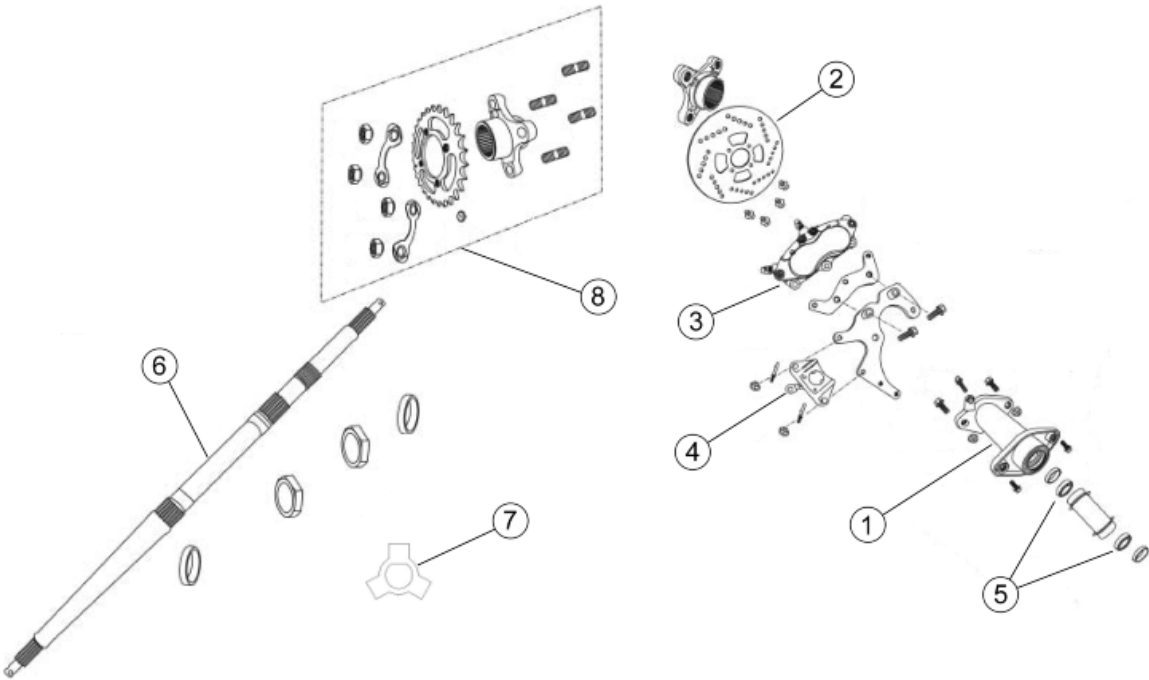
Steering column

| STERZO |        |                                     |          |
|--------|--------|-------------------------------------|----------|
|        | Code   | Action                              | Duration |
| 1      | 003112 | Central steering tube - replacement |          |
| 2      | 442101 | Braccetto - un lato - Sostituzione  |          |
| 3      | 003123 | Supporto tubo sterzo - Sostituzione |          |



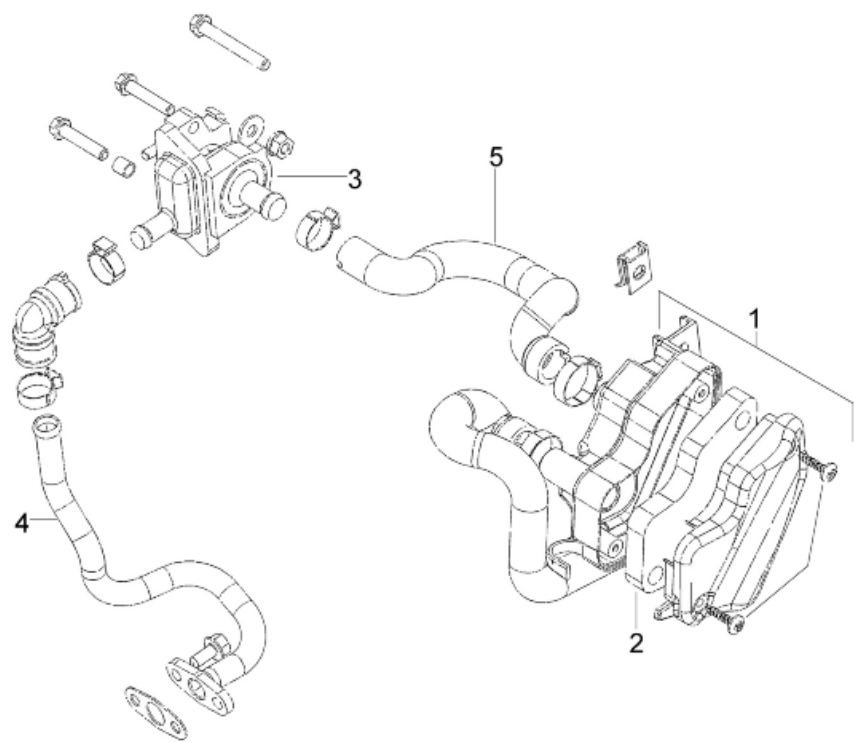
Rear wheel axle

| REAR WHEEL AXLE |        |                                                  |          |
|-----------------|--------|--------------------------------------------------|----------|
|                 | Code   | Action                                           | Duration |
| 1               | 002028 | Rear wheel hub - Replacement                     |          |
| 2               | 002070 | Rear brake disc - Replacement                    |          |
| 3               | 002048 | Rear brake calliper - Replacement                |          |
| 4               | 003109 | Parking brake mechanical calliper - replacement  |          |
| 5               | 821906 | Rear axle bearings                               |          |
| 6               | 831903 | Rear axle                                        |          |
| 7               | 301704 | Axle safety ring                                 |          |
| 8               | 000605 | Final drive (pinion, chain, crown) - Replacement |          |



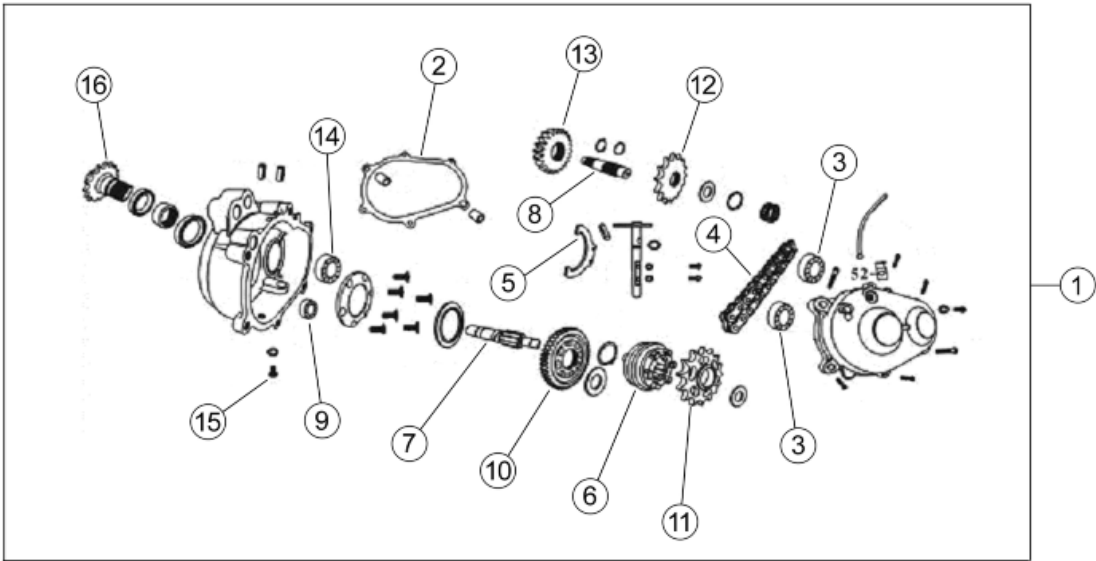
Secondary air box

| SECONDARY AIR HOUSING |        |                                                  |          |
|-----------------------|--------|--------------------------------------------------|----------|
|                       | Code   | Action                                           | Duration |
| 1                     | 001162 | Secondary air housing - Replacement              |          |
| 2                     | 001161 | Secondary air filter - Replacement / Cleaning    |          |
| 3                     | 001174 | SAS valve - Replacement                          |          |
| 4                     | 001163 | SAS valve / Head connection - Replacement        |          |
| 5                     | 001164 | Crankcase secondary air connection - Replacement |          |



Rotation inverter

| REVERSER |        |                                                    |          |
|----------|--------|----------------------------------------------------|----------|
|          | Code   | Action                                             | Duration |
| 1        | BO4000 | Reverser housing - Replacement                     |          |
| 2        | BO4017 | Gasket between crankcase and re-<br>verser housing |          |
| 3        | BO4002 | Gasket bearings - Replacement                      |          |
| 4        | BO4010 | Reverse gear chain - Replacement                   |          |
| 5        | 910201 | Fork                                               |          |
| 6        | 902007 | Selector - Replacement                             |          |
| 7        | BO4007 | Inlet shaft - Replacement                          |          |
| 8        | BO4006 | Intermediate shaft - Replacement                   |          |
| 9        | 331141 | Secondary shaft bearing - Replace-<br>ment         |          |
| 10       | 331151 | Reverser gear - Replacement                        |          |
| 11       | 821001 | Shaft, bearing or main pinion                      |          |
| 12       | 821002 | Shaft, bearing or secondary pinion                 |          |
| 13       | 002111 | Driven reverser gear - Replacement                 |          |
| 14       | 361603 | Primary axle bearing                               |          |
| 15       | 003124 | Reverser oil - Replacement                         |          |
| 16       | 361402 | Engine pinion                                      |          |





## A

Air filter: 37

## B

Battery: 49, 61, 66, 71, 216

Brake: 188–191, 193, 194, 241, 247

## C

Carburettor: 12, 32, 145, 150, 232

Coolant:

## E

Engine oil: 37

Engine stop:

## F

Fuel: 48, 145, 213, 237

Fuses: 69

## H

Headlight: 43, 210

Hub oil: 35

## I

Identification: 8

Instrument panel: 209

## M

Maintenance: 7, 32

## O

Oil filter: 226

## S

Saddle:

Shock absorbers: 178

Spark plug: 35, 64

## T

Tank: 213, 237, 238

Transmission: 10, 48, 78, 95

Turn indicators:

Tyres: 11