GILERA®

# SERVICE STATION MANUAL

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## GP 800 i.e.

# SERVICE STATION MANUAL

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PIAGGIO & C. S.p.A. - After-Sales
V.le Rinaldo Piaggio, 23 - 56025 PONTEDERA (Pi)

# SERVICE STATION MANUAL
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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.

# INDEX OF TOPICS

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This section describes the general specifications of the vehicle.

## Rules

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

## 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 open 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.

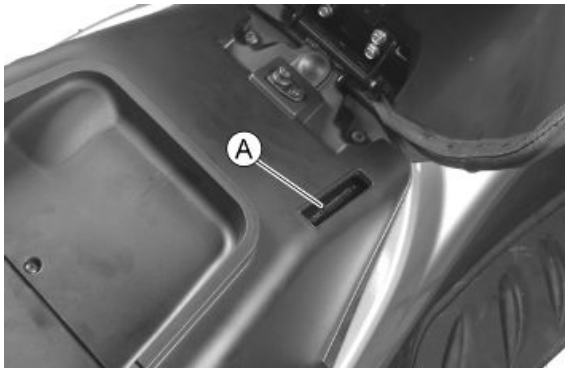
## Maintenance rules

- 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 solvent. Lubricate all the work surfaces except the tapered couplings before refitting.
- 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 measurement. 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.

## Vehicle identification

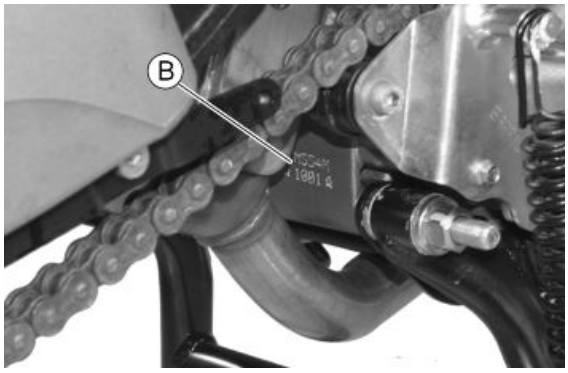
**Chassis prefix (A):**

ZAPM55100

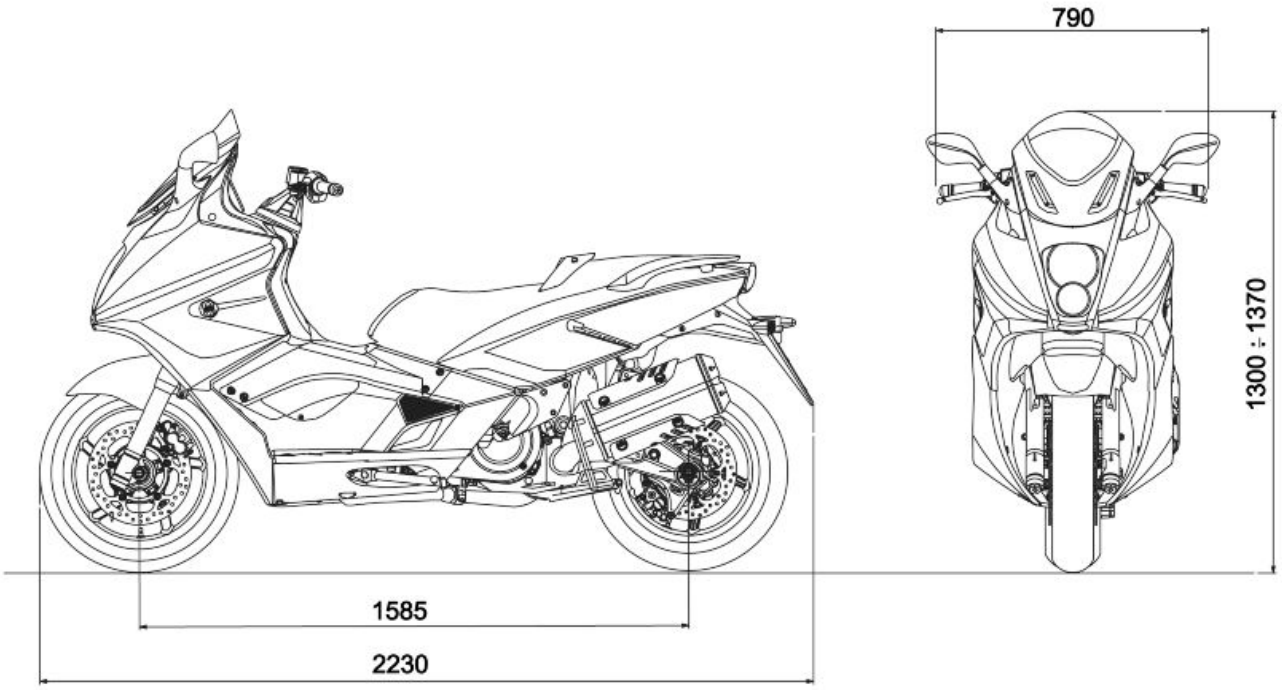



**Engine prefix (B):**

M554M




## Dimensions and mass



**WEIGHTS AND DIMENSIONS**

| Specification | Desc./Quantity |
|---|---|
| Kerb weight | 248 ± 10 kg |
| Maximum weight allowed | 450 kg |
| Maximum height | 1300 ÷ 1370 mm |
| Width | 790 mm |
| Wheelbase | 1585 mm |
| Length | 2230 mm |

## Engine

**ENGINE**

| Specification | Desc./Quantity |
|---|---|
| Type | 90° V-twin engine, 4-stroke, with double spark plug |
| Cubic capacity | 839 cm3 |
| Bore x stroke | 88 x 69 mm |
| Compression ratio | 10.5 ± 0.5 : 1 |
| Engine idle speed | 1,250 ± 100 rpm |
| Timing system | 4 valves, single overhead camshaft, driven. |
| Valve clearance | Inlet: 0.15 mm<br>Outlet: 0.15 mm |
| MAX. Power | 50.5 kW at 7,750 rpm |
| MAX. torque | 71 Nm at 4,500 rpm |
| Lubrication | Engine lubrication by a dry sump system, with double lobe pump (one for delivery and one for return), controlled by a chain and paper filter. |
| Lubrication pressure | 3.5 ÷ 4 bar |
| Minimum lubrication pressure (100° C) | 0.8 bar |
| Fuel supply | Multipoint electronic injection with single Ø 38-mm throttle body and electric fuel pump. |
| Cooling | Forced liquid circulation cooling. |
| Fuel | Unleaded petrol (95 RON) |

**TECHNICAL SPECIFICATIONS**

**OIL PUMP**

| Specification | Desc./Quantity |
|---|---|
| Type | Trochoidal |
| Rotor washers | Delivery pump: 12 mm<br>Scavenge pump: 22 mm |
| Assembly clearances | Lobe ends: 0.04 ÷ 0.1 mm |
| External rotor radial clearance | 0.05- 0.12 mm |
| Levelness | 0.1 mm |

**BY-PASS**

| Specification | Desc./Quantity |
|---|---|
| Type | with piston |
| Plunger diameter | Ø 14-0.016 -0.043 mm |
| Unloaded spring length | 52 mm |
| Calibration pressure | 4.5 bar |

## OIL FILTER

| Specification | Desc./Quantity |
|---|---|
| Type | Paper with pressure relief and anti-drain back by-pass valves |

## OIL MINIMUM PRESSURE INDICATOR LIGHT SWITCH

| Specification | Desc./Quantity |
|---|---|
| Calibration | 0.3 - 0.6 bar |

## HEAD LUBRICATION CONTROL JET

| Specification | Desc./Quantity |
|---|---|
| Diameter | 1 ± 0.05 mm * |

**** Tightening torque** 5÷7 N·m*

## PISTON COOLING NOZZLE

| Specification | Desc./Quantity |
|---|---|
| Diameter | Ø 1 ± 0.05 mm |

## CRANKCASE VENTILATION CHECK

| Specification | Desc./Quantity |
|---|---|
| Device | metal reed valve and decantation chamber |

## TECHNICAL SPECIFICATIONS

| Specification | Desc./Quantity |
|---|---|
| Cooling system capacity | 2.4 l |
| Prescribed fluid | AGIP PERMANENT SPEZIAL |
| Sealing pressure | Cap calibrated at 0.9 bar |

## THERMOSTAT

| Specification | Desc./Quantity |
|---|---|
| Type | Wax-type, with deviator |
| Starts opening | 85±2°C |

## ELECTRIC VENTILATION

| Specification | Desc./Quantity |
|---|---|
| Type | With piston |
| Electric ventilation starts at | 105°C |
| Electric ventilation stops at | 100°C |

## WATER PUMP

| Specification | Desc./Quantity |
|---|---|
| Type | Centrifugal |
| Control | Gear on oil delivery pump |

## RADIATOR

| Specification | Desc./Quantity |
|---|---|
| Type | Aluminium, with horizontal circulation |

**EXPANSION TANK**

| Specification | Desc./Quantity |
|---|---|
| Calibration | Automatic bleeding, in parallel with the radiator |

## Transmission

**TRANSMISSION**

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

## Capacities

**CAPACITY**

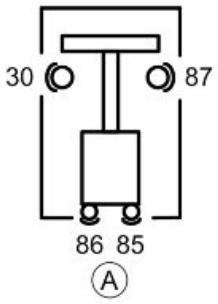
| Specification | Desc./Quantity |
|---|---|
| Engine oil | 2.5 l (without oil filter replacement)<br>2.6 l (with oil filter replacement) |
| Transmission oil | ~ ----- cm³ |
| Cooling system fluid | ~ 2.4 l |
| Fuel tank (reserve) | ~14 l ± 0.5 l (~1.8 l) |

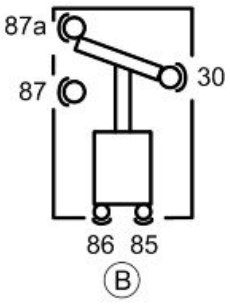
## Electrical system

**ELECTRICAL SYSTEM**

| Specification | Desc./Quantity |
|---|---|
| Start-up | Electric |
| Ignition | High efficiency electronic inductive ignition, integrated with the injection system, with variable advance and separate HV coil. |
| Ignition advance | Three-dimensional map managed by control unit |
| Spark plug | NGK CR7EKB |
| Alternative spark plug | - |
| Battery | 12 V / 14 Ah, SEALED BATTERY |
| Generator | Three-phase alternating current, 450W. |

There are two types of remote controls in the electrical system, those operating as "circuit breakers" «**A**», and those operating as a "switches" «**B**».



**CHECKING REMOTE CONTROLS «A» OPERATING AS CIRCUIT BREAKERS**


1) Check that, given regular conditions, there is no continuity between terminals 30 and 87.
2) Apply 12V voltage to power terminals 85 and 86 of the remote control.
3) With the remote control powered, check that there is continuity between terminals 30 and 87.
4) If these conditions are not fulfilled, the remote control is damaged and must be replaced.

**CHECKING REMOTE CONTROLS «B» OPERATING AS SWITCHES**

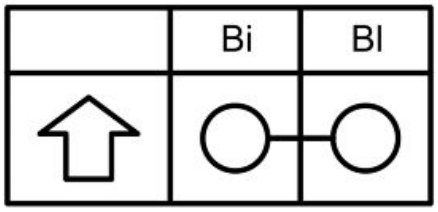

1) Check that, given regular conditions, there is no continuity between terminals 30 and 87 but that there is continuity between terminals 30 and 87a.
2) Apply 12V voltage to power terminals 85 and 86 of the remote control.
3) With the remote control powered, check that there is continuity between terminals 30 and 87. However, there must be no continuity between terminals 30 and 87a.
4) If these conditions are not fulfilled, the remote control is damaged and must be replaced.

To check buttons and switches make sure that, according to their position, the continuity of contacts is correct, as indicated in the following tables.

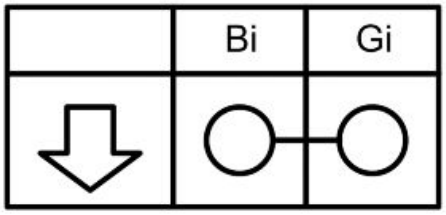
**«MODE» BUTTON**

| | Ve | Ro-Ne |
|---|---|---|
| MODE | ○ | ○ |

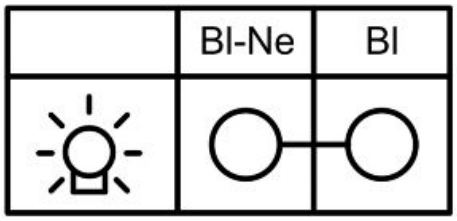
**WINDSHIELD «UP» BUTTON**



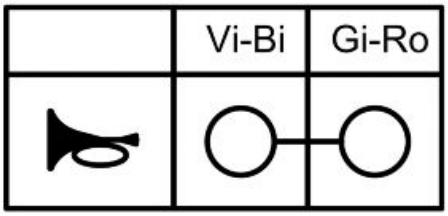

**WINDSHIELD «DOWN» BUTTON**



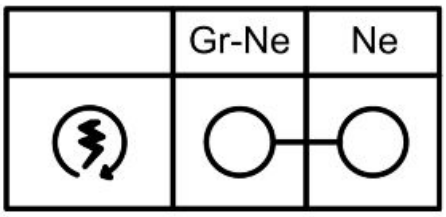

**HELMET COMPARTMENT LIGHT BUTTON**



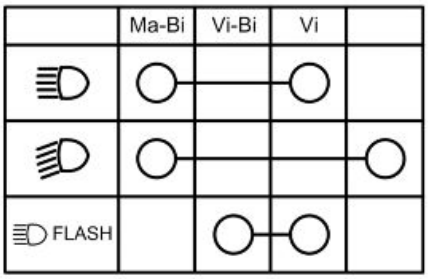

**HORN BUTTON**



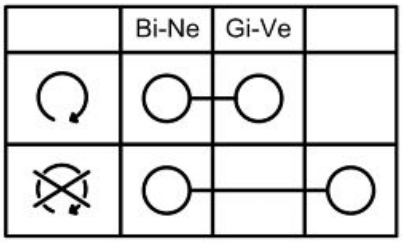
**STARTER BUTTON**



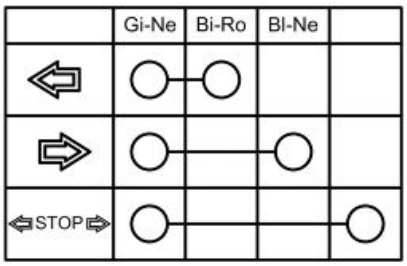

**LIGHT SWITCH**




**ENGINE STOP SWITCH**




**TURN INDICATOR SWITCH**



**INTAKE AIR TEMPERATURE SENSOR**

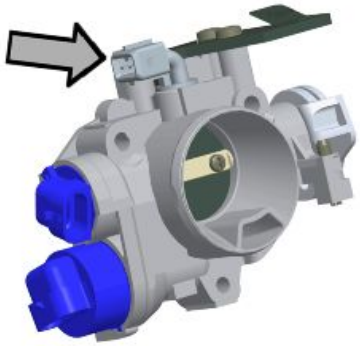
-10° = 9600 Ohm

0° = 5900 Ohm

+10° = 3800 Ohm

+20° = 2500 Ohm

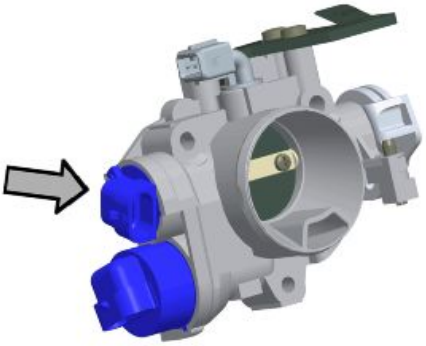
-30° = 1700 Ohm



**THROTTLE POSITION SENSOR**

With the switch set to "ON" at a variable voltage between 0.7V and > 4V between pins **23 - 3** on engine-side wiring.

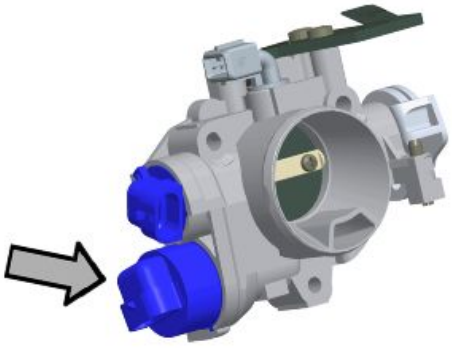
Ground insulation of pins **29 - 32 - 3** on engine-side wiring



**STEPPER MOTOR**

Resistance engine-side connector between pins **19 - 9** ~ 51 Ohm

Resistance engine-side connector between pins **18 - 17** ~ 51 Ohm



**FUEL INJECTOR**

Type: 4 holes

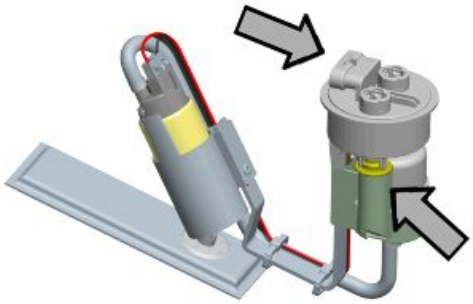
Conicity of the nozzle: 24°

Resistance at terminals: 13.7 ÷ 15.2 Ohm

**FUEL PUMP UNIT**

Mechanical type pressure regulator operating at a pressure of 3 BAR

Pump winding resistance: ~ 1,5 Ohm



**REVOLUTION TIMING SENSOR**

Resistance between "**+** and **-"** = 890 ± Ohm (pins **35 - 25** , engine-side wiring)

Insulation between "**+** and **S**" and between "- and **S**" (pins **35 - 34** and **25 - 34**, engine-side wiring)

**ENGINE TEMPERATURE SENSOR**

0° = 5900 Ohm

+10° = 3800 Ohm

+20° = 2500 Ohm

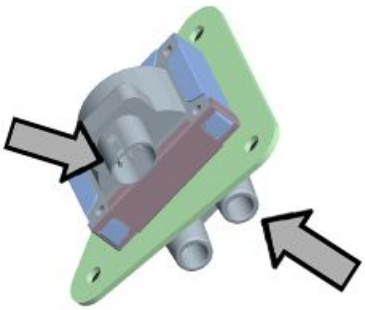
+30° = 1700 Ohm

+80° = 300 Ohm

**H.V. COIL**

Primary winding resistance: 520 ÷ 620 mOhm

Secondary resistance: 6830 ÷ 7830 Ohm

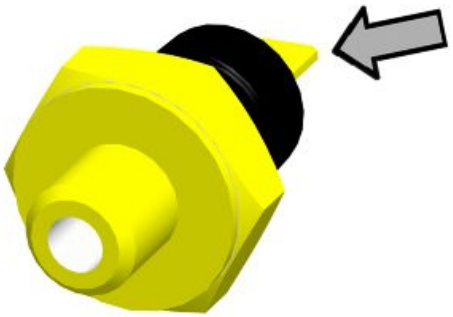


**MINIMUM OIL PRESSURE SENSOR**

Normally closed switch

Activation threshold: 0.3 - 0.6 bar

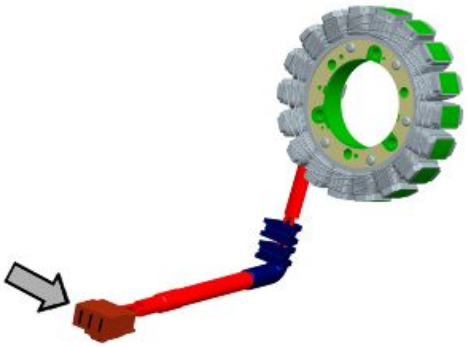
With the engine off: continuity between terminal and ground



**STATOR**

Resistance between terminals: 0.2 ÷ 1 Ohm

Terminal insulation from ground



## Frame and suspensions

**FRAME AND SUSPENSIONS**

| Specification | Desc./Quantity |
|---|---|
| Chassis | Double cradle with tubular and steel stamped plates |
| Front suspension | Hydraulic telescopic fork, single plate, ø 41-mm straight stems. |
| Front suspension travel | 126 mm |
| Oil quantity for stem | 295 ± 3 cm³ |
| Unloaded spring length | ----- mm |
| Rear suspension | Single shock absorber that acts directly on the fork. |
| Rear suspension travel | 135 mm |

## Brakes

**BRAKES**

| Specification | Desc./Quantity |
|---|---|
| Front brake | Ø 300-mm double disc brake with hydraulic control activated by the handlebar right-hand lever. Two floating callipers, ø 28 double plunger |
| Rear brake | Ø 280-mm disc brake, with hydraulic servo operated from the handlebar with the left-hand lever. One floating calliper with a single plunger |

## Wheels and tyres

**WHEELS AND TYRES**

| Specification | Desc./Quantity |
|---|---|
| Wheel rim type | Light alloy rims. |
| Front rim | 16" x 3.50 |
| Rear rim | 15" x 4.50 |
| Front tyre | Tubeless, 120/70 - 16" 57H |
| Rear tyre | Tubeless, 160/60 - 15" 67H |
| Front tyre pressure (with passenger) | 2.5 bar (-) |
| Rear tyre pressure (with passenger) | 2.75 bar (-) |

## Tightening Torques

**LUBRICATION**

| Name | Torque in Nm |
|---|---|
| Engine oil drainage plug | 21 ÷ 29 |
| Bulkhead screws for oil pump housing cover | 3 ÷ 4 |
| Engine oil filter | 12 - 16 |
| Oil pump chain tensioner pad | 2 ÷ 3 |
| Oil pump screws | 5 - 6 |
| By-pass scavenge duct fixing screws | 11 ÷ 13 |
| Lubrication circuit upper bulkhead | 3 ÷ 4 |
| Oil pump crown screw | 10 ÷ 14 |
| Screws fixing oil pump to the crankcase | 5 - 6 |
| Minimum oil pressure sensor | 10 |
| Water pump gear fixing screw | 5 - 6 |

**THERMAL GROUP AND TIMING SYSTEM**

| Name | Torque in Nm |
|---|---|
| Spark plug | 12 ÷ 14 |
| Head fixing stud bolts: | *** |
| Head fixing nuts | 10 - 12 |
| Exhaust / intake head fixing nuts: | 10 - 12 |
| Head lubrication control jet | 5 - 7 |
| Tensioner sliding block fixing screw: | 10 - 14 |
| injector fixing screw | 3 ÷ 4 |
| inlet manifold fixing screws | 11 - 13 |
| Tappet cover fixing screws: | 7 - 9 |
| Throttle body fixing screws | 11 ÷ 13 |
| camshaft retaining bracket fixing screws | 4 - 6 |
| Head fixing screws | 10 - 12 |
| Coolant temperature sensor | 21 ÷ 23 |
| Revolution timing sensor fixing screw | 7.5 ÷ 8.5 |
| Timing system chain tensioner screw | 11 ÷ 13 |
| Timing system gear on camshaft screw | 12 ÷ 14 |

**** Apply a preliminary torque of 10 Nm in a criss-crossed sequence. - tighten with a torque of 13 Nm + 90° in a criss-crossed sequence. - tighten again by 90° in a criss-crossed sequence.*

**TRANSMISSION COVER**

| Name | Torque in Nm |
|---|---|
| Drive pulley nut | 252 ÷ 278 |

| Name | Torque in Nm |
|---|---|
| Driven pulley nut | 153 ÷ 187 |
| Clutch ring nut | 65 - 75 |
| External transmission cover screws | 5 ÷ 7 |
| Internal transmission cover screws | 11 ÷ 13 |
| Air switch screw | 3 ÷ 4 |
| Air outlet grille screws | 3 ÷ 4 |

## FLYWHEEL COVER

| Name | Torque in Nm |
|---|---|
| Flywheel fixing nut | 116 ÷ 128 |
| Stator retainers | 8 - 10 |
| Screw fixing freewheel to flywheel | 13 ÷ 15 |
| Flywheel cover screws | 11 - 13 |

## CRANKCASE AND CRANKSHAFT

| Name | Torque in Nm |
|---|---|
| Starting ring gear retaining plate | 3 ÷ 4 |
| Engine crankcase coupling screws (M6) | 11 ÷ 13 |
| Engine crankcase coupling screws (M8) | 25 ÷ 28 |

## COOLING

| Name | Torque in Nm |
|---|---|
| Water pump rotor cover | 3 ÷ 4 |
| bleed screw | 3 ÷ 4 |
| Water pump impeller | 4 ÷ 5 |
| Screws tightening water pump gear protection plate | 3 ÷ 4 |

## CHASSIS

| Name | Torque in Nm |
|---|---|
| Side stand bolt nut | 37 |
| Screws fixing side stand button | 6 |
| Screw fixing electric fan - radiator | 2 ÷ 3 |
| Screw fixing radiator - chassis | 5 ÷ 7 |
| Nut fixing silent-block plate - chassis | 22 ÷ 25 |
| Nut fixing silent-block plate | 33 ÷ 41 |
| Pin fixing nut - M14 | 124 ÷ 153 |
| Pin fixing nut - M10 | 47 ÷ 52 |
| Upper nut fixing engine support link rods - chassis | 33 ÷ 41 |
| Lower nut fixing engine support link rods - chassis | 33 ÷ 41 |
| Nut fixing head - exhaust manifold | 16 ÷ 18 |
| Centre stand front bolt nut | 34 ÷ 39 |
| Centre stand rear bolt nut | 74 ÷ 81 |
| Screw fixing silencer - muffler support arm | 11 |
| Screw fixing catalytic converter - catalytic converter support | 22 ÷ 24 |
| Screw fixing muffler support arm - engine | 24 ÷ 27 |
| Silencer fixing screw | 22 |
| Manifold retainer clamp | 16 ÷ 18 |

## PINION UNIT

| Name | Torque in Nm |
|---|---|
| Screw for plate locking pinion driving bushing | 4 ÷ 6* |
| Screws fixing pinion unit cover | 4 ÷ 5* |
| Screws fixing pinion unit - chassis | 50 |
| Pinion unit oil drain screw | 13 ÷ 15 |
| Pinion unit oil filling screw | 13 ÷ 15 |
| Oil sealing casing clamp | 3 ÷ 5 |

*(*) Apply LOCTITE 243 threadlock*

## HANDLEBAR

| Name | Torque in Nm |
|---|---|
| Screws fixing handlebar supporting plate - steering tube | 50 ÷ 55 |
| Screws fixing frame - supporting plate | 4.5 ÷ 7 |
| Screws fixing half-handlebars - supporting plate | 20 ÷ 25* |
| Screw fixing half-handlebar insert - half-handlebar | 20 ÷ 25* |
| Handlebar cover fixing screw | 2.5 ÷ 4 |
| Brake pump stand fixing screws | 7 ÷ 10 |

*(*) Apply LOCTITE 243 threadlock*

## MISCELLANEOUS

| Name | Torque in Nm |
|---|---|
| starter motor retainers | 11 - 13 |

## BRAKE SYSTEM

| Name | Torque in Nm |
|---|---|
| Brake pipes / rear brake calliper coupling | 20 ÷ 25 |
| Brake pipes / brake pump coupling | 16 ÷ 20 |
| Screws fixing front brake disc to rim | 25 |
| Screws fixing rear brake disc to rim | 25 |
| Screws fixing brake pump to handlebar | 7 ÷ 10 |
| Screw fixing three-way union to fork head | 10 ÷ 12 |
| Screws fixing front brake calliper to fork | 20 ÷ 25 |
| Screw fixing rear brake calliper to supporting plate | 20 ÷ 25 |
| Screw fixing parking brake calliper to supporting plate | 24 ÷ 27 |
| Brake calliper bleed screw | 4 ÷ 7 |
| Parking brake adjusting nut | 10 |
| Nut fixing rear brake pipe retaining clip | 11 ÷ 13 |
| Pin fixing parking brake pads | 15 ÷ 20 |
| Brake pipes / three-way union coupling | 18 ÷ 23 |
| Brake pipes / front brake calliper coupling | 16 ÷ 20 |
| Rear brake pad fixing pins | 15 ÷ 20 |

## FRONT SUSPENSION

| Name | Torque in Nm |
|---|---|
| Screw fixing wheel pin on right fork leg | 6 ÷ 7 |
| Front wheel pin nut | 60 ÷ 70 |
| Hydraulic rod fixing screw | 25 ÷ 35* |
| Fork locking screws cap | 35 - 55 |
| Stem support clamp tightening screws | 20 ÷ 25 |

| Name | Torque in Nm |
|---|---|
| Steering tube lower ring nut | 20 ÷ 22 |
| Steering tube upper ring nut | 48 ÷ 54 |

*(*) Apply LOCTITE 243 threadlock*

**REAR SUSPENSION**

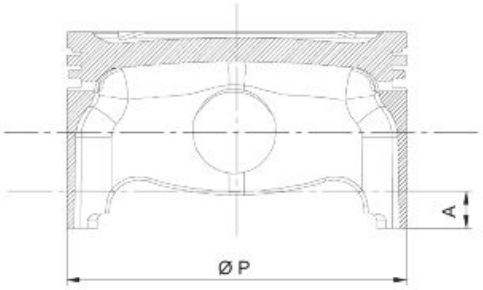
| Name | Torque in Nm |
|---|---|
| Nut fixing shock absorber - fork | 38 - 46 |
| Screw fixing shock absorber - fork | 38 - 46 |
| Screw fixing chain stop slider - fork | 5 ÷ 7 |
| Screw fixing centre stand stop buffer - fork | 5 ÷ 7 |
| Crown fixing screws | 22.5 ÷ 27.5* |
| Rear wheel pin nut | 70 |
| Fork locking ring nut | 60 ± 3 Nm |
| Fork pin set screw | 0.5 |
| Fork pin nut | 90 ± 5 |

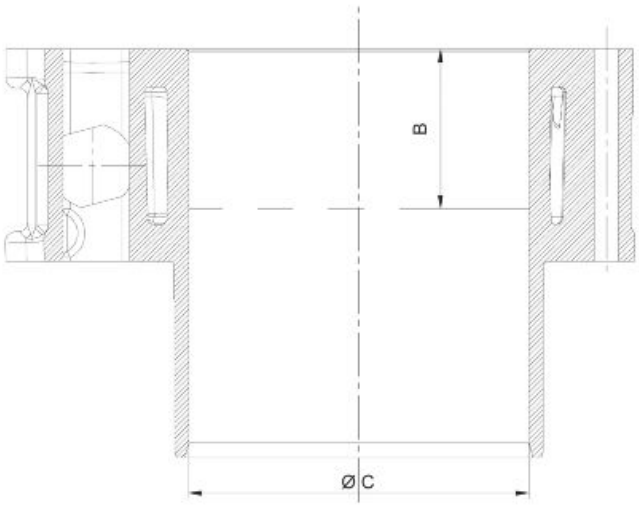
*(*) Apply LOCTITE 243 threadlock*

## Overhaul data

## Assembly clearances

## Cylinder - piston assy.



## HEIGHT TO MEASURE THE PISTON

| Specification | Desc./Quantity |
|---|---|
| A | 10 mm |
| B | 43 mm |

## CYLINDER - PISTON

| Specification | Desc./Quantity |
|---|---|
| Cylinder diameter C | 88 +0.018-0.01 mm |
| Piston Ø P | 87.968 ±0.014 mm |

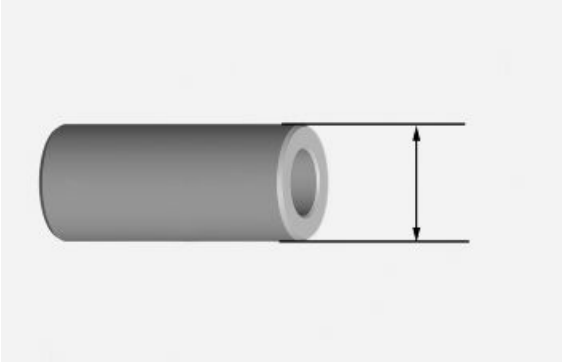
## COUPLING CATEGORIES

| Name | Initials | Cylinder | Piston | Play on fitting |
|---|---|---|---|---|
| Cylinder- Piston | A | 87.990÷87.997 | 87.954÷87.961 | 0.029÷0.043 |
| Cylinder- Piston | B | 87.997 ÷ 87.004 | 87.961 ÷ 87.968 | 0.029÷0.043 |
| Cylinder- Piston | C | 88.004÷88.011 | 87.968÷87.975 | 0.029÷0.043 |
| Cylinder- Piston | D | 88.011÷88.018 | 87.975 ÷ 87.982 | 0.029÷0.043 |

**N.B.**

**THE PISTON MUST BE INSTALLED WITH THE ARROW FACING TOWARDS THE EXHAUST SIDE, THE PISTON RINGS MUST BE INSTALLED WITH THE WORD «TOP» OR THE STAMPED MARK FACING UPWARDS.**

- Calculate the coupling clearance between pin and connecting rod end.

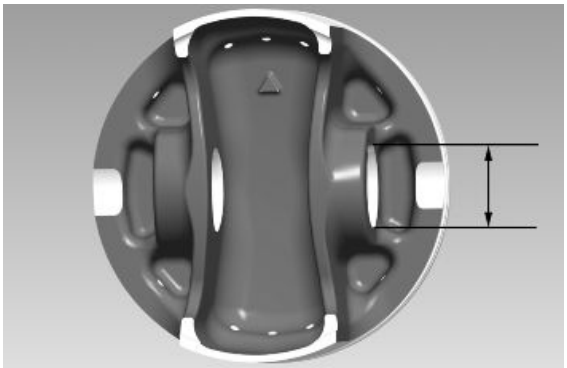


### Characteristic

**Standard clearance:**

0.015 ÷ 0.029 mm

- Measure the capacity diameter on the piston.



### Characteristic

**Standard diameter:**

22 + 0.006 + 0.001 mm

- 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

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

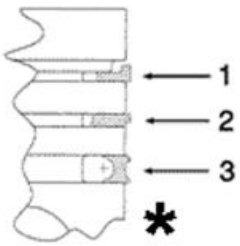
**Characteristic**

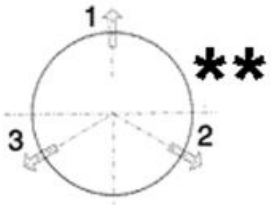
**Maximum allowable run-out:**

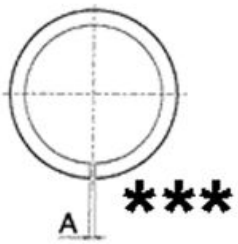
0.05 mm

- 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).

## Piston rings




***Fit rings «**2**» and «**3**» with the word «**TOP**» facing upwards.

**** Position the openings in the rings as shown here.

*****Value «**A**» of sealing ring inside the cylinder.

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

**Compression ring:** 0.15 ÷ 0.35 mm. Max. value 0.5 mm

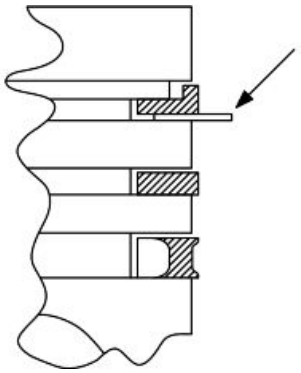
**Oil scraper ring:** 0.25 ÷ 0.50 mm. Max. value 0.65 mm

**Oil scraper ring:** 0.25 ÷ 0.50 mm. Max. value 0.65 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 clearances.



**Top ring Standard coupling clearance:** 0.01÷0.06 mm

**Maximum clearances allowed after use:** 0.10 mm

**Intermediate ring Standard coupling clearance:**0.02÷0.07 mm

**Maximum clearances allowed after use:** 0.10 mm

**Oil scraper ring Standard coupling clearance:** 0.01÷0.06 mm

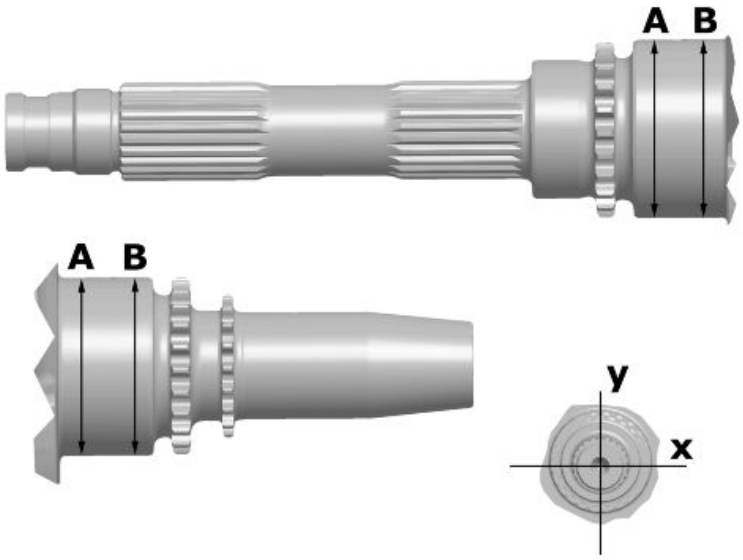
**Maximum clearances allowed after use:** 0.10 mm

Replace the piston if clearances exceed the maximum limits specified in the table.

## Crankcase - crankshaft - connecting rod

**Diameter of crankshaft bearings.**

Measure the capacity on both axes x-y.



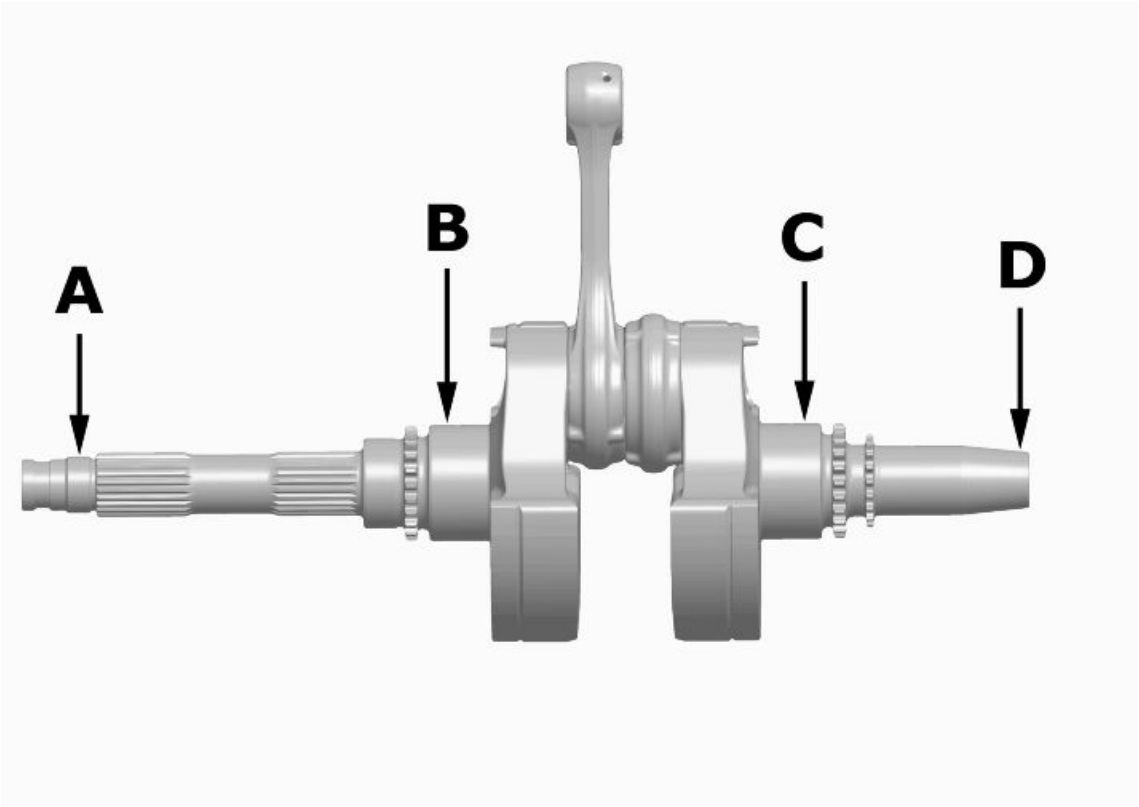
## CRANKSHAFT

| Specification | Desc./Quantity |
|---|---|
| Cat. 1 | Standard diameter: 45.010 ÷ 45.016 |
| Cat. 2 | Standard diameter: 45.016 ÷ 45.022 |

**Crankshaft alignment**

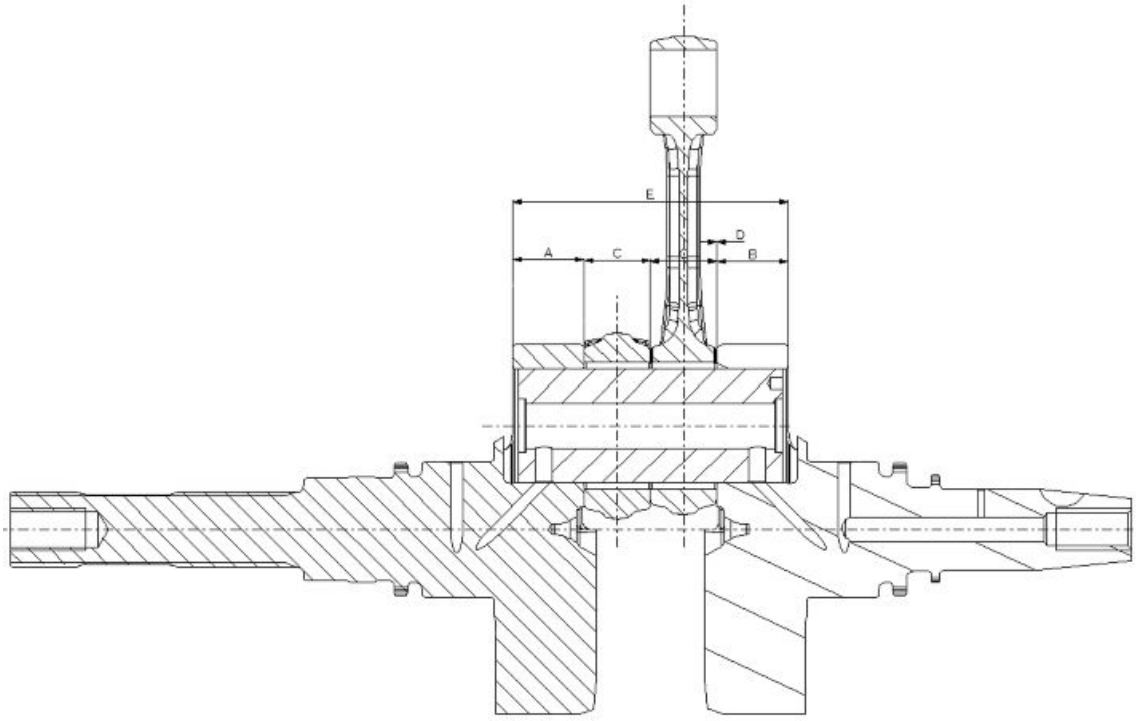
### Specific tooling

**020335Y Magnetic support for dial gauge**



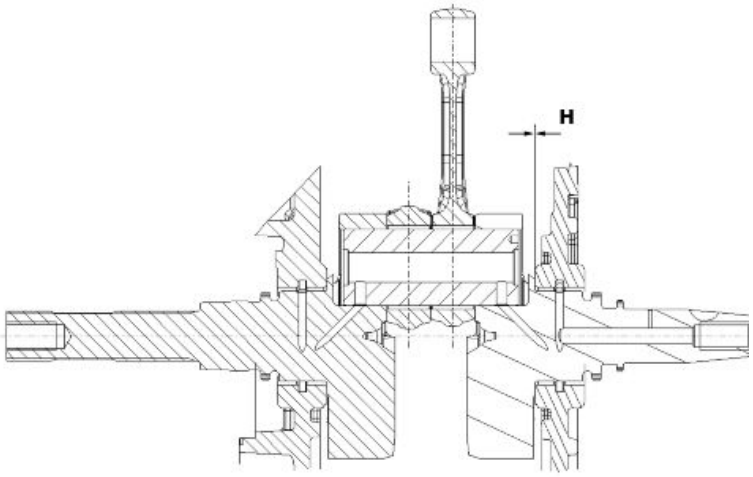

## MAX. ADMISSIBLE DISPLACEMENT

| Specification | Desc./Quantity |
|---|---|
| A = | 0.15 mm |
| B = | 0.010 mm |
| C = | 0.010 mm |
| D = | 0.10 mm |




**AXIAL CLEARANCE BETWEEN CRANKSHAFT AND CONNECTING ROD**

| Name | Description | Dimensions | Initials | Quantity |
|---|---|---|---|---|
| Half-shaft, transmission side | | 23.8 +0.1 | A | D = 0.20 ÷ 0.55 |
| Flywheel-side half-shaft | | 23.8 + 0.1 | B | D = 0.20 ÷ 0.55 |
| Connecting rod | | 22 -0.10 - 0.15 | C | D = 0.20 ÷ 0.55 |
| Complete crankshaft | | 91.8 +0.05 | E | D = 0.20 ÷ 0.55 |

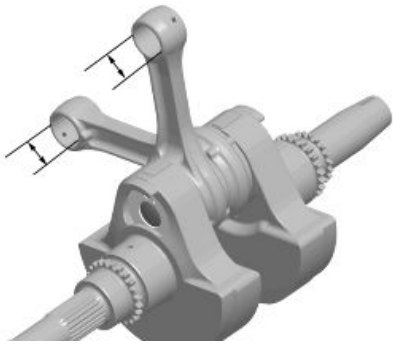



## Characteristic

**Crankshaft-crankcase axial clearance (H)**

0.1 ÷ 0.45 mm (when cold)

- Using a bore gauge, measure the connecting rod small end diameter.



**N.B.**

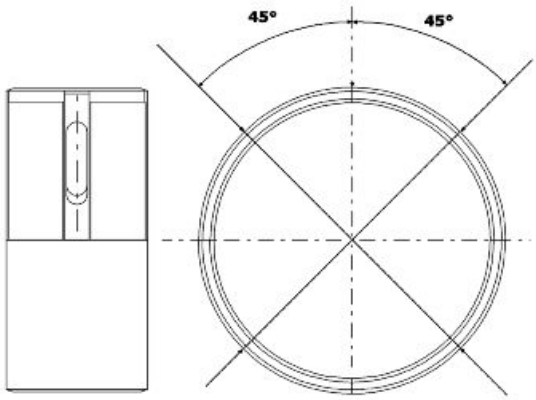
**IF THE CONNECTING ROD SMALL END DIAMETER EXCEEDS THE STANDARD DIAMETER, EXHIBITS WEAR OR OVERHEATING, PROCEED TO REPLACE THE CRANKSHAFT AS DESCRIBED IN CHAPTER CRANKCASE AND CRANKSHAFT.**

### Characteristic

**Standard diameter:**

22 + 0.025 +0.015 mm

- 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.




**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.**

Before assembling, check that the clearance between the engine crankcase bushing and the crankshaft is within the predetermined limits.

### Characteristic

**Crankshaft-bushing maximum clearance admitted:**

0.08 mm

- The standard bushing diameter after driving is variable on the basis of a coupling selection.
- The bushing seats in the crankcase and the crankshaft are classified into 2 categories.
- Bushings are subdivided into 3 categories according to their thickness (see the table).

The following kinds of bushings indicated in the table must be used according to the kind of coupling between the crankshaft and the crankcase.

| | | Y | |
|---|---|---|---|
| | | 1 | 2 |
| X | 1 | C | B |
| | 2 | B | A |

**KEY**

**X** = Crankshaft category

**Y** = Crankcase half-shell category

**A** = Red

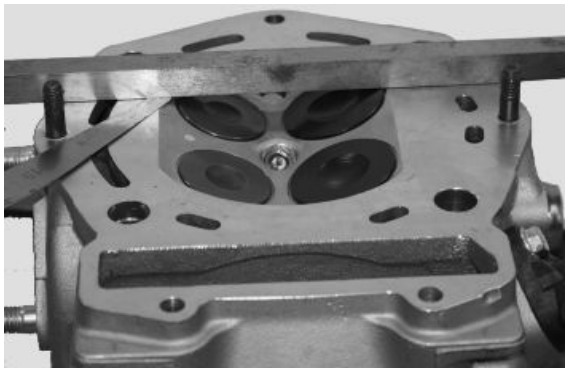
**B** = Blue

**C** = Yellow

## Cylinder Head

Before performing head service operations, thoroughly clean all coupling surfaces. Note the position of the springs and the valves so as not to change the original position during refitting

- Using a trued bar and feeler gauge check that the cylinder head surface is not worn or distorted.



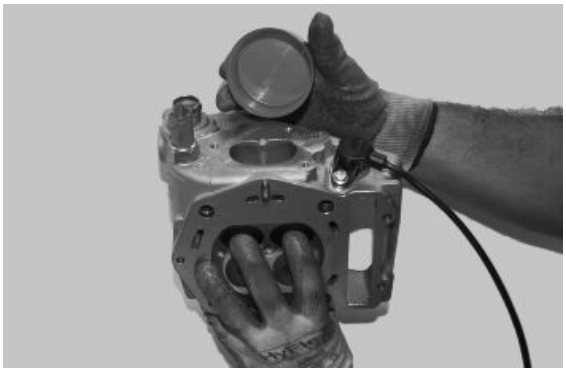
**Characteristic**

**Maximum allowable run-out:**

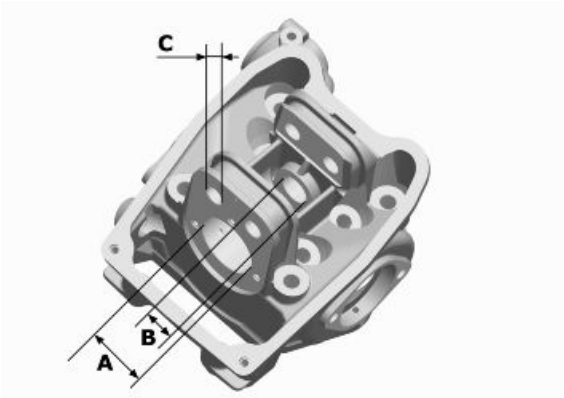
0.1 mm

- In case of irregularities, replace the head.
- Check the sealing surfaces for the intake and exhaust manifold.
- Check that the camshaft and the rocker pin capacities exhibit no wear.
- Check that the head cover surface is not worn.
- Check that the coolant sealing pad exhibits no oxidation.

- 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.



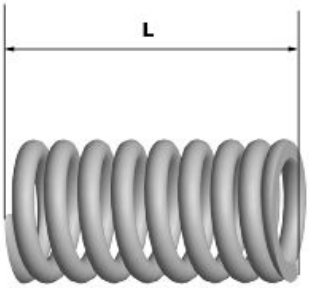
Measure the camshaft bearing seats and rocking lever support pins with a bore meter




**HEAD BEARINGS**

| Specification | Desc./Quantity |
|---|---|
| Bearing "A" | 42 +0.025 |
| Bearing "B" | 19.5 -0.2 |
| Bearing "C" | 13 +0.018 |

- Measure the unloaded spring length.




## Characteristic

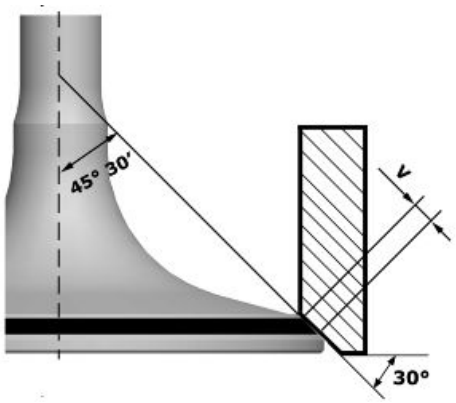
**Standard length:**

44.4 mm

**Admissible limit after use:**

42.4 mm

- Clean the valve seats of any carbon residues.
- Using the Prussian blue, check the width of the impression on the valve seat "**V**".




### Characteristic

**Standard value:**

1 - 1.3 mm

**Admissible limit:**

1.6 mm

- If the impression width on the valve seat is larger than the prescribed limits, true the seats with a 45° mill and then grind.
- In case of excessive wear or damages, replace the head.

**STANDARD VALVE LENGTH**

| Specification | Desc./Quantity |
|---|---|
| Inlet: | 95.0 ± 0.3 mm |
| Outlet: | 94.2 ± 0.3 mm |


- Measure the diameter of the valve stems in the three positions indicated in the diagram.

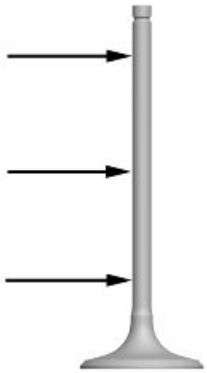
**STANDARD DIAMETER**

| Specification | Desc./Quantity |
|---|---|
| Inlet: | 4.987 - 4.972 mm |
| Outlet: | 4.975 - 4.960 mm |

**MINIMUM ADMISSIBLE DIAMETER**

| Specification | Desc./Quantity |
|---|---|
| Inlet: | 4.96 mm |
| Outlet: | 4.945 mm |

- Calculate the clearance between valve and valve guide.

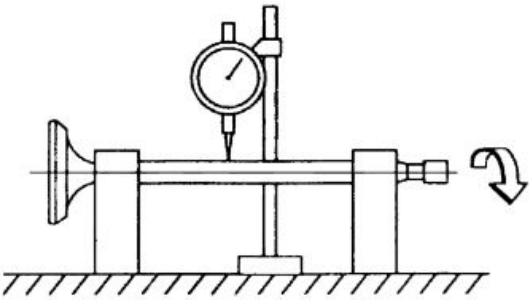


- Check the deviation of the valve stem by resting it on a "**V**" shaped abutment and measuring the extent of the deformation with a comparator.

### Characteristic

**Limit values admitted:**

0.1 mm

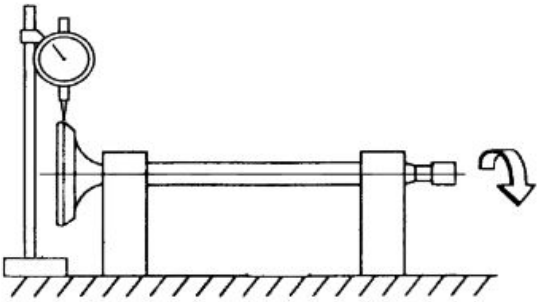


- Check the concentricity of the valve head by arranging a comparator at right angle relative to the valve head and rotate it on a "**V**" shaped abutment.

### Characteristic

**Admissible limit:**

0.03 mm

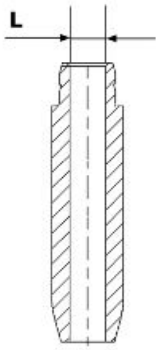


Measure the valve guide.

### Characteristic

**Valve guide:**

5 +0.012 mm



- After measuring the valve guide diameter and the valve stem diameter, check the clearance between guide and stem.

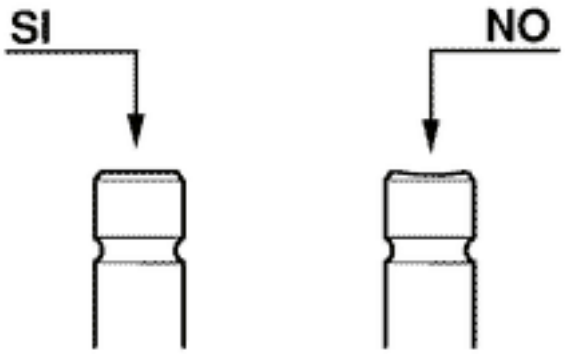
**OUTLET**

| Specification | Desc./Quantity |
|---|---|
| Standard clearance: | 0.025 ÷ 0.052 mm |
| Admissible limit: | 0.09 mm |

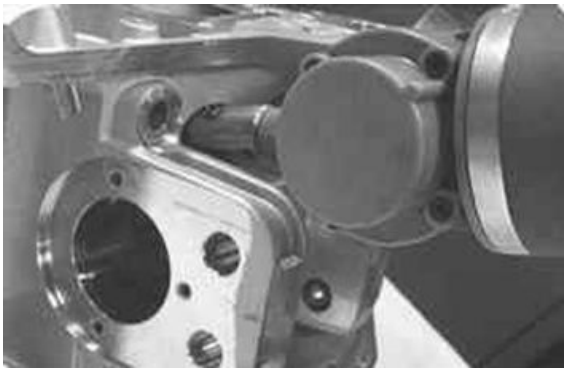
**INLET**

| Specification | Desc./Quantity |
|---|---|
| Standard clearance: | 0.013 - 0.04 mm |
| Admissible limit: | 0.08 mm |

- 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. To obtain better sealing performance, grind the valve seats. 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 CONTACT 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.**

**CAUTION**

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

- Check that the camshaft ends exhibit no scores or irregular wear.

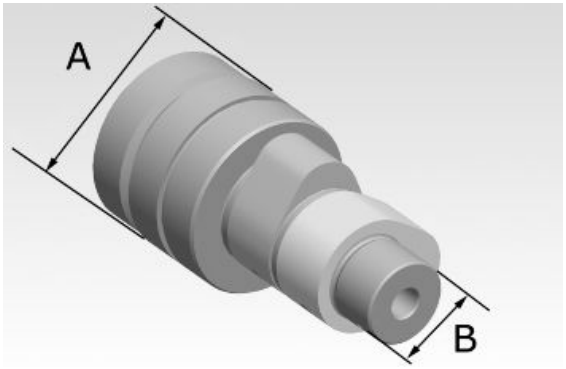
- Using a micrometer, measure the camshaft capacity.

**STANDARD DIAMETER**

| Specification | Desc./Quantity |
|---|---|
| Bearing A Ø: | 42 - 0.060 -0.085 mm |
| Bearing B diameter: | 20 - 0.020 -0.041 mm |

**MINIMUM ADMISSIBLE DIAMETER**

| Specification | Desc./Quantity |
|---|---|
| Bearing A Ø: | 41.910 mm |
| Bearing B diameter: | 19.940 mm |



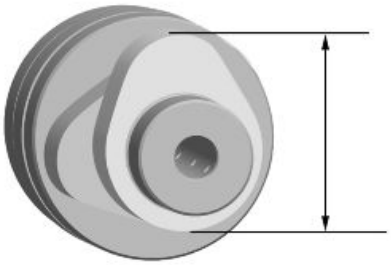

-Using a gauge, measure the cam height.

**STANDARD HEIGHT**

| Specification | Desc./Quantity |
|---|---|
| intake | 33.988 mm |
| discharge | 33.417 mm |

**ADMISSIBLE LIMITS**

| Specification | Desc./Quantity |
|---|---|
| intake | 33.740 mm |
| discharge | 33.170 mm |
| Standard axial clearance: | 0 - 0.22 mm |
| Maximum admissible axial clearance: | 0.3 mm |



- Check that the cam contact sliding block and the articulated register plate is free from wear.

- In case of wear, replace the component.

- Check that the rocking lever pins exhibit no scores or wear.

**Characteristic**

**Standard diameter:**

13 - 0.010 -0.018 mm

- Measure the inside diameter of each rocking lever.

**Characteristic**

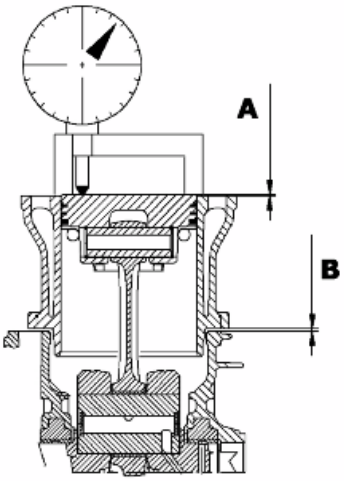
**Standard diameter:**

13 + 0.026 +0.015 mm

## Slot packing system

Shimming system to control compression ratio

**DISTANCE «A» IS A PROTRUSION OR RECESS VALUE OF THE PISTON CROWN WITH RESPECT TO THE CYLINDER PLANE. DISTANCE «A» HELPS DETERMINE THE THICKNESS OF GASKET «B» THAT HAS TO BE FITTED TO THE CYLINDER HEAD IN ORDER TO RESTORE COMPRESSION RATIO. BASE GASKET «B» MUST BE THICKER THE MORE THE PLANE FORMED BY THE PISTON TOP PROTRUDES FROM THE PLANE FORMED BY THE CYLINDER HEAD. ON THE OTHER HAND, THE MORE THE PISTON TOP IS RECESSED INTO THE CYLINDER TOP PLANE, THE SMALLER THE GASKET THICKNESS.**




**Characteristic**

**Compression ratio**

10.5 ± 0.5 : 1

**BASE GASKET THICKNESS**

| Name | Measure A | Thickness |
|---|---|---|
| «A» MEASURE TAKEN | - 0.185 - - 0.10 | 0.4 ± 0.05 |
| «A» MEASURE TAKEN | - 0.10 - + 0.10 | 0.6 ± 0.05 |
| «A» MEASURE TAKEN | + 0.10 ÷ + 0.185 | 0.8 ± 0.05 |

**N.B.**

**VALUES INDICATED WITH «-» REFER TO PISTON CROWN RECESSES WITH RESPECT TO THE CYLINDER PLANE.**

**N.B.**

**DISTANCE «A» MUST BE MEASURED WITHOUT ANY GASKET FITTED AT «B»**

## Products

**RECOMMENDED PRODUCTS TABLE**

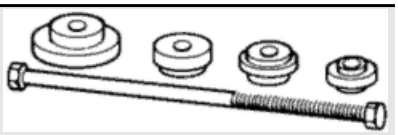
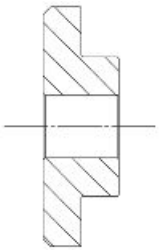
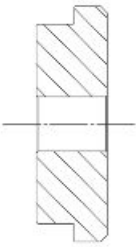
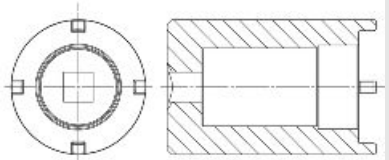
| Product | Description | Specifications |
|---|---|---|
| AGIP BRAKE 4 | Brake fluid | FMVSS DOT 4 Synthetic fluid |
| AGIP CITY HI TEC 4T | Engine oil | SAE 5W-40, API SL, ACEA A3, JASO MA Synthetic oil |
| SPECIAL AGIP PERMANENT fluid | coolant | Monoethylene glycol-based anti-freeze fluid, CUNA NC 956-16 |
| AGIP GP 330 | Grease for brake control levers, throttle, stand | White calcium complex soap-based spray grease with NLGI 2; ISO-L-XBCIB2 |
| 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 |
| AGIP FORK 7.5 W | Oil for front fork | Hydraulic fluid SAE 7.5 W |
| AGIP ROTRA MP 80W-90 | Transmission oil | SAE 80W-90, API GL-5 |
| AGIP CHAIN SPRAY | Spray lubricating grease | Spray lubricating grease for chains and gears |

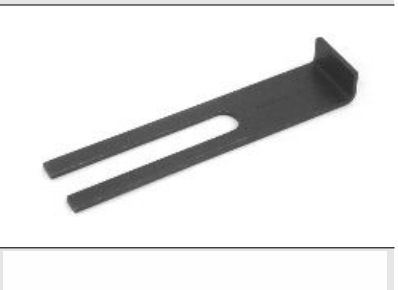
**UNIT OF MEASUREMENT - CONVERSION - ENGLISH SYSTEM AND INTERNATIONAL SYSTEM (IS).**

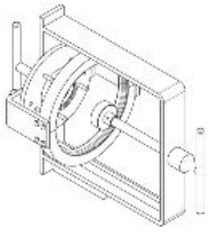
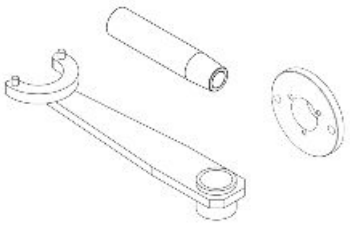
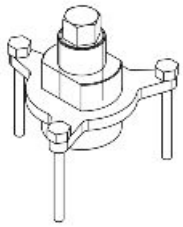
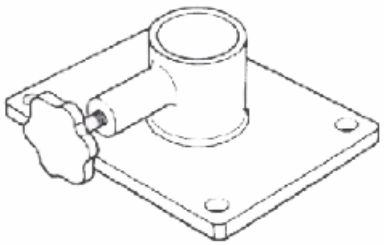
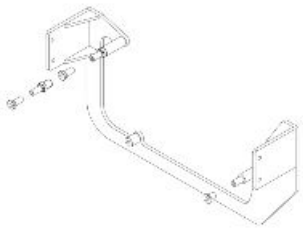
| Specification | Desc./Quantity |
|---|---|
| 1 Inch (in) | 25.4 Millimetres (mm) |
| 1 Foot (ft) | 0.305 Meter (m) |
| 1 Mile (mi) | 1.609 Kilometre (km) |
| 1 US Gallon (US gal) | 3.785 Litre (l) |
| 1 Pound (lb) | 0.454 Kilogram (Kg) |
| 1 Cubic inch ($in^3$) | 16.4 Cubic centimetres ($cm^3$) |
| 1 Foot pound (ft lb) | 1.356 Newton meter (Nm) |
| 1 Miles per hour (mi/h) | 1.602 Kilometres per hour (km/h) |
| 1 Pound per square inch (PSI) | 0.069 (bar) |
| 1 Fahrenheit (°F) | 32+(9/5) Celsius (°C) |

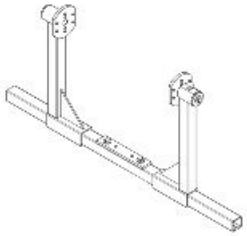
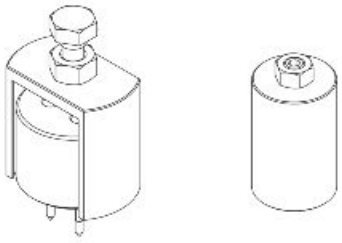
# INDEX OF TOPICS

## APPROPRIATE TOOLS

| Stores code | Description | |
|---|---|---|
| 001330Y | Tool for fitting steering seats |  |
| 001330Y014 | Tool for fitting steering seats |  |
| 001330Y015 | Tool for fitting steering seats |  |
| 020004Y | Punch for removing fifth wheels from headstock |  |
| 020668Y | Steering ring nut wrench |  |
| 020306Y | Punch for assembling valve seal rings |  |
| 020382Y012 | bush (valve removing tool) | |

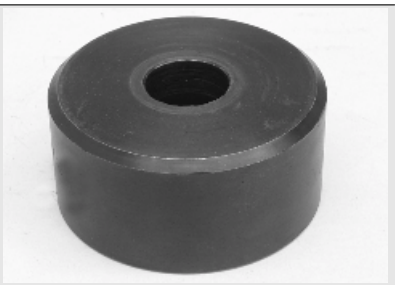
| Stores code | Description | |
|---|---|---|
| 020431Y | Valve oil seal extractor |  |
| 020128Y | Piston fitting band |  |
| 020470Y | Pin retainers installation tool |  |
| 020475Y | Piston position checking tool |  |
| 020512Y | Piston fitting fork |  |
| 020478Y | Punch for driven pulley roller casing |  |

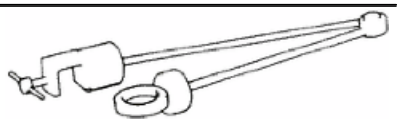
| Stores code | Description | |
|---|---|---|
| 020565Y | Flywheel lock calliper spanner |  |
| 020659Y | Tool to remove clutch and re-place belt |  |
| 020660Y | Driving pulley lock |  |
| 020713Y | Flywheel extractor |  |
| 020527Y | Engine support base |  |
| 020658Y | Engine plate |  |

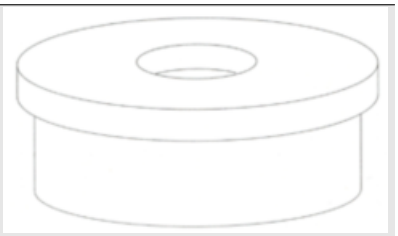
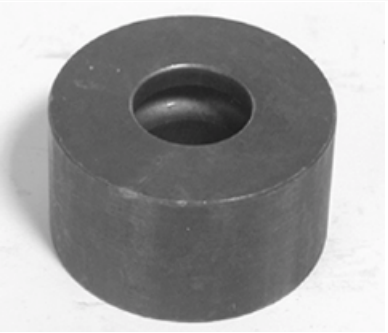
| Stores code | Description | |
|---|---|---|
| 020664Y | Flywheel side crankshaft fitting tip |  |
| 020665Y | Transmission side crankshaft fitting tip |  |
| 020709Y | Engine support |  |
| 020460Y | Scooter diagnosis and tester |  |
| 020469Y | Reprogramming kit for scooter diagnosis tester |  |
| 020661Y | Water pump overall seal replacement kit |  |

| Stores code | Description | |
|---|---|---|
| 020663Y | Water pump shaft oil seal punch |  |
| 020193Y | Oil pressure gauge |  |
| 020434Y | Oil pressure control fitting |  |
| 020480Y | Petrol pressure check set |  |
| 020331Y | Digital multimeter |  |

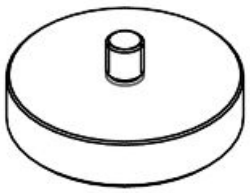
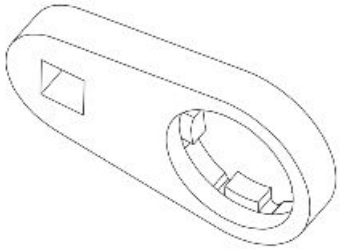
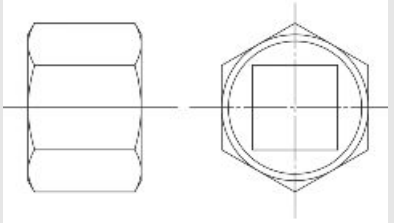
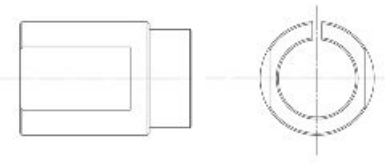
| Stores code | Description | |
|---|---|---|
| 020648Y | Single battery charger |   |
| 002465Y | Pliers for circlips |  |
| 020621Y | HV cable extraction adaptor |  |
| 020330Y | Stroboscopic light for timing control |  |
| 020335Y | Magnetic support for dial gauge |  |

| Stores code | Description | |
|---|---|---|
| 020262Y | Crankcase splitting strip |  |
| 001467Y007 | Driver for OD 54 mm bearing |  |
| 001467Y031 | Bell |  |
| 001467Y035 | Belle for OD 47-mm bearings |  |
| 001467Y002 | Driver for OD 73 mm bearing |  |
| 020329Y | MityVac vacuum-operated pump |  |

| Stores code | Description | |
|---|---|---|
| 020150Y | Air heater support |  |
| 020151Y | Air heater |  |
| 001467Y003 | Nut |  |
| 001467Y004 | Lug / Taper pin |  |
| 001467Y005 | Screw |  |
| 001467Y006 | Pliers to extract 20 mm bearings |  |
| 020467Y020 | Pliers to extract 30 mm bearings |  |

| Stores code | Description | |
|---|---|---|
| 001467Y001 | Pliers to extract 25 mm Ø bearings |  |
| 001467Y008 | Pliers to extract 17 mm ø bearings |  |
| 001467Y014 | Pliers to extract ø 15-mm bearings |  |
| 020357Y | 32 x 35 mm adaptor | |
| 020358Y | 37x40-mm adaptor | |
| 020359Y | 42x47-mm adaptor |  |
| 020360Y | Adaptor 52 x 55 mm |  |
| 020655Y | Adaptor 62x68 mm |  |
| 020670Y | Adaptor 34 mm | |

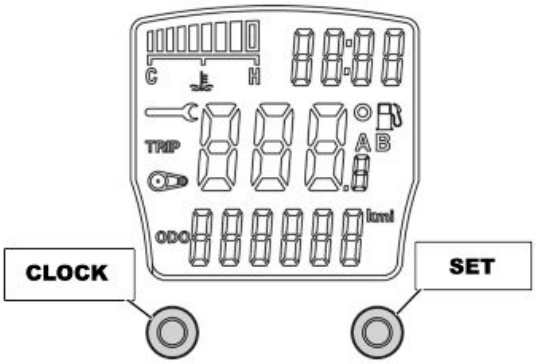
| Stores code | Description | |
|---|---|---|
| 020375Y | Adaptor 28 x 30 mm |  |
| 020364Y | 25-mm guide |  |
| 020412Y | 15 mm guide |  |
| 020439Y | 17 mm guide |  |
| 020483Y | 30 mm guide |  |

| Stores code | Description | |
|---|---|---|
| 020654Y | 35 mm guide |  |
| 020662Y | 50 mm guide |  |
| 020376Y | Adaptor handle |  |
| 020667Y | Wrench for fork pin adjustment ring nut |  |
| 020632Y | 22-mm Hexagonal spanner |  |
| 020633Y | Clamp for sealing ring driving of Kayaba 41-mm and Marzocchi 40-mm forks |  |

# INDEX OF TOPICS

Follow these steps to reset the service icons:

1. With the key set to OFF, hold down the "SET" button and turn the key to ON : the "BELT" and "SERVICE" icons start flashing.
2. Push the "CLOCK" button for less than 1 second and the icons are displayed sequentially. The icon selected remains ON and the other is no longer displayed.
3. Press the "CLOCK" button again for more than 3 seconds to reset the relative maintenance step and the icon is no longer displayed.




## Maintenance chart

**MAINTENANCE TABLE**

● *Replacement*
■ *Check*
** (Nominal: 0,15 mm INT and EXH) restore only if deviation exceeds 0.05 mm*
*** Replace every two years*

| Km x 1000 | 1 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Engine Oil | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● |
| Engine Oil - level check and top-up | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | |
| Oil filter | | | ● | | | | ● | | | | ● | | | | ● | | | | ● | | |
| CVT driving belt | | | | | ● | | | | ● | | | | ● | | | | ● | | | | ● |
| Slide pads and variator rollers | | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● |
| Ignition spark plugs | | | | | ● | | | | ● | | | | ● | | | | ● | | | | ● |
| CVT air filter (sponge-mesh) cleaning | | | | | ■ | | | | ■ | | | | ■ | | | | ■ | | | | ■ |
| Air filter | | | ■ | | ● | | ■ | | ● | | ■ | | ● | | ■ | | ● | | ■ | | ● |
| Throttle body (cleaning) | | | | | | | ■ | | | | | | ■ | | | | | | ■ | | |
| ECU software upgrade | | | | | | | ■ | | | | | | ■ | | | | | | ■ | | |
| Valve clearance * | | | | | | | ■ | | | | | | ■ | | | | | | ■ | | |
| Pinion supporting unit oil | ■ | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● |
| Final transmission (lubrication) | ■ | | ■ | | ■ | | | | ■ | | ■ | | | | ■ | | ■ | | | | ■ |
| Final transmission | | | | | ● | | | | ● | | | | ● | | | | ● | | | | ● |
| Brake pads | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Safety locks | ■ | | ■ | | | | ■ | | | | ■ | | | | ■ | | | | ■ | | |
| Throttle control - (adjustment) | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ |
| Electrical system and battery | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ |
| Coolant level ** | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ |
| Brake fluid level | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ |
| Tyre pressure and wear | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ |
| Steering | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ |

| Km x 1000 | 1 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Suspensions | | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ |
| Centre stand | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Vehicle road test | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ |

## Checking the spark advance

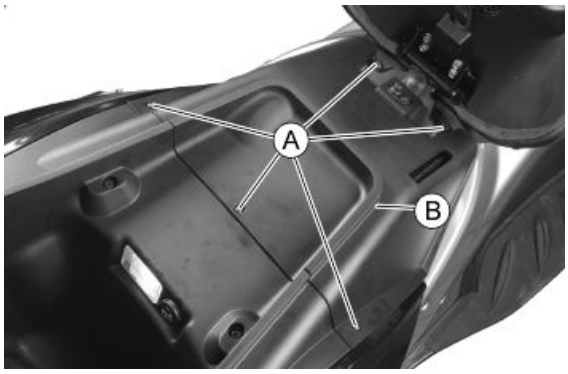
**See also**

Refitting the timing chain

## Spark plug

To replace the rear cylinder spark plugs:

- Tip the saddle forwards, undo the five screws «**A**» and remove cover «**B**».




- Disconnect caps «**C**» of the HV wire of the spark plugs.
- Unscrew the spark plugs using the wrench supplied.


- Upon refitting, place the spark plugs into the hole at the due inclination and tighten them by hand.
- Only use the wrench to lock spark plugs in place.
- Place caps «**C**» fully over the spark plugs.
- Refit cover «**B**».

**CAUTION**

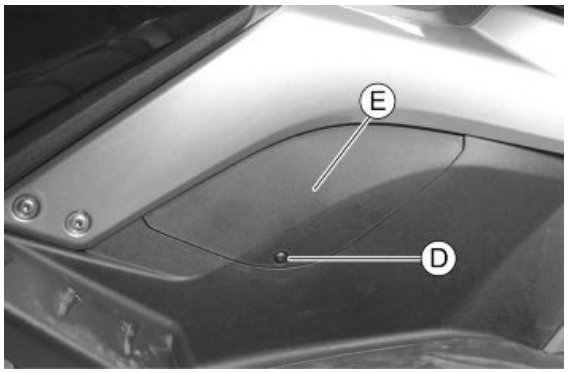
**SPARK PLUGS MUST BE REMOVED WHEN THE ENGINE IS COLD. SPARK PLUGS MAINTENANCE OPERATIONS ARE DESCRIBED IN THE SCHEDULED MAINTENANCE TABLE. USING NON-CONFORMING ELECTRONIC CENTRAL UNITS AND ELECTRONIC IGNITIONS OR SPARK PLUGS OTHER THAN THOSE PRESCRIBED MAY SERIOUSLY DAMAGE THE ENGINE.**

**N.B.**

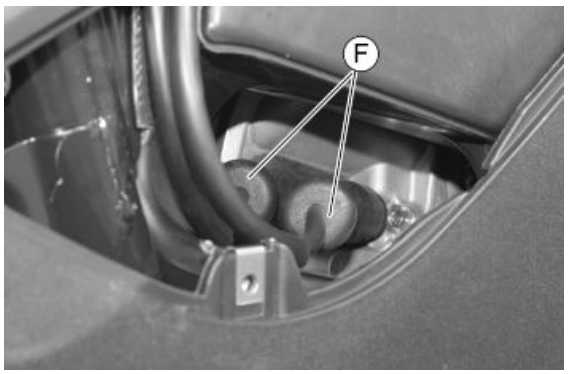
**THE USE OF SPARK PLUGS OTHER THAN THE INDICATED TYPE OR OF SHIELDLESS SPARK PLUG CAPS CAN CAUSE ELECTRICAL SYSTEM FAILURES.**

To replace the front cylinder spark plugs:

- Undo screw «**D**» and remove lid «**E**».




- Disconnect caps «**F**» of the HV wire of the spark plugs.
- Unscrew the spark plugs using the wrench supplied.




- Upon refitting, place the spark plugs into the hole at the due inclination and tighten them using the supplied spark plug wrench.
- Tighten the two spark plugs.
- Place caps «**F**» fully over the spark plugs.
- Refit the lid «**E**».

**CAUTION**

**SPARK PLUGS MUST BE REMOVED WHEN THE ENGINE IS COLD. SPARK PLUGS MAINTENANCE OPERATIONS ARE DESCRIBED IN THE SCHEDULED MAINTENANCE TABLE. USING NON-CONFORMING ELECTRONIC CENTRAL UNITS AND ELECTRONIC IGNITIONS OR SPARK PLUGS OTHER THAN THOSE PRESCRIBED MAY SERIOUSLY DAMAGE THE ENGINE.**

**N.B.**

**THE USE OF SPARK PLUGS OTHER THAN THE INDICATED TYPE OR OF SHIELDLESS SPARK PLUG CAPS CAN CAUSE ELECTRICAL SYSTEM FAILURES.**

## Characteristic

**Spark plug**

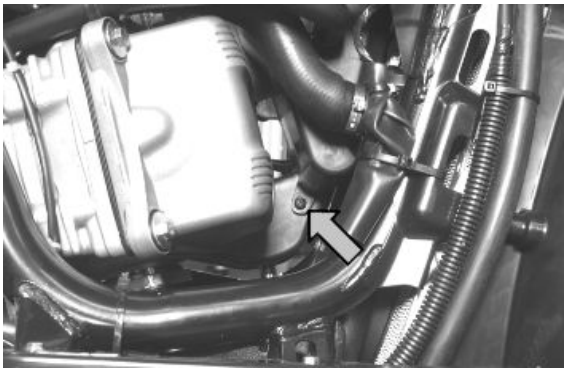
NGK CR7EKB

**Electrode gap**

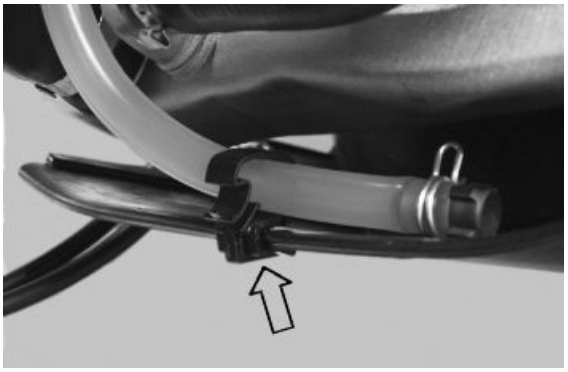
0.7 ÷ 0.9 mm

## Air filter

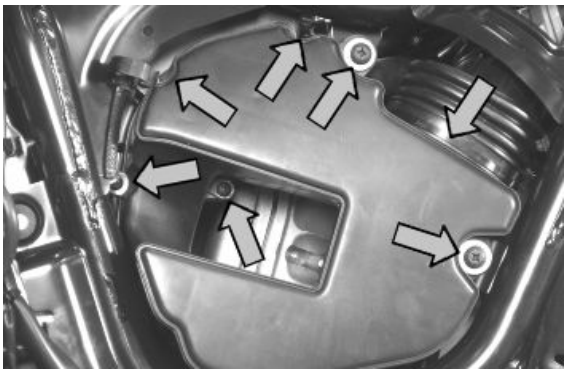
- Rimuovere la copertura laterale telaio da entrambi i lati del veicolo.
- Rimuovere la copertura centrale anteriore.
- Operando dal lato destro del veicolo, svitare la vite indicata.



- Disimpegnare dalla fascetta di ritegno la tubazione blow-by.

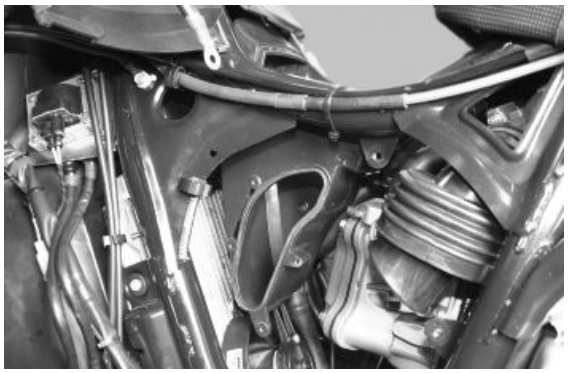


- Operando dal lato sinistro del veicolo, svitare le sei viti indicate e rimuovere la fascetta di ritegno del manicotto.



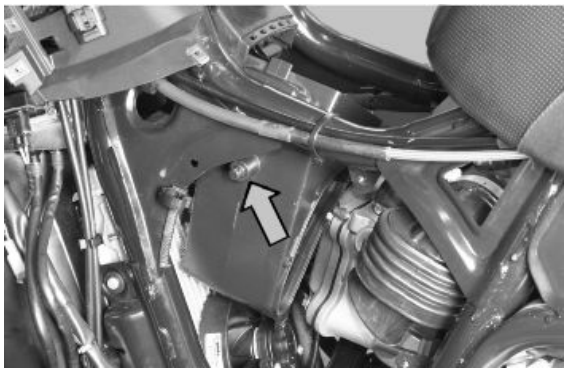
- Rimuovere l'elemento filtrante dalla parte interna del depuratore aria.
- Sfilare la tubazione di recupero vapori blow-by.

- Rimuovere la parte esterna del depuratore aria.

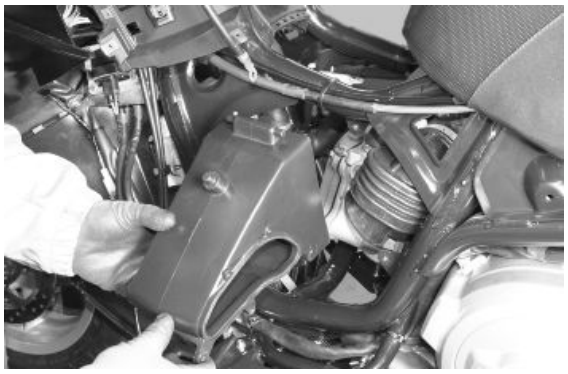


- Disimpegnare da entrambi i lati del veicolo gli occhielli della molla di chiusura e rimuoverla.

- Ruotare la parte interna del depuratore aria in modo da disimpegnare l'incastro sul telaio.

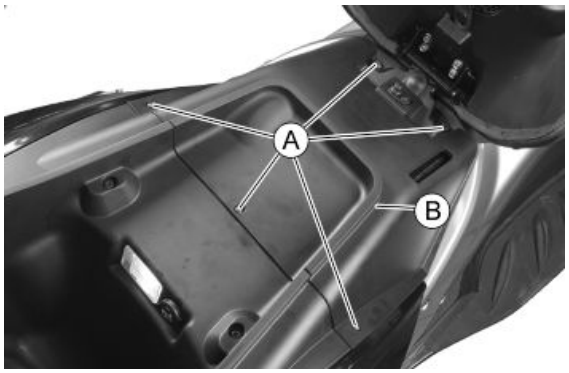


- Rimuovere la parte interna del depuratore aria.

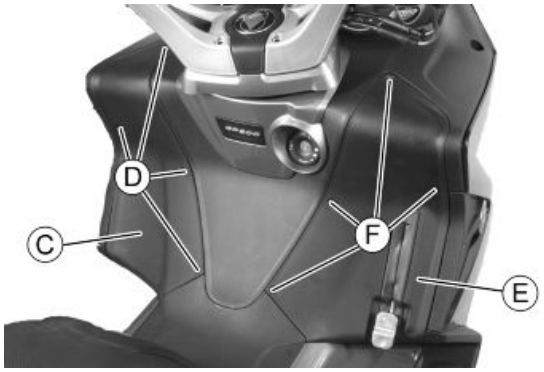


To access the air filter:

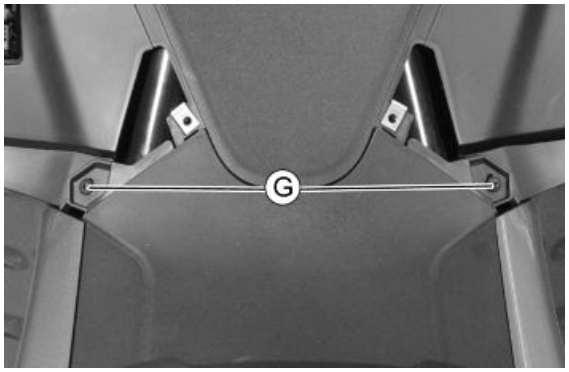
- Tip the saddle forwards, undo the five screws «A» and remove cover «**B**».



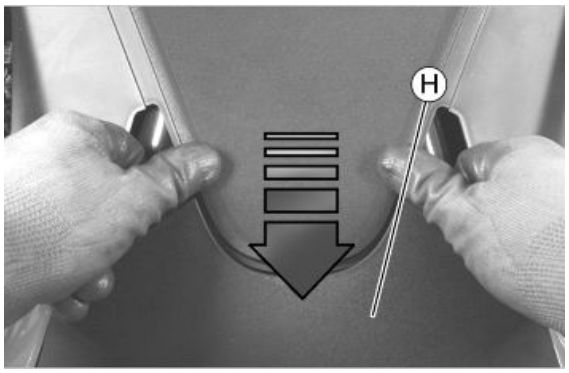

- Remove the battery compartment access cover «**C**» by undoing the four screws «**D** ».
- Remove the access cover to the cap of expansion tank «**E**» by undoing the four screws «**F**».




- Undo the two screws «**G**».




- Remove the central cover «**H**» holding it as shown in the figure and pulling it towards the rear part of the vehicle.

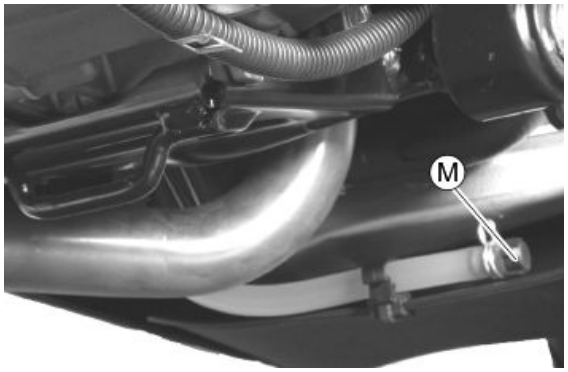


- Release clip «**I**» and remove the filter housing cover «**L**».


For filter cleaning:

- Hold the air filter upright and tap it several times on a clean cloth.
- If required, clean the air filter with a blast of compressed air (direct the air from the inside to the outside of the filter) opposite to the sense the air flow travels under regular operation.
- Clean the external side of the air filter with a clean cloth


- Remove the cap «**M**» regularly, drain the content into a container and send it to a recycling bank.

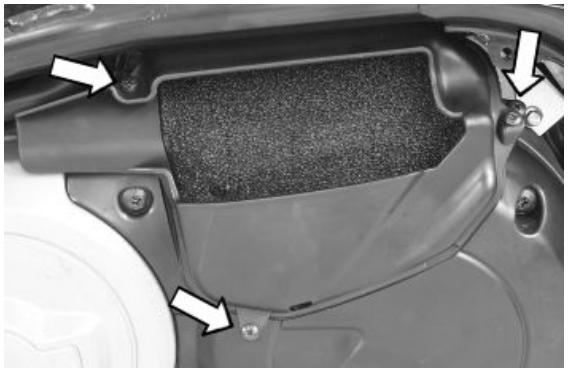



**AIR DEFLECTOR FILTER**

For filter removal:

- Remove the side fairings.

- Undo the three indicated screws and remove the air deflector.



- Remove the filter.

For filter cleaning:

- Wash the sponge with water and mild soap.
- Dry it with a clean cloth and short blasts of compressed air.
- Soak it in a mixture of 50% petrol and 50% specific oil.
- Gently squeeze the filtering element with your hands without wringing it; let it drip dry and then refit.

### Recommended products

**AGIP FILTER OIL Air filter**

Mineral oil with specific tackifier additive ISO VG 150

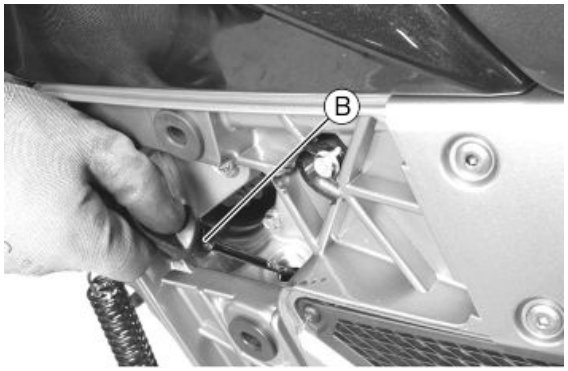
## Engine oil

In 4T engines, the engine oil is used to lubricate the distribution elements, the bench bearings and the thermal group. **An insufficient quantity of oil can cause serious damage to the engine.**
In all 4T engines, the deterioration of the oil characteristics, or a certain consumption should be considered normal, especially if during the run-in period. Consumption levels in particular can be influenced by the conditions of use (e.g.: oil consumption increases when driving at "full throttle".

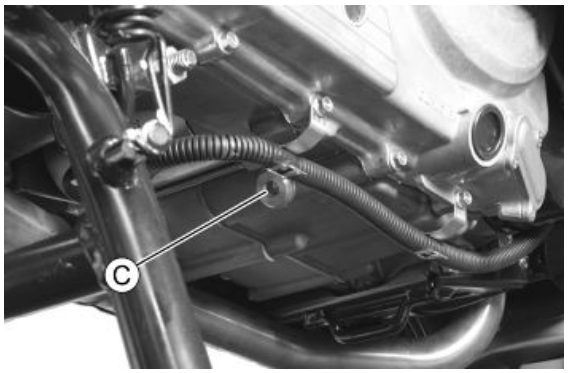
## Replacement

Replace oil and filter as indicated in the scheduled maintenance table.

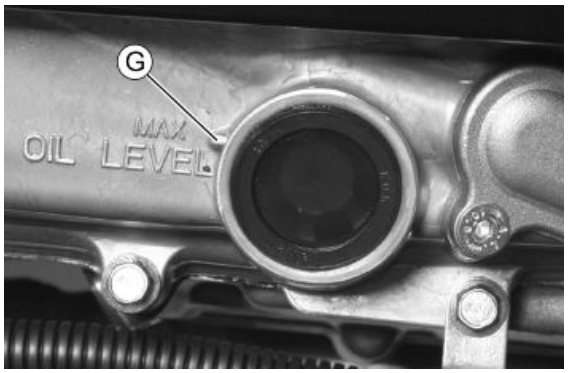
In order to facilitate oil drainage, remove lid «**A**» and loosen the cap/dipstick «**B**».




The engine should be emptied by draining the oil through the drainage plug «**C**» placed under the engine crankcase.




Since a certain quantity of oil still remains in the circuit, refill with approx. 2600 cm³ of oil through the cap «**A**». The engine has a reference «**G**» indicating that the maximum oil level has been reached inside the crankcase. This reference must be used only when changing oil, whereas the cap/dipstick «**B**» must be used when checking oil level. Then start up the vehicle, let it run for a few minutes and shut it off. After about 5 minutes, check the level and, if necessary, top-up but never exceeding the MAX level reference mark «**G**» sight glass on the right crankcase. For top-ups and oil changes, use new oil of the recommended type.




### Recommended products

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

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

Always check the oil level before carrying out top-ups. For topping-up:

- Unscrew and remove cap «**B**».
- Top up the oil in the reservoir until you reach the correct level.

- Pour oil in small quantities and wait until it is distributed throughout the engine before checking the level through the right crankcase sight glass «**G**».

The oil must reach the "MAX oil level" reference mark on the corresponding sight glass «**G**» on the right crankcase.

**WARNING**

**PROCEED TO TOP-UP WITH ENGINE OIL WHILE THE ENGINE IS WARM.**
**DO NOT GO BEYOND THE "MAX" MARK ON THE CRANKCASE OR BELOW THE "MIN" LEVEL MARK ON THE DIPSTICK TO AVOID SEVERE ENGINE DAMAGE.**

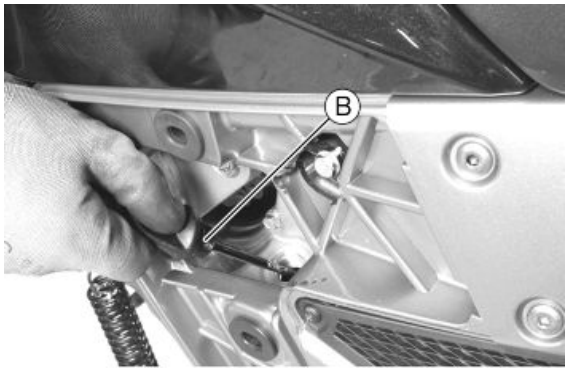
## Check

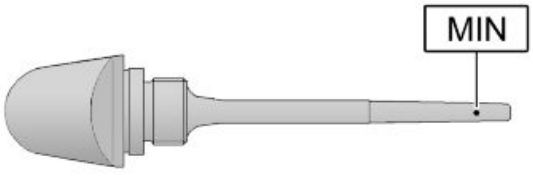
For oil level check:

- Keep the vehicle perfectly upright, with both wheels on the ground.
- Remove cover «**A**» holding it and pulling it out.


- Unscrew the dipstick cap «**B**» and check that the oil level exceeds the «**MIN**» mark.

In order to check oil level properly, keep the engine running for about 2 minutes and then wait at least 5 minutes once the engine is off.



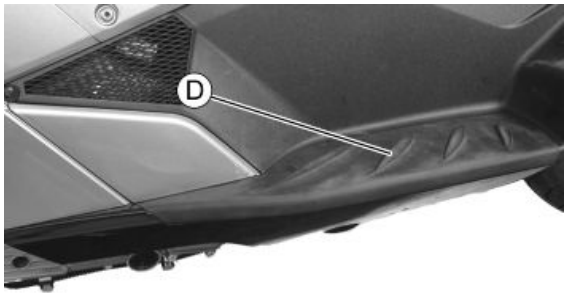



## Engine oil filter

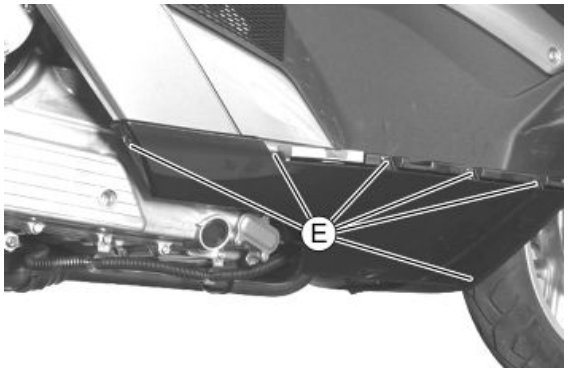
The cartridge filter must be replaced every time the oil is changed.

To access the oil cartridge filter:

- Remove mat «**D**».




- Undo the six screws «**E**» and remove the spoiler.

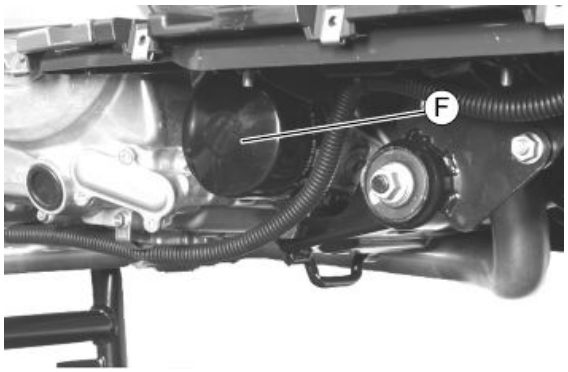



- Remove the cartridge filter «**F**» and fit a new one taking care to lubricate the sealing O-rings of the filter with engine oil.

### Recommended products

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

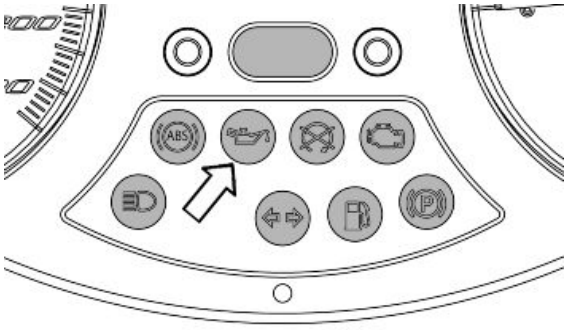
SAE 5W-40, API SL, ACEA A3, JASO MA Synthetic oil




## Oil pressure warning light

The vehicle is equipped with a warning light on the instrument panel that lights up when the key is turned to the «**ON**» position. However, this light should switch off once the engine has been started.

**If the light turns on during braking, at idling speed or while turning a corner, it is necessary to check the oil level and the lubrication system.**



## Checking the valve clearance

**Front head**

- Remove the plastic parts in order to free the head cover access.
- Undo the six fixing screws and remove the tappet cover together with the gasket.
- Check the valve clearance, and if necessary, restore the correct clearance.

### Characteristic

**Valve clearance**

Inlet: 0.15 mm

Outlet: 0.15 mm

### See also

Side fairings
Air filter

**Rear head**

- Remove the plastic parts in order to free the head cover access.
- Undo the six fixing screws and remove the tappet cover together with the gasket.
- Check the valve clearance, and if necessary, restore the correct clearance.

### Characteristic

**Valve clearance**

Inlet: 0.15 mm

Outlet: 0.15 mm

### See also

Helmet bay

- According to the procedure described in the «Engine Chapter» fit the tappet cover.

### See also

Refitting the rocker-arms cover

## Cooling system

Check coolant when the engine is cold as indicated in the scheduled maintenance table.

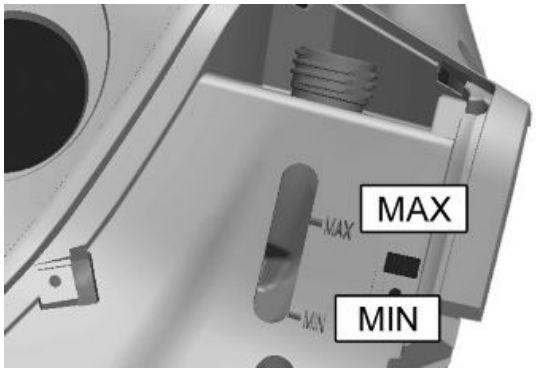
To check:

- Rest the vehicle upright on the stand, undo the four screws «**A**» and remove cover «**B**» partially.


- The fluid level should always be between the «**MIN**» and «**MAX**» level marks indicated on the knee-guard panel.
- If the coolant level is close to the minimum mark «**MIN**», top-up when the engine is cold.

**CAUTION**

**THE RECOMMENDED COOLANT MUST BE USED FOR TOP-UPS TO AVOID DAMAGING THE ENGINE.**




### Recommended products

**AGIP PERMANENT SPEZIAL coolant**

Monoethylene glycol-based antifreeze fluid, CUNA NC 956-16 (*)

## Braking system

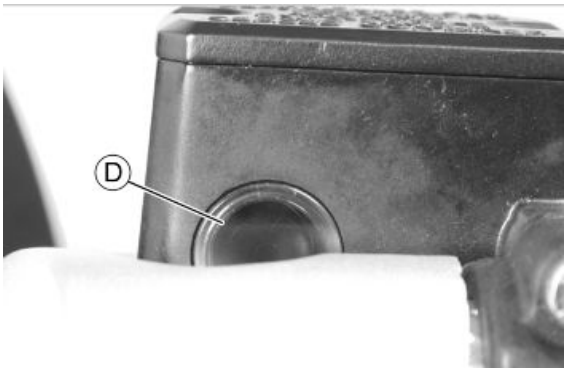
## Level check

The front and rear brake fluid reservoirs are both positioned on the handlebars.

Proceed as follows:

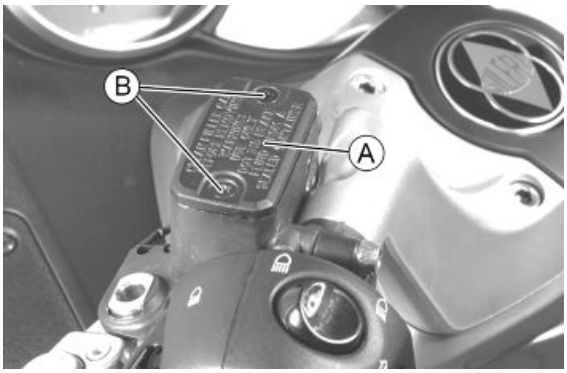
- Rest the vehicle onto the centre stand, with the handlebar centred.
- Check the fluid through the specific sight glass.
- Top-up whenever the level is below the MIN reference «**C**» for the left reservoir, and reference «**D**» for the right reservoir.

A certain lowering of the level is caused by wear on the pads.




## Top-up

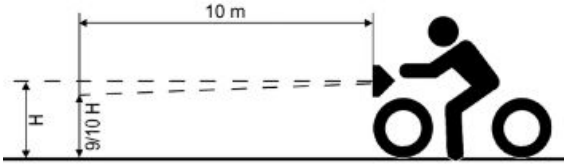
- Undo screws «**B**» and remove the reservoir cap «**A**». Top-up using only the fluid specified, without exceeding the maximum level.
This procedure applies to the rear brake pump top-up operation; follow the same procedure for the front brake pump.
Under standard climatic conditions, replace coolant as indicated in the scheduled maintenance table.




**Recommended products**
**AGIP BRAKE 4 Brake fluid**
FMVSS DOT 4 Synthetic fluid

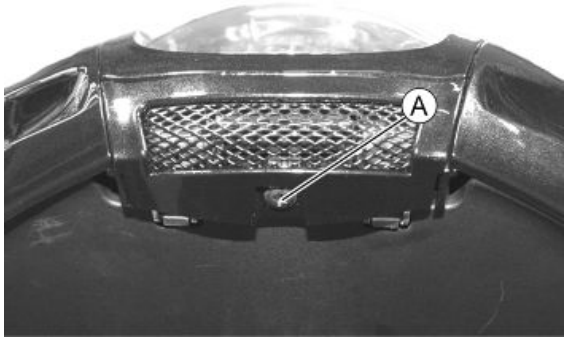
## Headlight adjustment

Proceed as follows:
- Place the vehicle in running order and with the tyres inflated to the prescribed pressure, on a flat surface 10 m away from a white screen situated in a shaded area, making sure that the longitudinal axis of the vehicle is perpendicular to the screen;
- Turn on the headlight and check that the limit of the light 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.

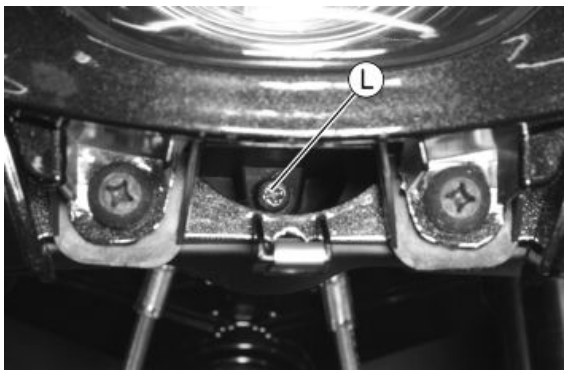


Adjustment:

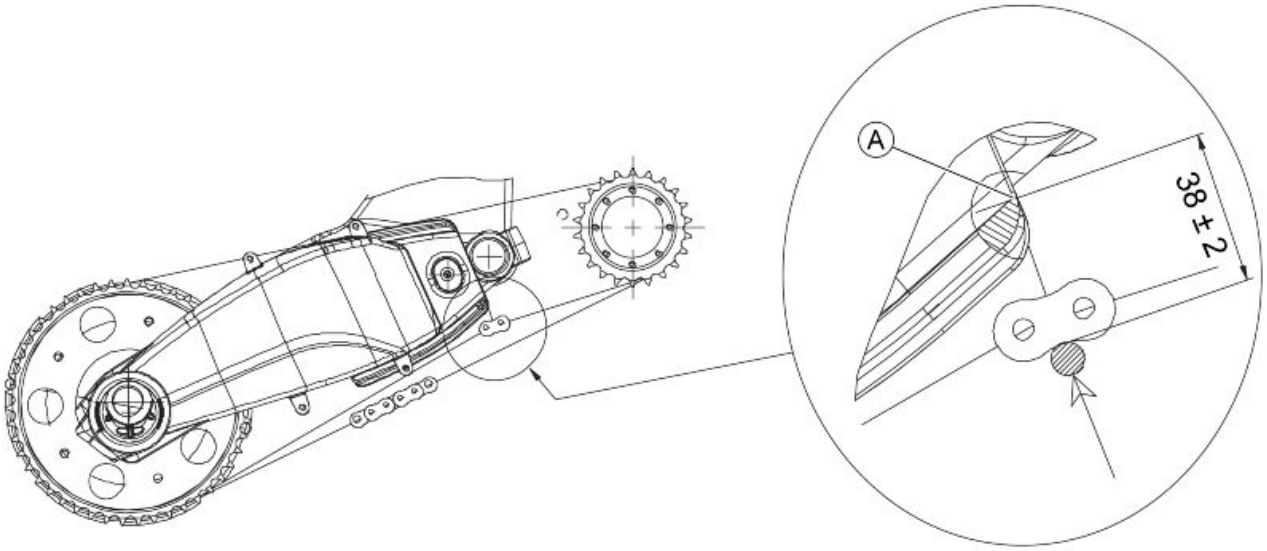
- Undo screw «**A**» and remove the grille.




- Act on the screw «**L**». Turn it anticlockwise to raise the light beam and turn it clockwise to lower it.




## Drive chain

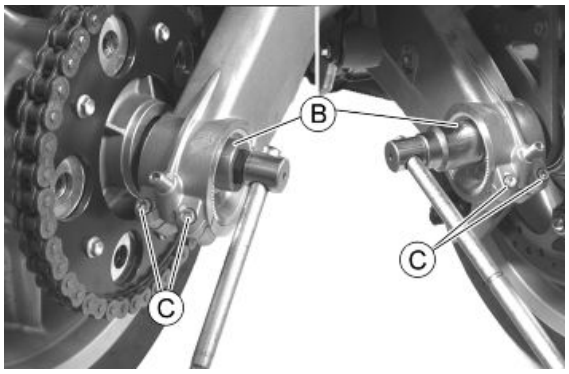



To check the drive chain clearance:

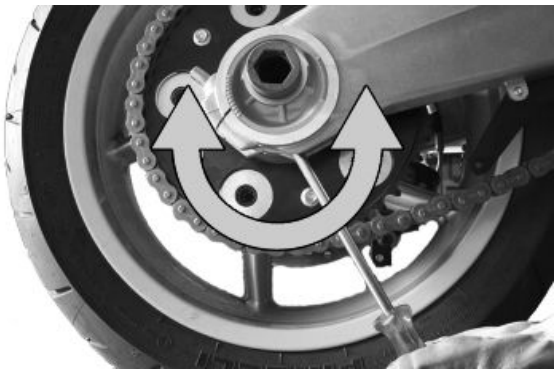
- Stop the engine.
- Position the scooter on centre stand.

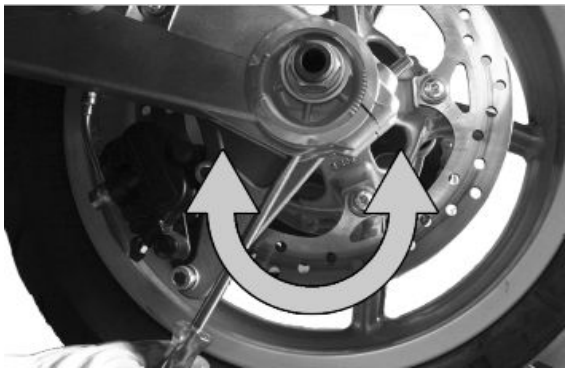
- Remove the chain guard.
- Act on the rear wheel so that a link notch matches point «**A**».
- Tighten the chain and check that the distance between the chain link lower notch and point «**A**» is 38 mm ± 2 mm.
- Rotate the wheel to check the vertical oscillation of the chain in other positions; clearance should remain constant for all the wheel rotation phases. Adjust the chain if clearance is uniform but out of the specified limit.

To adjust the drive chain clearance:
- Loosen the wheel axle lock nut «**B**».
- Loosen the two screws «**C**» on both sides.




- Insert a pin through the holes on the planetary gears supporting the axle and rotate them to obtain the ideal chain tension. There are references on the planetary gears supporting the axle, proceed so that the reference indicated is the same on both sides of the fork.





**Drive chain cleaning**

Do not wash the chain with water jets, vapour jets, high-pressure water jets and highly flammable solvents. Wash the chain with fuel oil or kerosene. Maintenance operations should be more frequent if there are signs of early rust. Lubricate the chain with a recommended product whenever necessary after washing and drying it.

## Recommended products

**AGIP CHAIN SPRAY Spray lubricating grease**

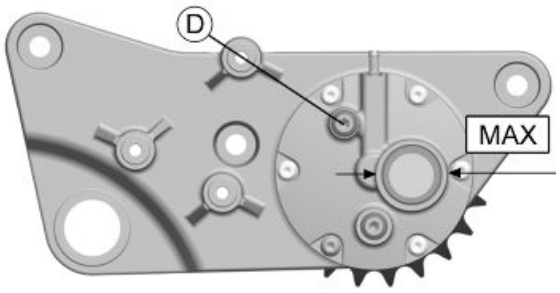
Spray lubricating grease for chains and gears

**PINION UNIT**

The pinion unit oil should be checked and changed as indicated in the scheduled maintenance table. The oil level should never be below the "MAX" reference mark indicated in the figure. Otherwise:

**-** Undo screw «**D**».

**-** Restore the level by adding recommended oil with a syringe taking care not to exceed the "**MAX**" reference mark indicated in the figure.




**WARNING**

**DO NOT EXCEED THE "MAX" LEVEL WHEN TOPPING UP.**

### Recommended products

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

SAE 80W-90, API GL-5

- Tighten the drain screw to the prescribed torque.

### Locking torques (N*m)

**Pinion unit oil filling screw 13 ÷ 15**

# INDEX OF TOPICS

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

For each breakdown, a list of the possible causes and respective interventions is given.

## Engine

## Excessive oil consumption/Exhaust smoke

**EXCESSIVE CONSUMPTION**

| Possible Cause | Operation |
|---|---|
| Wrong valve adjustment | Adjust the valve clearance properly |
| Overheated valves | Remove the head and the valves, grind or replace the valves |
| Misshapen/worn valve seats | Replace the head assembly |
| Worn cylinder, Worn or broken piston rings | Replace the piston cylinder assembly or piston rings |
| Worn or broken piston rings or piston rings that have not been fitted properly | Replace the piston cylinder unit or just the piston rings |
| Oil leaks from the couplings or from the gaskets | Check and replace the gaskets or restore the coupling seal |
| Worn valve oil guard | Replace the valve oil guard |
| Worn valve guides | Check and replace the head unit if required |

## 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 |

## 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 |

## Insufficient braking

**INEFFICIENT BRAKING SYSTEM**

| Possible Cause | Operation |
|---|---|
| Inefficient braking system | Check the pad wear (1.5 min). Check that the brake discs are not worn, scored or warped. Check the correct level of fluid in the pumps and replace brake fluid if necessary. Check there is no air in the circuits; if necessary, bleed the air. 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 |
| Brake disc slack or distorted | Check the brake disc screws are locked; measure the axial shift of the disc with a dial gauge and with wheel mounted on the scooter. |

## Brakes overheating

**BRAKES OVERHEATING**

| Possible Cause | Operation |
|---|---|
| Defective sliding of pistons | Check calliper and replace any damaged part. |
| 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. |
| Clogged compensation holes on the pump | Clean carefully and blast with compressed air |
| Swollen or glued rubber gaskets | Replace gaskets. |

## Steering and suspensions

## Heavy steering

**STEERING HARDENING**

| Possible Cause | Operation |
|---|---|
| Steering hardening | Check the tightening of the top and bottom ring nuts. If irregularities continue in turning the steering even after making the above adjustments, check the seats in which the ball bearings rotate: if they are recessed or if the balls are squashed, replace them. |

## Excessive steering play

**EXCESSIVE STEERING CLEARANCE**

| Possible Cause | Operation |
|---|---|
| Torque not conforming | Check the tightening of the top and bottom ring nuts. If irregularities continue in turning the steering even after making the above adjustments, check the seats in which the ball bearings rotate: |

| Possible Cause | Operation |
|---|---|
| | if they are recessed or if the balls are squashed, replace them. |

## Noisy suspension

**NOISY SUSPENSION**

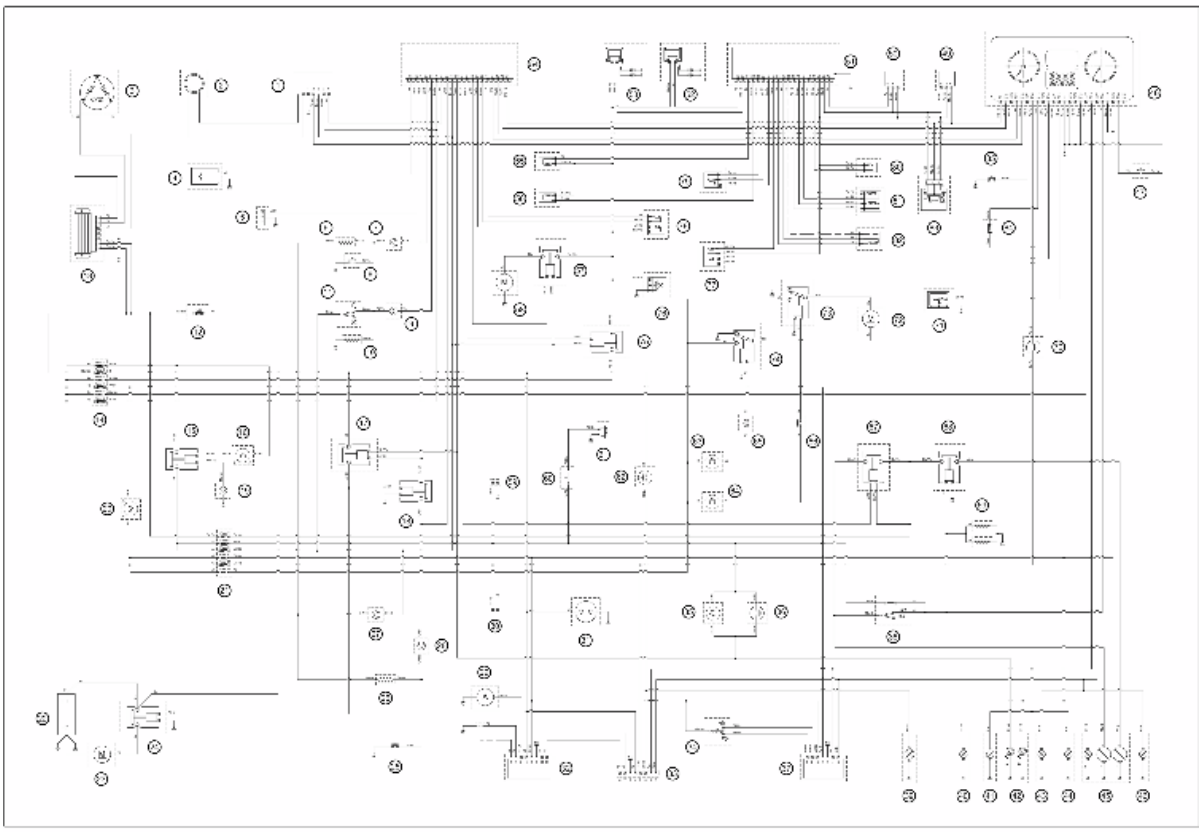
| Possible Cause | Operation |
|---|---|
| Malfunctions in the suspension system | If the front suspension is noisy, check: the efficiency of the front shock absorbers; the condition of the ball bearings and relevant lock-nuts, the limit switch rubber buffers and the movement bushings. In conclusion, check the tightening torque of the wheel hub, the brake calliper, the shock absorber disk in the attachment to the hub and the steering tube. |

## Suspension oil leakage

**OIL LEAKAGE FROM SUSPENSION**

| Possible Cause | Operation |
|---|---|
| Seal fault or breakage | Replace the shock absorber Check the condition of wear of the steering covers and the adjustments. |

# INDEX OF TOPICS



**1.** Immobilizer decoder

**2.** Immobilizer aerial

**3**. Magneto flywheel

**4.** Roll-over sensor

**5.** Diagnostics socket

**6.** Resistance 120 Ohm - 2W

**7.** 1A diode

**8.**Stand button

**9.** 1A diode

**10.** Resistance 120 Ohm - 2W

**11.** Engine stop switch

**12.** 40A fuse

**13.** Voltage regulator

**14.** Main fuses

**15.** Main relay

**16.** Key switch contacts

**17.** Start-up remote control switch relay

**18.** Start-up maintenance relay

**19.** 1A diode

**20.** Key switch contacts

**21.** Auxiliary fuses
**22.** 12V - 14Ah battery
**23.** Starter motor
**24.** Start-up remote control switch
**25.** Starter button
**26.** Resistance 120 Ohm - 2W
**27.** 1A diode
**28.** 1A diode
**29.** Saddle opening actuator
**30.**GPS wiring
**31.** LV coil - max.180W
**32.** Saddle opening receiver
**33.** Pre-installation for antitheft device
**34.** Turn indicator switch
**35.** Stop button on rear brake
**36.** Stop button on front brake
**37.** Turn indicator control device
**38.** Light switch
**39.** Helmet compartment light bulb
**40**. License plate bulb
**41.** Rear left turn indicator bulb
**42.** Rear light
**A.** Stop light LEDs
**B.** Rear position light LEDs
**43.** Rear right turn indicator bulb
**44.** Front left turn indicator bulb
**45.** Headlight
**A.** Front position light bulb
**B.** Low-beam light bulb
**C.** High-beam light bulb
**46.** Front right turn indicator bulb
**47.** MODE button
**48.** Instrument panel
**49.** Vehicle speed sensor
**50.** Barometric pressure sensor
**51.**Electronic ignition device (Engine connector)
**52.** Front cylinder HV coil
**53.** Rear cylinder HV coil

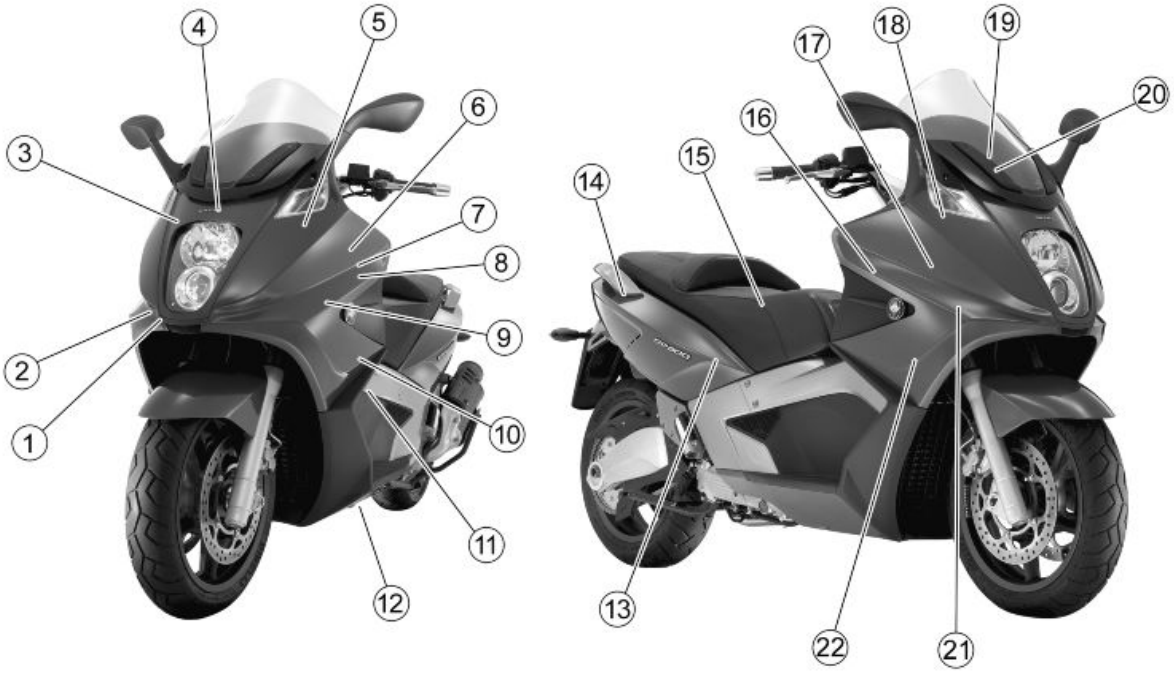
**54.** Electronic ignition device (Vehicle connector)
**55.** Front cylinder fuel injector
**56.** Rear cylinder fuel injector
**57.** Electric fan relay
**58.** Electric fan
**59.** Wiring for accessories
**60.** Horn button
**61.** Horn
**62.** Helmet compartment light switch
**63.** Windshield DOWN button
**64.** Windshield UP button
**65.** Windshield limit switch
**66.** Windshield limit switch
**67.** Low-beam light relay
**68.** High-beam light relay
**69.** Resistance 120 Ohm - 2W
**70.** Hand brake
**71.** Fuel level transmitter
**72.** Windshield motor
**73.** Windshield relay
**74.** Windshield relay
**75.** Injection load relay
**76.** Fuel pump
**77.** Engine temperature sensor
**78.** Lambda probe
**79.** Throttle valve potentiometer
**80.** Air temperature sensor
**81.** Idle speed regulator
**82.** Revolution sensor
**83.** Monostable
**84.** External temperature sensor
**85.** Oil pressure sensor

**Key**

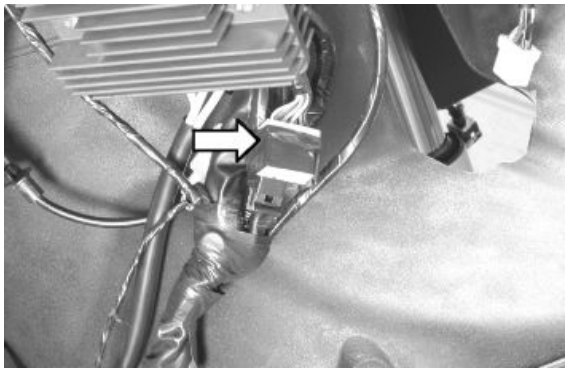
**Ar:** Orange **Az:** Sky blue **Bi**: White **Bl**: Blue **Gi**: Yellow **Gr:**Grey

**Ma**:Brown **Ne:** Black **Ro**: Pink **Rs:** Red **Ve**: Green **Vi:** Purple

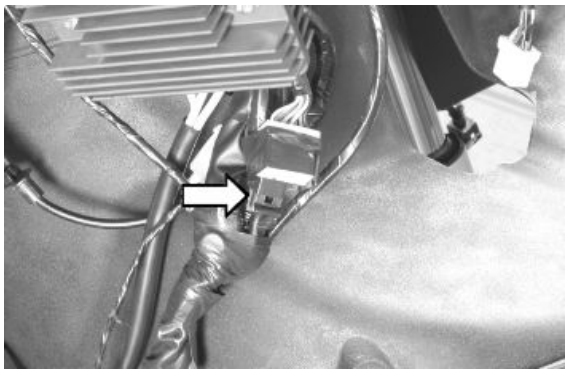
## Components arrangement



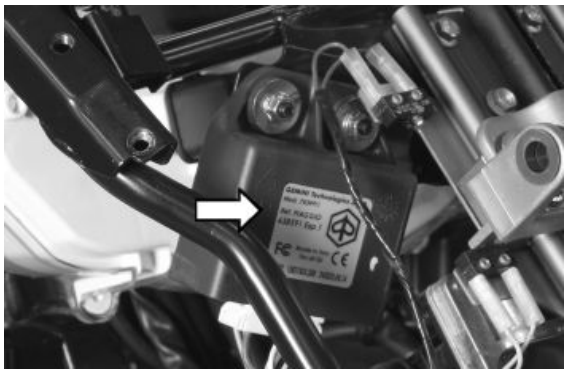

**1**. Pre-installation for antitheft device : to reach it, remove the front shield.



**2**. Wiring for accessories: to reach it, remove the front shield.

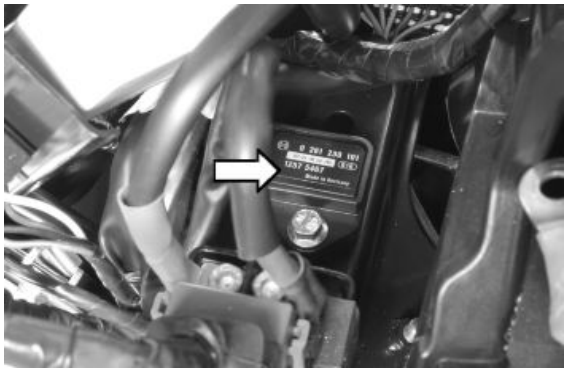


**3**. Saddle opening receiver: to reach it, remove the front shield.

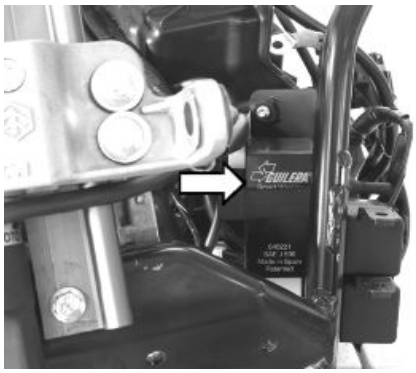


**4**. Control unit: to reach it, remove the front shield.

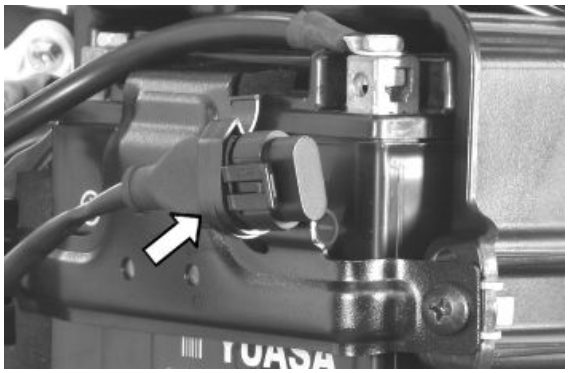
**5**. Barometric pressure sensor: to reach it, remove the front shield.



**6**. Turn indicator control device: to reach it, remove the front shield.



**7**. Diagnostics socket: to reach it, remove the battery cover.



**8**. Battery: to reach it, remove the battery cover.

### Characteristic

**Battery**

12 V / 14 Ah, SEALED BATTERY


**9**. Remote controls: to reach them, remove the front shield.

**KEY**

**A**. Electric fan relay

**B**. Start-up remote control switch relay

**C**. Main relay

**D**. Injection load relay

**E**. Start-up maintenance relay

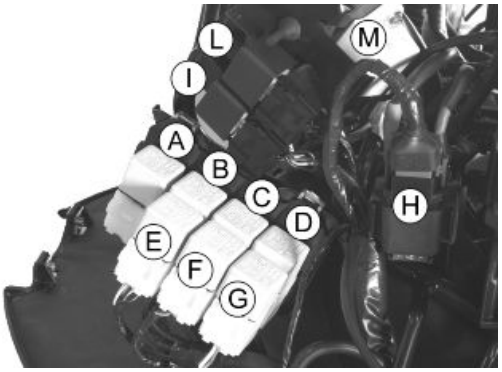
**F**. Low-beam light relay

**G**. High-beam light relay

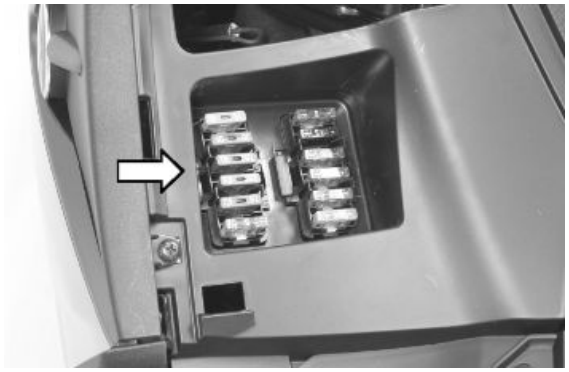
**H**. Start-up remote control switch

**I-L**. Windshield relay

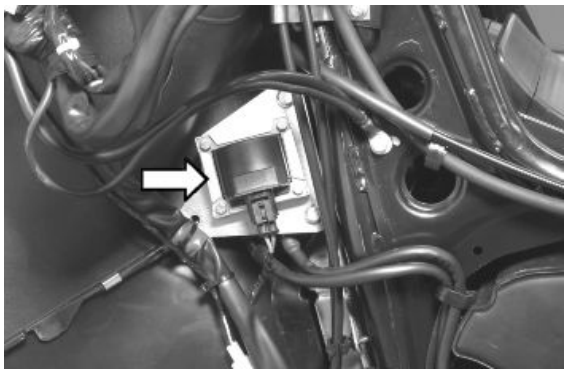
**M.** Electric control management device




**10**. Fuses: to reach it, remove the battery cover.

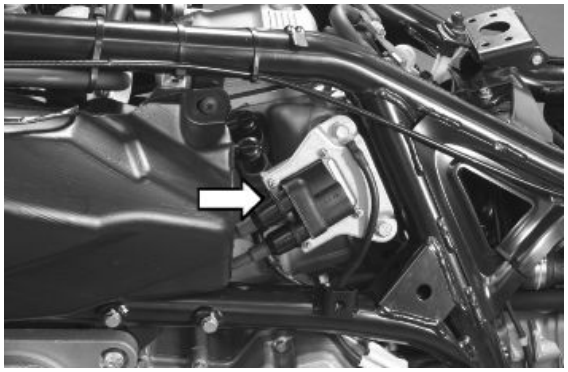


**11**. Front Cylinder HV coil: to reach it, remove the left fairing;

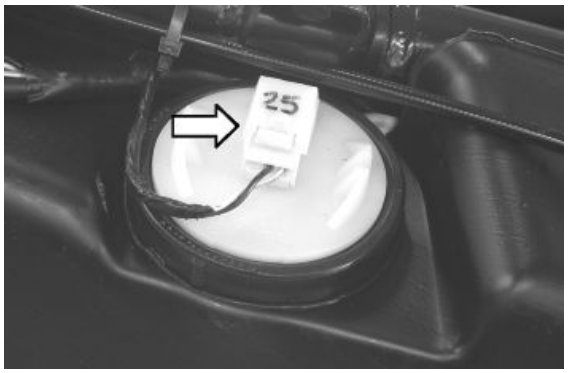


**12**. Stand button: to reach it, remove the left foot-rest.

**13**. Rear Cylinder HV coil: to reach it, remove the right fairing.



**14**. Fuel level transmitter: to reach it, remove the right fairing.




### Electric characteristic

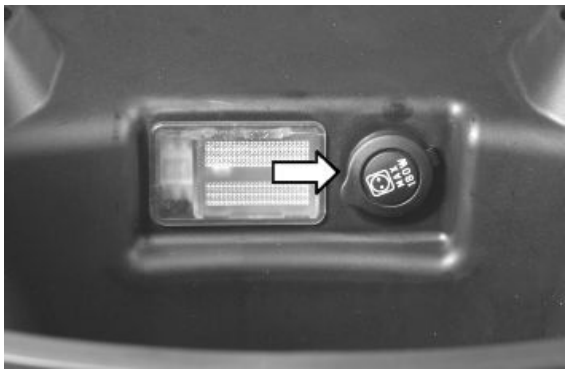
**Full tank position**

<= 5 Ohm

**Empty tank position**

98 ± 5 Ohm

**15**. Plug socket: to reach it, open the helmet compartment.

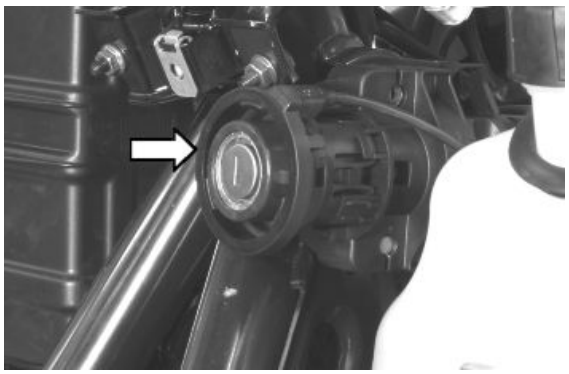


### Electric characteristic

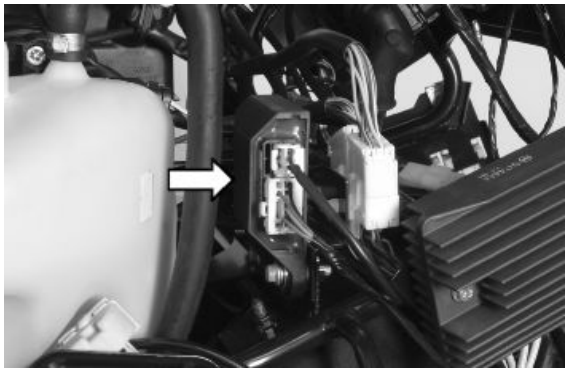
**Plug socket**

12 V - 180 W MAX

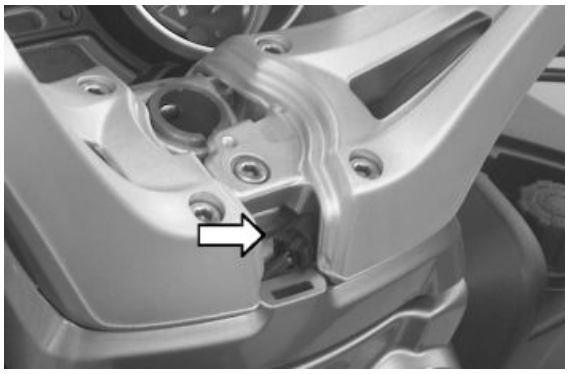
**16**. Immobilizer aerial: to reach it, remove the shield back plate.



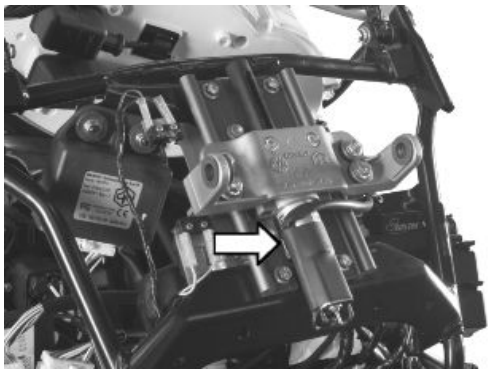
**17**. Immobilizer decoder: to reach it, remove the front shield.



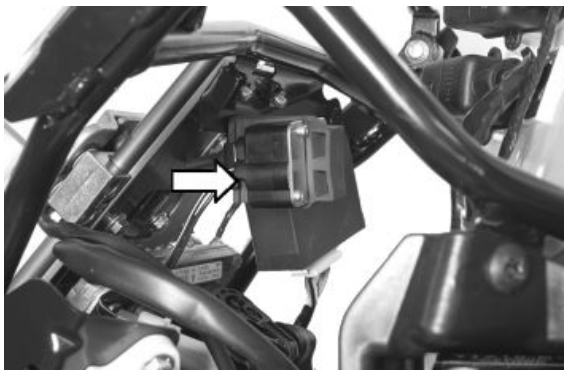
**18**. GPS wiring: to reach it, remove the handlebar central cover.



**19**. Windshield motor: to reach it, remove the front shield.



**20**. Roll-over sensor: to reach it, remove the front shield.

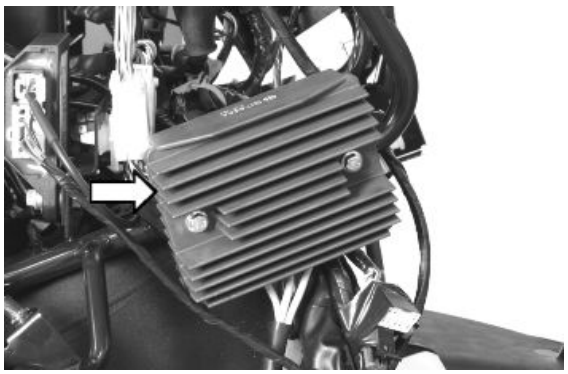


**21**. Voltage regulator: to reach it, remove the front shield.

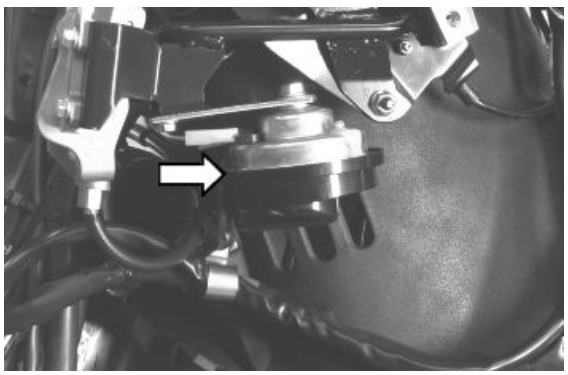
**Electric characteristic**

**Control voltage**

14 ÷ 14.7 V at 1000÷8000 rpm



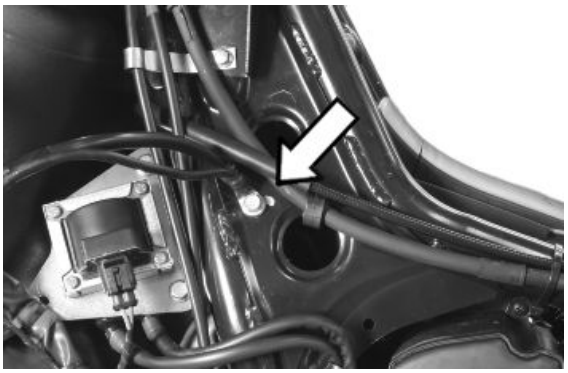
**22**. Horn: to reach it, remove the front shield.



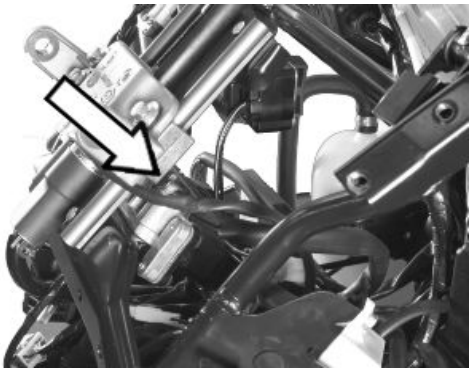
## Ground points

There are three ground points in the electrical system:

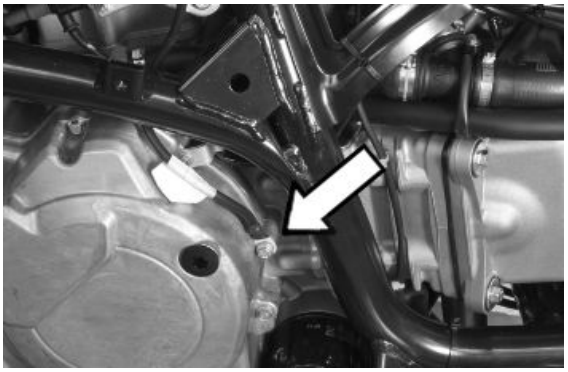
**A.** Located on the left part of the chassis. To reach it, remove the shield back plate.



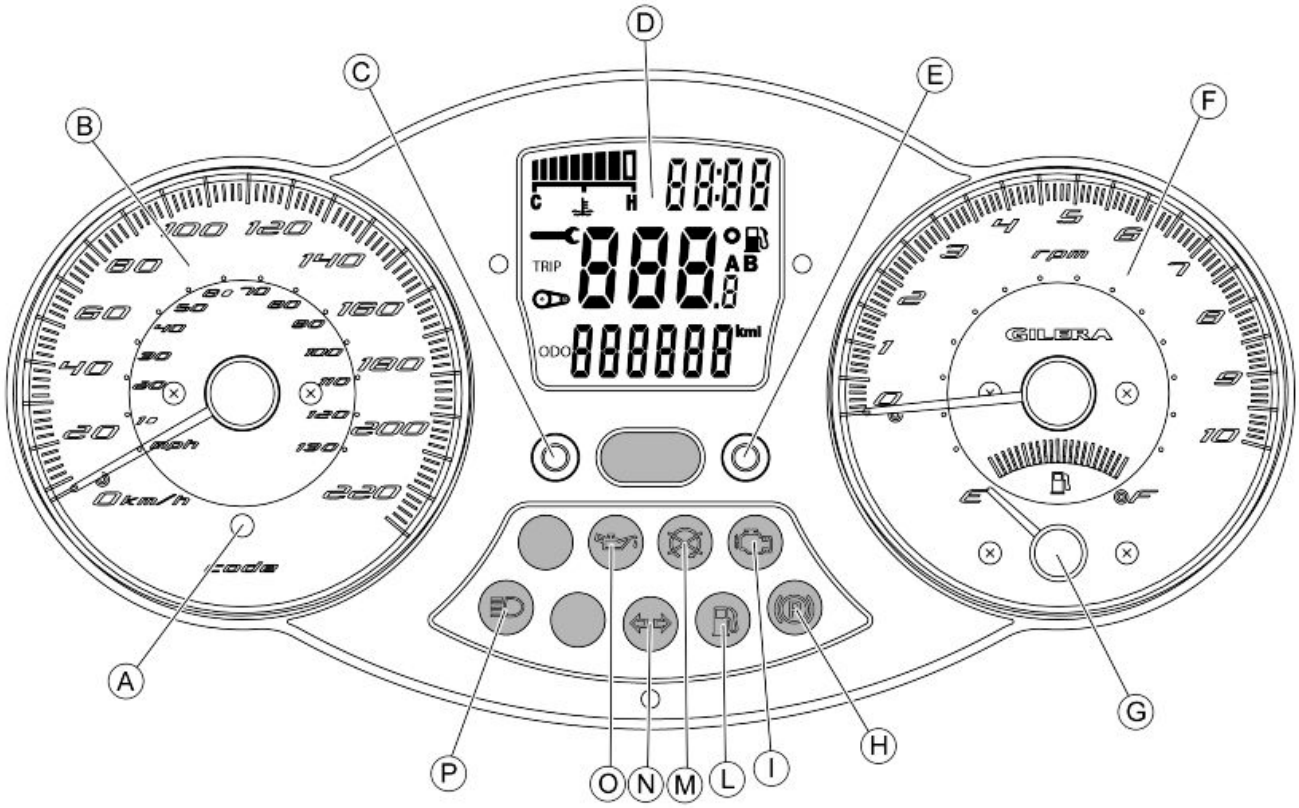
**B.** Located on the control unit in the front part of the vehicle. To reach it, remove the front shield.



**C.** Located on the engine in the right part of the vehicle. To reach it, remove the right side fairing.



## Instrument panel




**KEY**

**A** = Immobilizer / antitheft LED

**B**= Speedometer with twin scale (km/h and mph)

**C** = CLOCK switch

**D** = Digital display

**E**= SET switch

**F**= Rpm indicator

**G** = Fuel gauge

**H** = Warning light for parking brake engaged

**I** = Engine control telltale light and injection system failure warning light

**L** = Low fuel warning light

**M** = Engine stop warning light

**N**= Turn indicator warning light

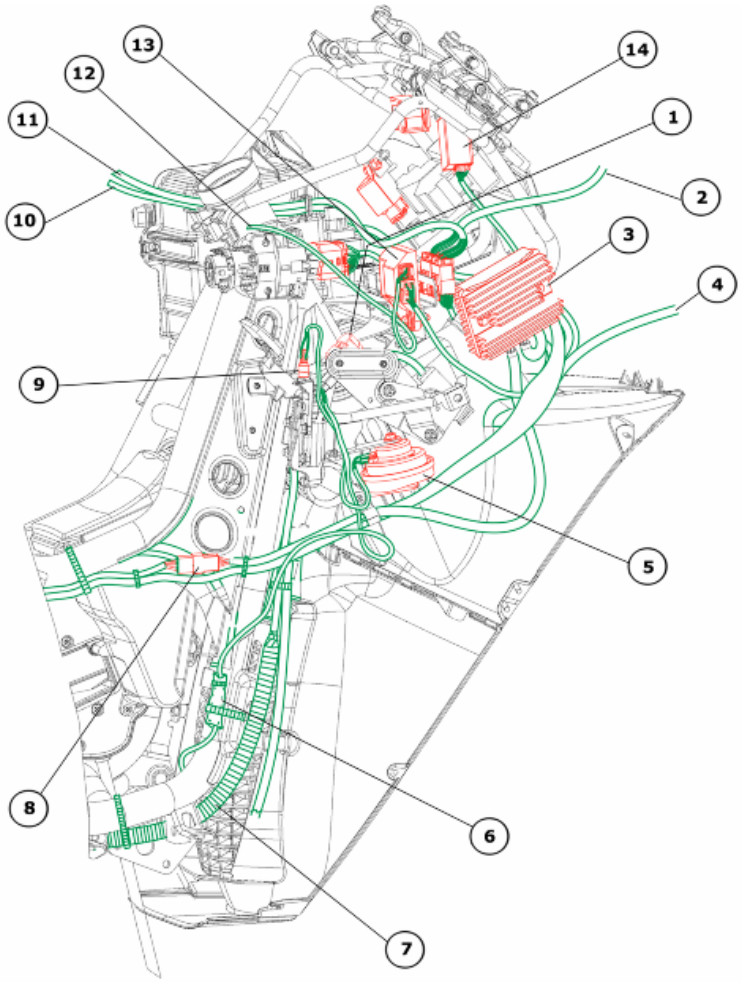
**O** = Low oil pressure warning light

**P** = High-beam warning light

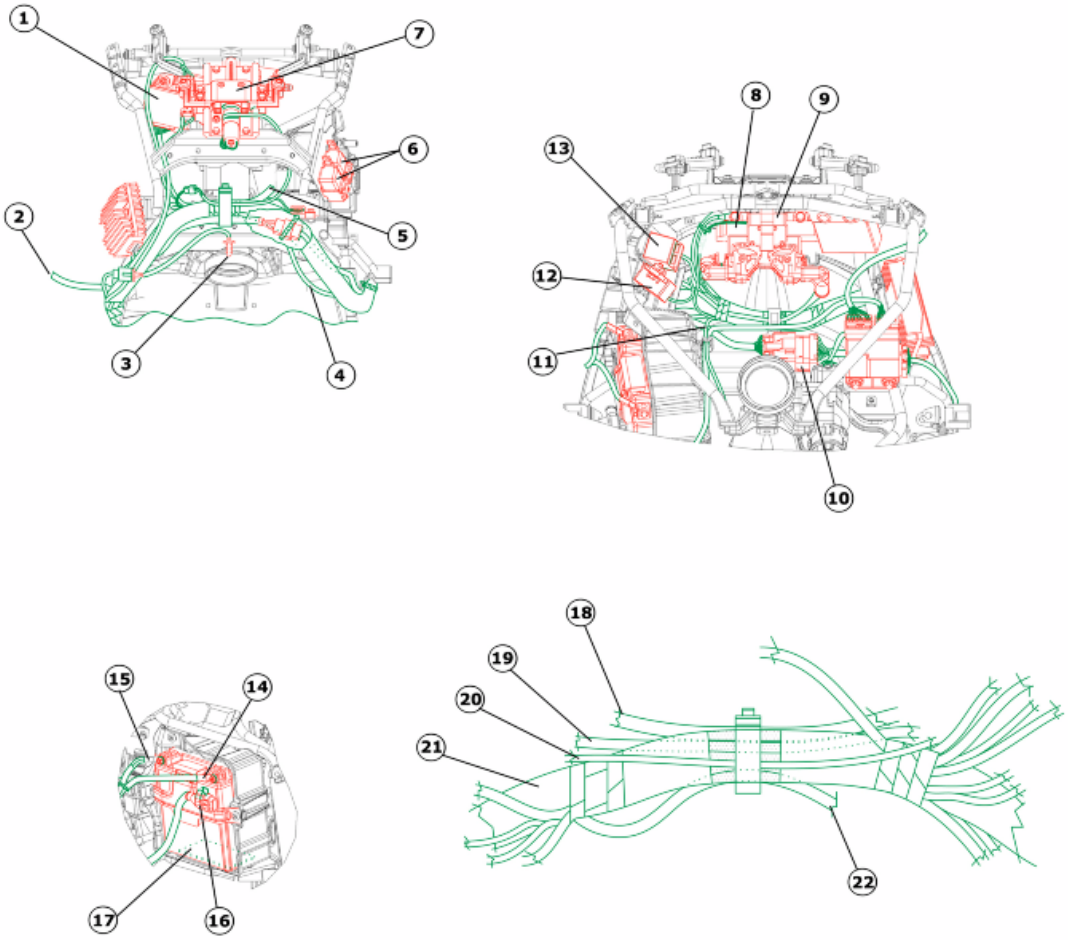
## Electrical system installation

### Front side


1. Remote control unit
2. To the left turn indicator
3. To the regulator
4. HV coil
5. To the side stand switch
6. Engine wire unit
7. Ground point
8. To the battery
9. Start-up remote control switch
10. Remote control switches - electric windshield switches



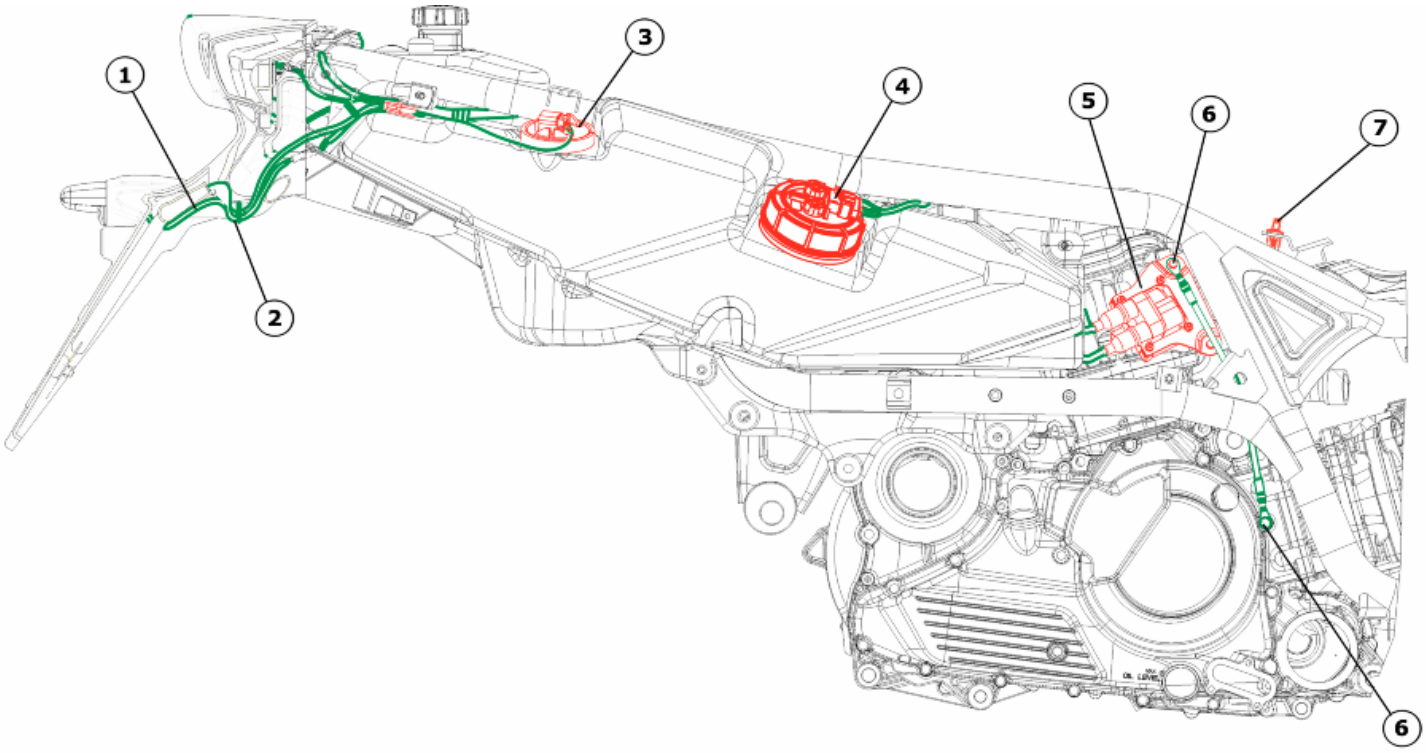

1. Saddle opening actuator
2. To the right control unit on the handlebar
3. Voltage regulator
4. To the right turn indicator
5. Snail horn
6. Electric fan connection
7. Starter motor cable
8. Regulator - flywheel connector
9. Parking brake switch
10. To the left control unit on the handlebar
11. GPS wiring
12. To the immobilizer aerial
13. Immobilizer ECU
14. Saddle opening receiver



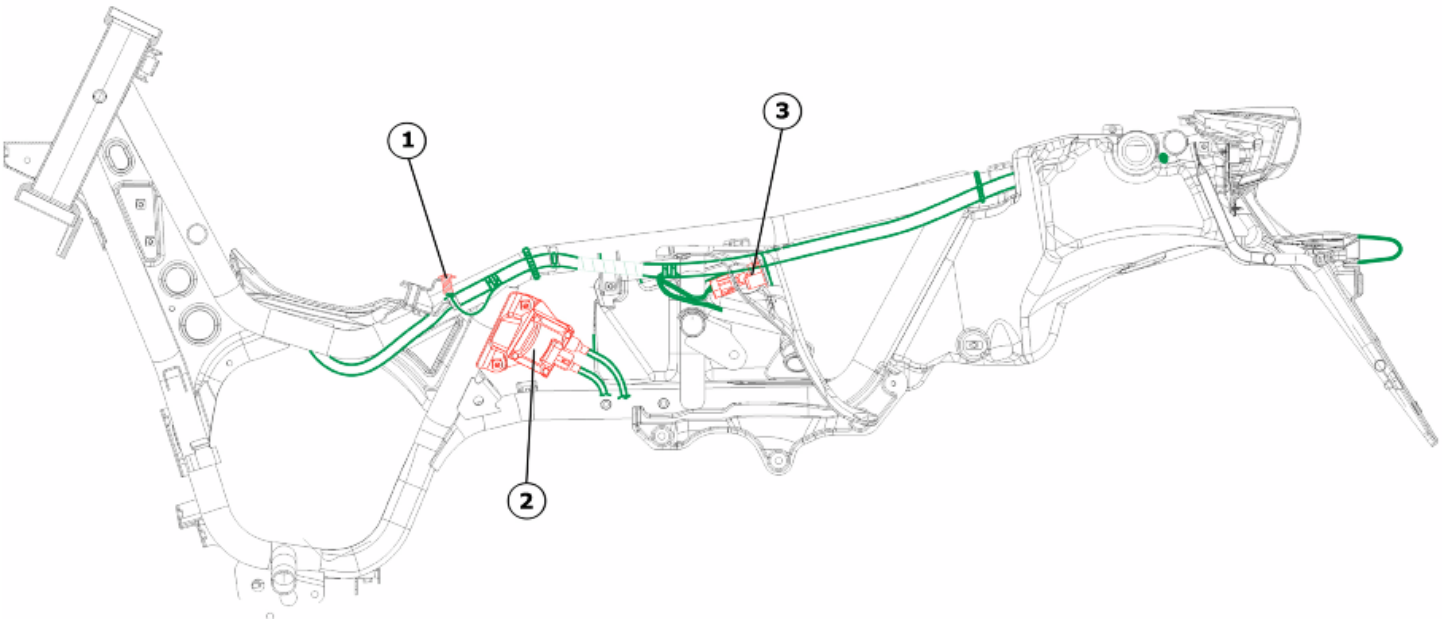

1. Saddle opening receiver
2. To the right turn indicator
3. External temperature sensor
4. To the side stand switch
5. To the instrument panel
6. Remote control switches - electric windshield switches
7. Electric windshield motor
8. Injection electronic control unit
9. Overturn sensor
10. Connection between main system and the system on the engine
11. GPS wiring
12. Buttons control device on the handlebar
13. Turn indicator control device
14. To the battery negative
15. To the battery positive
16. Diagnostic socket for hand-held computer

17. Battery
18. Cable from engine control unit
19. Starter motor cable
20. Electric windshield motor cable
21. Chassis wire unit
22. Voltage regulator cable

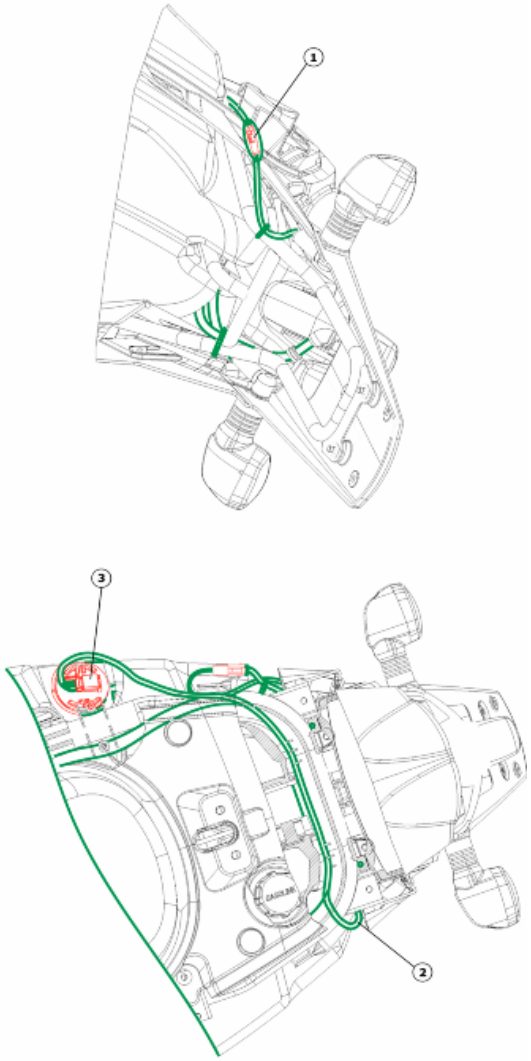
## Back side



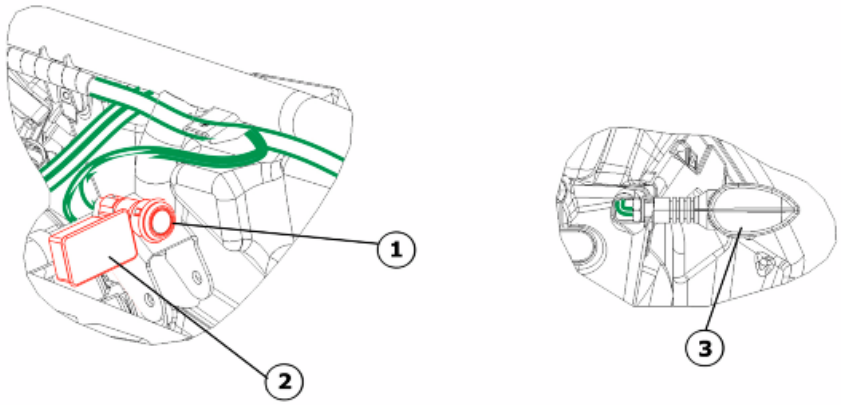

1. To the license plate light
2. To the right turn indicator
3. To the fuel level transmitter
4. To the fuel pump
5. Rear cylinder HV coil
6. Ground point
7. Helmet compartment light switch



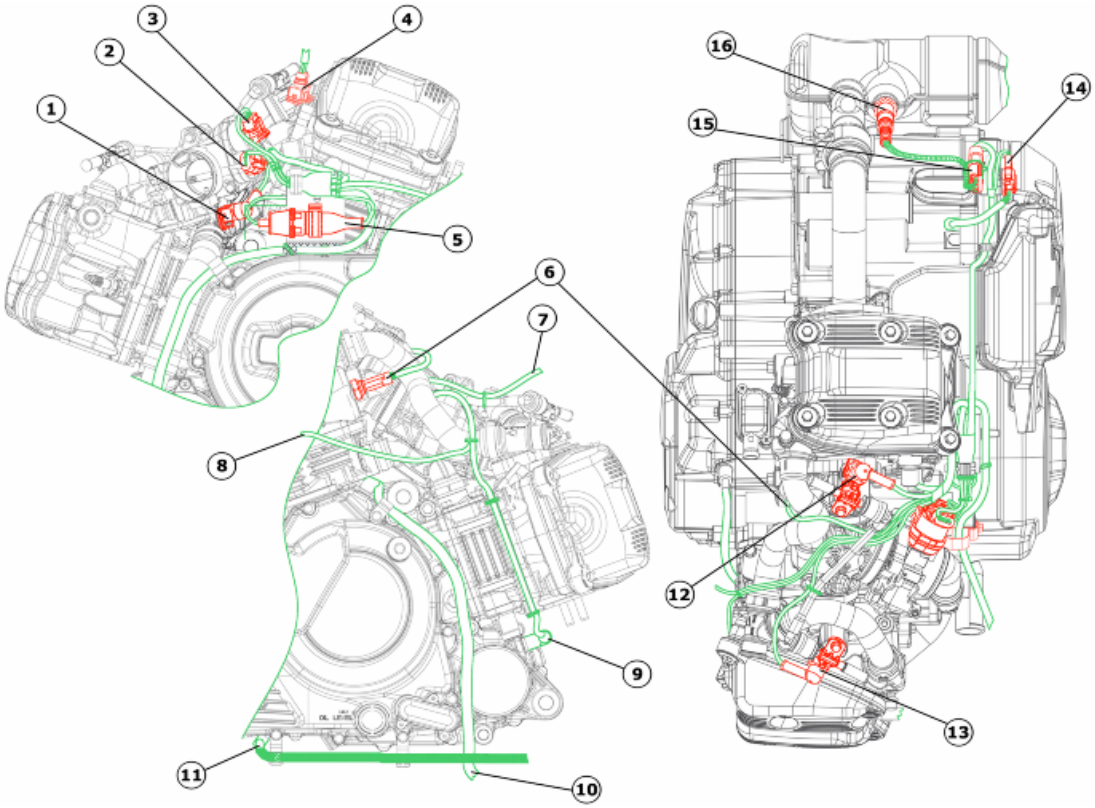

1. Helmet compartment light switch
2. Rear cylinder coil
3. Plug socket and helmet compartment light




1. Left turn indicator connection
2. To the left turn indicator
3. Fuel level transmitter




1. Plug socket for accessories
2. Helmet compartment light
3. Rear turn indicators

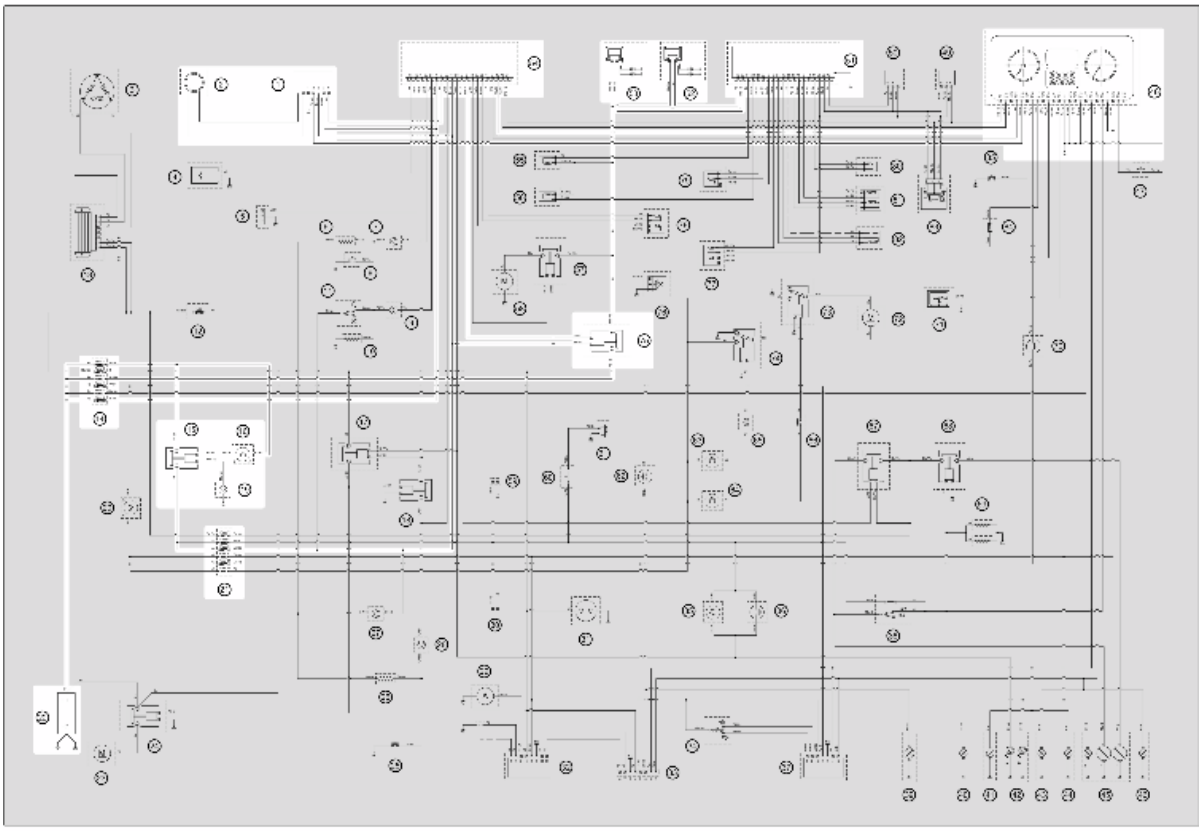



1. Air temperature sensor
2. Throttle valve sensor

3. Stepper motor
4. Rear cylinder fuel injector
5. Rpm timing sensor
6. Engine temperature sensor
7. To the front cylinder fuel injector
8. To the rear cylinder HV coil
9. Oil pressure sensor
10. To the voltage regulator
11. Starter motor cable
12. Rear cylinder fuel injector
13. To the front cylinder fuel injector
14. Speed sensor connector
15. Lambda probe connector
16. Lambda probe

## Conceptual diagrams

## Ignition



**KEY**

**1.** Immobilizer decoder

**2.** Immobilizer aerial

**14.** Main fuses

**15.** Main relay

**16.** Key switch contacts

**19.** 1A diode

**21.** Auxiliary fuses

**22.** 12V - 14Ah battery

**48.** Instrument panel

**51.**Electronic ignition device (Engine connector)

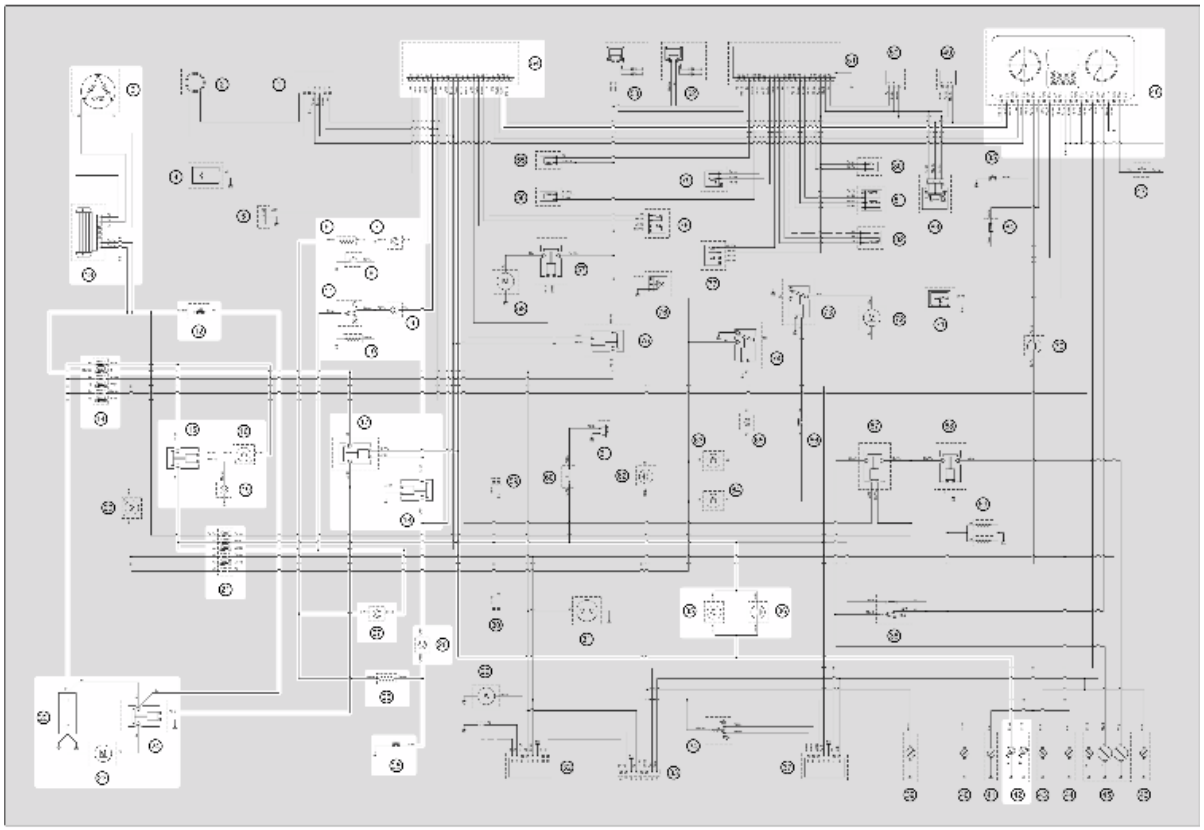
**52.**Front cylinder HV coil

**53.** Rear cylinder HV coil

**54.** Electronic ignition device (Vehicle connector)

**75.** Injection load relay

## Battery recharge and starting



**KEY**

**3**. Magneto flywheel

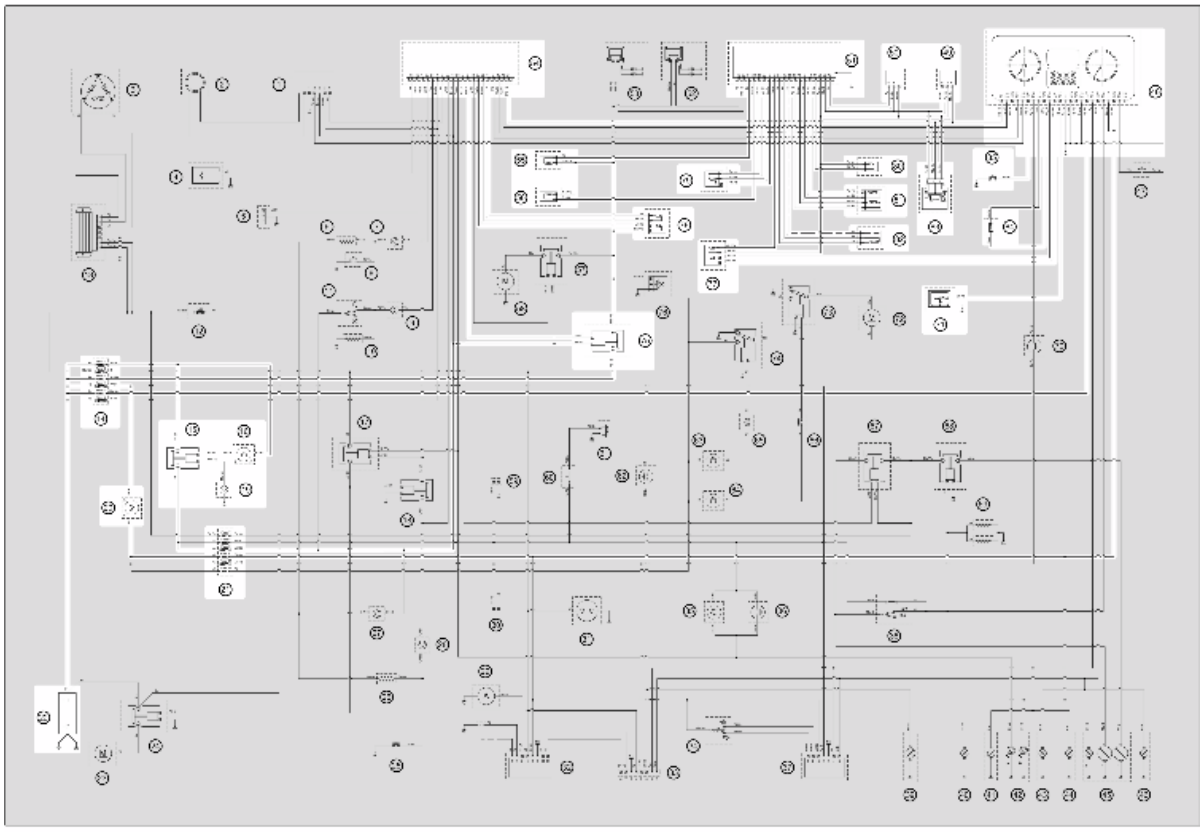
**6.** Resistance 120 Ohm - 2W

**7.** 1A diode

**8.** Stand button

**9.** 1A diode
**10.** Resistance 120 Ohm - 2W
**11.** Engine stop switch
**12.** 40A fuse
**13.** Voltage regulator
**14.** Main fuses
**15.** Main relay
**16.** Key switch contacts
**17.** Start-up remote control switch relay
**18.** Start-up maintenance relay
**19.** 1A diode
**21.** Auxiliary fuses
**22.** 12V - 14Ah battery
**23.** Starter motor
**24.** Start-up remote control switch
**25.** Starter button
**26.** Resistance 120 Ohm - 2W
**27.** 1A diode
**28.** 1A diode
**35.** Stop button on rear brake
**36.** Stop button on front brake
**42.** Rear light
**A.** Stop light LEDs
**48.** Instrument panel
**54.** Electronic ignition device (Vehicle connector)

## Level indicators and enable signals section



**KEY**

**14.** Main fuses

**15.** Main relay

**16.** Key switch contacts

**19.** 1A diode

**20.** Key switch contacts

**21.** Auxiliary fuses

**22.** 12V - 14Ah battery

**48.** Instrument panel

**49.** Vehicle speed sensor

**50.** Barometric pressure sensor

**51.**Electronic ignition device (Engine connector)

**54.** Electronic ignition device (Vehicle connector)

**55.** Front cylinder fuel injector

**56.** Rear cylinder fuel injector

**71.** Fuel level transmitter

**75.** Injection load relay

**77.** Engine temperature sensor

**78.** Lambda probe

**79.** Throttle valve potentiometer

**80.** Air temperature sensor

**81.** Idle speed regulator

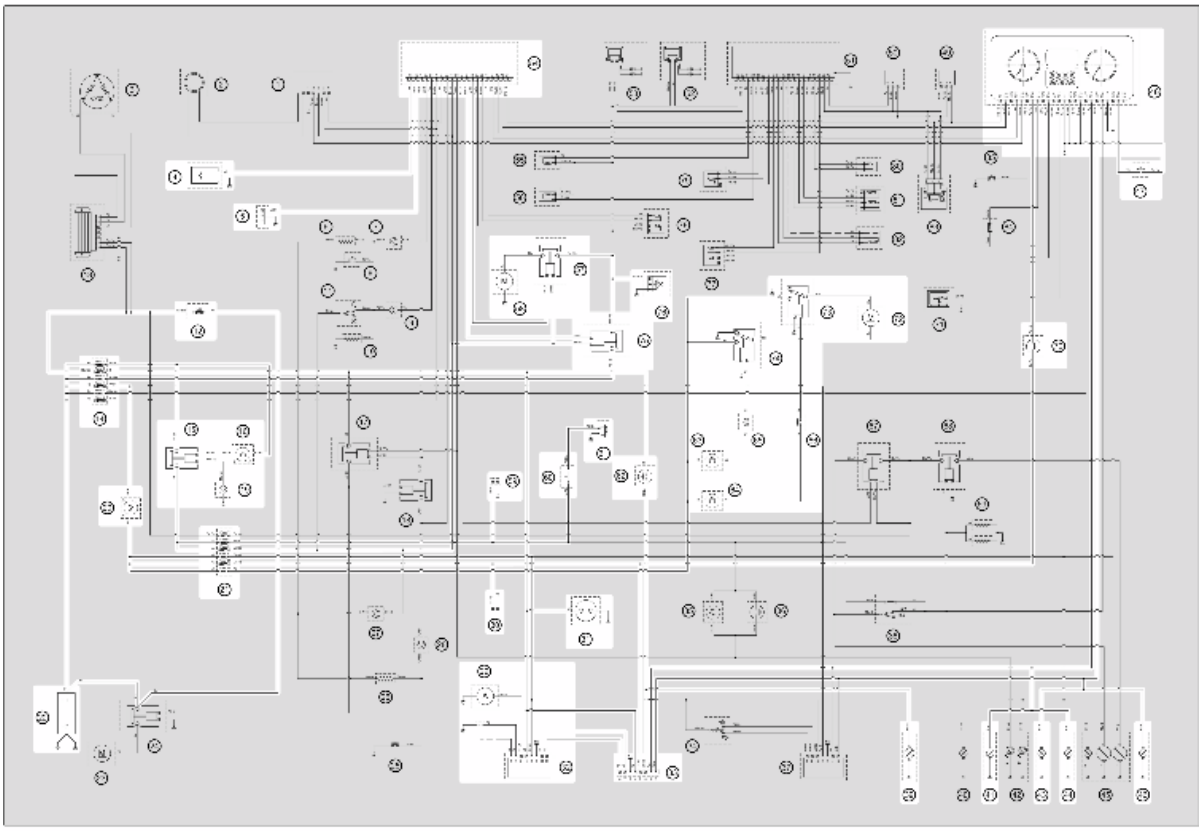
**82.** Engine rpm sensor

**83.** Monostable

**84.** External temperature sensor

**85.** Oil pressure sensor

## Devices and accessories



**KEY**

**4.** Roll-over sensor

**5.** Diagnostics socket

**14.** Main fuses

**15.** Main relay

**16.** Key switch contacts

**19.** 1A diode

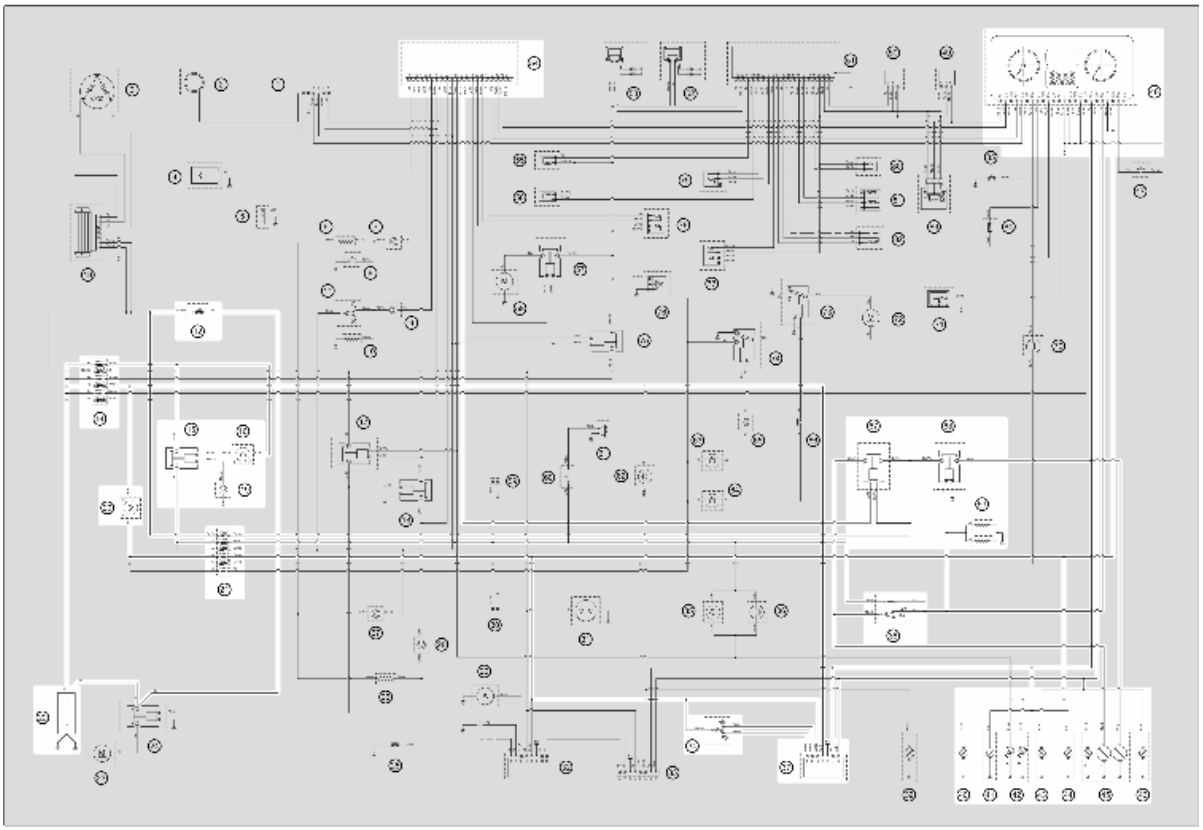
**20.** Key switch contacts

**21.** Auxiliary fuses

**22.** 12V - 14Ah battery

**29.** Saddle opening actuator
**30.**GPS wiring
**31.** LV coil - max.180W
**32.** Saddle opening receiver
**33.** Pre-installation for antitheft device
**39.** Helmet compartment light bulb
**41.** Rear left turn indicator bulb
**43.** Rear right turn indicator bulb
**44.** Front left turn indicator bulb
**46.** Front right turn indicator bulb
**47.** MODE button
**48.** Instrument panel
**54.** Electronic ignition device (Vehicle connector)
**57.** Electric fan relay
**58.** Electric fan
**59.** Wiring for accessories
**60.** Horn button
**61.** Horn
**62.** Helmet compartment light switch
**63.** Windshield DOWN button
**64.** Windshield UP button
**65.** Windshield limit switch
**66.** Windshield limit switch
**70.** Hand brake
**72.** Windshield motor
**73.** Windshield relay
**74.** Windshield relay
**75.** Injection load relay
**76.** Fuel pump

## Lights and turn indicators



**KEY**

**14.** Main fuses

**15.** Main relay

**16.** Key switch contacts

**19.** 1A diode

**20.** Key switch contacts

**21.** Auxiliary fuses

**22.** 12V - 14Ah battery

**34.** Turn indicator switch

**37.** Turn indicator control device

**38.** Light switch

**40**. License plate bulb

**41.** Rear left turn indicator bulb

**42.** Rear light

**B.** Rear position light LEDs

**43.** Rear right turn indicator bulb

**44.** Front left turn indicator bulb

**45.** Headlight

**A.** Front position light bulb

**B.** Low-beam light bulb

**C.** High-beam light bulb

**46.** Front right turn indicator bulb

**48.** Instrument panel

**54.** Electronic ignition device (Vehicle connector)

**67.** Low-beam light relay

**68.** High-beam light relay

**69.** Resistance 120 Ohm - 2W

## Checks and inspections

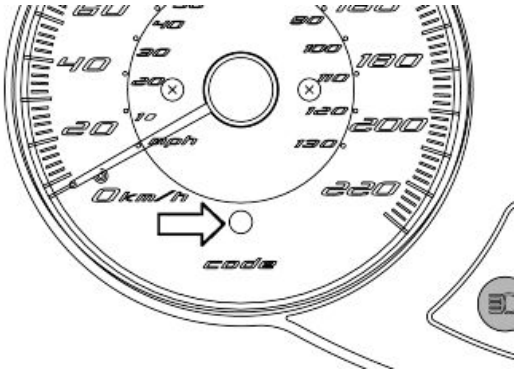
This section is devoted to the checks on the electrical system components.

## Immobiliser

The EMS system is independent from the immobilizer antitheft device.

Its functions are:

- Start-up enabled by key recognition.
- Deterrent flashing.




The system consists of:

-EMS system control unit

- Decoder
- Aerial
- master key
- service key
- Deterrent and diagnosis LED

## Virgin circuit

When control unit (ECU) and decoder are not programmed, the following conditions occur:

- Key switch set to «**OFF**»:

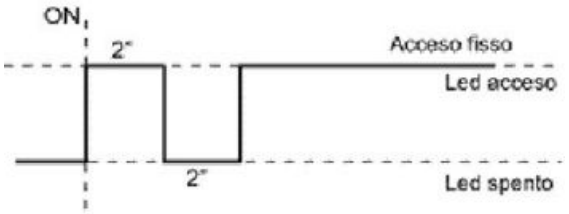
Deterrent flashing inactive.

- Key switch set to «**ON**»:

Ignition and injection disabled and LED on with solid light.

When the key switch is set to "**ON**", the LED switches on as shown in the figure.

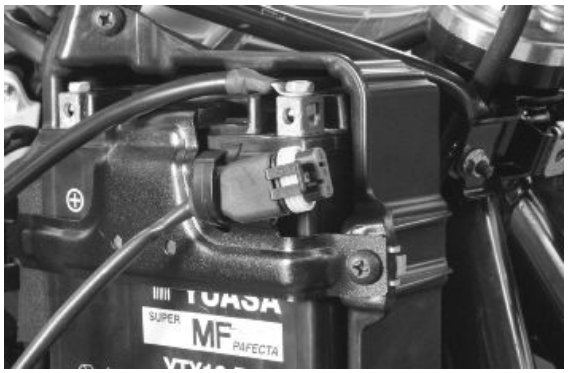
The LED is turned on by the decoder.



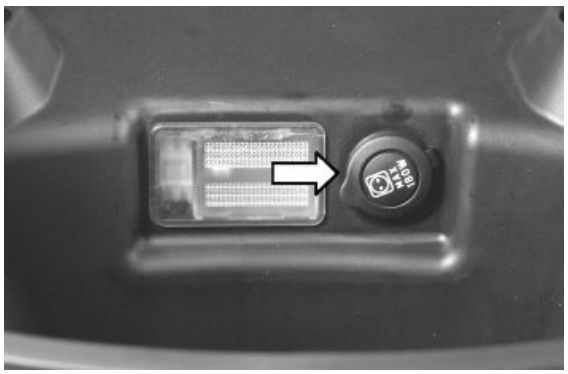

### Specific tooling

**020460Y Scooter diagnosis and tester**

To connect the diagnostic tester, open the battery inspection port and pull out the EMS diagnosis socket. Remove the protection cap and connect the tester terminal.




Power the diagnostic tester by connecting the terminals to the battery poles, or the specific connector to the socket inside the helmet compartment.



Set the switch to "**ON**" and select the diagnostic tester menu to the immobiliser function.

Scroll the pages to display the control unit data.

**N.B.**

**AN UNPROGRAMMED SYSTEM CANNOT BE DETECTED UPON FIRST FITTING, OR IN CASE THE DECODER AND THE CONTROL UNIT ARE REPLACED CONCURRENTLY.**

The information will be as follows:

Unprogrammed control unit «**ON**»

Start-up disabled «**ON**»

Key number Zero › 250

**1 Replacing the small cylinder**

- Remove the original master key transponder and install it on the master key of the new cylinder.
- Program the system again as described in the injection chapter.

**2 Decoder replacement**

When the decoder is replaced it is necessary to program the system again.

Programming is indispensable for the engine start-up. (see injection chapter).

**3 Control unit replacement**

Programming is indispensable when the control unit is replaced to enable the engine start-up.

In this case it is sufficient to switch to "**ON**" using the master key.

**N.B.**

**THE SERVICE KEY IS NOT USED FOR PROGRAMMING.**
**- WHEN NOT PROGRAMMED, THE CONTROL UNIT ALLOWS NO FUNCTIONAL DIAGNOSIS ON THE ENGINE.**

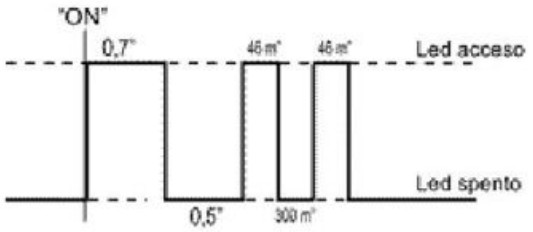
**4 Replacing or duplicating service keys**

Keys can be duplicated using the blank keys and the original master key.

**WITH MASTER KEY**

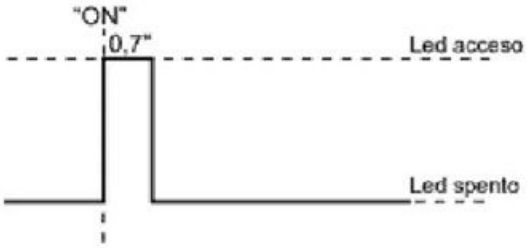
When the key switch is set to "**ON**" and programming is performed normally, the LED switches on as shown in the figure.

After the confirmation flash when switching to "**ON**", a number of flashes are emitted, equal to the number of keys used for programming.

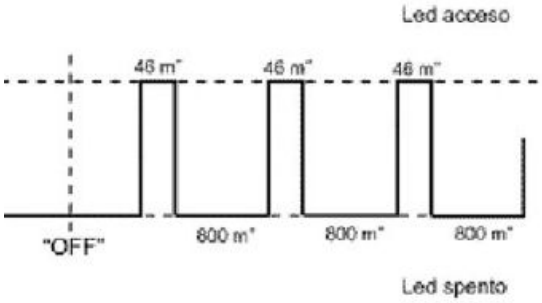


**WITH SERVICE KEYS**

After the confirmation flash when switching to «**ON**», the LED remains off.




Switching from «**ON**» to «**OFF**» with programmed system causes the intermittent switching on of the LED, with an antitheft effect.
This occurs with any key used for programming.



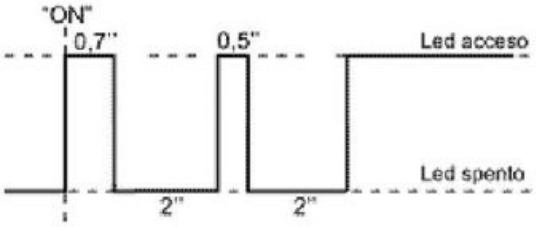

If the scooter is not used, the deterrent light stops automatically after 48 hours to prevent discharging the battery. A new 48-h cycle starts by switching from "**OFF**" to "**ON**" and "**OFF**" again.

## Diagnostic codes

The LED indication is divided into 3 steps:
1st step: A flash: "**ON**" switching recognition
2nd step: Series of flashes: diagnosis code indication
3rd step: Steady light on or off:
on = start-up disabled off = start-up enabled

## Diagnostic code - 1 flash

Code 1 indicates a non-programmed system.
If the code is still displayed after having carried out the programming procedure, repeat the procedure carefully observing the "**ON**" times of each key.

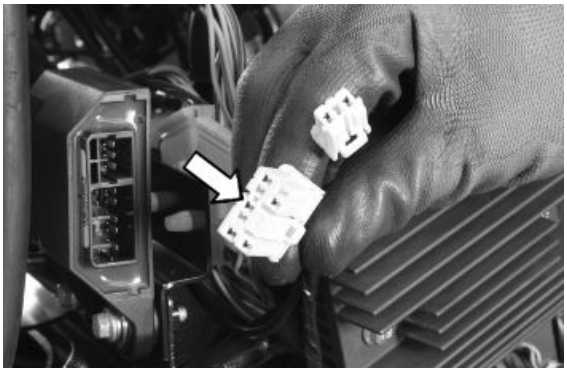



If the code is still displayed, proceed as follows:
- Disconnect the battery negative.
- Remove the control unit connector.
- Remove the main decoder connector.

**N.B.**

**TO ACCESS THE COMPONENTS, SEE THE COMPONENTS LAYOUT CHAPTER.**

**1**- With a multimeter, check the continuity between pin 7 of the vehicle side connector control unit and pin 6 of the decoder connector.
YES go to 3 NO go to 2



**2** - Repair or replace the wiring.

**3** - Check the connections carefully

YES go to 5 NO go to 4

**4** - Restore

**5** - Replace the decoder. Connect the battery. Repeat the programming. YES go to 7 NO go to 6

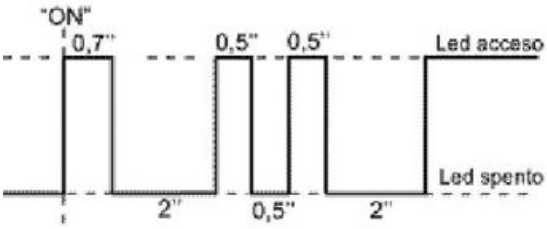
**6** - Disconnect the battery, replace the control unit, connect the battery. Repeat the programming.

**7** - The system is OK

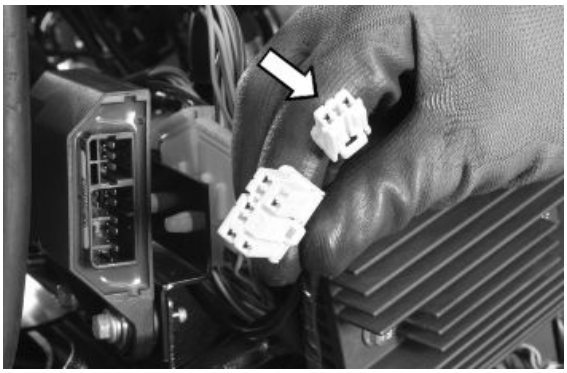
## Diagnostic code - 2 flashes

Code no. 2 denotes a system where the decoder does not perceive the transponder signal.
- Start-up disabled
- Injection telltale light on, steady

In this case, proceed as follows:




**1** - Check whether the code is repeated using the second key.
YES go to 3 NO go to 2



**2** - Failure detected with the service key Replace and program again. Failure detected with the master key.
Replace the transponder using one from the new cylinder kit.
Replace decoder and control unit.
Program again.

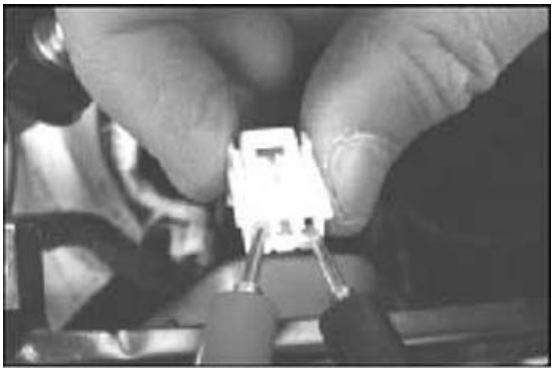
**3** - Check the proper connection of the aerial connector.

YES go to 5 NO go to 4

**4** - Restore the connection and check the presence of the code

**5** - Disconnect the aerial connector and check continuity (8 ± 2 W).

YES go to 7 NO go to 6



**6** - Replace the aerial.

**7** - Check the proper position of the aerial.

YES go to 9 NO go to 8

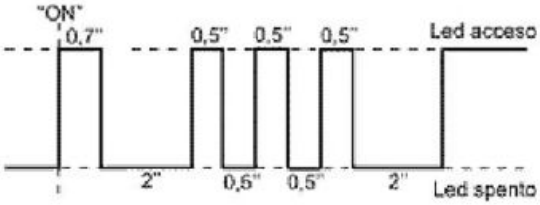
**8** - Place it in proper position

**9** - Replace the decoder and check the presence of the code

## Diagnostic code - 3 flashes

Code no. 3 denotes a system where the decoder perceives a transponder not provided for by programming.

- Start-up disabled
- Injection telltale light on, steady




**1**- Check whether the code is still displayed using the master key

YES go to 3 NO go to 2

**2** - Program again using all service keys

**3** - Check that all components (keys - decoder - control unit) are properly matched.

YES go to 5 NO go to 4

**4** - Restore

**5** - Replace decoders and control unit. Program the components again.

## Ignition circuit

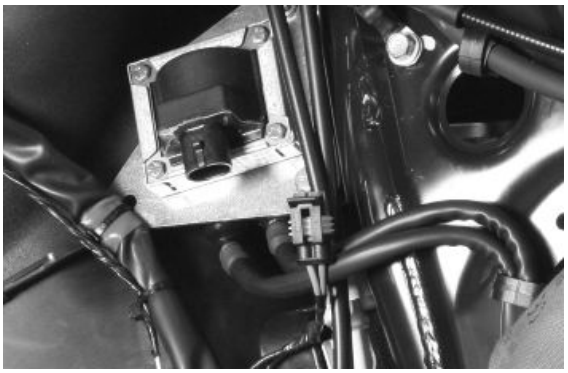
## No spark plug

**HV coil primary check**

**WARNING**

**ALL CONTINUITY TESTS MUST BE CARRIED OUT WITH THE CORRESPONDING CONNECTORS DISCONNECTED.**

Disconnect the connector and measure the resistance between coil pins. If values are correct, check wiring continuity.



For the front cylinder coil:

- Sky Blue cable between coil and pin 10 of the control unit engine-side connector.
- Black-Green cable between coil connector and injection load remote control base.

For the rear cylinder coil:

- Pink-Black cable between coil and pin 38 of the control unit engine-side connector.
- Black-Green cable between coil connector and injection load remote control base.

Restore connections if necessary.

### Electric characteristic

**High voltage coil primary resistance value**

0.7 ÷ 0.9 Ohm

**HV coil secondary check**

Disconnect the spark plug caps and measure the resistance between both.

### Electric characteristic

**Resistance value of high voltage coil secondary with spark plug caps**

~ 17000 Ohm

If values are incorrect, disconnect the caps and measure the resistance directly between the HV cable terminals.

### Electric characteristic

**High voltage coil secondary resistance value**

~ 7000 Ohm

If values are correct, measure the resistance of one cap.

### Electric characteristic

**Spark plug cap resistance**

~ 5000 Ohm

## 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.
This, in its turn, is connected directly to the ground and the battery positive passing through the 40A protective 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

**Stator winding check-up**

**WARNING**

**THE CHECK-UP CAN BE MADE WITH THE STATOR PROPERLY INSTALLED.**

1) Remove the right central chassis cover.
2) Disconnect the connector between stator and regulator with the three yellow cables as shown in the photograph.
3) Working on the stator connector pin, measure the resistance between each of the yellow terminals and the other two.

**Electric characteristic**

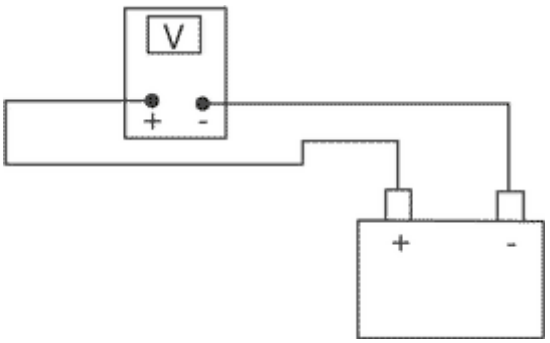
**Resistance:**

0.2 - 1 Ω

4) Check that there is insulation between the each yellow cable and the ground.
5) If values are incorrect, replace the stator.

## Voltage regulator check

With a perfectly charged battery and after removing the fuses for lights (No. 7 and 10), measure the voltage at the battery poles with the engine running at 5000 rpm.
The voltage should not exceed 14.7 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

**Look for any leakage**

1) Access the battery by removing the specific compartment in the shield back plate.

2) Check that the battery does not show signs of losing fluid before checking the output voltage.

3) Turn the ignition key to position OFF, connect the terminals of the tester between the negative pole (-) of the battery and the black cable and only then disconnect the black cable from the negative pole (-) of the battery.

4) With ignition key still at OFF, the reading detected by the ammeter must be ≤ 0.5 mA.

**Check the charging current**

**WARNING**

**BEFORE CARRYING OUT THE CHECK, MAKE SURE THAT THE BATTERY IS IN GOOD WORKING ORDER.**

1) Place the vehicle on its centre stand

2) With the battery correctly connected to the circuit, place the tester terminals between the battery terminals..

3) Turn on the engine, increase the engine rpm and, at the same time, measure the voltage.

### Electric characteristic

**Control voltage**

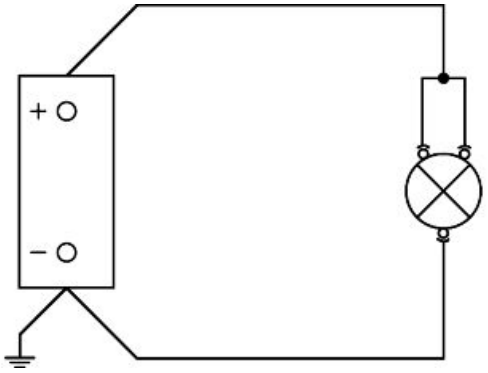
14 ÷ 14.7 V at 1000÷8000 rpm

**Maximum current output check.**

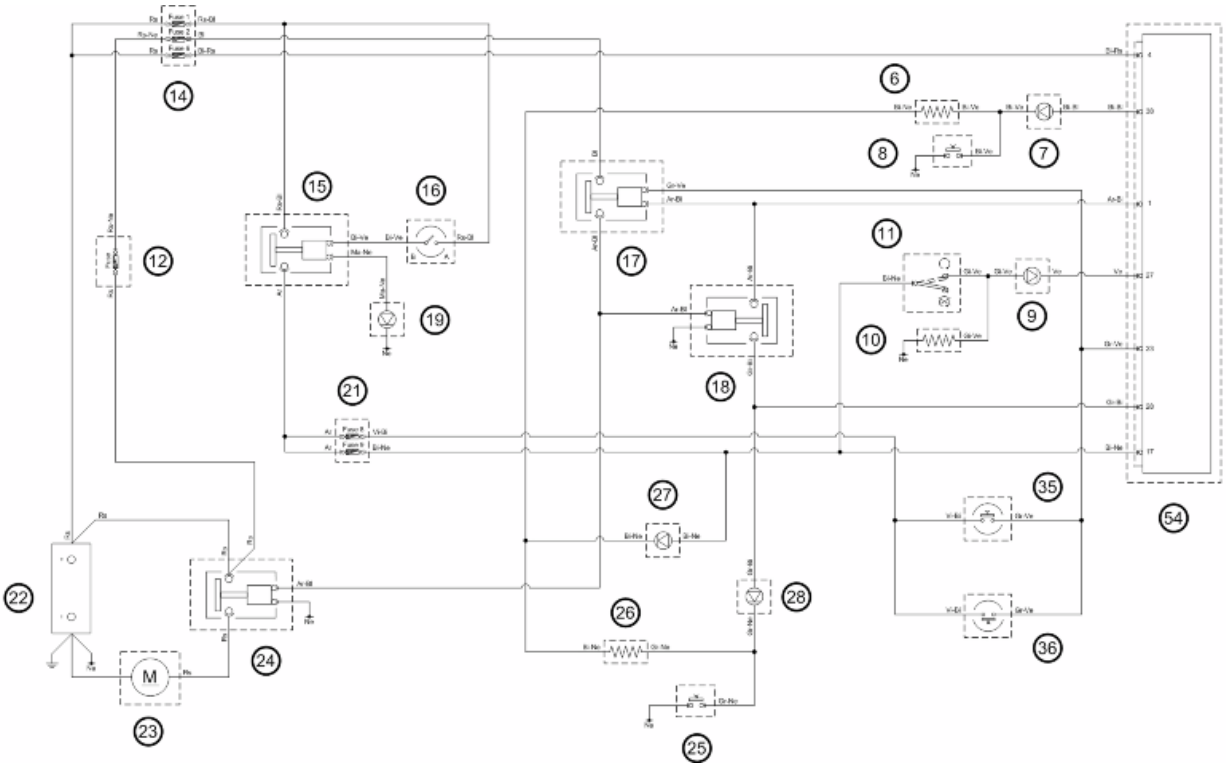
- Connect a 12V-55W twin-filament bulb to the battery poles as shown in the figure.
- Connect the diagnostic tester to the socket in the battery compartment, power it and start the active diagnosis for the electric fan.
- With the engine off and the panel set to «**ON**» with the lights on, allow the battery voltage to stop at 12V.
- Connect a DC ammeter clamp to the 2 recharge positive poles in the regulator output.
- Start the engine and rev it up to a high engine speed while reading the value on the pincer.

With an efficient battery a value must be detected:

> 20A



## Starter motor




**KEY**

**6.** Resistance 120 Ohm - 2W

**7.** 1A diode

**8.** Stand button

**9.** 1A diode

**10.** Resistance 120 Ohm - 2W

**11.**Engine stop switch

**12.** 40A fuse

**14.** Main fuses

**15.** Main relay

**16.** Key switch contacts

**17.** Start-up remote control switch relay

**18.** Start-up maintenance relay

**19.** 1A diode

**21.** Auxiliary fuses

**22.** 12V - 14Ah battery

**23.** Starter motor

**24.** Start-up remote control switch

**25.** Starter button

**26.** Resistance 120 Ohm - 2W

**27.** 1A diode

**28.** 1A diode

**35.** Stop button on rear brake

**36.** Stop button on front brake

**54.** Electronic ignition device (Vehicle connector)

**WARNING**

**ALL CONTINUITY TESTS MUST BE CARRIED OUT WITH THE CORRESPONDING CONNECTORS DISCONNECTED.**

If the starter motor does not work, proceed as follows:

1) Check the starter motor ground connection.

2) Check the continuity of the Red cable between the starter motor and the start-up remote control switch. Also check continuity between the latter and the battery.

3) Check the start-up remote control switch.

4) Check that the Black cable of the start-up remote control switch is earthed.

5) Check the continuity of the Orange-Blue cable between the start-up remote control switch, start-up remote control switch relay and the start-up maintenance relay.

6) Check the start-up remote control switch relay and the start-up maintenance relay.

7) Check 40A fuse, fuse No. 2, the continuity of the Red-Black cable connecting them and the continuity of the Blue cable between the fuse box (fuse No. 2) and the start-up remote control switch relay.

8) Check the start-up maintenance relay ground connection (Black cable).

9) Check the continuity of the following cables, restore them if necessary:

- between the starter button Grey-Black cable (negative multimeter probe) and the start-up maintenance relay Grey-White cable (positive probe). Also check continuity between the latter and pin 28 of the control unit vehicle-side connector.
- between the stand button White-Green cable (negative multimeter probe) and pin 38 of the control unit vehicle-side connector, (positive multimeter probe).
- between stop buttons, start-up remote control switch relay and pin 23 of the control unit vehicle-side connector (Grey-Green cable).
- between pin 1 of the control unit vehicle-side connector, start-up remote control switch relay and start-up maintenance relay (Orange-White cable).

10) Check the control unit power supply:

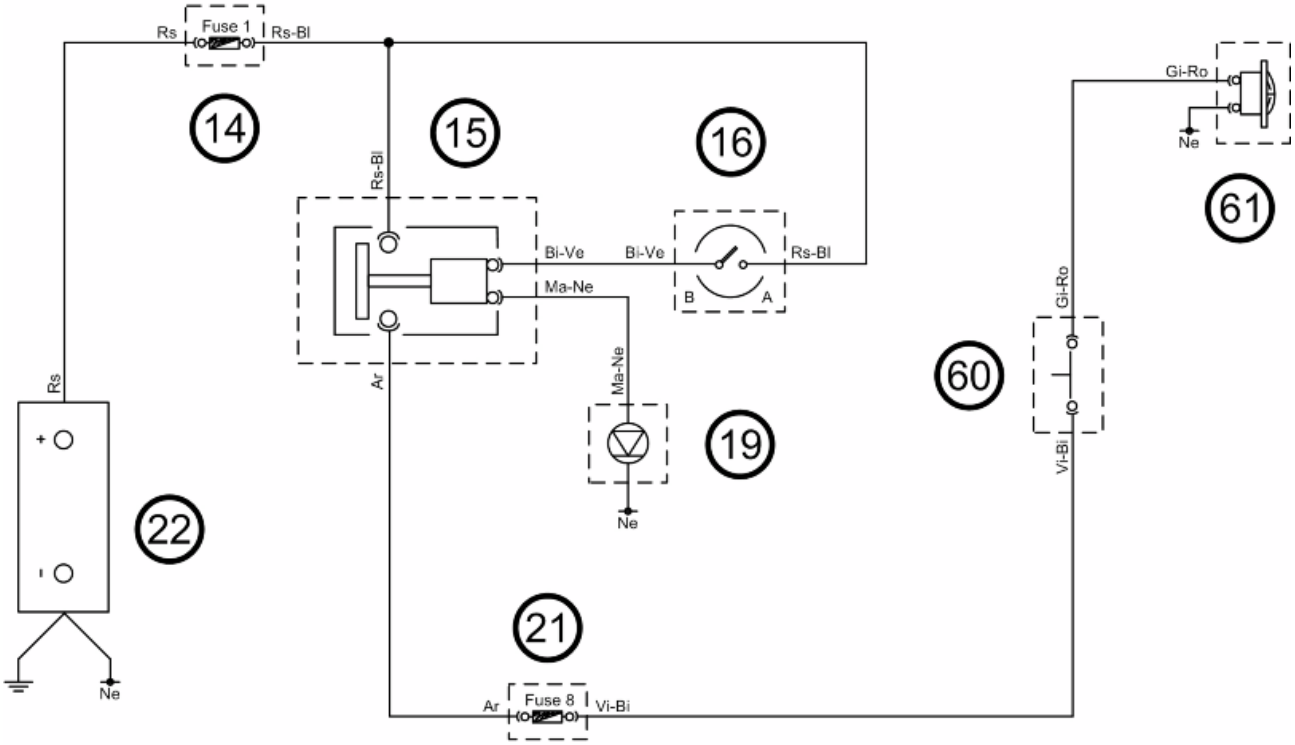
- Check there is voltage between pin 4 of the control unit vehicle-side connector and ground. If there is no voltage, check the continuity of the cable harness and fuse No. 6.
- With the key switch set to «ON», check there is voltage between pin 17 of the control unit vehicle-side connector and ground. If there is no voltage, check the continuity of the cable harness, fuses No. 1 and 9, the main relay and the key switch contacts.

11) Check the fuse No. 8 and the continuity of the Purple-White cable in the fuse box output with the stop buttons.

12) Check the continuity of the cable harness between fuse No. 9 and the engine stop switch (White-Black cable). Also check continuity between the latter (positive multimeter probe, Yellow-Green cable) and pin 27 of the control unit vehicle-side connector (negative probe, Green cable).

13) Check the contacts of the starter button, stop buttons, stand button and engine stop switch.

## Horn control




**KEY**

**14.** Main fuses

**15.** Main relay

**16.** Key switch contacts

**19.** 1A diode

**21.** Auxiliary fuses

**22.** 12V - 14Ah battery

**60.** Horn button

**61.** Horn

**WARNING**

**ALL CONTINUITY TESTS MUST BE CARRIED OUT WITH THE CORRESPONDING CONNECTORS DISCONNECTED.**

If the horn does not work:

1) Check the working order of fuse No. 1.

2) Check contacts «**A**» and «**B**» of the key switch.

3) Check the main relay.

4) Check that the Brown-Black cable of the main relay is earthed.

5) With the key switch set to «**ON**» check if there is voltage between the Orange cable of the main relay and the ground connection.

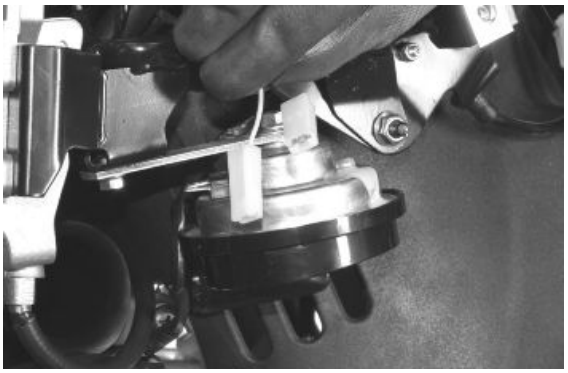
6) If there is no voltage, check the continuity of the cable harness with the fuse box.

7) Check the working order of fuse No. 8.

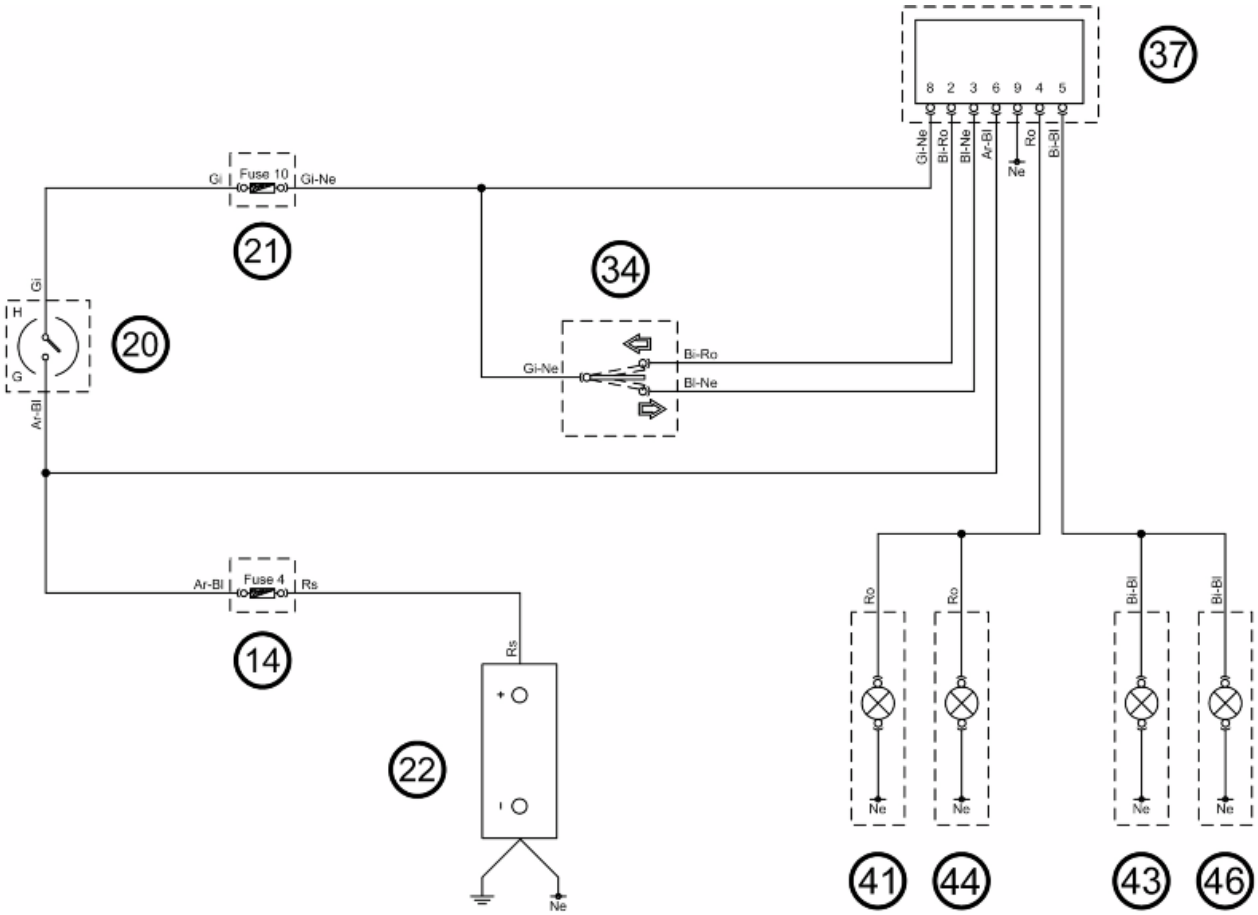
8) Check the horn button contacts.

9) Check if there is voltage between the Yellow-Pink cable of the horn button, with the latter pressed, and the ground connection. If there is no voltage, check the continuity of the cable harness between the main relay, fuse box and button.

10) Check the continuity of the Yellow-Pink cable between the horn and the button, and whether the Black cable of the horn is earthed. Repair the cable harness if necessary.



## Turn signals system check




**KEY**

**14.** Main fuses

**20.** Key switch contacts

**21.** Auxiliary fuses

**22.** 12V - 14Ah battery

**34.** Turn indicator switch

**37**. Turn indicator control device

**41.** Rear left turn indicator bulb

**43.** Rear right turn indicator bulb

**44.** Front left turn indicator bulb

**46.** Front right turn indicator bulb

**WARNING**

**ALL CONTINUITY TESTS MUST BE CARRIED OUT WITH THE CORRESPONDING CONNECTORS DISCONNECTED.**

If turn indicators do not work:

1) Check the working order of bulbs.

2) Check the working order of fuse No. 4.

3) Check if there is voltage between pin 6 (Orange-Blue) and 9 (Black) of the turn indicator control device connector. If there is no voltage, check the continuity of the cable harness.

4) Check contacts «**G**» and «**H**» of the key switch.

5) Check the working order of fuse No. 10.

6) With the key switch set to «**ON**», check if there is voltage between pin 8 (Yellow-Black) and 9 (Black) of the turn indicator control device connector. If there is no voltage, check the continuity of the cable harness.

7) Check the turn indicator switch contacts.

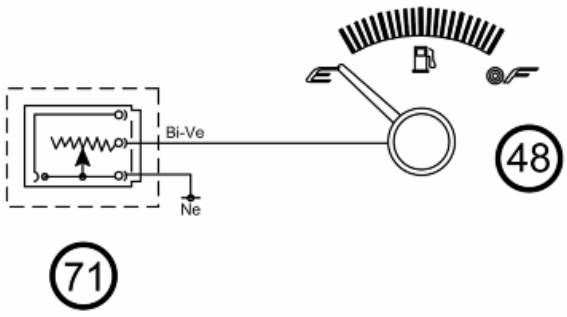
8) With the turn indicator switch pressed, check if there is voltage between pins 2 and 9 (switch to the left) and pins 3 and 9 (switch to the right) of the turn indicator control device.

9) If there is no voltage, check the continuity of the cable harness between the fuse box and the turn indicator switch. Also check continuity between the latter and the turn indicator control device.

10) Check the continuity of the cable harness between the bulbs and the turn indicator control device.

## level indicators

**FUEL GAUGE**



**KEY**

**48.** Instrument panel

**71.** Fuel level transmitter

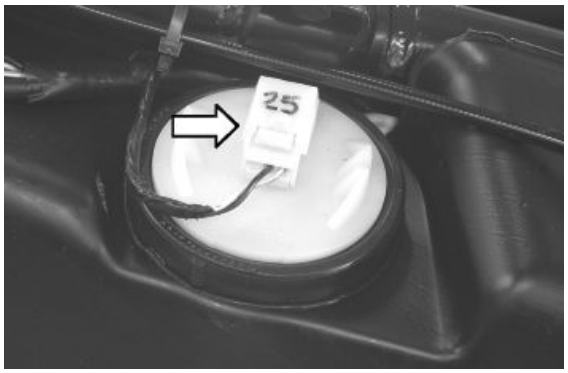
**WARNING**

**ALL CONTINUITY TESTS MUST BE CARRIED OUT WITH THE CORRESPONDING CONNECTORS DISCONNECTED.**

If faults are detected:

1) With a multimeter, check the resistance values between the White-Green cable and the Black cable of the fuel level transmitter by moving the arm with the float.

2) If the transmitter works, but the indication on the multimeter is not exact, check the continuity of the cable harness between transmitter and multimeter.




### Electric characteristic

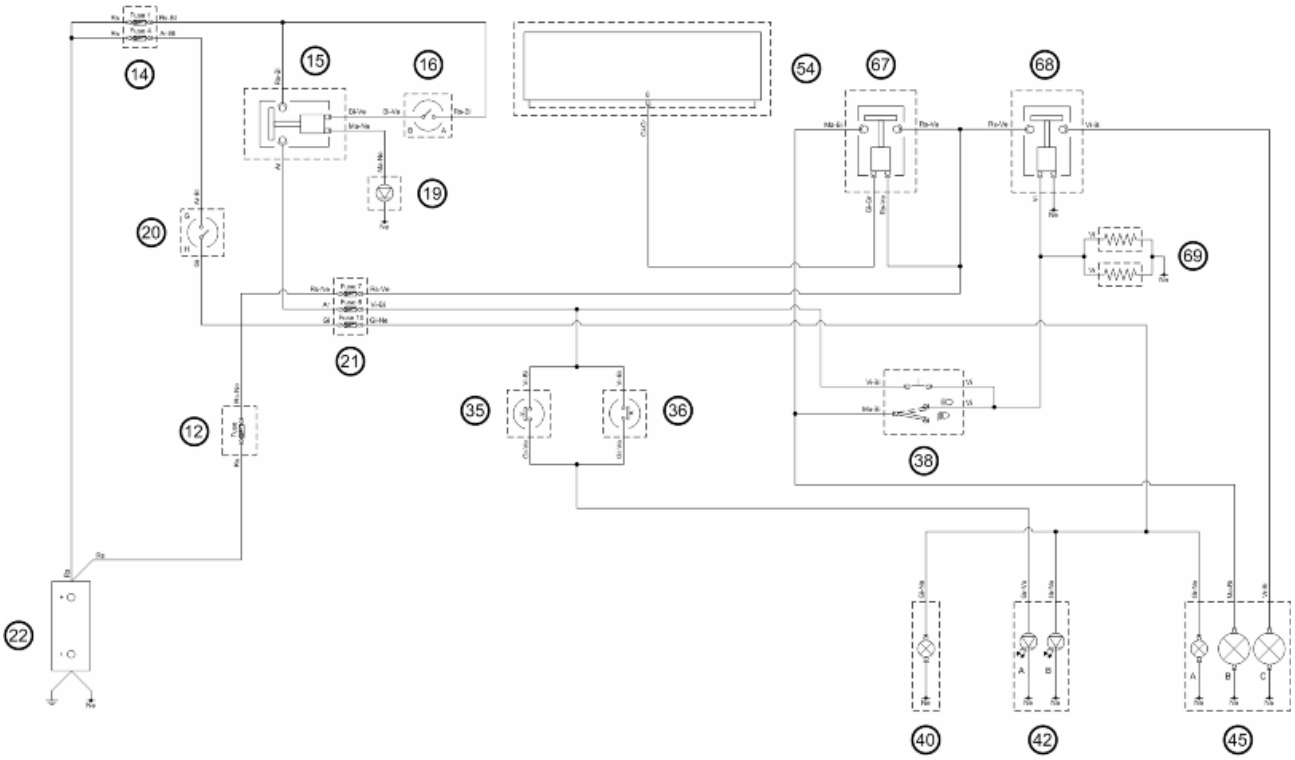
**Full tank position**

<= 5 Ohm

**Empty tank position**

98 ± 5 Ohm

## Lights list



**KEY**

**12.** 40A fuse

**14**. Main fuses

**15**. Main relay

**16**. Key switch contacts

**19**. 1A diode

**20**. Key switch contacts

**21**. Auxiliary fuses

**22**. 12V - 14Ah battery

**35**. Stop button on rear brake

**36**. Stop button on front brake

**38**. Light switch

**40**. License plate bulb

**42**. Rear light

A. Stop light LEDs

B. Rear position light LEDs

**45**. Headlight

A. Front position light bulb

B. Low-beam light bulb

C. High-beam light bulb

**54**. Electronic ignition device (Vehicle connector)

**67**. Low-beam light relay

**68**. High-beam light relay

**69**. Resistance 120 Ohm - 2W

**WARNING**

**ALL CONTINUITY TESTS MUST BE CARRIED OUT WITH THE CORRESPONDING CONNECTORS DISCONNECTED.**

**TAIL LIGHT CHECK**

1) Check the bulbs and replace them as indicated in the bulb table.

2) Check fuse No. 4 and contacts «**G**» and «**H**» of the key switch.

3) Check the continuity of the cable harness between the battery, fuse box (fuse No. 4) and contacts of the key switch.

4) Check fuse No. 10.

5) Check the continuity of the cable harness between the key switch, fuse box (fuse No. 10) and bulbs.

6) Check that the Black cables of the bulbs are earthed.

**LOW-BEAM LIGHT CHECK**

1) Check the bulb and, if necessary, replace it as indicated in the bulb table.

2) Check the working order of fuse No. 1.

3) Check contacts «**A**» and «**B**» of the key switch.

4) Check the main relay

5) Check that the Brown-Black cable of the main relay is earthed.

6) With the key switch set to «**ON**», check if there is voltage between the Orange cable of the main relay and the ground connection.

7) If there is no voltage, check the continuity of the cable harness with the fuse box (fuse No. 1).

8) Check the working order of fuse No. 7.

9) Check the continuity of the cable harness between the main relay, fuse box (fuse No. 7) and the low-beam light relay (Red-Green cables).

10) Check the low-beam light relay.

11) Check the continuity of the cable harness between the low-beam light relay and the bulb (Brown-White cable).

12) Check the continuity of the cable harness between the low-beam light relay and the control unit vehicle-side connector (Yellow-Grey cable).

13) Check that the Black cable of the bulb is earthed.

**HIGH-BEAM LIGHT CHECK**

1) Check the bulb and, if necessary, replace it as indicated in the bulb table.

2) Check the continuity of the cable harness between the light switch and the low-beam light relay (Brown-White cable).

3) Check the light switch contacts.

4) Check the continuity of the cable harness between the light switch and the high-beam light relay (Purple cable).

5) Check the high-beam light relay.

6) Check the continuity of the cable harness between the high-beam light relay and fuse No. 7 (Red-Green cable).

7) Check that the Black cable of the high-beam light relay is earthed.

8) Check the continuity of the cable harness between the high-beam light relay and the bulb (Purple-White cable).

9) Check that the Black cable of the bulb is earthed.

10) If the high-beam light does not work in flashing mode:

- Check the continuity of the cable harness of the main relay and fuse No. 8 (Orange cable).
- Check fuse No. 8.
- Check the continuity of the cable harness between the fuse box (fuse No. 8) and the light switch (Purple-White cable).
- Check the high-beam flash switch contacts.
- Check the continuity of the cable harness between the high-beam flash switch and the high-beam light relay (Purple cable).

**STOP LIGHT CHECK**

1) Check LEDs and replace the rear light assembly if necessary.

2) Check the working order of fuse No. 1.

3) Check contacts «**A**» and «**B**» of the key switch.

4) Check the main relay.

5) Check that the main relay and ground Brown-Black cable is earthed.

6) With the key switch set to «**ON**», check if there is voltage between the Orange cable of the main relay and the ground connection.

7) If there is no voltage, check the continuity of the cable harness with the fuse box (fuse No. 1).

8) Check fuse No. 8 and the continuity of the cable harness with the main relay (Orange cable).

9) Check the continuity of the cable harness between fuse No. 8 and the stop buttons (Purple-White cables).

10) Check that the stop buttons work properly.

11) Check the continuity of the cable harness between the stop buttons and the rear light (Grey-Green cable).

12) Check that the Black cable of the rear light is earthed.

**LIGHT BULBS TABLE**

| | Specification | Desc./Quantity |
|---|---|---|
| 1 | Low-beam bulb | **Type:** HALOGEN (H7)<br>**Power:** 12V - 55W<br>**Quantity:** 1 |
| 2 | High-beam light bulb | **Type:** HALOGEN (H1)<br>**Power:** 12V - 55W<br>**Quantity:** 1 |
| 3 | Front tail light bulb | **Type:** ALL GLASS<br>**Power:** 12V - 5W<br>**Quantity:** 1 |
| 4 | Front turn indicator bulb | **Type:** WITH BULB<br>**Power:** 12V - 10W<br>**Quantity:** 1 RHS + 1 LHS |
| 5 | Rear tail light bulb | **Type:** LED<br>**Power:** -<br>**Quantity:** 1 |
| 6 | Stop light bulb | **Type:** LED<br>**Power:** -<br>**Quantity:** 1 |
| 7 | Rear turn indicator light bulb | **Type:** WITH BULB<br>**Power:** 12V - 10W<br>**Quantity:** 1 RHS + 1 LHS |
| 8 | License plate light bulb | **Type:** ALL GLASS<br>**Power:** 12V - 5W<br>**Quantity:** 1 |
| 9 | Helmet compartment light bulb | **Type:** FESTOON BULB<br>**Power:** 12V - 5W<br>**Quantity:** 1 |
| 10 | Instrument panel bulb | **Type:** ALL GLASS<br>**Power:** 12V - 2W<br>**Quantity:** 4 |
| 11 | Turn indicator warning light bulb | **Type:** ALL GLASS<br>**Power:** 12V - 1.4W |

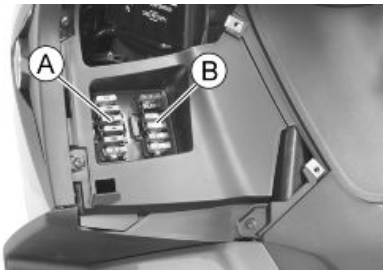
| Specification | Desc./Quantity |
|---|---|
| | **Quantity:** 2 |

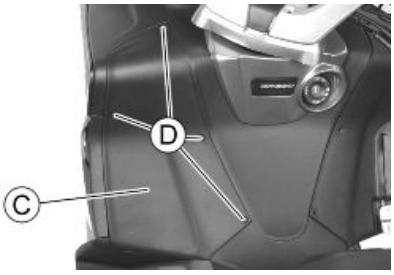
## Fuses

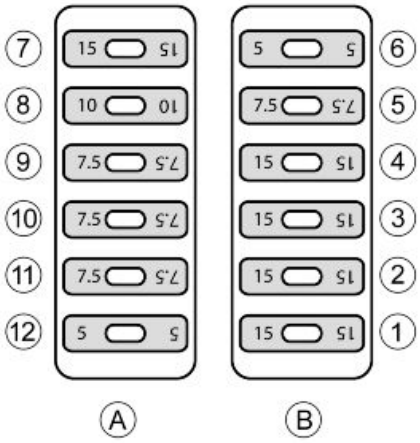
The electrical system has twelve fuses distributed in two fuse boxes «**A**» and «**B**» to protect the different installation circuits. They are placed inside the battery compartment and can be accessed by undoing the four screws «**D**» and removing the plastic cover «**C**». The chart shows the position and characteristics of the fuses in the vehicle.

**CAUTION**

**BEFORE REPLACING A BLOWN FUSE, FIND AND SOLVE THE FAILURE THAT CAUSED IT TO BLOW. NEVER TRY TO REPLACE THE FUSE WITH ANY OTHER MATERIAL (E.G., A PIECE OF ELECTRIC WIRE).**




**FUSES**

| | Specification | Desc./Quantity |
|---|---|---|
| 1 | Fuse No. 1 | **Capacity:** 15A<br>**Protected circuits:**<br>Live: Main relay, fuses No. 8-9 (via relay). |
| 2 | Fuse No. 2 | **Capacity:** 15A<br>**Protected circuits:** Helmet compartment lightning, plug socket, Pre-installation for antitheft device, saddle opening receiver, start-up maintenance relay (via relay), start-up remote control switch (via relay). |
| 3 | Fuse No. 3 | **Capacity:** 15A<br>**Protected circuits:** Injection load (via relay). |
| 4 | Fuse No. 4 | **Capacity:** 15A |

| | Specification | Desc./Quantity |
|---|---|---|
| | | **Protected circuits:** Turn indicator control device.<br>Live: Fuses No. 10-11-12. |
| 5 | Fuse No. 5 | **Capacity:** 7.5 A<br>**Protected circuits:** Instrument panel. |
| 6 | Fuse No. 6 | **Capacity:** 5A<br>**Protected circuits:** ECU, decoder. |
| 7 | Fuse No. 7 | **Capacity:** 15A<br>**Protected circuits:**Low-beam light relay, high-beam light (via relay), low-beam light (via relay). |
| 8 | Fuse No. 8 | **Capacity:** 10 A<br>**Protected circuits (live):** Wiring for accessories, horn, stop light, high-beam light relay. |
| 9 | Fuse No. 9 | **Capacity:** 7.5 A<br>**Protected circuits (live):** Injection load relay, electrical fan relay, ECU, decoder. |
| 10 | Fuse No. 10 | **Capacity:** 7.5 A<br>**Protected circuits (live):** Saddle opening receiver, turn indicator control device, tail lights, instrument panel. |
| 11 | Fuse No. 11 | **Capacity:** 7.5 A<br>**Protected circuits (live):** Wiring for GPS, pre-installation for antitheft device, parking brake. |
| 12 | Fuse No. 12 | **Capacity:** 5A<br>**Protected circuits (live):** Windshield relay, engine for windshield (via relay). |

## Sealed battery

**Sealed battery start-up operations**

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 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

## Specific tooling

**020333Y Single battery charger**

**020334Y Multiple battery charger**

Cleaning the battery

The battery should always be kept clean, especially on its top side, and the terminals should be coated with Vaseline.

**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.**

**CAUTION**

**CHARGE THE BATTERY BEFORE USE TO ENSURE OPTIMUM PERFORMANCE. FAILURE TO CHARGE THE BATTERY ADEQUATELY BEFORE BEING PUT INTO OPERATION WILL LEAD TO A PREMATURE FAILURE OF THE BATTERY.**

If the scooter is not used for a given time (1 month or more) it will be necessary to periodically recharge the battery.

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, remembering that the ground wire (**black**) marked (-) must be connected to the **negative** clamp while the other two **red** wires marked (+) must be connected to the clamp marked with the + **positive** sign.

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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 RENEWAL RECHARGE AFTER OPEN-CIRCUIT STORAGE**

**1) Voltage check up**

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

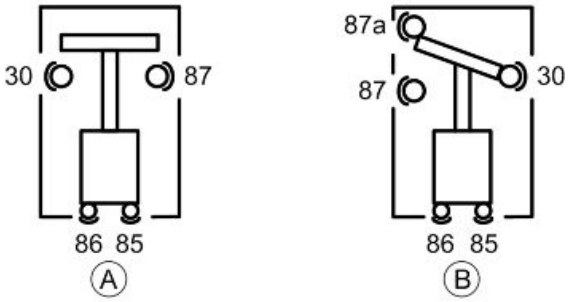
**3) Constant current battery charge mode**

- Charge current equal to 1/10 of the battery rated capacity

- Charge time: Maximum 5 h

## Remote controls check

There are two types of remote controls in the electrical system, those operating as "circuit breakers" «**A**», and those operating as a "switches" «**B**».




**CHECKING REMOTE CONTROLS «A» OPERATING AS CIRCUIT BREAKERS**

1) Check that, given regular conditions, there is no continuity between terminals 30 and 87.

2) Apply 12V voltage to power terminals 85 and 86 of the remote control.

3) With the remote control powered, check that there is continuity between terminals 30 and 87.

4) If these conditions are not fulfilled, the remote control is damaged and must be replaced.


**CHECKING REMOTE CONTROLS «B» OPERATING AS SWITCHES**

1) Check that, given regular conditions, there is no continuity between terminals 30 and 87 but that there is continuity between terminals 30 and 87a.

2) Apply 12V voltage to power terminals 85 and 86 of the remote control.

3) With the remote control powered, check that there is continuity between terminals 30 and 87.

However, there must be no continuity between terminals 30 and 87a.

4) If these conditions are not fulfilled, the remote control is damaged and must be replaced.

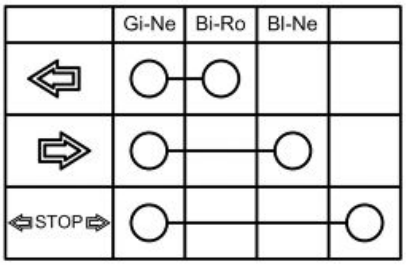
## Switches check

To check buttons and switches make sure that, according to their position, the continuity of contacts is correct, as indicated in the following tables.

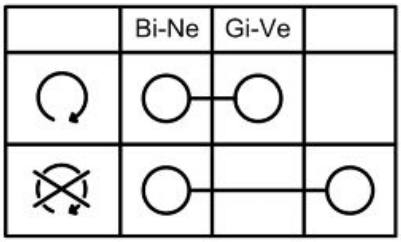
**KEY**

**Ar:** Orange **Az:** Sky Blue **Bi:** White **Bl:** Blue **Gi:** Yellow **Gr:** Grey **Ma:** Brown **Ne:** Black **Ro:** Pink **Rs:** Red **Ve:** Green **Vi:** Purple

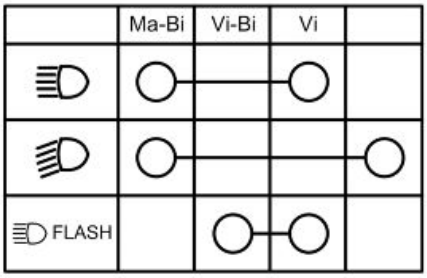
**TURN INDICATOR SWITCH**



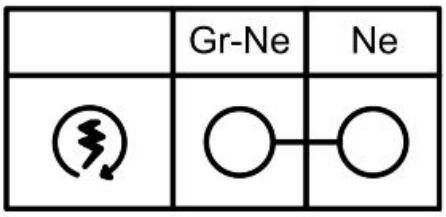

**ENGINE STOP SWITCH**



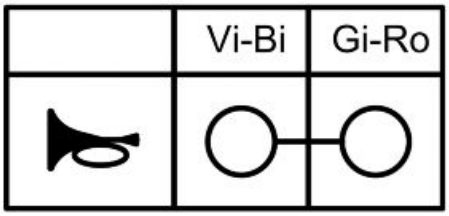

**LIGHT SWITCH**



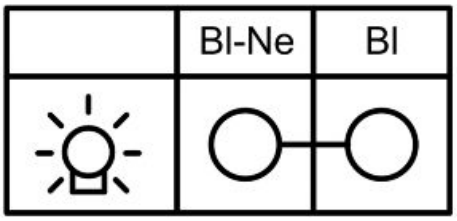
**STARTER BUTTON**



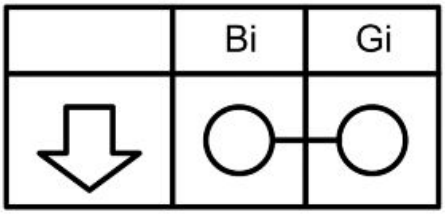

**HORN BUTTON**



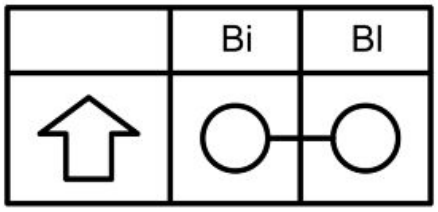

**HELMET COMPARTMENT LIGHT BUTTON**



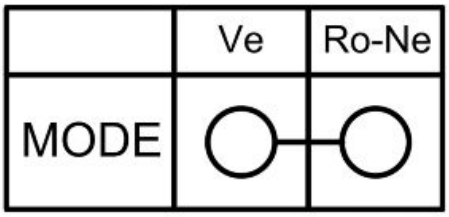

**WINDSHIELD «DOWN» BUTTON**



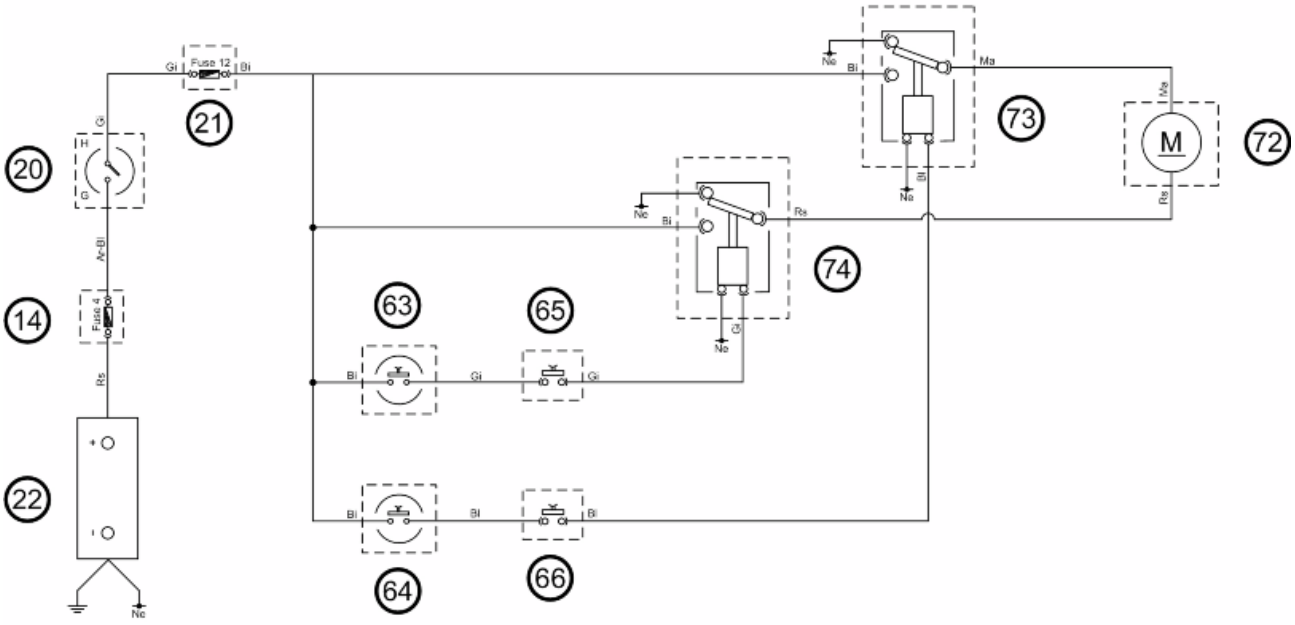
**WINDSHIELD «UP» BUTTON**




**«MODE» BUTTON**




## Electrical windshield check



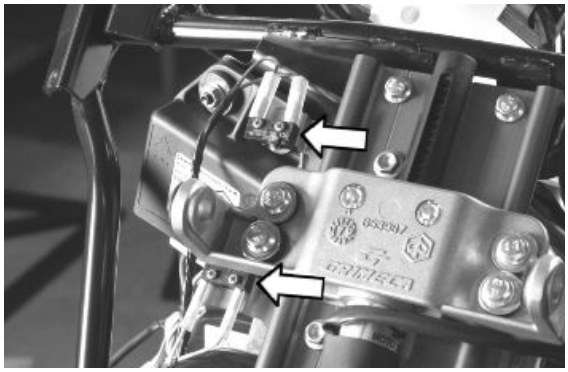

**KEY**

**14.** Main fuses

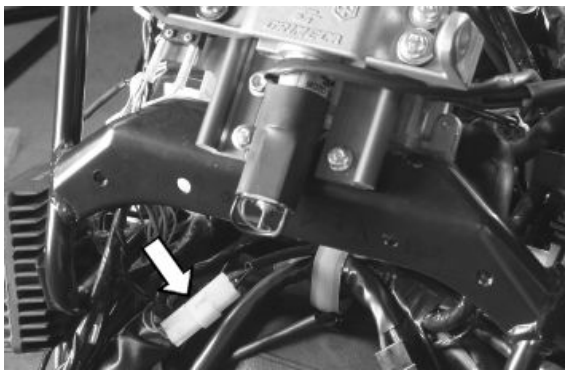
**20.** Key switch contacts

**21.** Auxiliary fuses
**22.** 12V - 14Ah battery
**63.** Windshield DOWN button
**64.** Windshield UP button
**65.** Windshield limit switch
**66.** Windshield limit switch
**72.** Windshield motor
**73.** Windshield relay
**74.** Windshield relay

If the windshield motor does not work:
1) Check fuse No. 4.
2) Check contacts «**G**» and «**H**» of the key switch.
3) Check fuse No. 12.
4) Check cable harness continuity (White cables) between the fuse-box and the switches and between the fuse-box and the remote controls.
5) With the specific switches pressed and the windshield not at the end of its travel, check whether there is voltage between the Blue and the Black cables for one remote control, and between the Yellow and Black cables for the other remote control.
6) If there is no voltage, check the continuity of the cable harness and check the contacts of switches and limit switches.



7) Check that the remote controls work properly.
8) Check that the Black cables of the remote controls are earthed.
9) Check continuity of the cable harness between engine and remote controls.

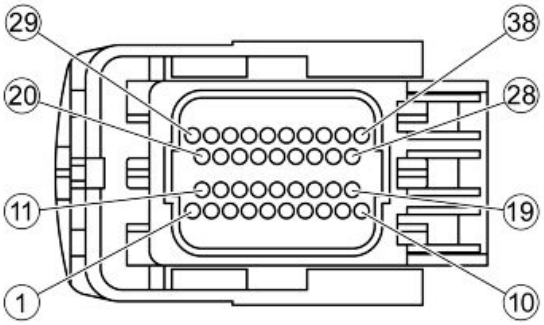


## Connectors

**CAUTION**

**JOINTS ARE SEEN FROM THE CONNECTOR INPUT SIDE.**

**ENGINE CONTROL UNIT CONNECTOR**




**3.** Throttle valve potentiometer (Orange-Sky Blue)

**5.** Engine temperature (Grey-Green)

**9.** Idle adjustment motor (Sky Blue-Yellow)

**10.** Cylinder 2 HV coil (Sky Blue)

**13.** Barometric pressure signal (Orange)

**14.** Air temperature sensor (White-Grey)

**17.** Idle adjustment motor (Sky Blue-Red)

**18.** Idle adjustment motor (Sky Blue-Black)

**19.** Idle adjustment motor (Orange-Red)

**20.** Sensor negative (Sky Blue-Green)

**22.** Sensor positive (Red-Blue)

**25.** Engine rpm sensor (White)

**28.** Cylinder 1 injector (Red-Yellow)

**29.**Throttle valve potentiometer (Grey-Black)

**32.**Throttle valve potentiometer (Brown-Yellow)

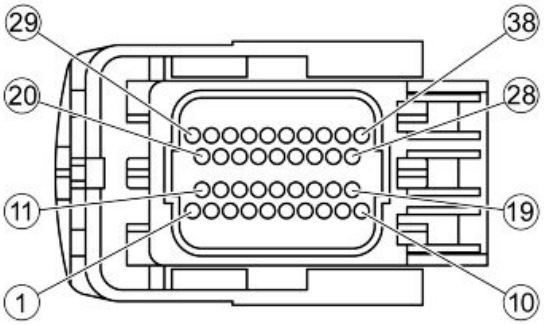
**34.** Engine rpm sensor shield (Black)

**35.** Engine rpm sensor (Red)

**37.** Cylinder 2 injector (Blue)

**38.** Cylinder 1 HV coil (Pink-Black)

**VEHICLE CONTROL UNIT CONNECTOR**




**1.** Start-up remote control switch relay (Orange-White)

**4.**Battery positive (White-Red)

**6.** Injection load relay (Black-Purple)

**7.** Immobilizer decoder (Orange)

**8.** Low-beam light relay (Yellow-Grey)

**9.** Rpm indicator (Brown)

**11.** Lambda probe (Purple)

**13.** Injection telltale light (Brown-Black)

**14.** Electric fan relay (Blue-Yellow)

**16.** Diagnostics socket (Purple-White)

**17.** Live positive (White-Black)

**18.** Engine disabled warning light (Sky Blue-Yellow)

**22.** Lambda probe (White-Green)

**23.** Stop lights (Grey-Green)

**24.** Vehicle speed signal (Brown-Red)

**27.** Engine stop switch (Green)

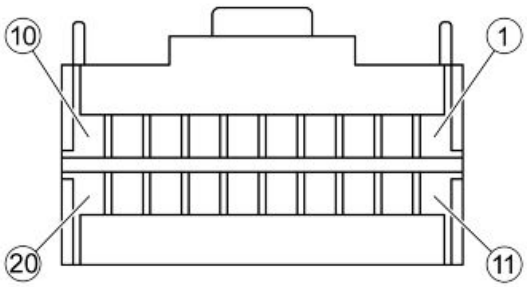
**28.** Starter button (Grey-White)

**32.** Lambda probe (Grey-Red)

**35.** Roll-over sensor (Yellow)

**38.** Stand switch (White-Blue)

**INSTRUMENT PANEL CONNECTOR «A»**




**1.** Vehicle speed signal (Brown-Red)

**2.** Fuel level indicator (White-Green)

**3.** Water temperature sensor (Green-Yellow)

**4.** Water temperature sensor ground (Brown-Black)

**5.** MODE remote button (Green)

**6.** Oil pressure warning light (Pink-White)

**7.** Left turn indicator warning light (Pink)

**8.** Right turn indicator warning light (White-Blue)

**9.** High-beam warning light (Purple)

**10.** Parking brake warning light (Sky Blue-Black)

**11.** Engine rpm signal (Brown)

**12.** Ambient temperature sensor (Yellow-Blue)

**13.** Ambient temperature sensor ground (White-Yellow)

**14.** Engine disabled warning light (Sky Blue-Yellow)

**15.** Immobilizer warning light (Red-Green)

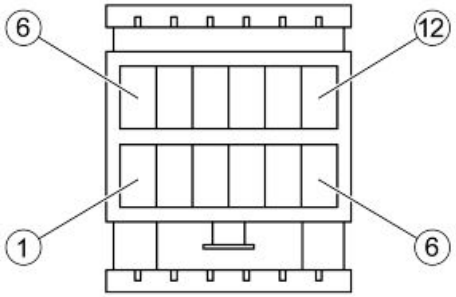
**16.** Engine check warning light (Brown-White)

**17.** Ground (Pink-Black)

**18.** Ground (Pink-Black)

**19.** Ground (Pink-Black)

**INSTRUMENT PANEL CONNECTOR «B»**




**5.** Live positive (Yellow-Black)

**6.** Battery positive (Red-Black)

**11.** Ground (Pink-Black)

**12.** Live positive (Yellow-Black)

**IMMOBILIZER DECODER CONNECTOR**

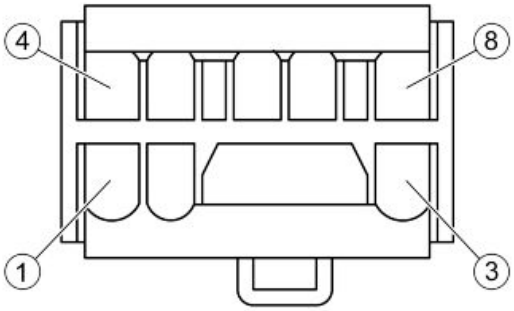
**2.** Immobilizer warning light (Red-Green)

**3.** Battery positive (White-Red)

**4.** Ground (Black)

**6.** Control unit (Orange)

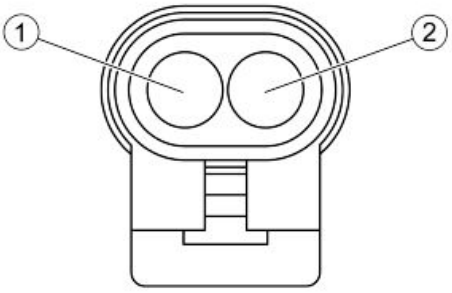
**8.** Live positive (White-Black)




**REAR CYLINDER HV COIL CONNECTOR**

**1.** Injection load relay (Black-Green)

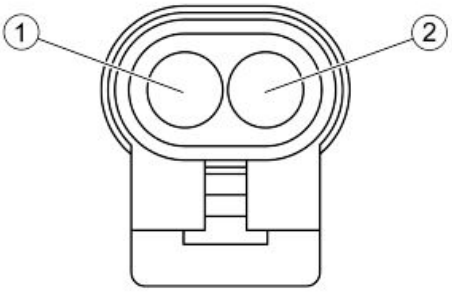
**2.** Control unit (Pink-Black)




**FRONT CYLINDER HV COIL CONNECTOR**

**1.** Injection load relay (Black-Green)

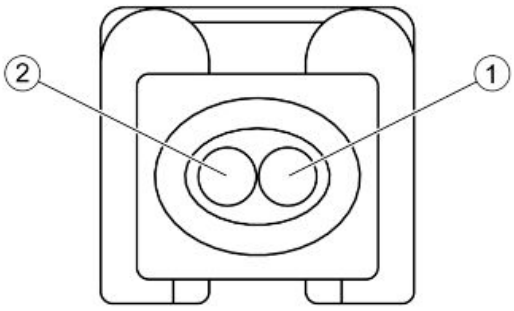
**2.** Control unit (Sky Blue)




**REAR CYLINDER INJECTOR CONNECTOR**

**1.** Control unit (Red-Yellow)

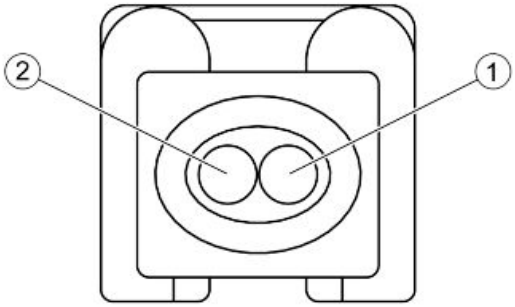
**2.** Injection load relay (Black-Green)



**FRONT CYLINDER INJECTOR CONNECTOR**

**1.** Control unit (Blue)

**2.** Injection load relay (Black-Green)




**ANTITHEFT DEVICE PRE-INSTALLATION CONNECTOR**

**1.** Left turn indicators (Pink)

**2.** Right turn indicators (White-Blue)

**3.** Ground (Black)

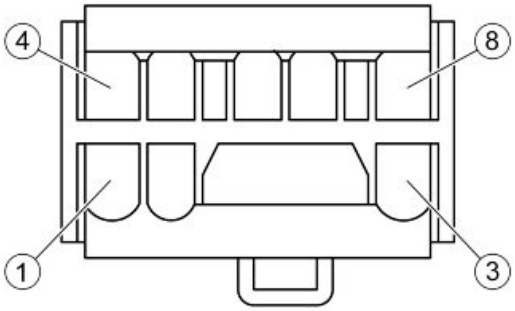
**4.** Battery positive (Blue)

**5.** Live positive (Yellow-Black)

**6.** Helmet compartment light bulb (Blue-Black)

**7.** Saddle opening receiver (Green)

**8.** Saddle opening receiver (Sky Blue)




**SADDLE OPENING RECEIVER CONNECTOR**

**1.** Aerial (Purple)

**2.** Saddle opening actuator (Yellow-Grey)

**3.** Reset (White)

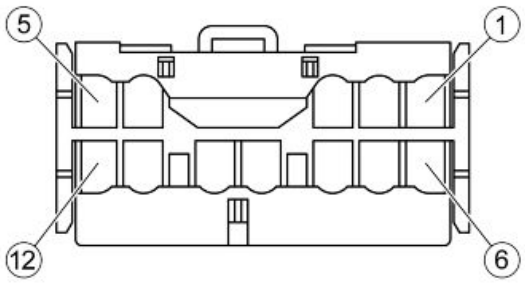
**4.** Battery positive (Blue)

**6.** Live positive (Yellow-Black)

**7.** Ground (Black)

**11.** Pre-installation for antitheft device (Green)

**12.** Pre-installation for antitheft device (Green)




**TURN INDICATOR CONTROL DEVICE CONNECTOR**

**2.** Left turn indicator switch (White-Pink)

**3.** Right turn indicator switch (Blue-Black)

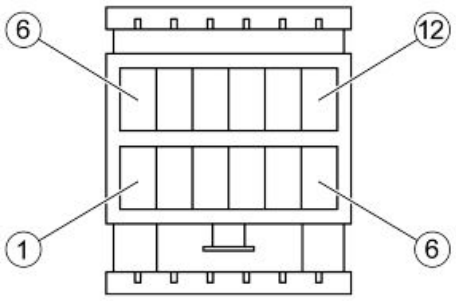
**4.** Left turn indicators (Pink)

**5.** Right turn indicators (White-Blue)

**6.** Battery positive (Orange-Blue)

**8.** Live positive (Yellow-Black)

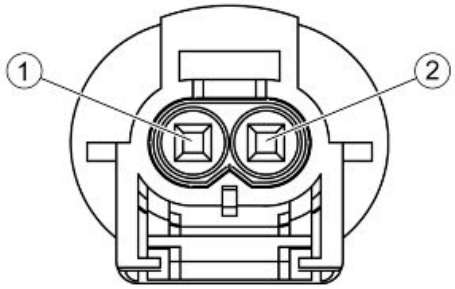
**9.** Ground (Black)



**GPS WIRING CONNECTOR**

**1.** Ground (Black)

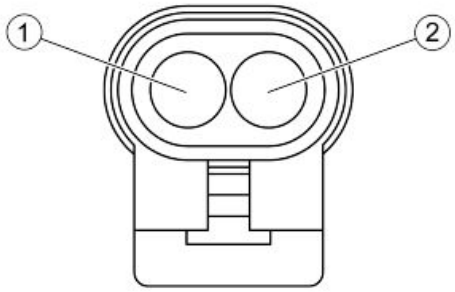
**2.** Live positive (Yellow-Red)




**WIRING FOR ACCESSORIES - CONNECTOR**

**1.** Ground (Black)

**2.** Live positive (Purple-Black)



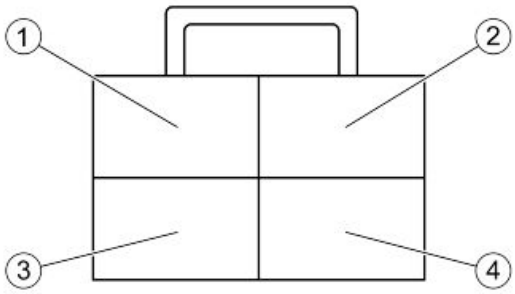

**VOLTAGE REGULATOR CONNECTOR**

**1.** Battery positive (Red-Black)

**2.** Ground (Black)

**3.** Battery positive (Red-Black)

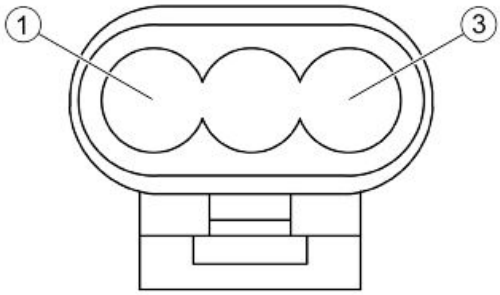
**4.** Ground (Black)




**DIAGNOSTICS SOCKET CONNECTOR**

**2.** Ground (Black)

**3.** Control unit (Purple-White)



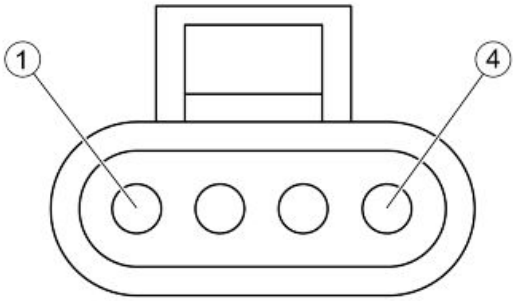
**IDLE ADJUSTMENT MOTOR CONNECTOR**

**1.** Control unit (Sky Blue-Red)

**2.** Control unit (Orange-Red)

**3.** Control unit (Sky Blue-Yellow)

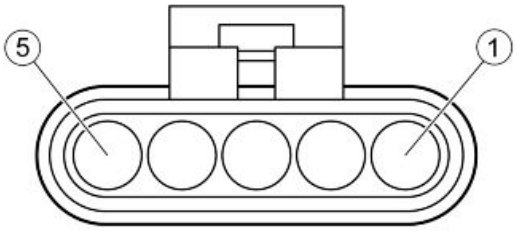
**4.** Control unit (Sky Blue-Black)




**FUEL PUMP CONNECTOR**

**2.** Ground (Black)

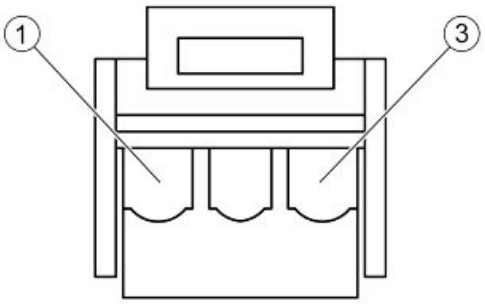
**5.** Injection load relay (Black-Green)




**FUEL LEVEL TRANSMITTER CONNECTOR**

**2.** Ground (Black)

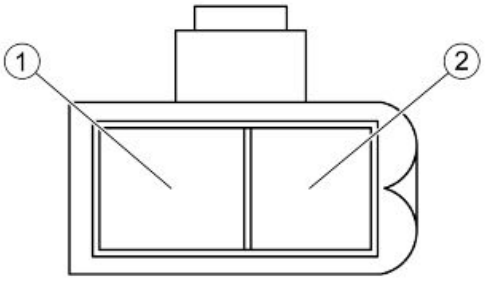
**3.** Instrument panel (White-Green)




**STAND SWITCH CONNECTOR**

**1.** Ground (Black)

**2.** Control unit (White-Green)



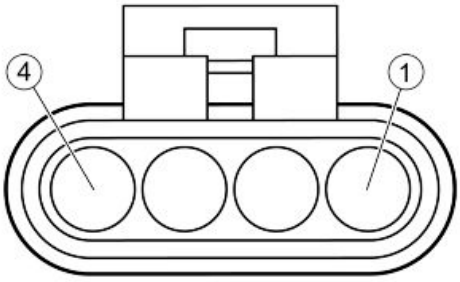
**LAMBDA PROBE CONNECTOR**

**1.** Control unit (White-Green)

**2.** Control unit (Grey-Red)

**3.** Control unit (Purple)

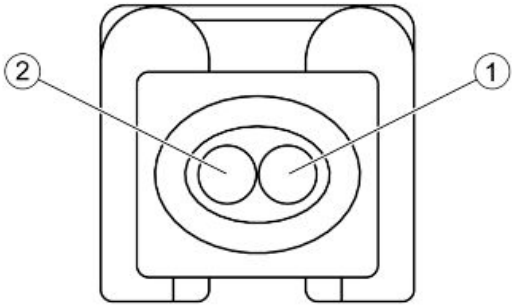
**4.** Injection load relay (Black-Green)




**AIR TEMPERATURE SENSOR CONNECTOR**

**1.** Control unit (White-Grey)

**2.** Control unit negative (Sky Blue-Green)



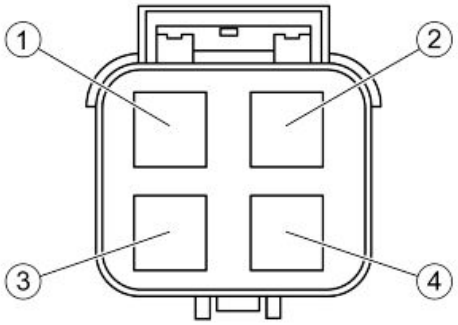

**WATER TEMPERATURE SENSOR CONNEC-TOR**

**1.** Control unit (Grey-Green)

**2.** Instrument panel (Green-Yellow)

**3.** Control unit negative (Sky Blue-Green)

**4.** Instrument panel (Brown-Black)

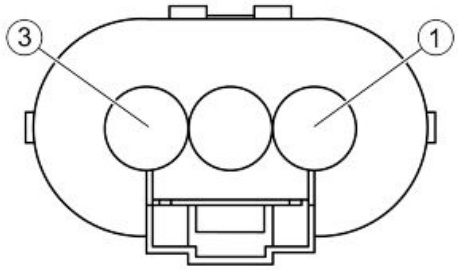



**VEHICLE SPEED SENSOR CONNECTOR**

**1.** Control unit negative (Sky Blue-Green)

**2.** Vehicle speed signal (Brown-Red)

**3.** Control unit positive (Red-Blue)

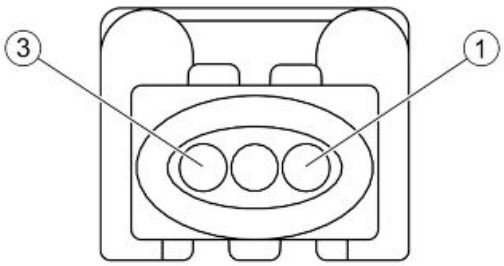


**ENGINE RPM SENSOR CONNECTOR**

**1.** Control unit (White)

**2.** Control unit (Red)

**3.** Sensor shield (Black)

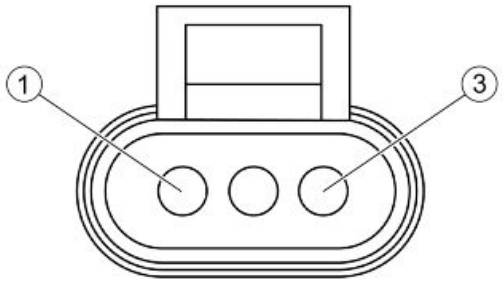



**THROTTLE SENSOR CONNECTOR**

**1.** Control unit (Grey-Black)

**2.** Control unit (Brown-Yellow)

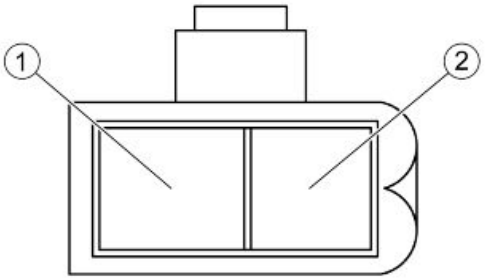
**3.** Control unit (Orange-Sky Blue)




**EXTERNAL TEMPERATURE SENSOR CONNECTOR**

**1.** Control unit (White-Yellow)

**2.** Control unit negative (Yellow-Blue)

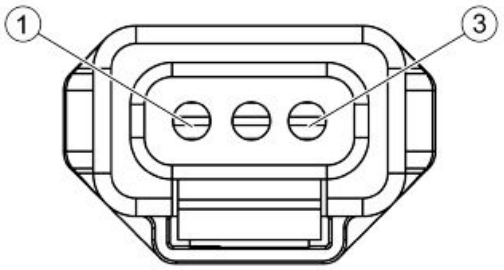



**BAROMETRIC PRESSURE SENSOR CONNECTOR**

**1.** Control unit positive (Red-Blue)

**2.** Control unit negative (Sky Blue-Green)

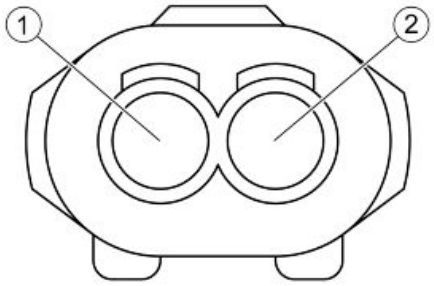
**3.** Barometric pressure signal (Orange)



**ROLL-OVER SENSOR CONNECTOR**

**1.** Control unit (Yellow)

**2.** Ground (Black)




## Remote seat opening

The vehicle is equipped with a remote control to open the saddle.

This remote control is supplied together with the keys and at the manufacturing stage, it has been programmed to work together with the ECU that control the opening device.

If the remote control is lost, a new one can be requested and programmed, by resetting the ECU memory and following the same steps as per programming the immobilizer system in the keys.

## Battery replacement

The remote control in the black ignition key is powered by inner batteries that get discharged after extended used.

You may need to replace the batteries if the remote control fails or if its range of operation is reduced.

To replace the batteries, separate the two halves of the remote control by inserting the blade of a plain slot screwdriver at one point on the edge and slide it all around.

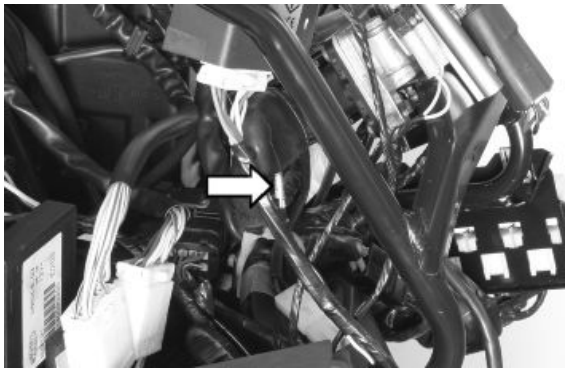
### Electric characteristic

**Batteries used:**

CR1616

## Zeroing

1) Remove the front shield in order to reach the control unit that receives/ controls saddle opening.
2) A white cable, that comes from pin 3 of the control unit, goes out from the wiring. Earth it at least 10 seconds in order to delete all the remote controls programmed and stored in the control unit.



## Programming

Follow these steps to program the remote controls:

**1**. Insert the remote control key to be programmed in the steering lock key block.

**2**. Turn the key to «**ON**», press the button on the remote control, release the button, turn the key back to «**OFF**» from the «**ON**» position, all within 4 seconds.

**3** Wait 1 to 8 seconds.

**4**. Repeat steps 2 and 3 for 4 times without removing the key.

The control unit confirms the programming has been successfully executed by opening the saddle.

**WARNING**

**TO STORE THE OTHER REMOTE CONTROLS TO MEMORY, (MAXIMUM 8), YOU NEED TO REPEAT THE WHOLE PROCEDURE AGAIN. FAILURE TO CARRY OUT THESE OPERATIONS WITHIN THE INDICATED TIMES WILL RESULT IN THE AUTOMATIC CANCELLATION OF THE PROCESS FOR PROGRAMMING THE REMOTE-CONTROLLED KEYS.**

**WARNING**

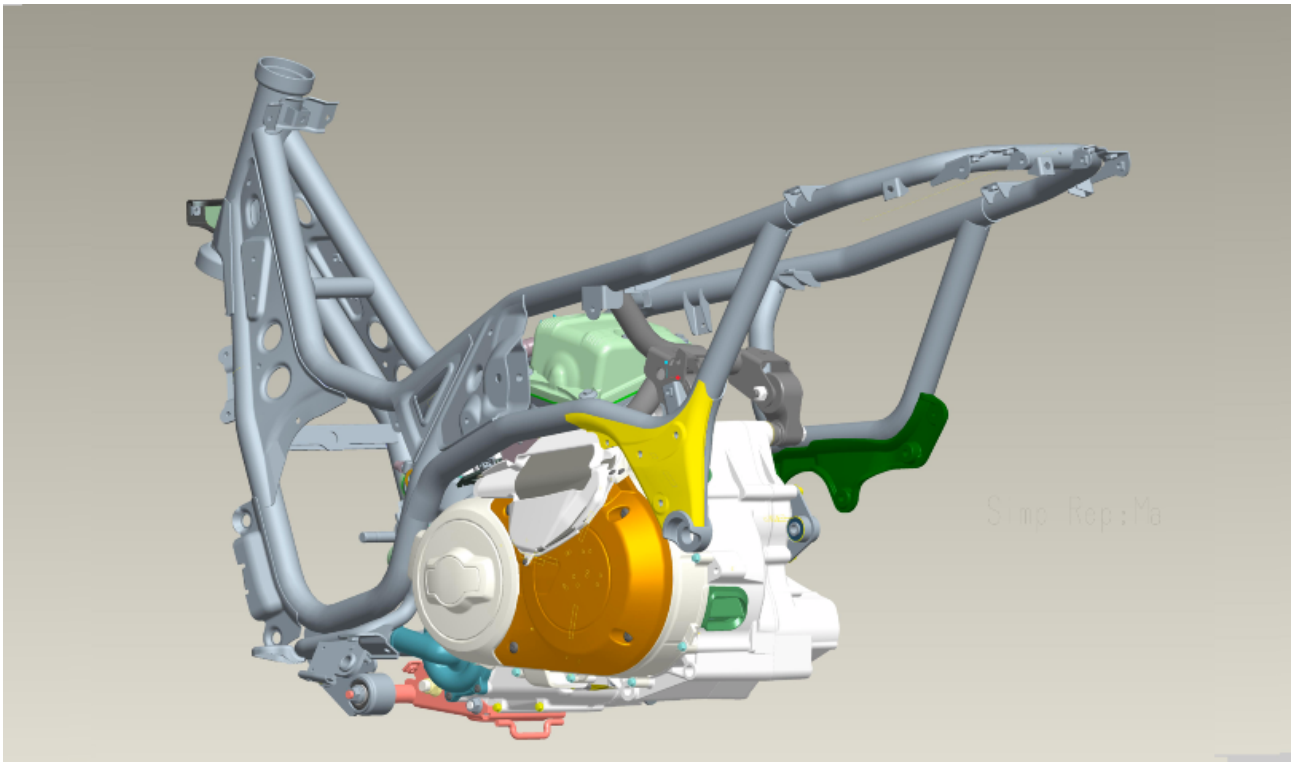
**AVOID PRESSING THE REMOTE CONTROL BUTTON MORE THAN ONCE WHEN FAR AWAY FROM THE SCOOTER. THE SYNCHRONISM BETWEEN THE REMOTE CONTROL AND THE RECEIVER CAN BE IMPAIRED. SHOULD THIS BE THE CASE, REPEAT THE PROGRAMMING PROCEDURE. DO NOT KEEP THE REMOTE CONTROL IN PLACES WITH TEMPERATURES EXCEEDING 60° C THE BATTERY WILL RUN DOWN TOO QUICKLY.**

**WARNING**

**TO AVOID BATTERY DISCHARGE, THE SADDLE OPENING REMOTE CONTROL RADIO RECEIVER DEACTIVATES 7 DAYS AFTER THE LAST TIME THE VEHICLE WAS SHUT OFF. JUST TURN THE KEY TO «ON» TO REACTIVATE THE RECEIVER.**

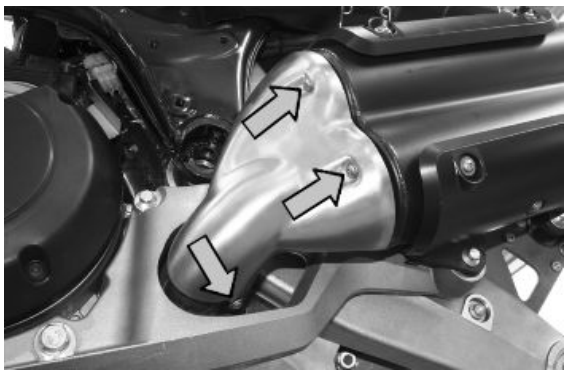
# INDEX OF TOPICS

This section describes the operations to carry out when removing the engine from the vehicle.

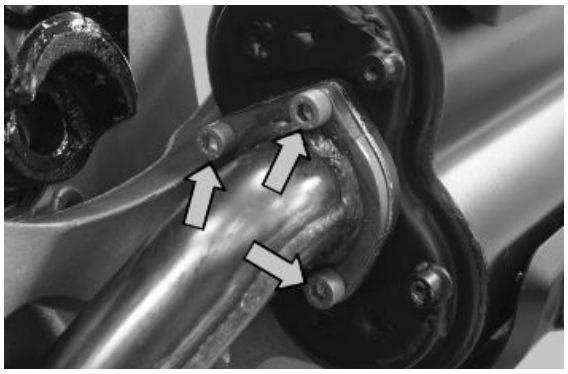


## Exhaust assy. Removal

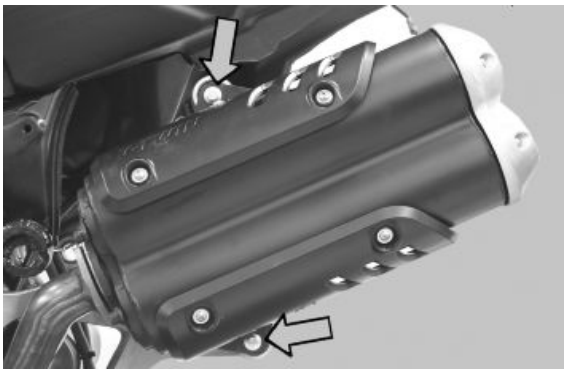
- Support the vehicle adequately.
- Remove the helmet compartment.
- Remove the rear swingarm.
- Undo the three screws indicated, collect the washers and remove the heat-protection cover.



- Undo the three screws indicated and collect the washers.

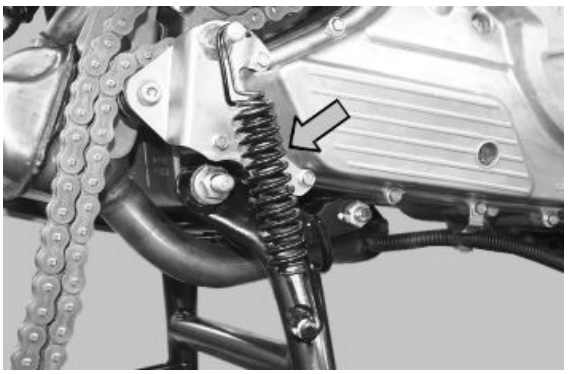


- Unscrew the two retainers fixing the silencer to the muffler supporting arm.

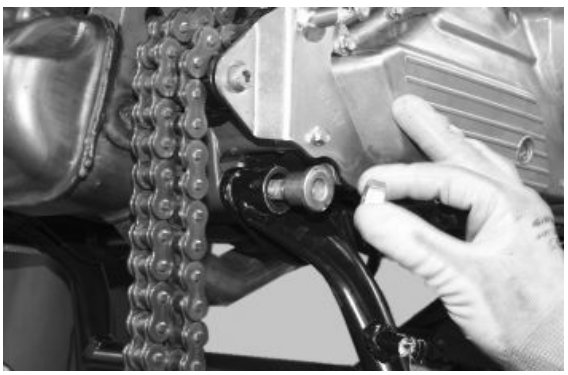


- Remove the silencer together with the gasket.

- Remove the return springs of the centre stand.



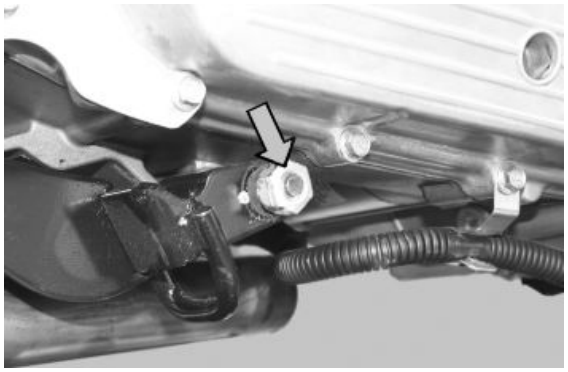
- Unscrew the nut fastening the rear pin.



- Remove the stand rear pin and collect the washer.

- Remove the centre stand plus the four bushings.

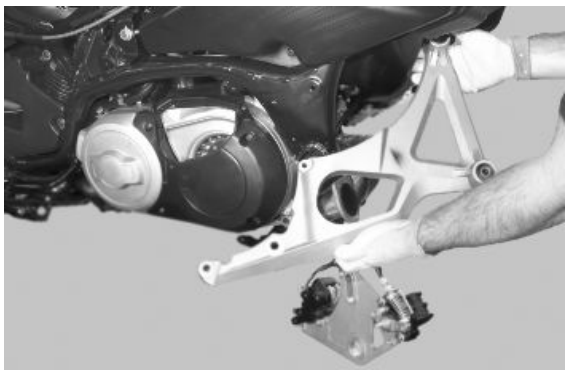
- Unscrew the nut fastening the front pin.



- Unscrew the front pin and collect the washer.
- The attachment plate of the centre stand is now free. For size reasons, it can only be removed after being released from the catalytic converter retainers.

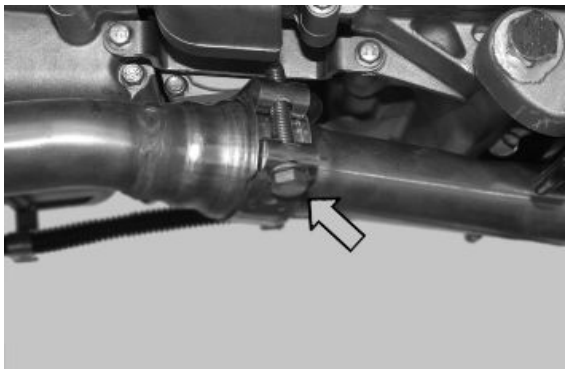
- The stand fixing pins also fasten the muffler supporting bracket.
- Undo the upper screw fixing it to the engine, and the muffler supporting arm is now free.

- Release the muffler supporting arm from the catalytic converter.

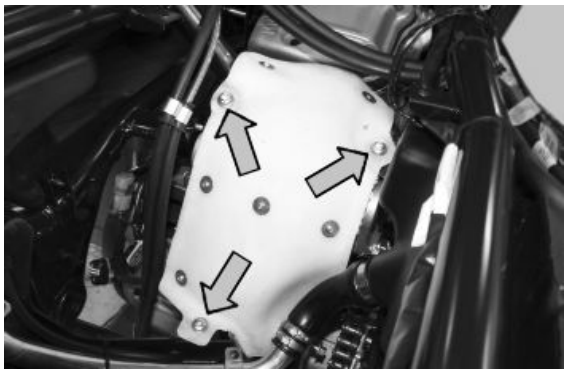


- Unscrew the two nuts fixing the front exhaust manifold.

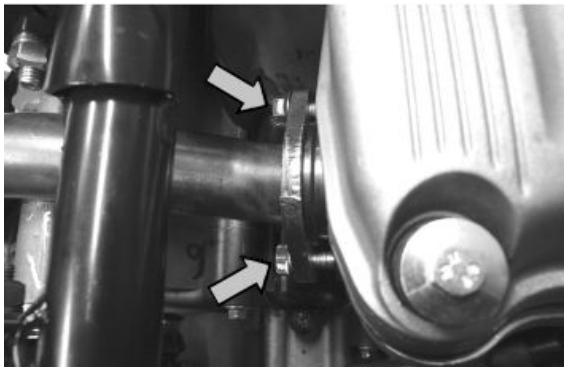
- Unscrew the nut indicated, loosen the clamp, and remove the front exhaust manifold together with the gasket and the graphite bushing.



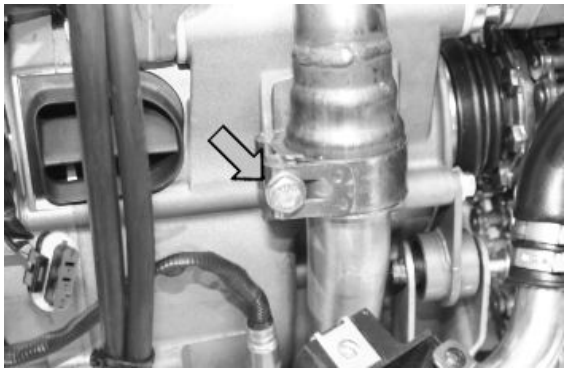
- Undo the three screws indicated and remove the rear exhaust manifold cover.



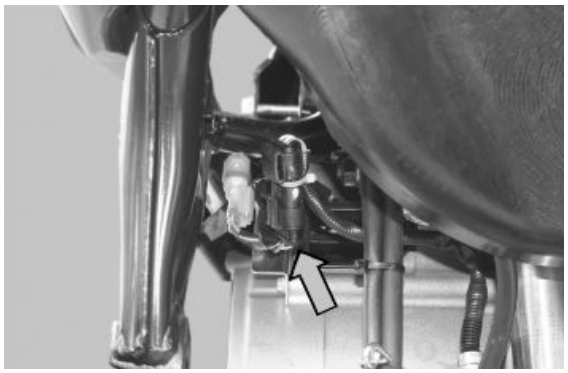
- Unscrew the two nuts fixing the rear exhaust manifold.



- Loosen the clamp by undoing the screw indicated.

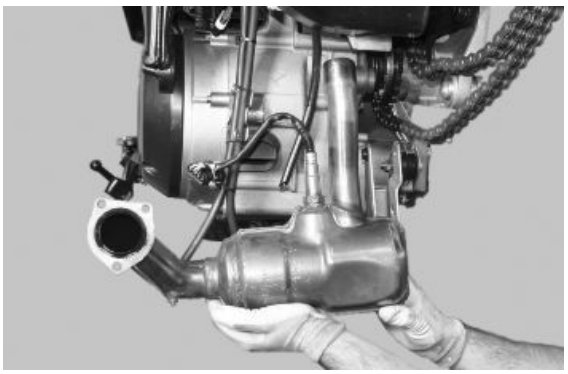


- Disconnect the lambda probe connector.



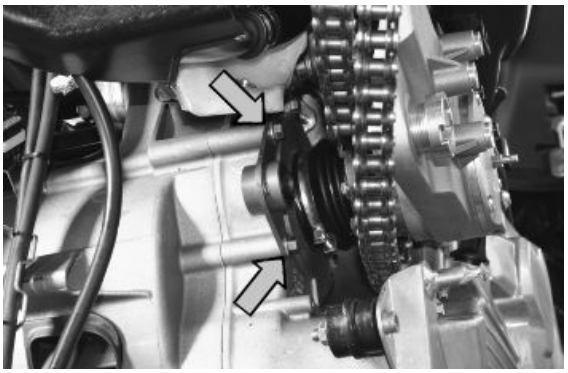
- Undo the screw fixing the catalytic converter to the supporting bracket to the engine.
- The catalytic converter is now free.
- Release the attachment plate of the centre stand.

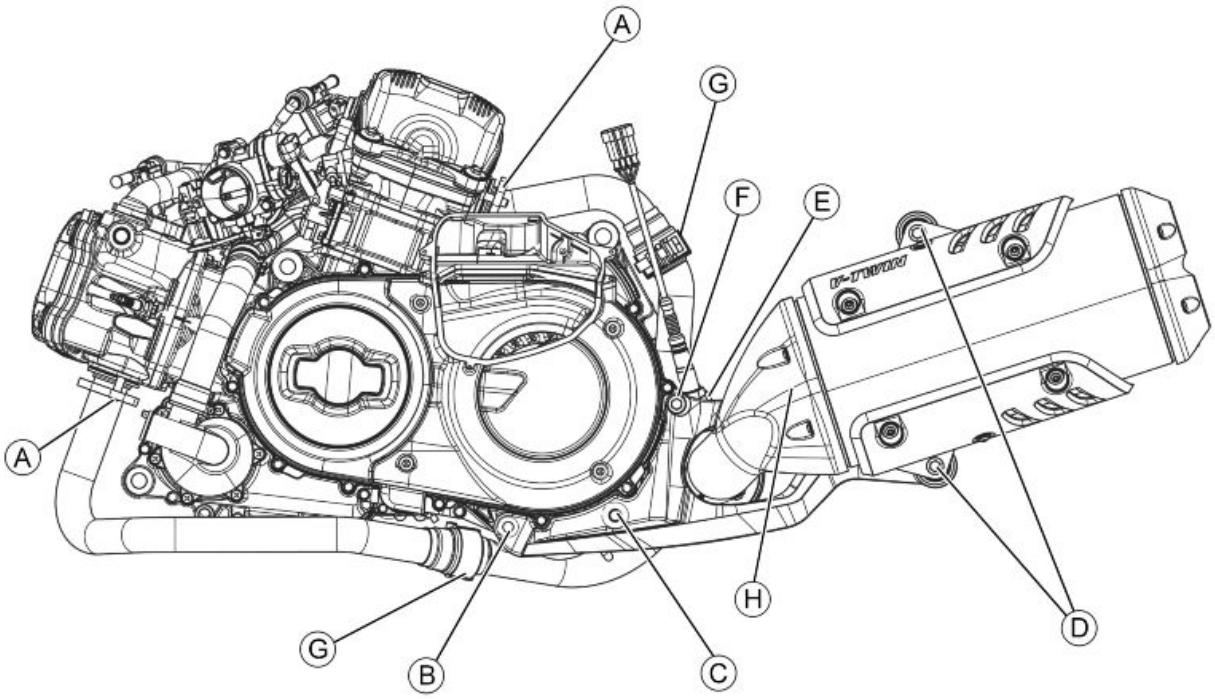
- Remove the catalytic converter.



- Remove rear exhaust manifold together with the gasket and the graphite bushing.

- Unscrew the two retainers fixing the catalytic converter support to the engine.
- Check the silent-block for wear; replace it if necessary.






**KEY:**

**A:** Nut fixing head - exhaust manifold

**B:** Centre stand front bolt nut

**C.** Centre stand rear bolt nut

**D:** Screw fixing silencer - muffler support arm

**E:** Screw fixing catalytic converter - catalytic converter support

**F:** Screw fixing muffler support arm - engine

**G:** Manifold retainer clamp

**H:**Silencer fixing screw

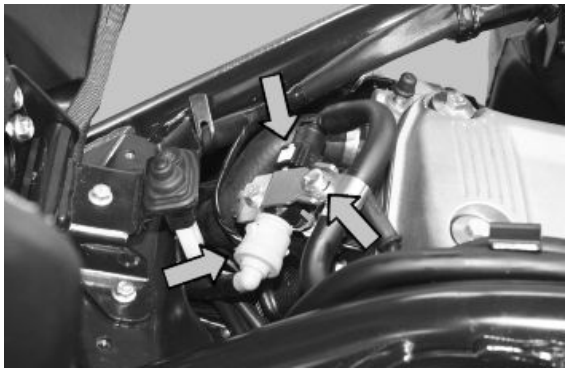
- Follow the removal steps but in reverse order; be careful to tighten to the prescribed torques.

**MUFFLER TIGHTENING TORQUES**

| Name | Torque in Nm |
|---|---|
| Nut fixing head - exhaust manifold | 16 ÷ 18 |
| Centre stand front bolt nut | 34 ÷ 39 |
| Centre stand rear bolt nut | 74 ÷ 81 |
| Screw fixing silencer - muffler support arm | 11 |
| Silencer fixing screw | 22 |
| Screw fixing catalytic converter - catalytic converter support | 22 ÷ 24 |
| Screw fixing muffler support arm - engine | 24 ÷ 27 |

## Removal of the engine from the vehicle

**REMOVAL**



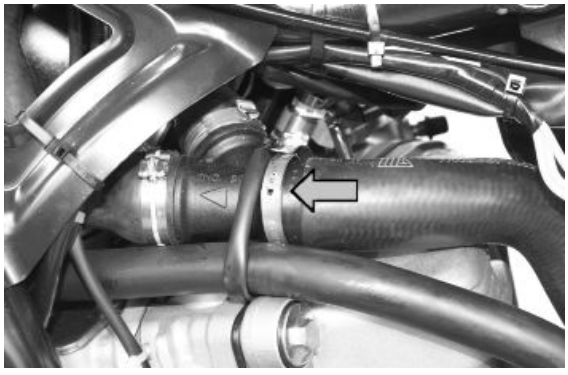
- Support the rear part of the vehicle adequately.
- Remove the helmet compartment and the side cases.
- Remove the external air cleaner.
- Get a container of suitable capacity and empty the cooling system; remove the pipes from the rotor cover.
- Remove the rear swingarm.

Remove the complete muffler unit.

- Remove the pinion unit.
- Unscrew the fuel tank cap and keep it in place so as to keep the tank pressurised.
- Disconnect the delivery and reverse fuel pipes from the pump.
- From both cylinders disconnect: the injector connector, undo the screw and release it from the retainer clamp, remove the pipes connecting both injectors.

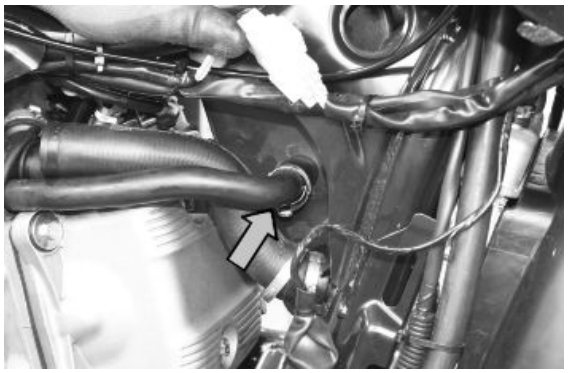
**N.B.**

**BE VERY CAREFUL WHEN PULLING OUT THE CARBURETTOR PIPING SINCE AN EXCESSIVE FORCE MAY DAMAGE THE PLASTIC INSERTS ON THE PUMP BODY. UPON REASSEMBLY, IT IS THEREFORE NECESSARY TO SLIGHTLY PRESS THE PIPING AND THE RETAIN RIM TOWARDS THE PUMP, THEN KEEP THE RIM PRESSED AND PULL THE COUPLING UPWARDS.**

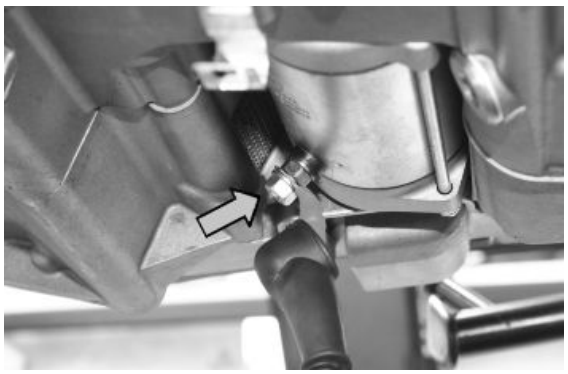


- Remove the clamp indicated and disconnect the water outlet pipe from the heads.

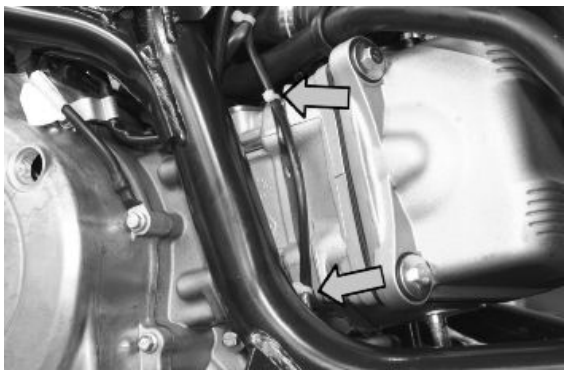
- Disconnect the blow-by intake pipes from the filter housing.



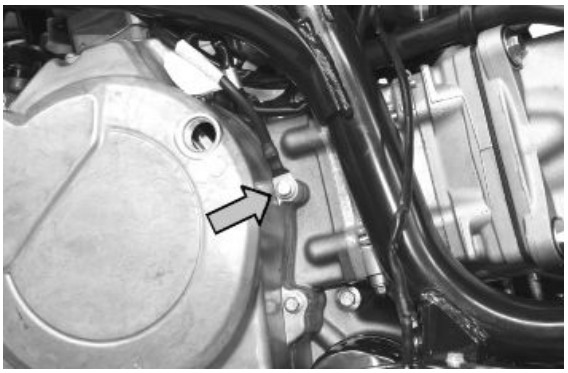
- Remove the spark plug tubes.
- Unscrew the nut and disconnect the positive from the starter motor.



- Disconnect the engine minimum oil pressure sensor connector.
- Remove the two retainer clamps.



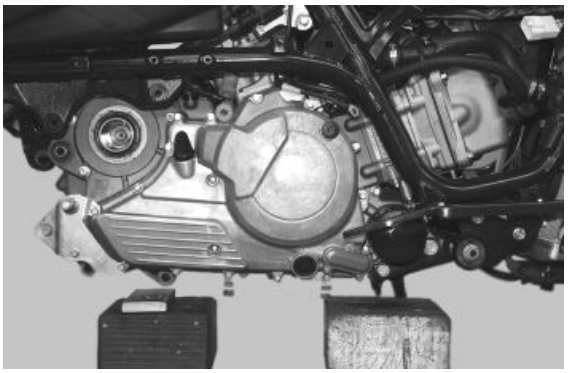
- Disconnect the ground lead from the retainer on the flywheel cover.



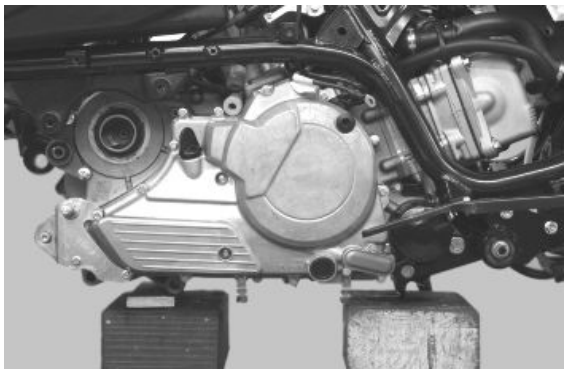
- Disconnect the speed sensor connector.

- Disconnect the stator connector and release the wiring from the indicated clamps.

- Prepare two plates under the engine block so as to create a supporting base.



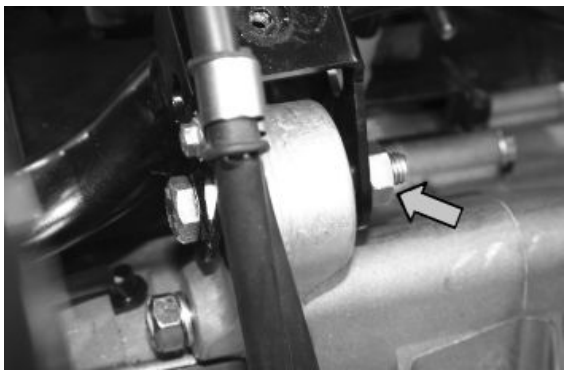
- Lower the vehicle so as to rest the engine in a horizontal position on the plates previously placed.



- Loosen the six fuel tank retainers to the chassis.
- Unscrew the nut indicated from both sides of the engine and remove the fixing pin. Be particularly careful when detaching the right half-tank to let the pin come out.

**CAUTION**

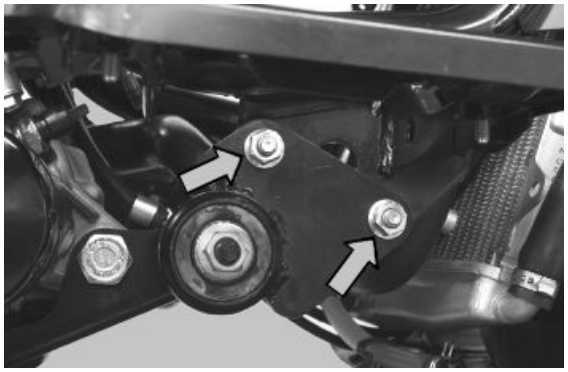
**THE ENGINE IS NOW FREE FROM ITS REAR RETAINERS.**



- Release the engine from the front retainers, unscrewing from both sides the nuts indicated; remove the two screws from the internal part.

**CAUTION**

**THE ENGINE IS NOW FREE FROM ITS RETAINERS AND DISCONNECTED FROM THE CHASSIS.**



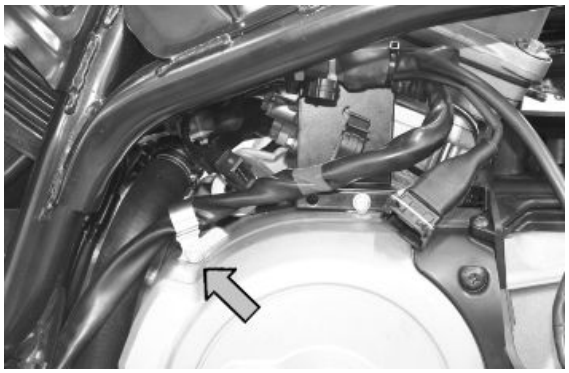
- Partially lift the rear section of the chassis so as to free it from the engine.

**N.B.**

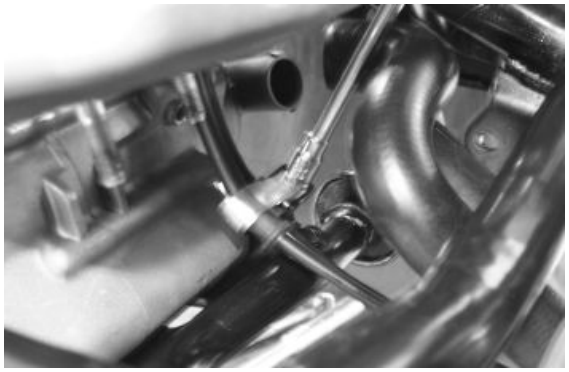
**GUIDE THE CHASSIS SO AS TO RELEASE IT FROM THE RIGHT-SIDE FRONT HEAD COVER.**

- Disconnect the following connectors: engine revs, Stepper motor, TPS, intake air temperature and coolant temperature sensor.

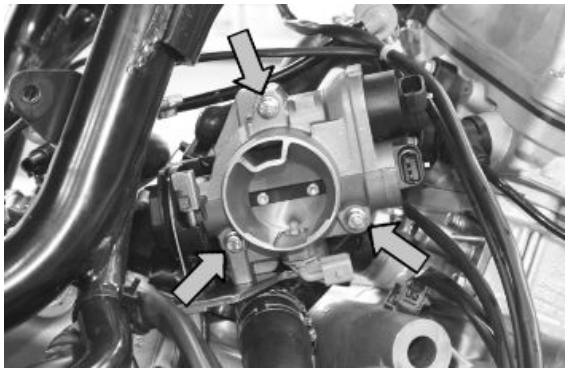
- Undo the screw fixing the wiring retaining brackets on the engine.



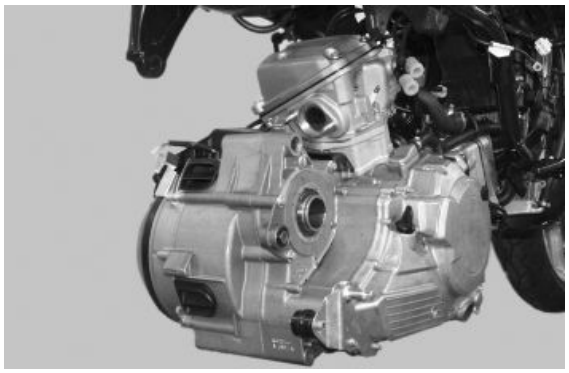
- Undo the screw fixing the throttle control pipe retaining bracket.



- Lift the rear section of the chassis completely so as to get free access to the throttle body fixing screws.
- Undo the three screws fixing the throttle body to the inlet manifold

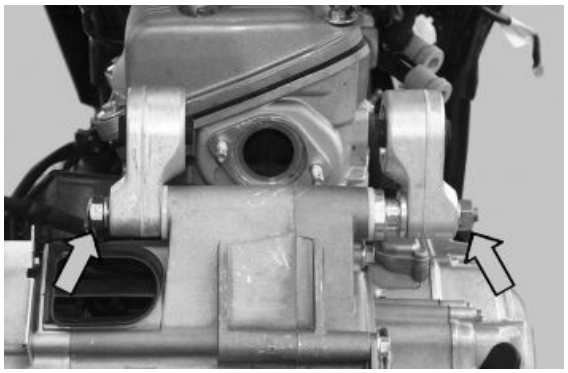


- The engine is now free.

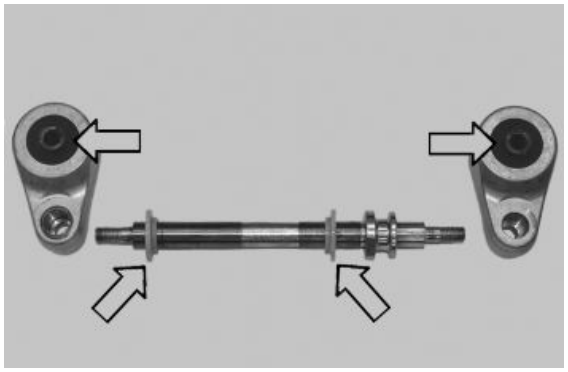


**REAR SUPPORT SERVICE**

- Undo the two nuts indicated and collect the washers.

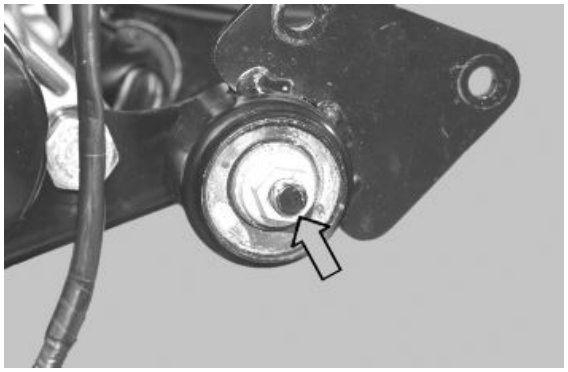


- Remove the link rods.
- Slide off the pin.
- Check the silent-block and the Teflon bushings for wear; replace the components if necessary.



**FRONT SUPPORT SERVICE**

- Undo the indicated screw from both sides of the vehicle and remove the supports.



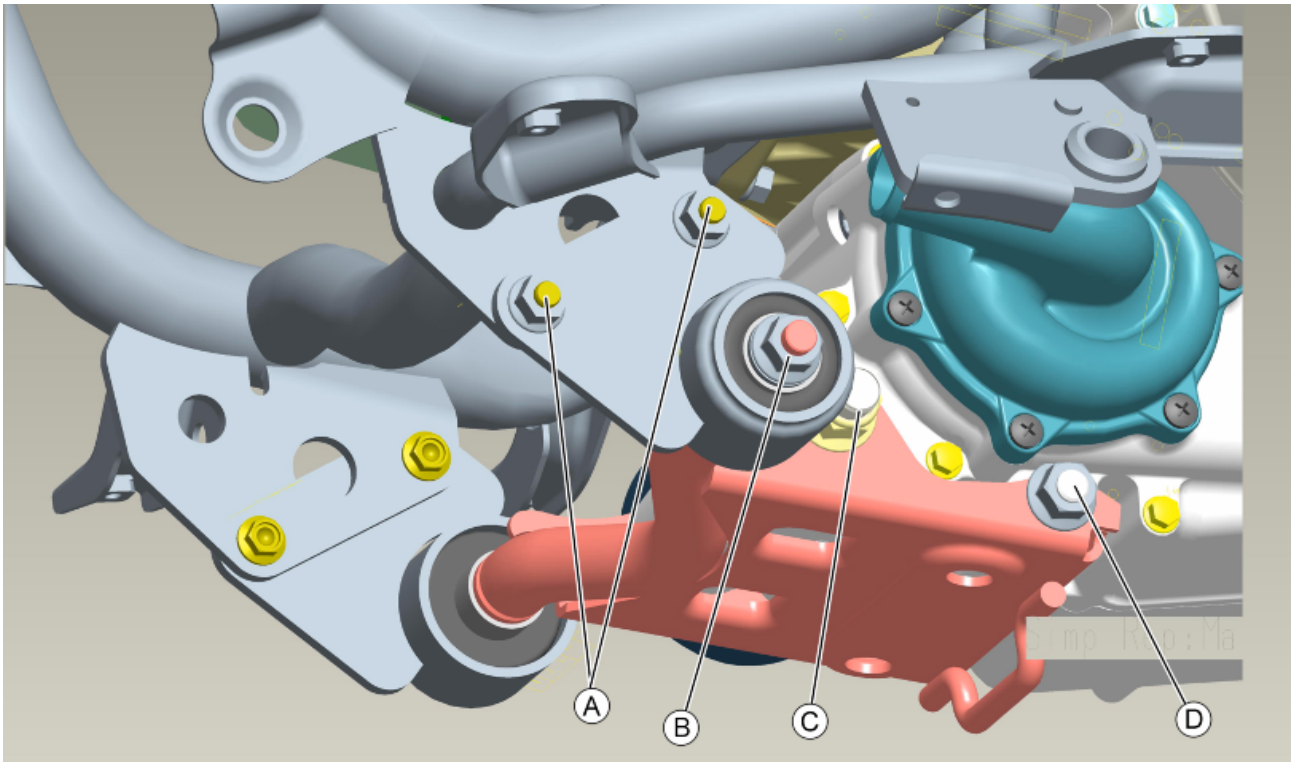
- Check the silent-block for wear; replace the components if necessary.

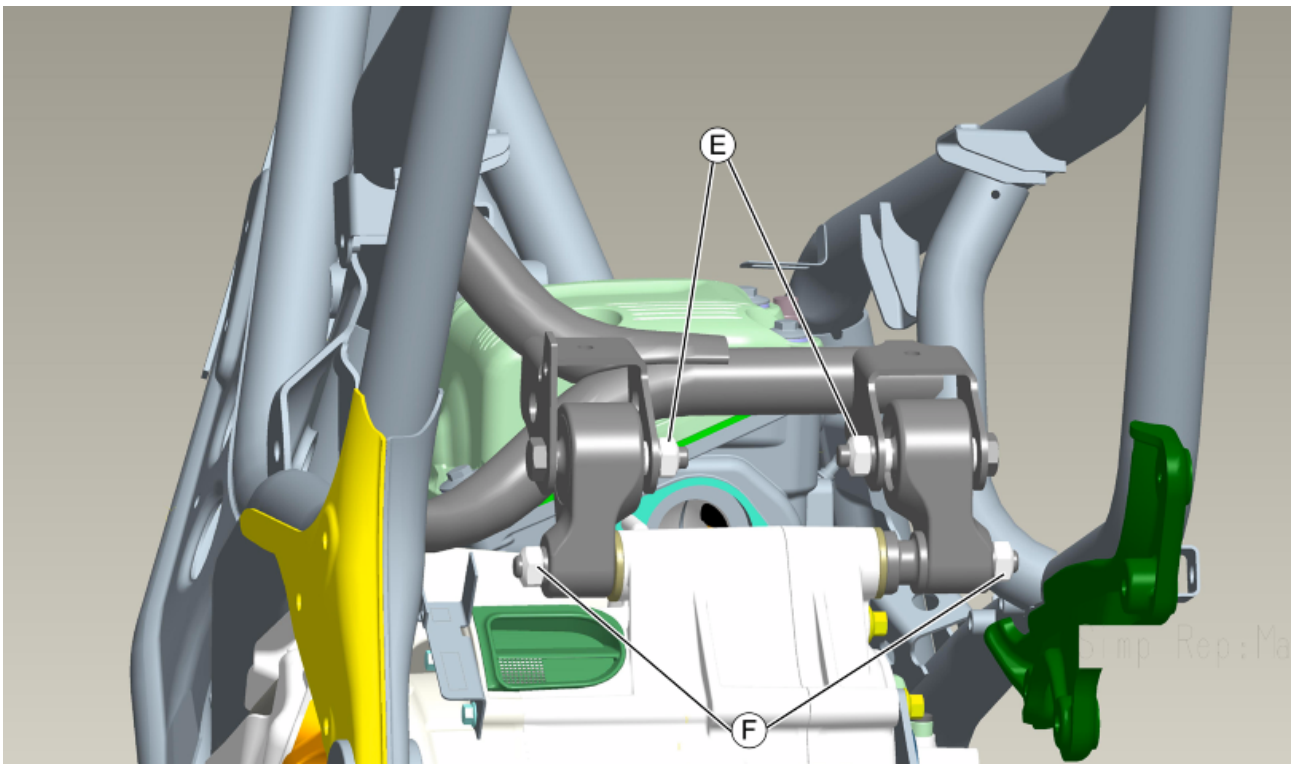
**See also**

Exhaust assy. Removal
Helmet bay
Air filter
Fuel tank
Fork

End gear shaft

**FITTING**




**KEY:**

**A:** Nut fixing silent-block plate - chassis

**B:** Nut fixing silent-block plate

**C.** Pin fixing nut - M14

**D:** Pin fixing nut - M10

**E:** Upper nut fixing engine support link rods - chassis

**F:** Lower nut fixing engine support link rods - chassis

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

**ENGINE TO CHASSIS LOCKING TORQUES**

| Name | Torque in Nm |
|---|---|
| Nut fixing silent-block plate - chassis | 22 ÷ 25 |
| Nut fixing silent-block plate | 33 ÷ 41 |
| Pin fixing nut - M14 | 124 ÷ 153 |
| Pin fixing nut - M10 | 47 ÷ 52 |
| Upper nut fixing engine support link rods - chassis | 33 ÷ 41 |
| Lower nut fixing engine support link rods - chassis | 33 ÷ 41 |

- Restore all the retainers, check the engine oil level and top-up with the recommended oil type if necessary.

- Fit the complete muffler unit.

- Fit the pinion unit, the rear fork together with the wheel and check if the chain tension is adequate.

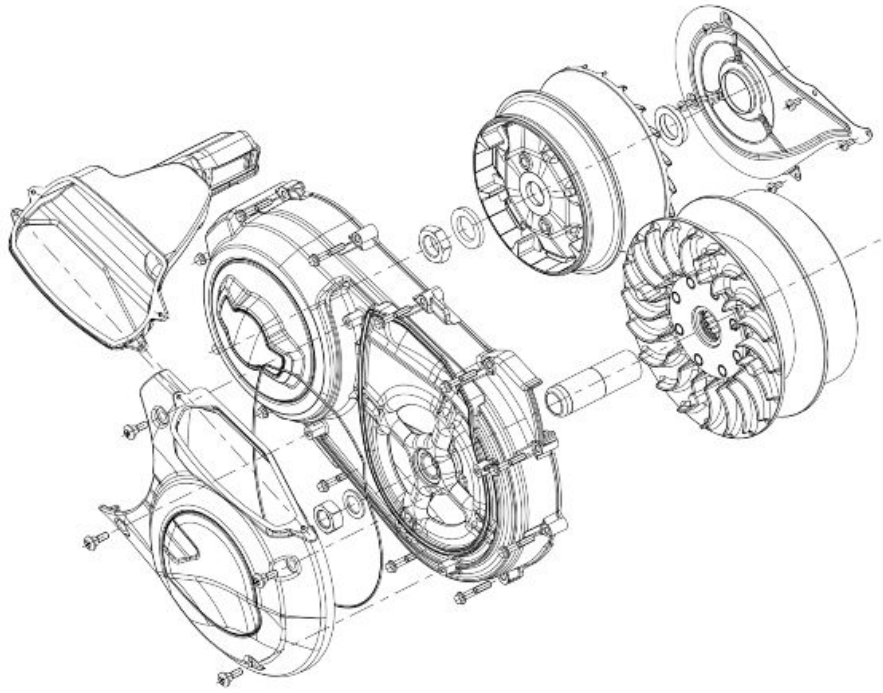
- Fill and bleed the cooling circuit.

- Check the functioning of the accelerator and the electrical devices.

# INDEX OF TOPICS

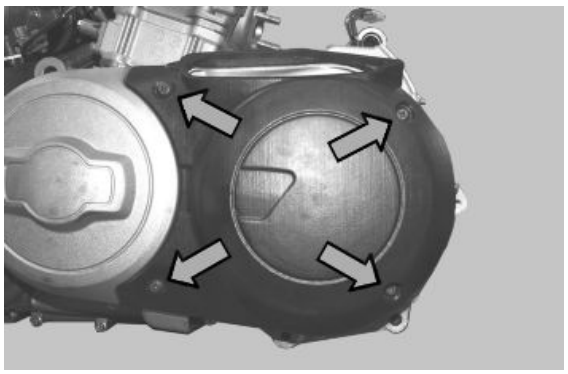
This section describes the operations to be carried out on the engine and the tools to be used.

## Automatic transmission

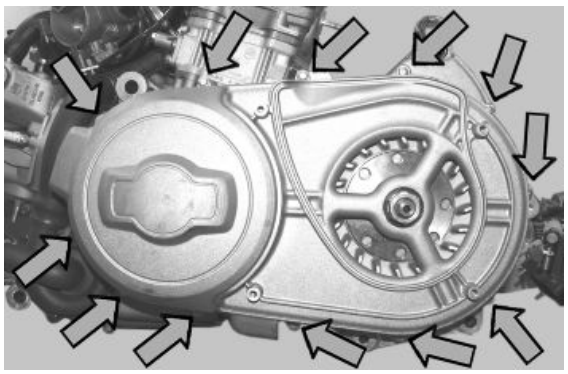


## Transmission cover

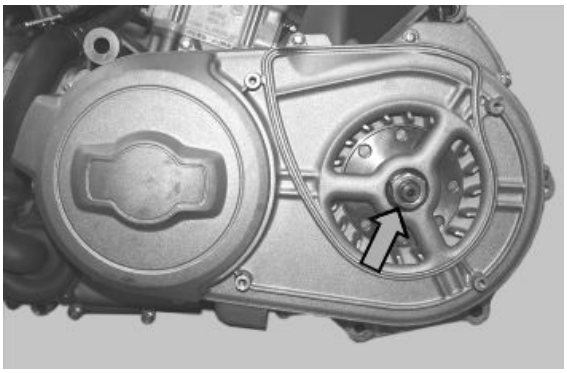
- Undo the four air deflector fixing screws.



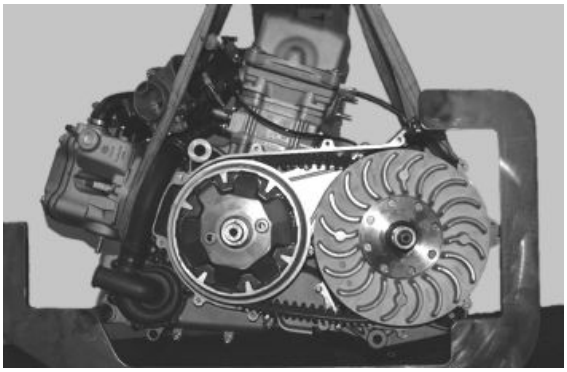
- Undo the twelve screws fixing it to the engine crankcase.



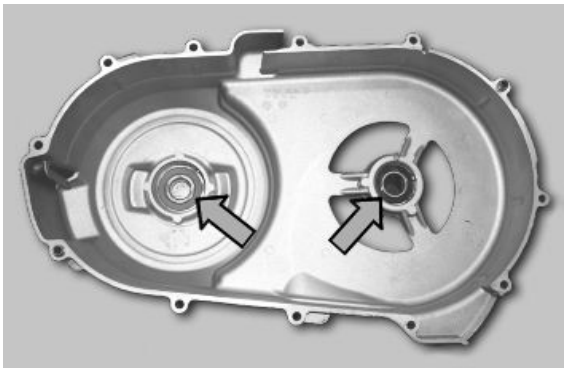
- Loosen the driven pulley shaft fixing nut with an offset wrench and lock pulley shaft rotation using a hex box-spanner.
- Remove the nut and collect the washer.



- Remove the transmission cover with a mallet to help extracting both shafts from their bearings.

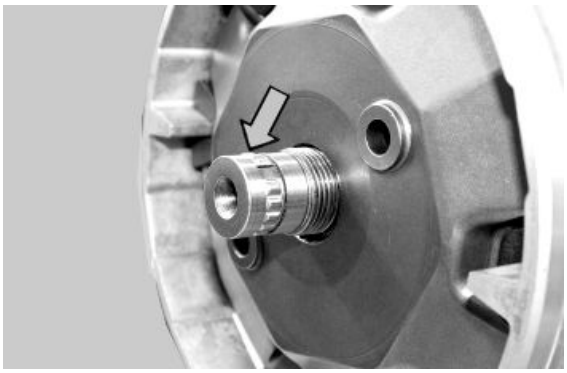


- Check that both bearings rotate freely; otherwise, replace them.



**N.B.**

**EACH TIME THE TRANSMISSION COVER IS REMOVED, REPLACE THE CRANKSHAFT ADJUSTING RING.**

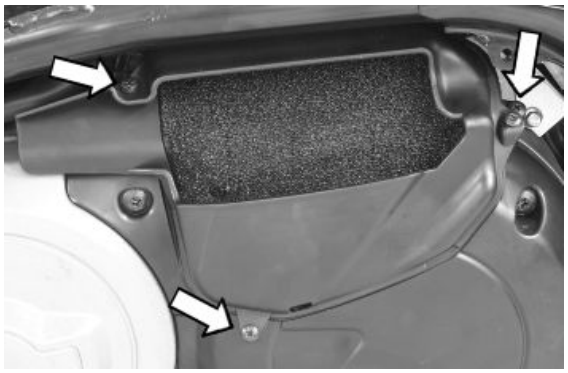


- Remove the adjusting ring.

- Replace it with a new one.

## Air duct filter

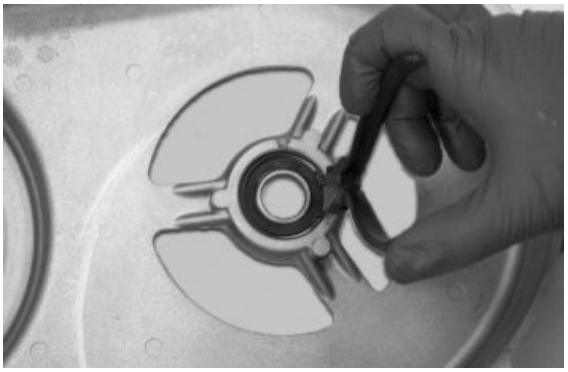
- Undo the three indicated screws and remove the air deflector.



- Remove the filter.

## Removing the driven pulley shaft bearing

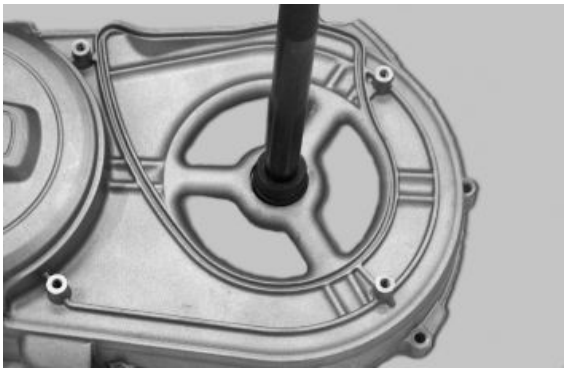
- Remove the transmission cover.
- Remove the seeger ring.



- Place transmission cover on a wood surface and use the special tool so that it is adequately supported.
- Pull out the bearing using the special tool.

**N.B.**

**BELL MUST BE PLACED INTO THE TRANSMISSION COVER, CLOSE TO THE BEARING SEAT AND THE WOODEN SURFACE, SINCE WITHOUT BELL THE ENTIRE COVER STRUCTURE WOULD BEND. NOT ONLY IN THE AREA OF MAXIMUM STURDINESS.**



### Specific tooling

**001467Y002 Driver for OD 73 mm bearing**

**020376Y Adaptor handle**

**020357Y 32 x 35 mm adaptor**

**020363Y 20 mm guide**

## Refitting the driven pulley shaft bearing

- Heat the transmission cover interior using the heat gun.

### Specific tooling

**020151Y Air heater**

- Place the bearing onto the special tool with a little grease to prevent it from coming out.
- Install the new bearing using the special tool.

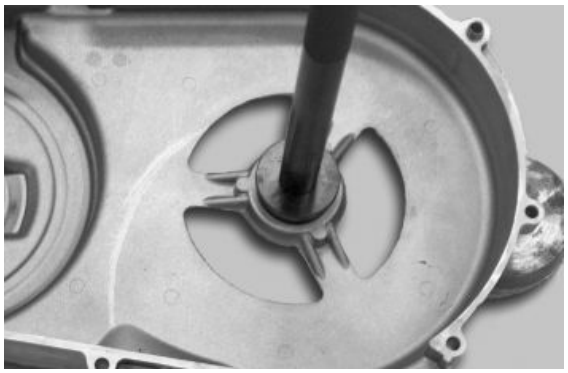
### Specific tooling

**020376Y Adaptor handle**

**020359Y 42x47-mm adaptor**

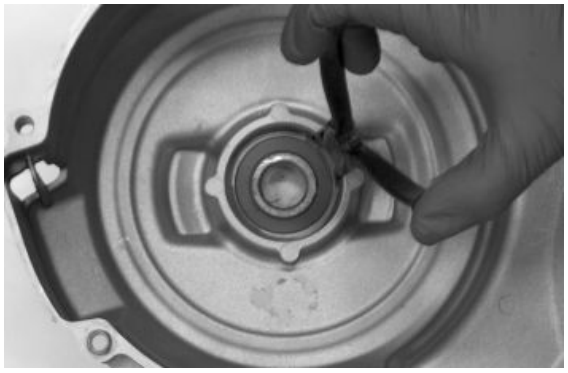
**020363Y 20 mm guide**

- Refit the seeger ring.



## Driving pulley shaft supporting bearing removal

- Remove the transmission cover.
- Remove the seeger ring.

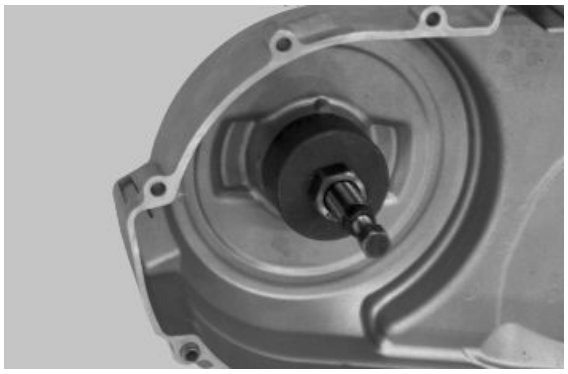


- Take out the bearing using the specific tool.

**Specific tooling**

**001467Y007 Driver for OD 54 mm bearing**

**001467Y006 Pliers to extract 20 mm bearings**



## Driving pulley shaft supporting bearing fitting

- Heat the transmission cover interior using the heat gun.

**Specific tooling**

**020151Y Air heater**

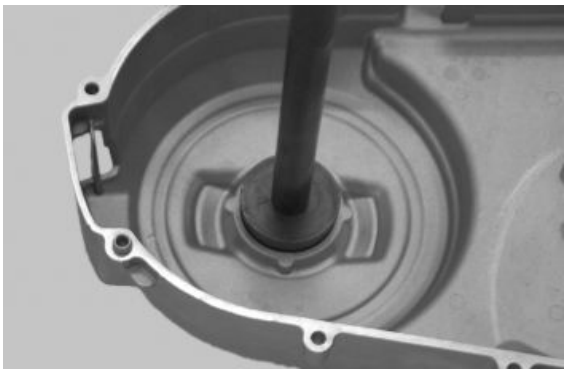
- Place the bearing onto the special tool with a little grease to prevent it from coming out.
- Install the new bearing using the special tool.

**Specific tooling**

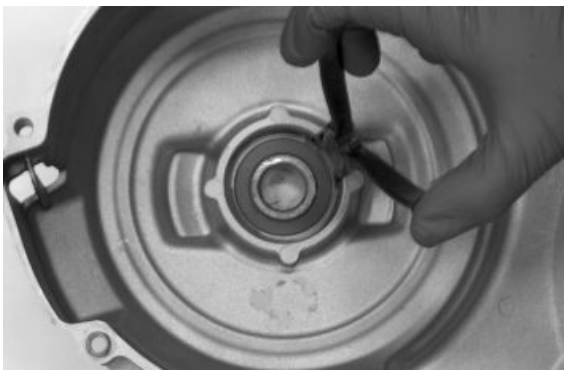
**020376Y Adaptor handle**

**020360Y Adaptor 52 x 55 mm**

**020363Y 20 mm guide**



- Refit the seeger ring.



## Removing the driven pulley

**See also**

Removing the driving pulley

## Inspecting the clutch drum

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

**N.B.**

**CHECK THE ECCENTRICITY MEASURED, 0.2 MM MAX.**

**Characteristic**

**Max. value:**

175.5 mm

**Standard value:**

175+0+0.2 mm

## Removing the clutch

Remove the clutch together with the driven pulley using the specific tool.

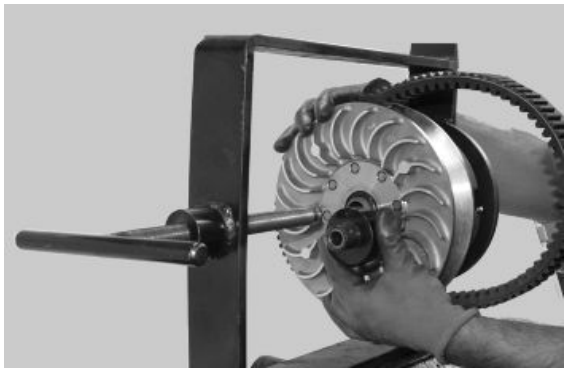
**CAUTION**

**WHILE PERFORMING THESE OPERATIONS, AVOID CONTACT WITH OIL OR GREASE WHICH COULD MAKE THE FAYING SURFACES BETWEEN THE BELT AND THE HALF-PULLEYS SLIPPERY.**

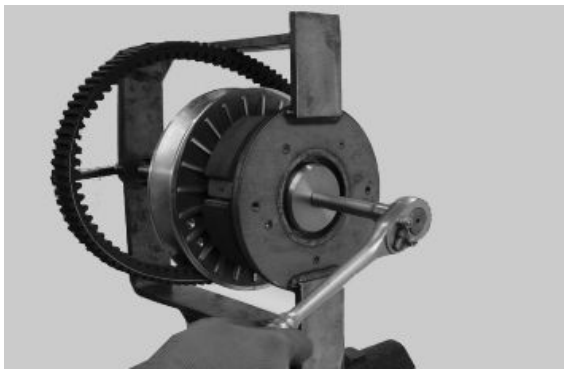
### Specific tooling

**020659Y Tool to remove clutch and replace belt**

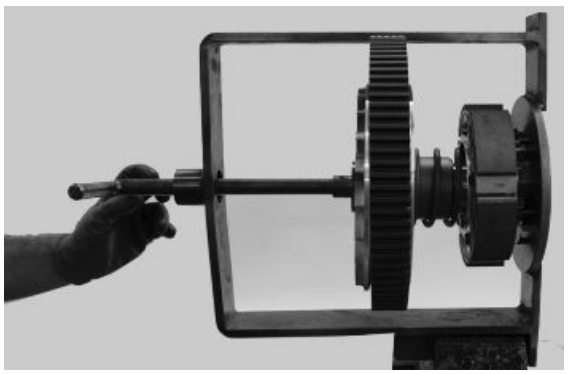
- Place the clutch assembly on the tool by inserting the pins in the ventilation holes.
- Fit the centring bushing until it stops.



- Unscrew the ring nut using the adaptor.



- Screw until the clutch is completely disassembled.



## Inspecting the clutch

- Check the thickness of the clutch mass friction material.

### Characteristic

**Minimum thickness permitted:**

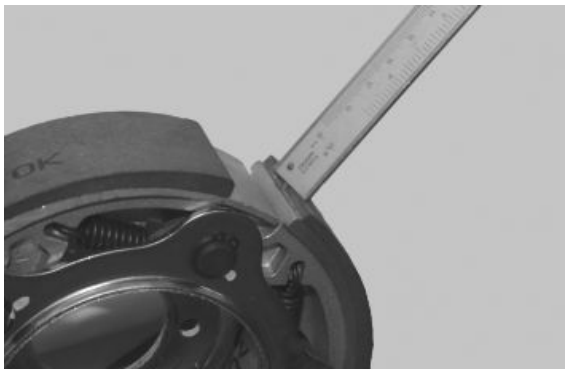
1 mm

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

**N.B.**

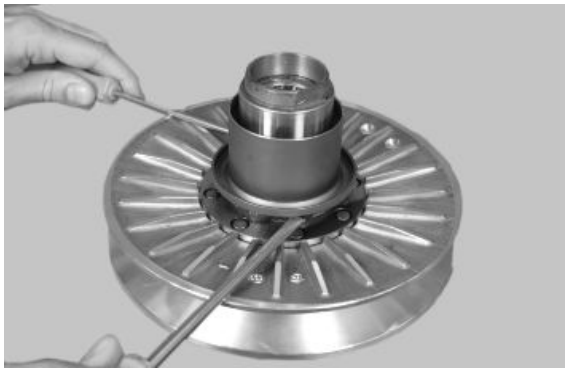
**UPON RUNNING-IN, THE MASSES MUST EXHIBIT A CENTRAL CONTACT SURFACE AND MUST NOT BE DIFFERENT FROM ONE ANOTHER. VARIOUS CONDITIONS CAN CAUSE THE CLUTCH TO TEAR.**

- Do not open the masses using tools to prevent a variation in the return spring load.

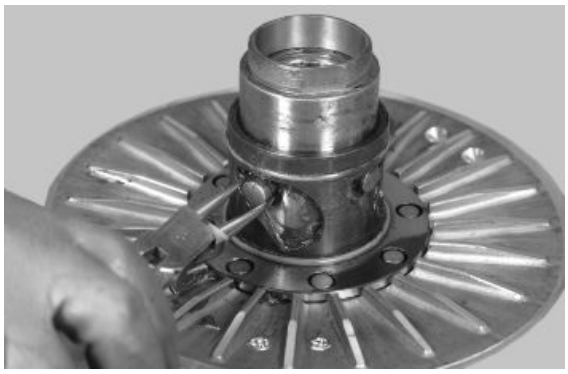


## Pin retaining collar

- Extract the collar using 2 screwdrivers.



- Remove the 4 guide pins.
- Extract the moving driven half-pulley.



## Removing the driven half-pulley bearing

- Check that the bushing is free from wear and damage; otherwise replace the fixed driven half-pulley.
- Remove the lock ring using pliers.

- Using the special tool inserted through the roller bearing, pull out the ball bearing.

**N.B.**

**PROPERLY SUPPORT THE PULLEY TO PREVENT DAMAGING THE THREADING.**

### Specific tooling

**020376Y Adaptor handle**

**020456Y Ø 24 mm adaptor**

**020364Y 25-mm guide**

**N.B.**

**IF YOU NEED TO OVERHAUL THE BEARINGS ON AN ASSEMBLED DRIVEN PULLEY UNIT, IT IS NECESSARY TO SUPPORT THE UNIT BY THE BELL**

### Specific tooling

**001467Y002 Driver for OD 73 mm bearing**

- Remove the roller bearing using the special tool, supporting the fixed half-pulley with the bell.

### Specific tooling

**020376Y Adaptor handle**

**020375Y Adaptor 28 x 30 mm**

**020183Y 30 mm guide**

**001467Y002 Driver for OD 73 mm bearing**

## Inspecting the driven fixed half-pulley

- Check that the belt contact surface is free from wear.
- Measure the outer diameter of the pulley bushing.

### Characteristic

**Minimum admissible diameter**

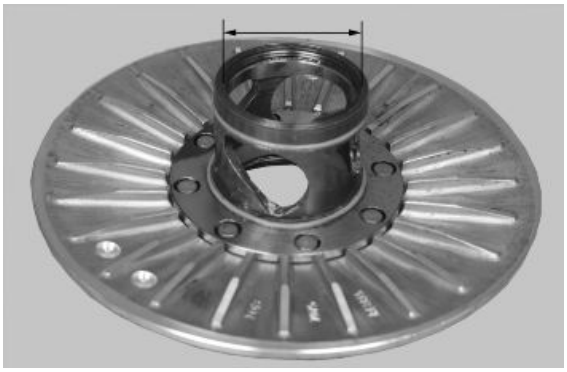
54.91 mm

**Standard diameter:**

55.00 -0.015-0.035 mm

## Inspecting the driven sliding half-pulley

- Check that the belt contact surface is free from wear.
- Remove the 2 inside sealing rings and the 2 outside O-rings.
- Measure the movable half-pulley bushing inside diameter.



### Characteristic

**Maximum admissible diameter:**

55.05 mm

**Standard diameter:**

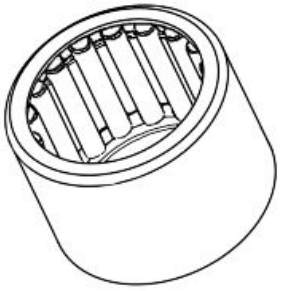
55.00 +0.035 0.00 mm

## Refitting the driven half-pulley bearing

- Install a new roller bearing using the special tool.

**N.B.**

**PLACE THE BEARING WITH THE WRITINGS AND THE EMBEDDED OIL GUARD FACING OUTWARDS.**



- Properly support the half-pulley to prevent damaging the threading.

If you are working on the driven pulley unit fully assembled, use the special tool.

### Specific tooling

**020478Y Punch for driven pulley roller casing**

**001467Y002 Driver for OD 73 mm bearing**

- Install a new ball bearing using the special tool.

**Specific tooling**

**020376Y Adaptor handle**

**020477Y Adaptor 37 mm**

**020364Y 25-mm guide**

- Insert the seeger lock ring.

## Refitting the driven pulley

- Insert the new oil guards
- Insert the new O-rings

**N.B.**

**O-RINGS ARE OF TWO SIZES. THE LARGE ONE IS INSTALLED ON THE MACHINING END RADIUS, AT THE BASE OF THE HALF-PULLEY.**

- Install the half-pulley on the bushing being careful not to damage the top sealing ring during the introduction.
- Make sure the pins and collar are not worn, reassemble the pins and collar.

- Using a bent beak greaser, lubricate the driven pulley unit with about 10 gr. of grease, this operation should be carried out through one of the two holes into the bushing to obtain the exit of the grease from the opposite hole. This operation is necessary to avoid the presence of grease beyond the O-rings.

### 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

## Inspecting the clutch spring

- Measure the length of the movable driven half-pulley spring while it is not loaded.

### Characteristic

**Standard length:**

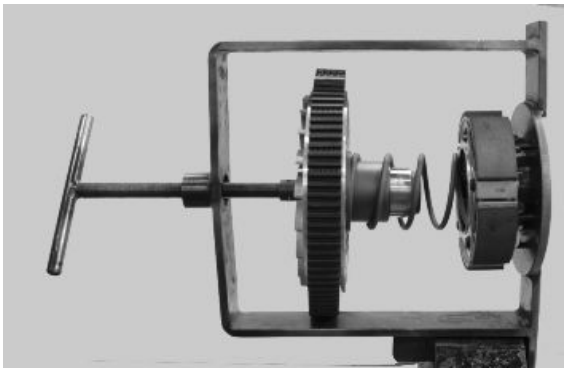
190.2 mm

**Admissible limit after use:**

182 mm

## Refitting the clutch

- Prepare the specific tool as per the removal phase.
- Preassemble the driven pulley unit.
- Insert the driven pulley unit, the spring with sheath and clutch into the tool.



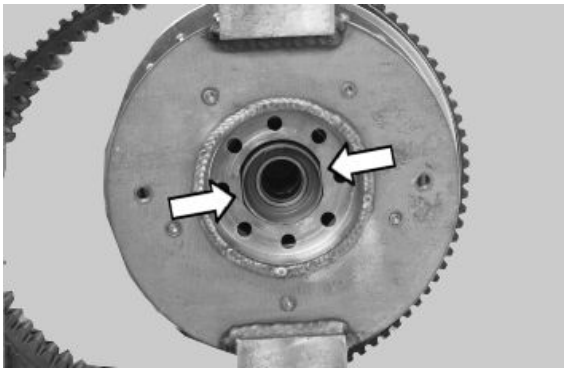
**CAUTION**

**WHILE PERFORMING THESE OPERATIONS, AVOID CONTACT WITH OIL OR GREASE WHICH COULD MAKE THE FAYING SURFACES BETWEEN THE BELT AND THE HALF-PULLEYS SLIPPERY.**

### Specific tooling

**020659Y Tool to remove clutch and replace belt**

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



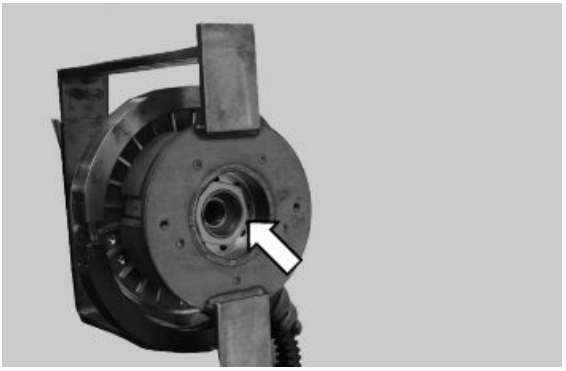
**N.B.**

**BE CAREFUL NOT TO DAMAGE THE SHEATH OR THE BUSHING THREADED END.**

- Screw the locking ring nut and tighten to the prescribed torque.

**Locking torques (N*m)**

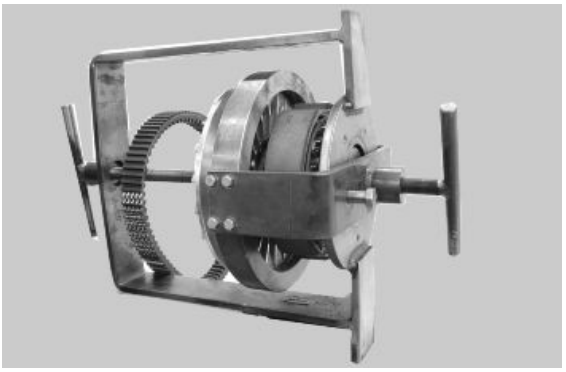
**Clutch ring nut 65 - 75**



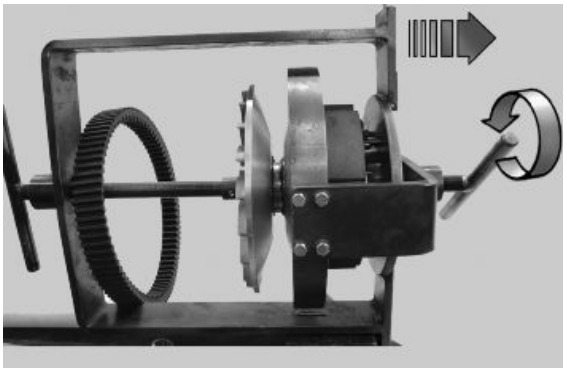
- With a specific tool, separate the two half-pulleys and fit the belt according to its direction of rotation.

**CAUTION**

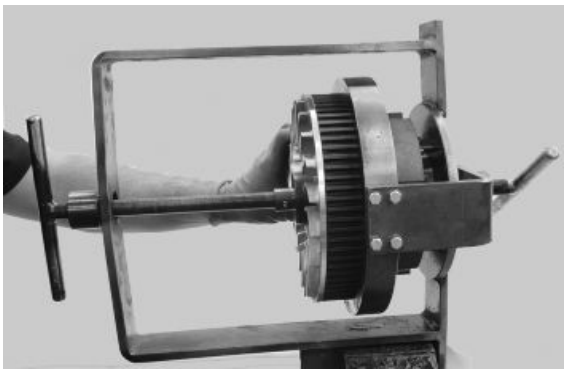
**PLACE THE TWO HALF-RINGS ADEQUATELY SO THAT THEY PERFECTLY ADHERE TO THE HALF-PULLEY.**



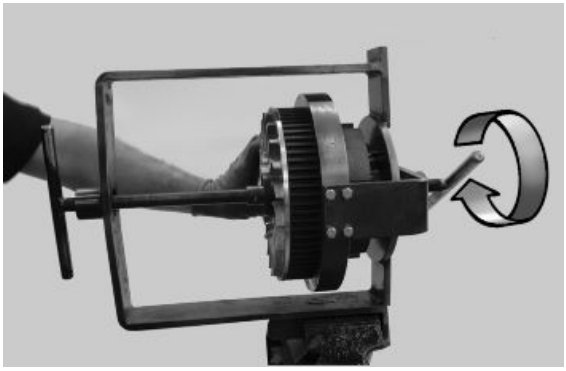
- Screw the tool so as to separate the two half-pulleys.



- Position the belt.

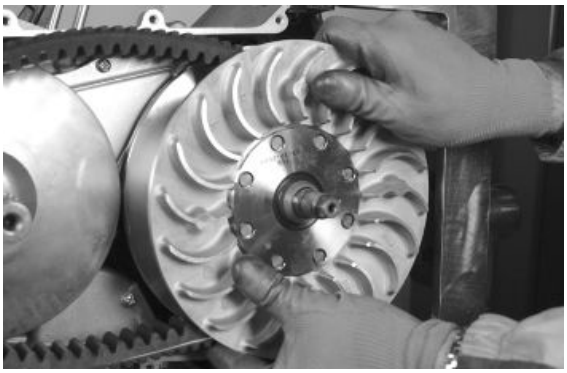


- Unscrew until the tool frees from the half-pulley and remove it.



## Refitting the driven pulley

- Fit the driving belt in the driven pulley with the specific tool.
- Fit the assembled unit on the shaft.



**See also**

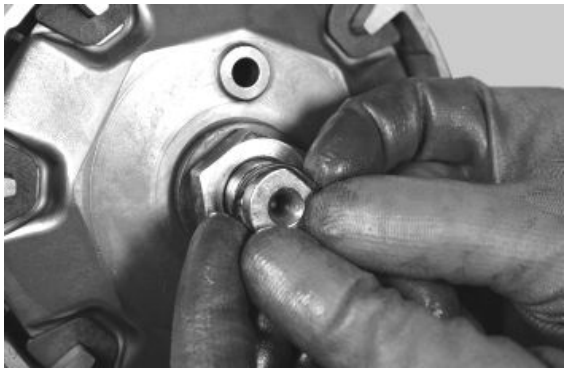
Refitting the clutch

## Drive-belt

- Make sure the driving belt is not damaged and does not show abnormal wear.
- Replace as indicated in the scheduled maintenance table.

## Removing the driving pulley

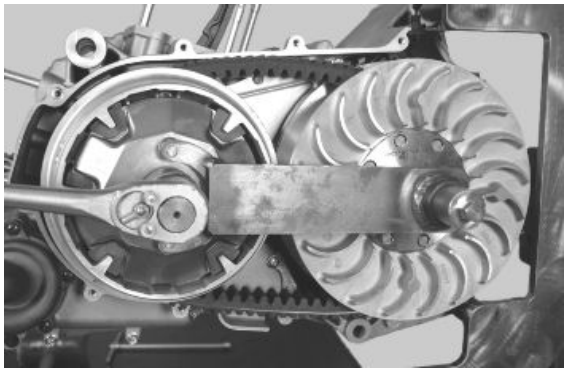
- Remove the O-ring as shown in the photograph.



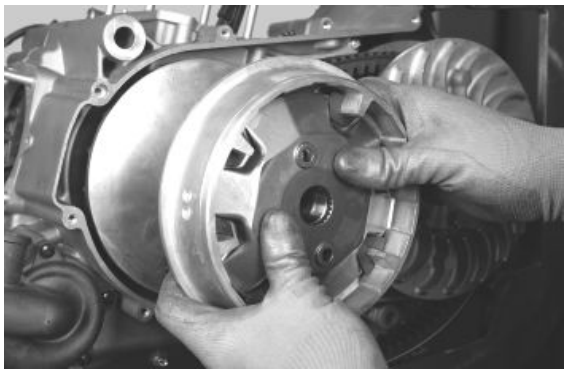
- Lock the driving pulley using the appropriate tool.
- Unscrew the fixing nut and collect the belleville spring and the washer.

### Specific tooling

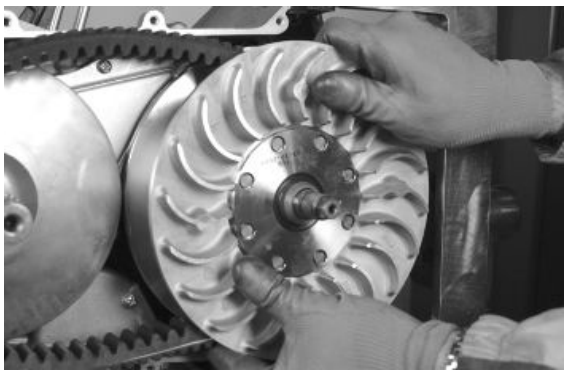
**020660Y Driving pulley lock**



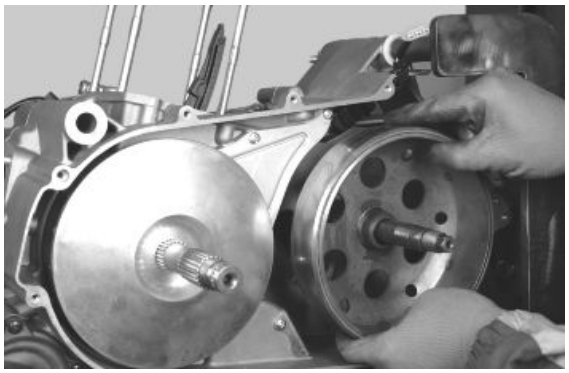
- Remove the roller container.



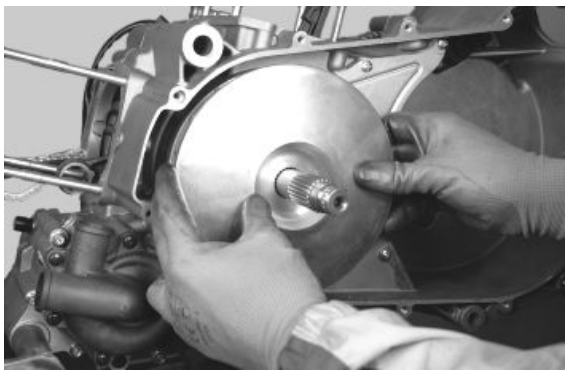
- Remove the driven pulley together with the belt.



- Remove the clutch bell.



- Remove the driving half-pulley.

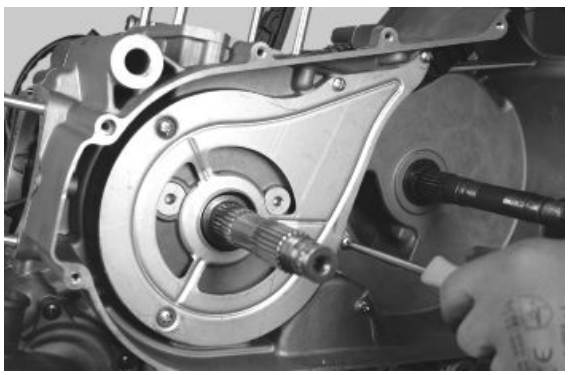


- Remove the spacer.

**N.B.**

**THE SPACER IS CONICAL; UPON REFITTING BE CAREFUL TO INSERT IT WITH THE SMALLER DIAMETER FACING THE INSIDE.**

- Undo the five fixing screws and remove the air switch.



## Inspecting the rollers case

- Check that the inside bushings shown in the figure exhibit no signs of abnormal wear and measure the inside diameter.

**CAUTION**

**DO NOT LUBRICATE OR CLEAN THE BUSHINGS**

### Characteristic

**Maximum admissible diameter:**

40.045 mm

**Standard diameter:**

40.00 +0.009 +0.034 mm

- Measure the pulley sliding bushing outside diameter shown in the figure.

### Characteristic

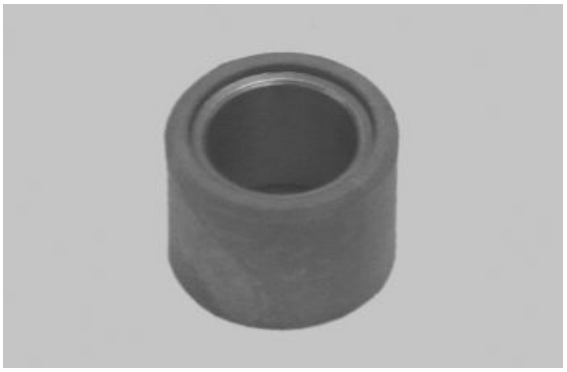
**Minimum admissible diameter**

39.05 mm

**Standard diameter:**

40.00 -0.015 -0.040 mm

- Check that the rollers are not damaged or worn.



### Characteristic

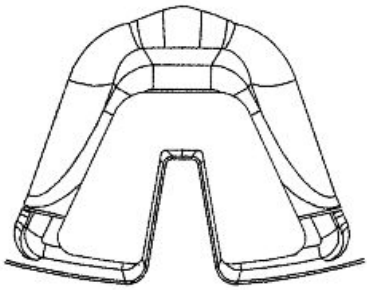
**Minimum admissible diameter**

Ø 24.5 mm

**Standard diameter:**

25.0 ± 0.1 mm

- 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.



**Characteristic**

**Standard clearance:**

0.01 ÷ 0.1 mm

## Refitting the driving pulley

- Follow the removal steps but in reverse order being careful to tighten to the prescribed torques with the specific tool.

**Specific tooling**

**020660Y Driving pulley lock**

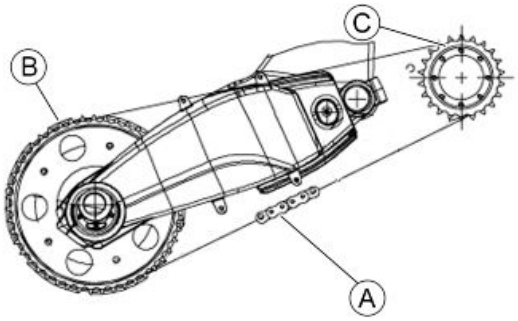
**Locking torques (N*m)**

**Drive pulley nut 252 ÷ 278 Air switch screw 3 ÷ 4**

## End gear shaft

**«A» - CHAIN**

- Lubricate, check and restore chain tension as indicated in the scheduled maintenance table; see the «Maintenance» Chapter.
- To replace, follow the instructions in the following pages.




**«B» - CROWN**

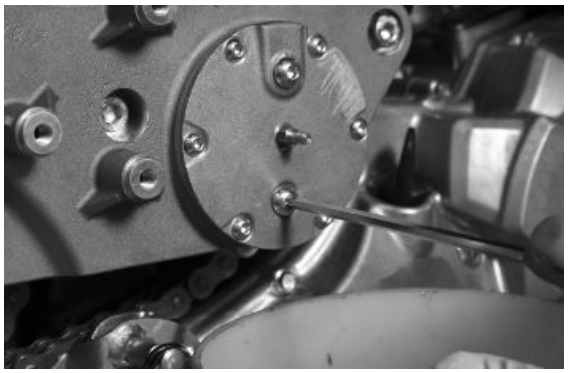
- The crown is fastened to an anti-vibration buffer flange to the rear wheel.
- To replace, follow the instructions in the following pages.

**«C» - PINION**

- The pinion is an integral part of the pinion unit.
- To replace, follow the instructions in the following pages.

**SMONTAGGIO GRUPPO PIGNONE**

- Rimuovere l'asse del forcellone posteriore.
- Rimuovere la pedana poggiapiedi e la fiancata dal lato destro.
- Predisporre un recipiente di capacità adeguata e svitando la vite inferiore scaricare l'olio.

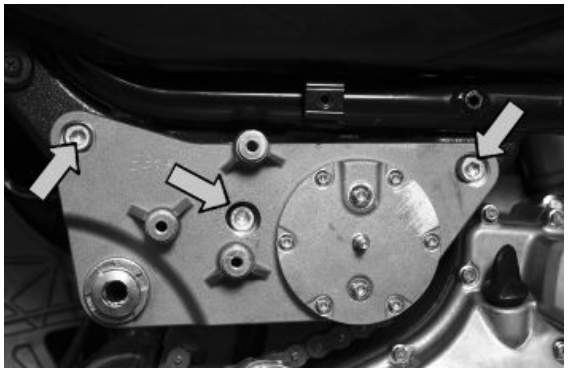


**CAUTION**

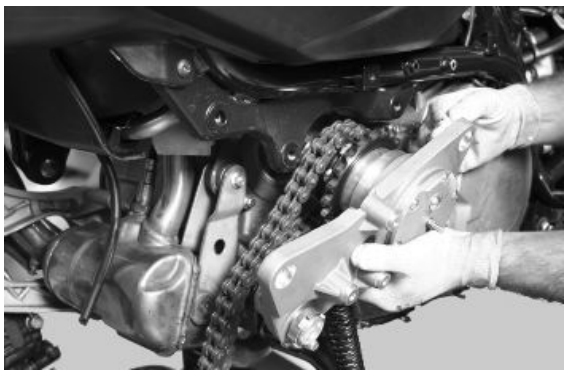
**NON È POSSIBILE SCARICARE TUTTO L'OLIO CONTENUTO DALLA VITE DI SCARICO. PRESTARE ATTENZIONE DURANTE LO SMONTAGGIO E LA REVISIONE A NON DISPERDERE L'OLIO CONTENUTO ALL'INTERNO.**

- Tirare la catena, fino a quando la vite di serraggio della cuffia di tenuta olio, solidale con l'asse gruppo pignone, sia in una posizione che permetta l'accesso di un cacciavite.
- Allentare la vite di serraggio.

- Svitare le tre viti di collegamento al telaio.



- Rimuovere il gruppo pignone completo di catena.



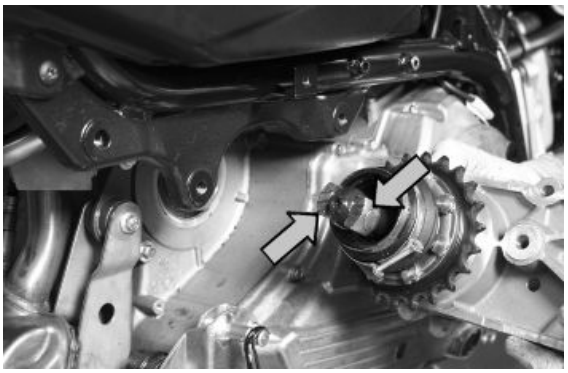
**N.B.**

**PRESTARE ATTENZIONE ALL'OLIO RIMANENTE NELLA CUFFIA DI TENUTA.**

- Disimpegnare il pignone dalla catena.

**CAUTION**

**PRESTARE ATTENZIONE CHE I PATTINI DI TRASCINAMENTO NON CADANO.**



**PINION UNIT SERVICE**

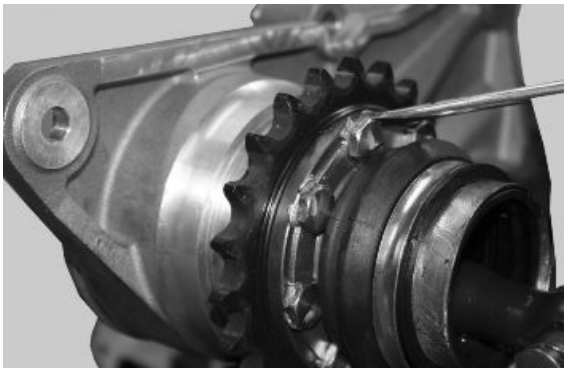
- Fasten the support in a vice.

- Remove both engine-side driving sliders.

**N.B.**

**THE FOUR DRIVING SLIDERS (TWO ON THE SUPPORT SIDE AND TWO ON THE ENGINE SIDE) ARE INTERCHANGEABLE. MARK THEM SO AS TO RESPECT THE FITTING CLEARANCE CREATED DURING THE MOVEMENT PHASE.**

- Loosen the eight screws fixing the pinion to the driving bushing from the safety plate.

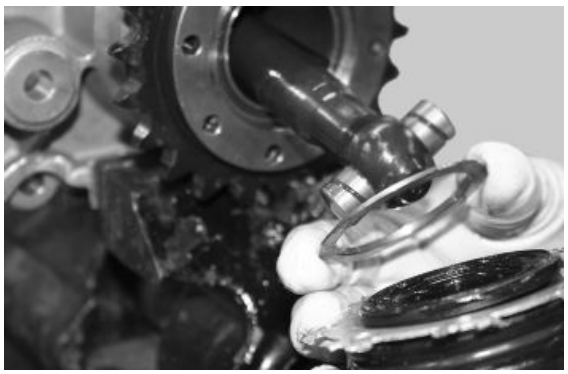


- Undo the eight screws.

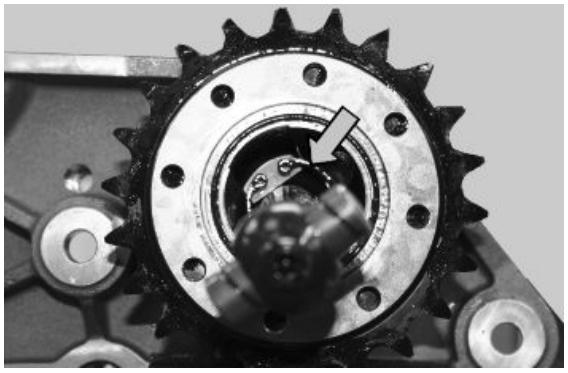
- Detach the oil sealing cap together with the fixing ring.

**N.B.**

**NOTE THE POSITION OF THE FIXING RING. THE MACHINED SURFACE SNAPS ON THE CAP.**

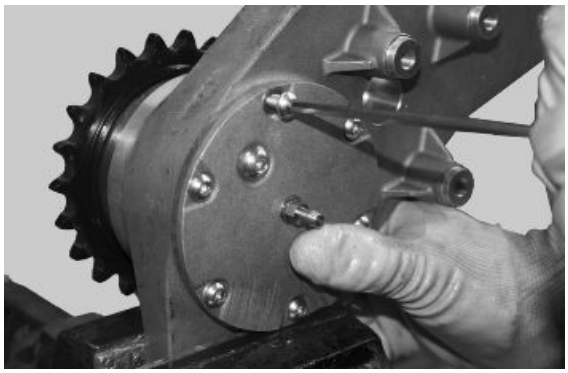


- Remove the seeger ring.



- Remove the shaft together with the driving sliders.
- Check that the shaft and the four driving sliders exhibit no signs of abnormal wear.

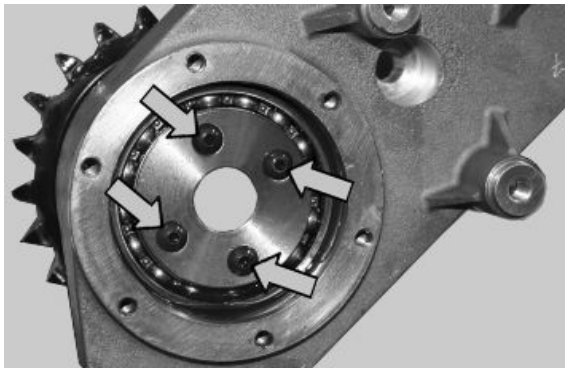
- Undo the six fixing screws and remove the cover from the opposite side.



- Undo the four screws and remove the plate.

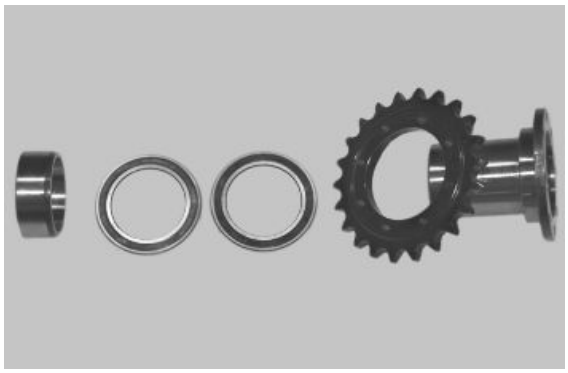
**N.B.**

**THE PLATE FORMS AN INTEGRAL UNIT WITH THE PINION DRIVING BUSHING AND THE SUPPORT. ONCE THE PLATE IS UNSCREWED, REMOVE THE PINION.**

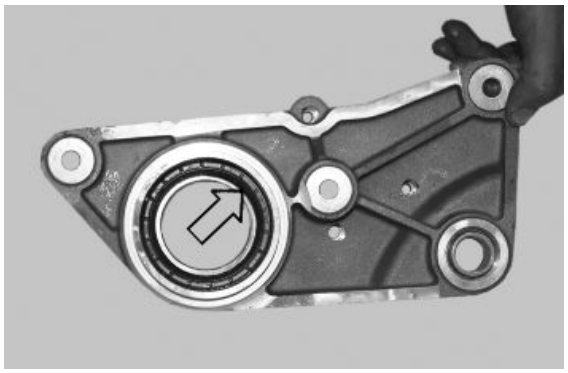


- Remove the pinion driving bushing plus the pinion, bearings and spacer from the support.

- Slide off the components from the driving bushing.



- Remove the oil seal indicated.



- Fit the specific tool and pull out the bearing working from inside the pinion unit.

**Specific tooling**

**020360Y Adaptor 52x54 mm**

**020662Y Guide 50 mm**

**020376Y Adaptor handle**

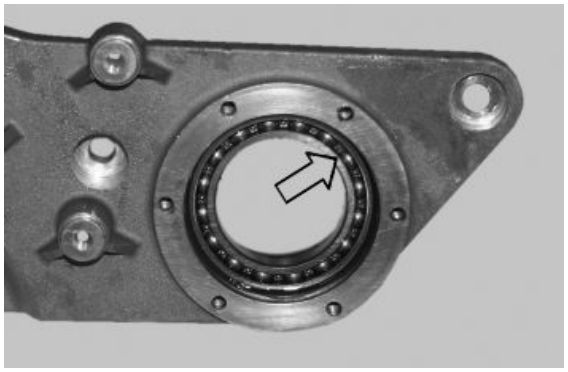
- Drive a new bearing with the specific tool working from outside the pinion unit.

**Specific tooling**

**020655Y Adaptor 62x68 mm**

**020662Y Guide 50 mm**

**020376Y Adaptor handle**



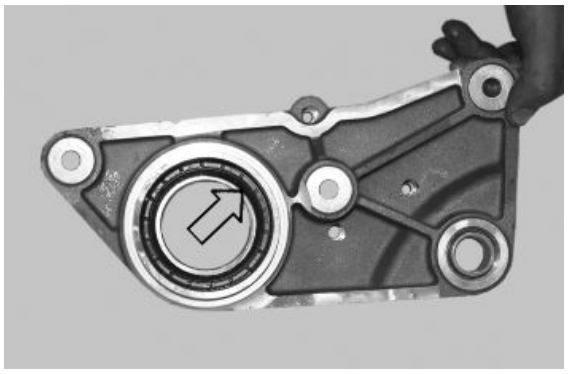
- Fit the specific tool and drive a new oil seal working from inside the pinion unit.

**Specific tooling**

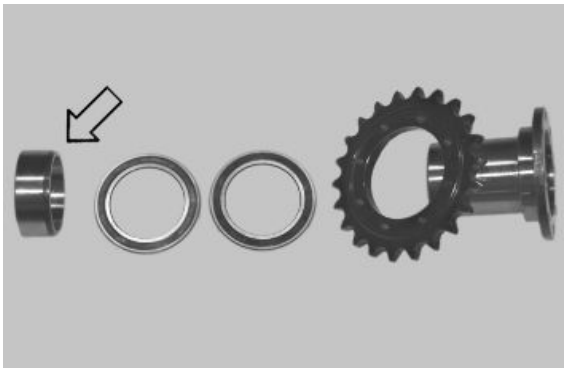
**020655Y Adaptor 62x68 mm**

**020662Y Guide 50 mm**

**020376Y Adaptor handle**



- Fit the new components on the driving bushing, pinion, bearings and bushing, following the sequence indicated in the photograph, being careful to place the bushing properly.



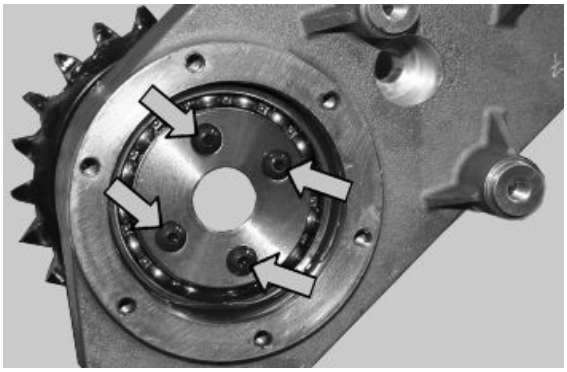
- In the support, fit the pinion driving bushing plus with the pinion, bearings and spacer previously assembled.

- Fit the plate and tighten the four fixing screws using the recommended product from the opposite side.

* Loctite 243 medium-strength

### Locking torques (N*m)

**Screw for plate locking pinion driving bushing 4 ÷ 6***



- Grease the driving sliders with the recommended product.
- Fit the shaft together with the seeger ring and the support side driving sliders.

### Recommended products

**AGIP GREASE PV2 Grease for steering bearings, bolt seatings for swinging arms and faying surface of driven pulley spring (only pulley side)**

Soap-based lithium and zinc oxide grease containing NLGI 2; ISO-L-XBCIB2

- Fit the seeger ring in the seat.

- Fit the oil sealing cap with the fixing ring, complying with the position indicated during removal.

**N.B.**

**FIT THE OIL SEALING CAP EDGES UNDER THE SAFETY PLATE.**

- Tighten the eight screws fixing the pinion to the driving bushing and with a punch fold the tongues of the safety plate.
- Grease the driving sliders with the recommended product.
- Fit both engine side driving sliders.

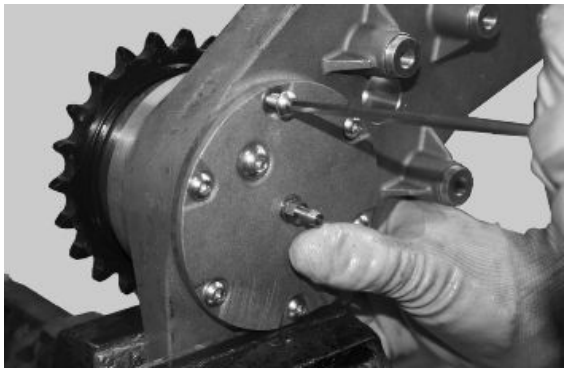
### Recommended products

**AGIP GREASE PV2 Grease for steering bearings, bolt seatings for swinging arms and faying surface of driven pulley spring (only pulley side)**

Soap-based lithium and zinc oxide grease containing NLGI 2; ISO-L-XBCIB2

- Fit the cover and tighten the six fixing screws to the prescribed torque using the recommended product from the opposite side.

(*) Apply Loctite 243 medium-strength

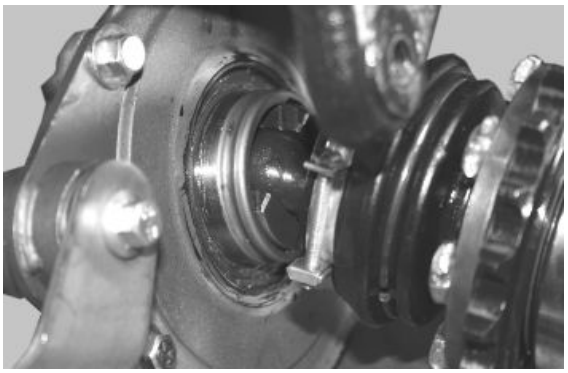


### Locking torques (N*m)

**Screws fixing pinion unit cover 4 ÷ 5***

**PINION UNIT FITTING**

- Fit the complete pinion unit in its housing on the engine.



- Fit the oil sealing cap over the pinion unit shaft.
- Tighten the clamp to the prescribed torque.

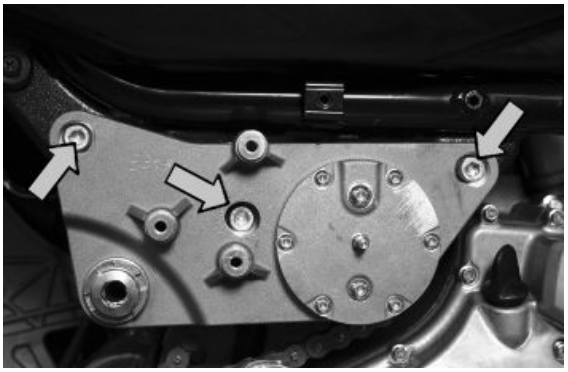
### Locking torques (N*m)

**Oil sealing casing clamp 3 ÷ 5**

- Tighten the three fixing screws to the prescribed torque.

### Locking torques (N*m)

**Screws fixing pinion unit - chassis 50**



- Tighten the oil drain screw «**B**» to the prescribed torque.

### Locking torques (N*m)

**Pinion unit oil drain screw 13 ÷ 15**

- Undo the oil filling screw «**D**».
- Fill up to the oil level with the recommended product following the indications described in the figure.

**WARNING**

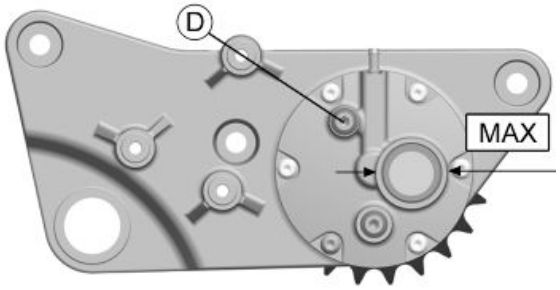
**DO NOT EXCEED THE "MAX" LEVEL WHEN TOPPING UP.**

### Recommended products

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

SAE 80W-90, API GL-5

- Tighten the oil filling screw «**D**» to the prescribed torque.




**Locking torques (N*m)**

**Pinion unit oil filling screw 13 ÷ 15**

**CROWN REPLACEMENT**

- Remove the rear wheel.
- Undo the five screws fixing the crown to the anti-vibration buffer.

- Replace the crown with a new one and tighten the fixing screws using the recommended product.

(*) Apply Loctite 243 medium-strength

**Locking torques (N*m)**

**Crown fixing screws 22.5 ÷ 27.5***

**CHAIN REPLACEMENT**

- Release the chain from the rear wheel.
- Remove the complete pinion unit so as to release the chain.
- Replace the chain with a new one and following the indications described in the specific sections, fit the pinion unit and the wheel. Restore the correct chain clearance following the indications in the «Maintenance» Chapter.

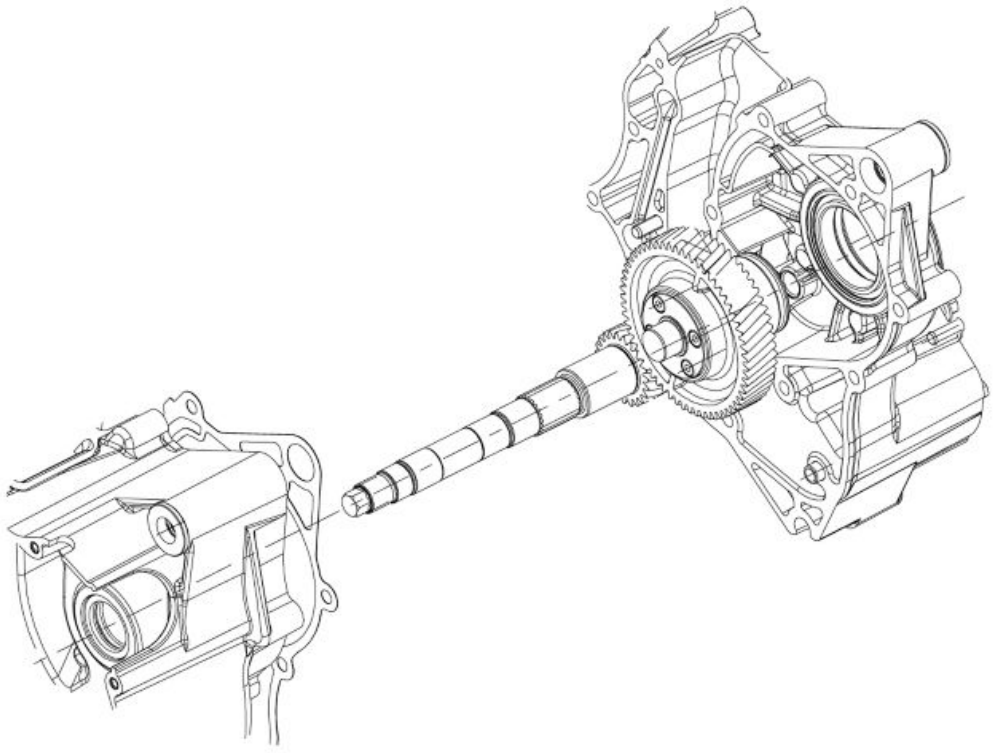
## Refitting the transmission cover

- Follow the removal steps but in reverse order being careful to tighten to the prescribed torques with the specific tool.

**Locking torques (N*m)**

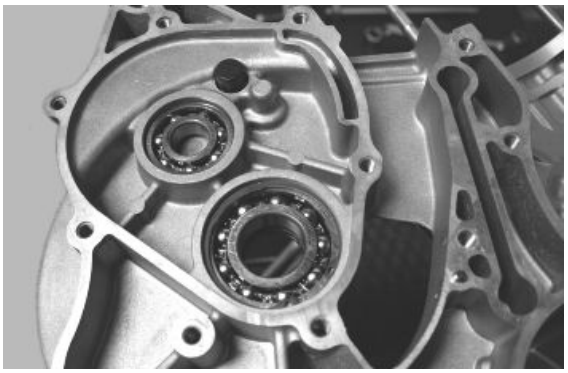
**Driven pulley nut 153 ÷ 187 Internal transmission cover screws 11 ÷ 13 External transmission cover screws 5 ÷ 7**

## End gear



**PINION UNIT SHAFT BEARING REMOVAL**

- The toothed wheel (pinion unit shaft) rotates on two bearings located on both crankcase halves. To replace, proceed as follows.
- Transmission-side crankcase half:
- Remove the driven pulley shaft axle and the toothed wheel.

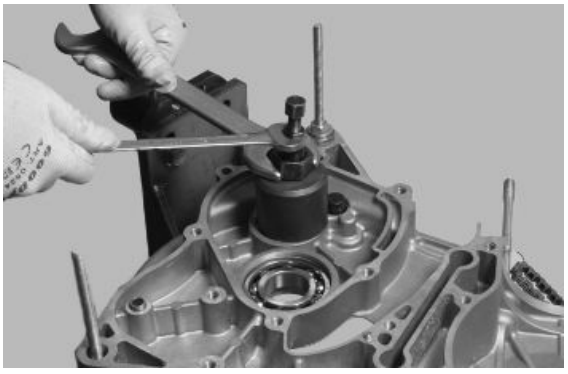


- Acting on the specific tool, take out the bearing.

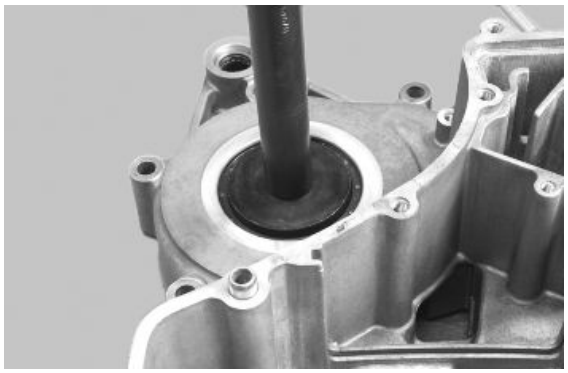
### Specific tooling

**001467Y006 Pliers to extract 20 mm bearings**

**001467Y035 Belle for OD 47-mm bearings**



- Flywheel-side crankcase half:
- Remove the oil seal and the bearing with the specific tool.



### Specific tooling

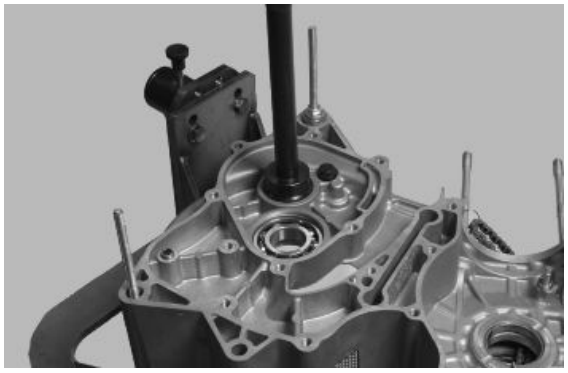
**020376Y Adaptor handle**

**020662Y Guide 50 mm**

**020360Y Adaptor 52x54 mm**

**PINION UNIT SHAFT BEARING FITTING**

- The toothed wheel (pinion unit shaft) rotates on two bearings located on both crankcase halves. To fit, proceed as follows.
- Transmission-side crankcase half:
- Heat the crankcase using the heat gun.



### Specific tooling

**020151Y Air heater**

- Insert the pinion unit shaft bearing until it stops against the bottom of the seat using the specific tool.

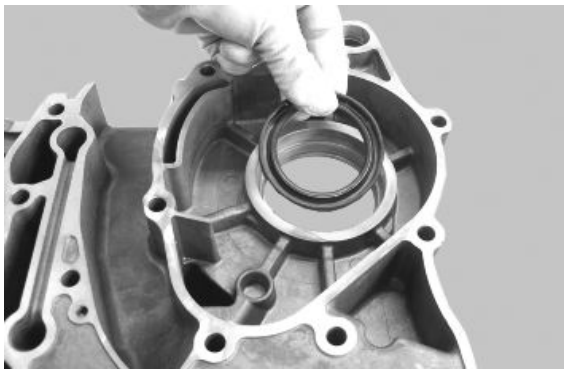
### Specific tooling

**020376Y Adaptor handle**

**020363Y 20 mm guide**

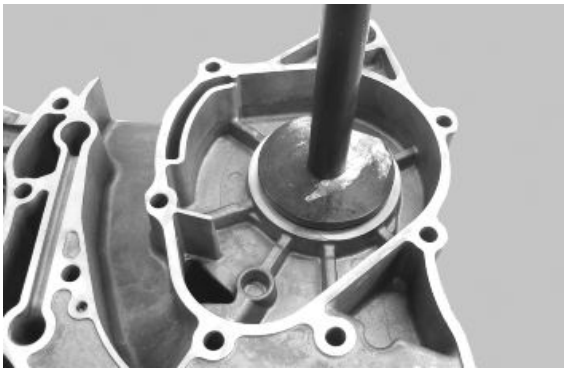
**020359Y 42x47-mm adaptor**

- Flywheel-side crankcase half:
- Heat the crankcase using the heat gun.



### Specific tooling

**020151Y Air heater**



- Fit the oil seal until it stops against the bottom of the seat using the specific tool.

### Specific tooling

**020376Y Adaptor handle**

**020655Y Adaptor 62x68 mm**

**020662Y 50 mm guide**

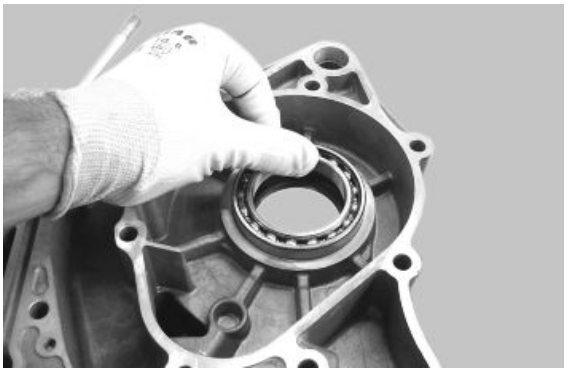
- Insert the driven pulley shaft bearing until it stops against the bottom of the seat using the specific tool.

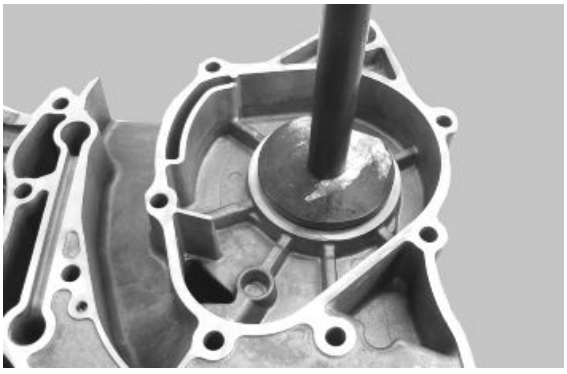
### Specific tooling

**020376Y Adaptor handle**

**020655Y Adaptor 62x68 mm**

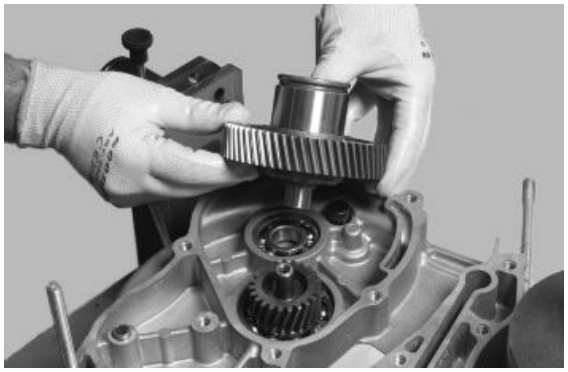
**020662Y 50 mm guide**



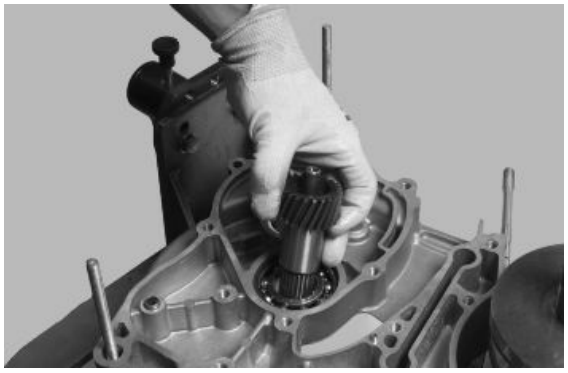


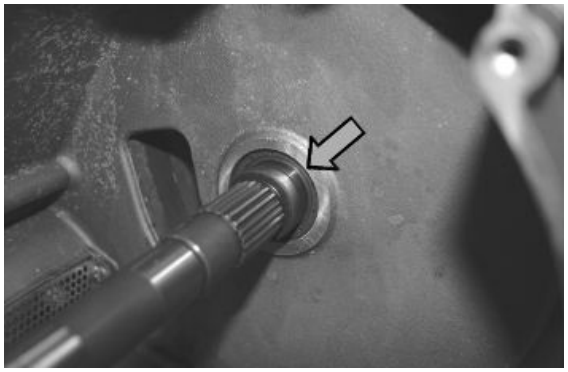
## Removing the driven pulley shaft bearing

- Slide off the toothed wheel (pinion unit shaft).

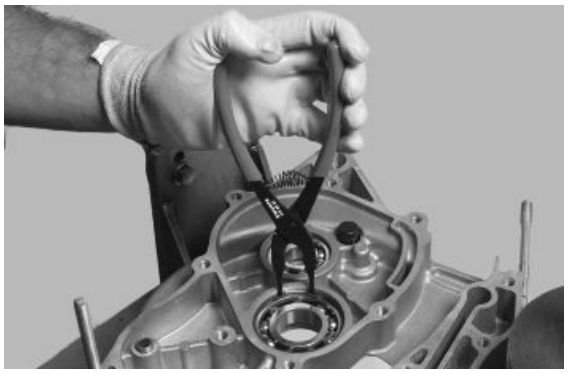


- Slide off the driven pulley shaft from one side and with a screwdriver remove the oil seal from the other side.

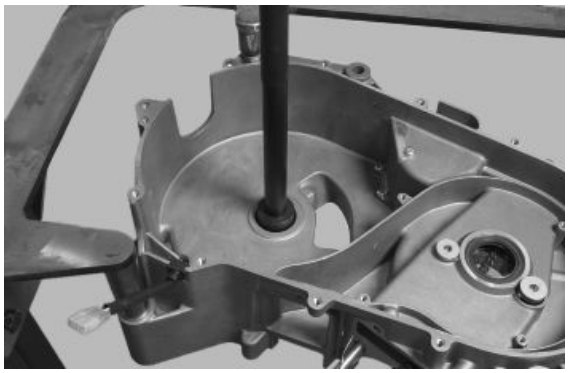




- Remove the seeger ring.



- Remove the bearing with the specific tool.



**Specific tooling**

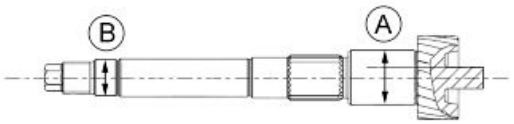
**020376Y Adaptor handle**

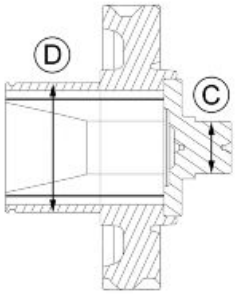
**020483Y 30 mm guide**

**020358Y 37x40-mm adaptor**

## Inspecting the hub shaft

- Check the two shafts exhibit no wear or distortion of the toothed surfaces, the bearing housings, and the oil seal housings.
- In case of faults, replace the damaged parts.




**Characteristic**

**Bearing diameter for driven pulley shaft:**

A= Ø30 -0.01 -0.02 mm

B= Ø20 -0.01 -0.02 mm

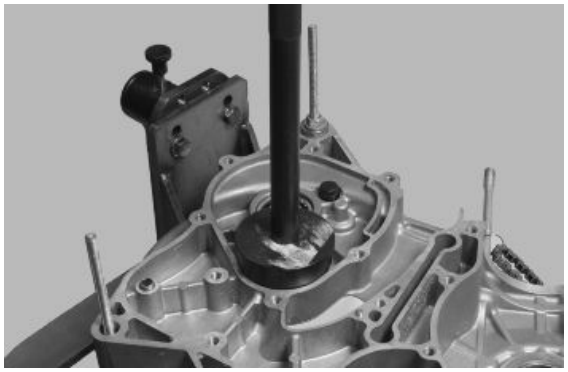
**Diameter for pinion unit shaft:**

C= Ø20 -0.01 -0.02 mm

D= Ø50 -0.01 -0.023 mm

## Refitting the driven pulley shaft bearing

- Heat the crankcase using the heat gun.



**Specific tooling**

**020151Y Air heater**

- Insert the driven pulley shaft bearing until it stops against the bottom of the seat using the specific tool.

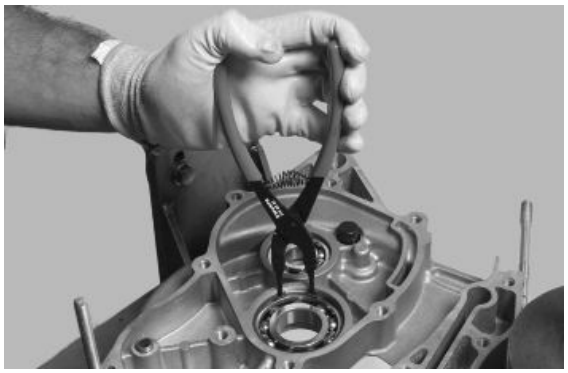
**Specific tooling**

**020376Y Adaptor handle**

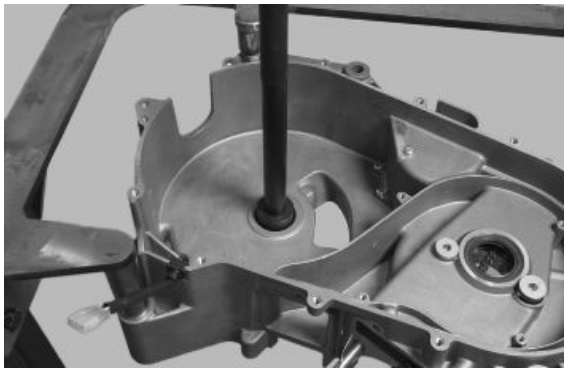
**020483Y 30 mm guide**

**020655Y Adaptor 62x68 mm**

- Fit the seeger ring.

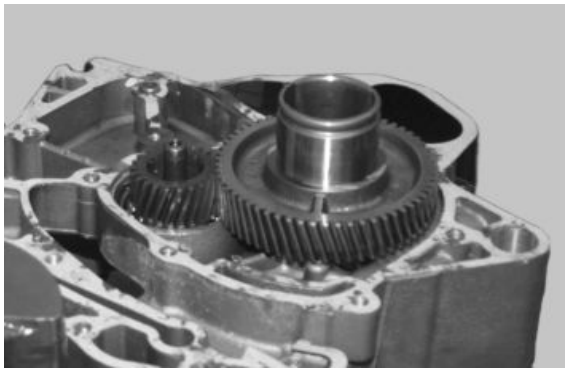


- Fit the oil seal from outside the transmission-side crankcase half.

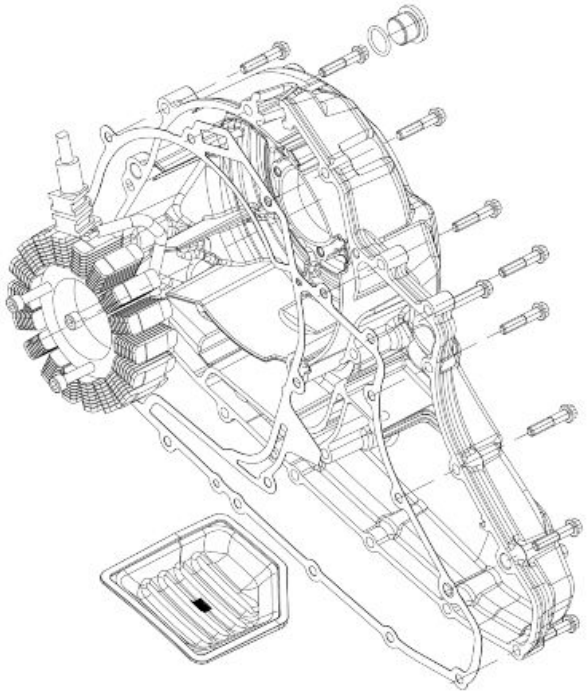


## Refitting the hub bearings

- Place the two shafts as shown in the figure.

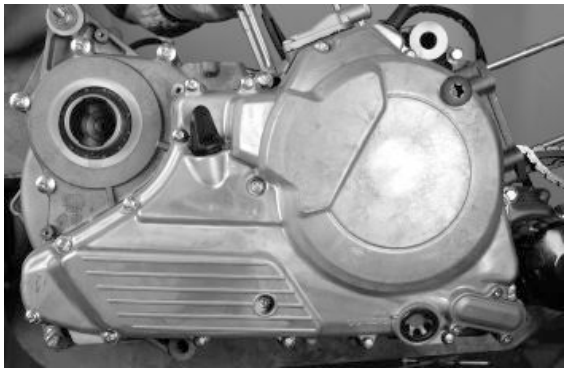


## Flywheel cover



## Removing the hub cover

- Remove the sixteen screws fixing it to the crankcase.



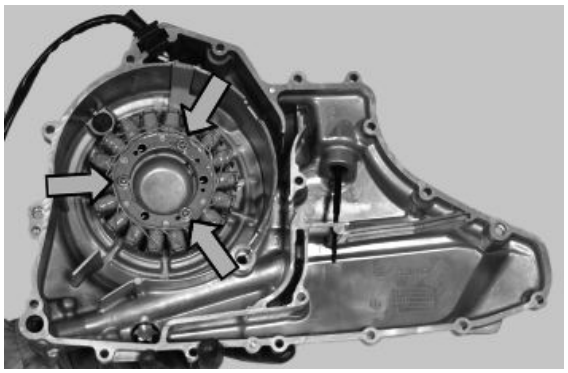
- Remove the flywheel cover.

**N.B.**

**THE COVER OFFERS RESISTANCE DUE TO THE FLYWHEEL MAGNETIC FIELD.**

## Removing the stator

- Unscrew the 3 fastening screws and remove stator and its wiring.



## Inspecting the cover components

- Check the condition of the stator and of the respective cable harness.

- Check the continuity between the 3 phases.

**N.B.**

**VALUES ARE STATED AT AMBIENT TEMPERATURE. A CHECK WITH THE STATOR AT OPERATING TEMPERATURE MAY RESULT IN VALUES HIGHER THAN THOSE STATED.**

### Electric characteristic

**Resistance:**

0.2 - 1 Ω

- Check the ground insulation of each phase.
- If a fault is found, carry out a thorough check of the cable harness that contains two types of cable: Rigid cables close to the stator and flexible cables close to the connector.

- Check that the winding is positioned so as not to interfere with the heads of the retaining screws.

## Refitting the stator

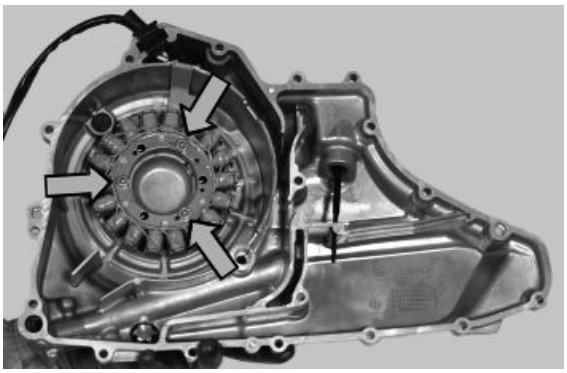
- Install the stator assembly together with the wiring harness, tightening the 3 screws to the prescribed torque.

**N.B.**

**INSERT THE RUBBER WIRING SEALING GASKET INTO THE SPECIAL SEAT ON THE CRANKCASE.**

### Locking torques (N*m)

**Stator retainers 8 - 10**



## Refitting the flywheel cover

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

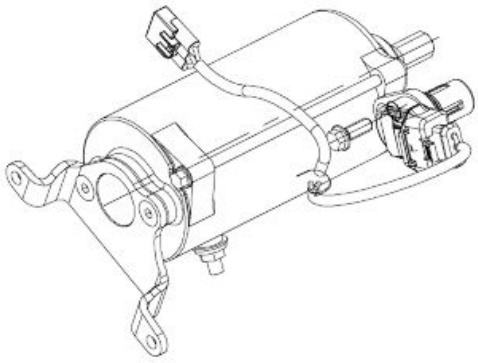
**CAUTION**

**CLOSING THE COVER MAY POSE A RISK TO THE OPERATOR DUE TO THE STRONG MAGNETISM OF THE FLYWHEEL. BE PARTICULARLY CAREFUL WITH YOUR HANDS AND FINGERS.**

### Locking torques (N*m)

**Flywheel cover screws 11 - 13**

## Flywheel and starting



The starter is sold as a complete part.

Before deciding to replace it, carry out the following tests:

**- Battery**

Check the voltage after a pause:

Voltage >12.5V

- Check the correct connection of the negative terminals (battery negative and starter motor negative) between them and to the chassis.

- Recharge and if necessary, replace the battery.

- Connect the diagnostic tester (see the «injection» chapter).

Connect the induction clamp of an ammeter to the positive power supply cable of the starter motor.

Remove the 7.5A fuse No. 10 (see the «fuses» chapter).

Switch in position "ON" with interrupt switch in position "RUN" and side stand raised.

Select the "PARAMETERS" function.

Start the engine (so that it cannot move) long enough to measure the rpm and starter absorption.

**N.B.**

**THE DECLARED RPM VALUE IS THAT INDICATED BY THE TESTER, THE RPM READING IS NOT THE REAL ONE, BUT IS VALID FOR DIAGNOSTIC PURPOSES.**

### Specific tooling

**020460Y Scooter diagnosis and tester**

### Electric characteristic

**Absorption at trailing speed:**

120 A

**Revolution speed =**

approx. 300-400 rpm

The starter system has a transmission between the motor armature and engine shaft equipped with freewheel coaxial to the flywheel and torque limiter on the intermediate shaft.

The limiter is calibrated to 100 Nm (10 kgm); this component protects the structure of the engine and the starter kinematic mechanism in the event of incorrect starting with consequent inverse rotations.
The freewheel is used for a sufficiently silent starting.
The starter control (energised remote control) is slaved to enabling signals by the side stand and the emergency OFF/RUN switch, which does not allow starting given dangerous conditions.
The starter control circuit is not controlled by the immobilizer system, therefore before insisting on the starter system, check the consensus of the immobilizer.
In order to check the enabling switches circuit, see the «Electrical system» chapter, whereas to check the engine shaft control transmission, follow what is described in the «Flywheel and starter system» chapter.

## Removing the starter motor

- Disconnect the electric terminals.
- Unscrew the nuts fixing it to the crankcase.

## Removing the flywheel magneto

- Lock the flywheel and loosen the nut fixing it to the shaft with the specific tool.

**Specific tooling**

**020713Y Flywheel extractor**

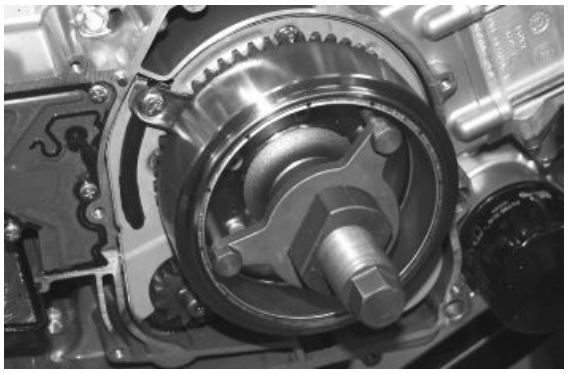
- Fit the specific extractor, and unlock the flywheel acting on the tool.

**CAUTION**

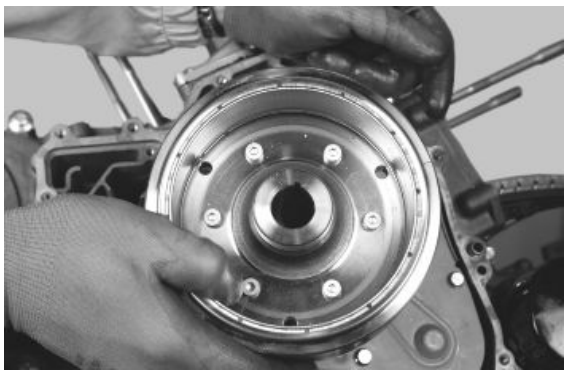
**THE THREAD IS ANTICLOCKWISE.**

**Specific tooling**

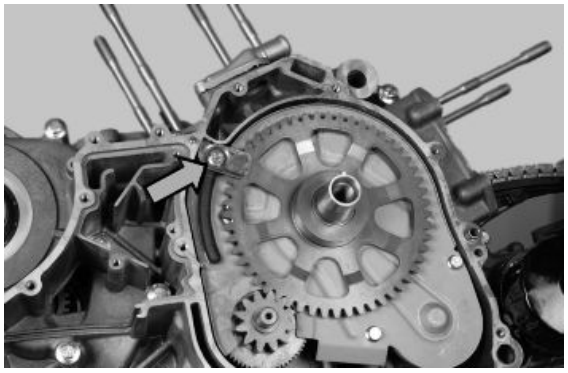
**020713Y Flywheel extractor**



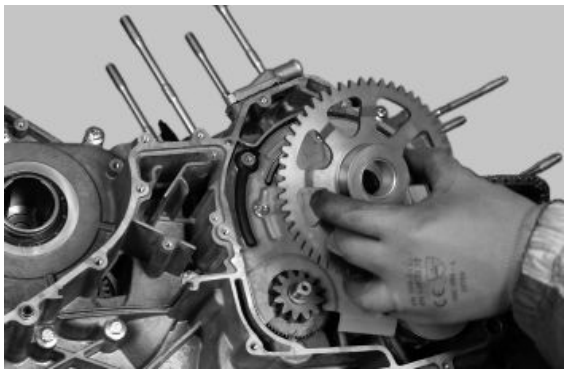
- Once it is unlocked, remove the flywheel.



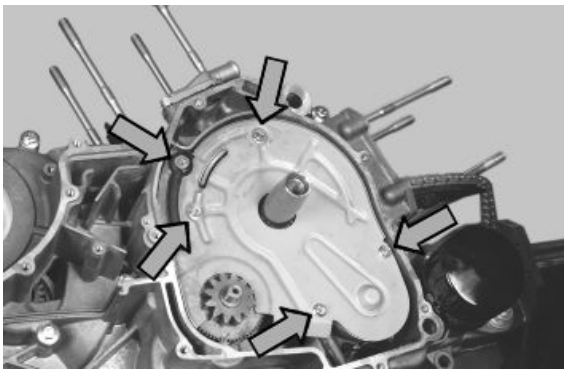
- Unscrew the plate fixing screw.



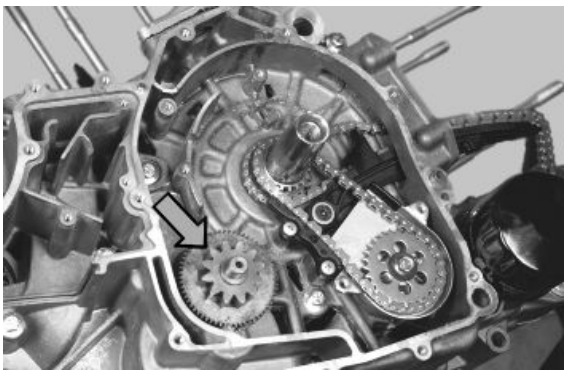
- Remove the starting ring gear.



- Undo the five fixing screws and remove the oil pump compartment closing bulkhead.



- Remove the intermediate gear.



## Inspecting the flywheel components

- Check the integrity of the magnets.
- Check that the magnet support cage is free from deformation or cracks.

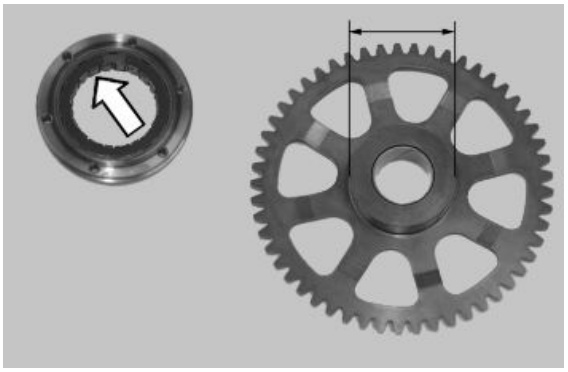
## Starter gear rim

- Check that there is no wear or abnormal impressions on the "rollers" of the freewheel and on the surface of the starter ring gear hub.
- Check the hub outside diameter.

**Characteristic**

**Hub outside diameter:**

Diameter 45.665 + 0.008 +0.005 mm

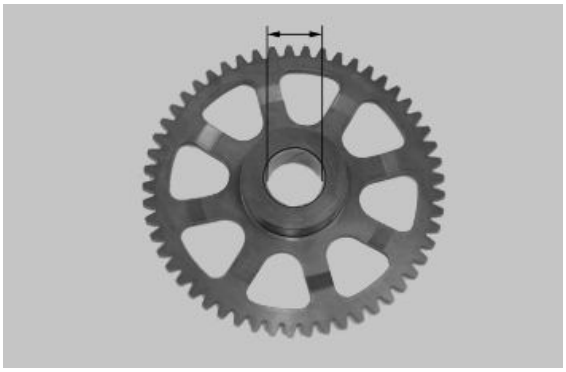


- Check the inside diameter of the bushing of the starter gearing.
- Check that the toothing is not worn.

### Characteristic

**Inside diameter of the bushing:**

Diameter 27 + 0.020 +0.041 mm



**N.B.**

**IF THE FAULTS DISCOVERED AFFECT THE HUB, REPLACE THE STARTER RING GEAR AND FREEWHEEL.**
**IF ONLY THE BUSHING IS WORN, IT IS POSSIBLE TO REPLACE ONLY THE COMPLETE START-UP RIM. IN THAT CASE, CHECK ALSO THE DIAMETER AND THE SURFACE OF THE CONNECTION ON THE CRANKSHAFT. IN CASE OR IRREGULARITIES, REPLACE THE CRANKSHAFT.**

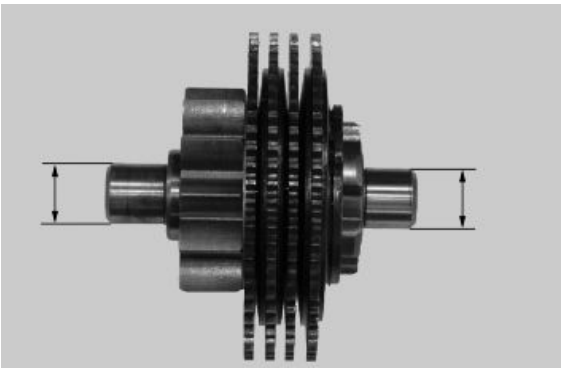
## Intermediate gear

- Check that the toothing is not worn.
- Check the diameter of the two bearings.

### Characteristic

**Gear bearing diameter:**

12 - 0 0.011 mm

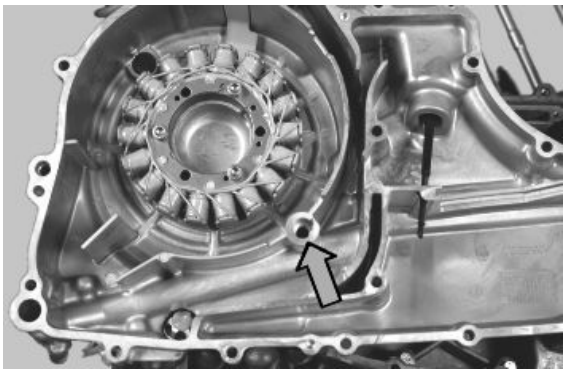


Also check the shaft diameter on the flywheel cover and on the engine crankcase.

### Characteristic

**Bearing diameter on the flywheel cover**

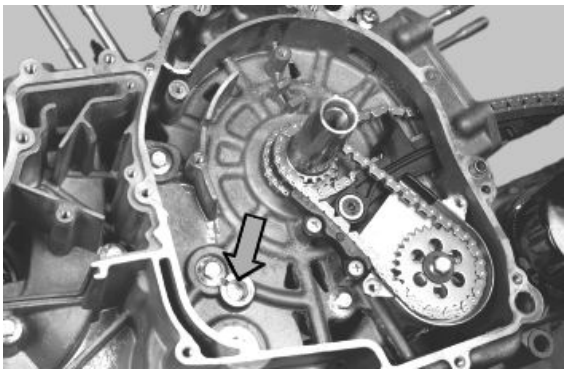
12 + 0.034 -0.016 mm



### Characteristic

**Bearing diameter on the engine crankcase:**

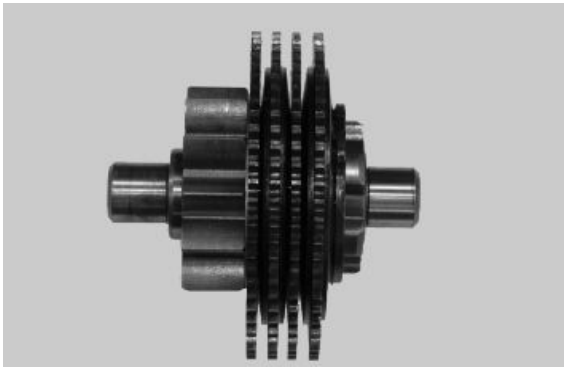
12 + 0.034 -0.016 mm



**N.B.**

**THE TORQUE LIMITER IS PROVIDED WITH 4 GEARS THAT HAVE THE FUNCTION OF CLUTCH DRIVE PLATES.**

Driven plates consist of 4 Belleville springs provided with grooved profiles; this assembly allows transmitting torques below 100 Nm (10 kgm).
In case of incorrect start-up procedures, the torque limiter prevents any kicks, resulting in inversion of rotation direction of the crankshaft which would impair the engine structure



The limiter assembly cannot be overhauled. In case of irregularities on the toothed discs, replace the assembly.

## Refitting the free wheel

- Make sure the free wheel contact 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

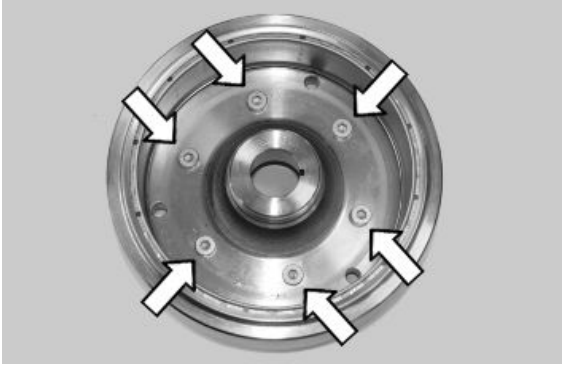
**Loctite 243 Medium strength threadlock**

Loctite 243 medium-strength threadlock

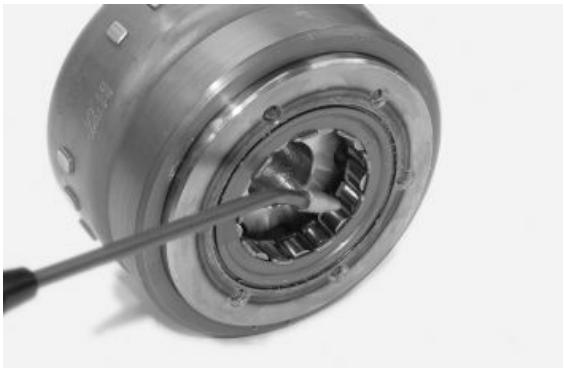
- Fit the freewheel on the magneto flywheel making sure that the ground side is in contact with the flywheel itself, i.e. with wheel seeger ring visible.
- Lock the six clamping screws in criss-cross fashion to the prescribed torque.

**Locking torques (N*m)**

**Screw fixing freewheel to flywheel 13 ÷ 15**

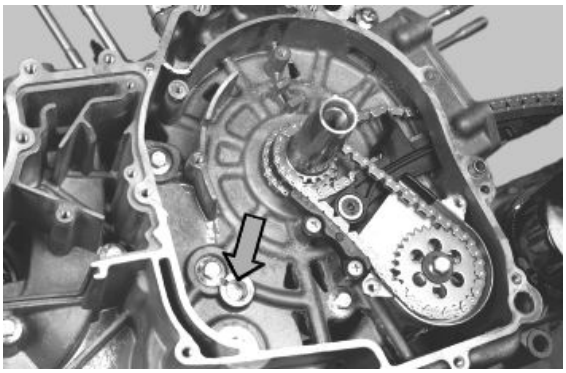


- Oil the free wheel "rollers".

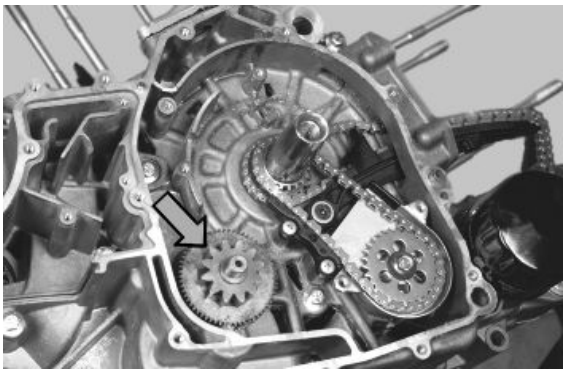


## Refitting the intermediate gear

- Lubricate the gear housing on the engine crankcase.



- Insert the intermediate gear with torque limiter



- Lubricate the inside bushing and the starter ring gear hub surface.

- Install the start-up rim on the flywheel turning it clockwise and inserting at the same time.

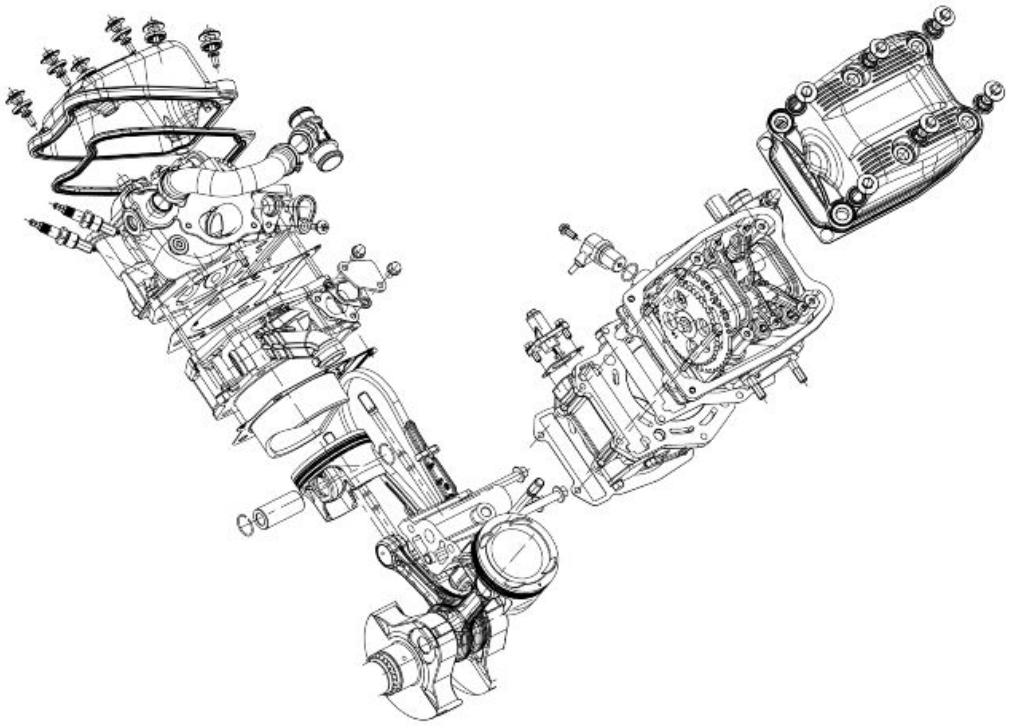
## Refitting the starter motor

- Check that the O-ring is in good working order and lubricate it.
- Insert the starter motor.
- Tighten the 2 fastening screws to the prescribed torque.

**Locking torques (N*m)**

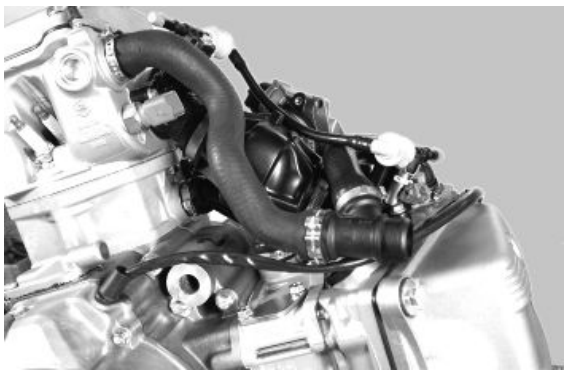
**starter motor retainers 11 - 13**

## Cylinder assy. and timing system

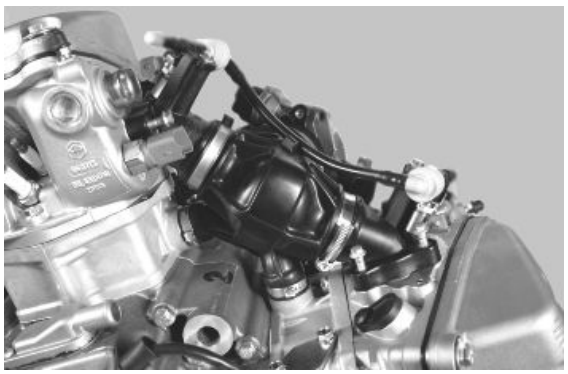


## Removing the intake manifold

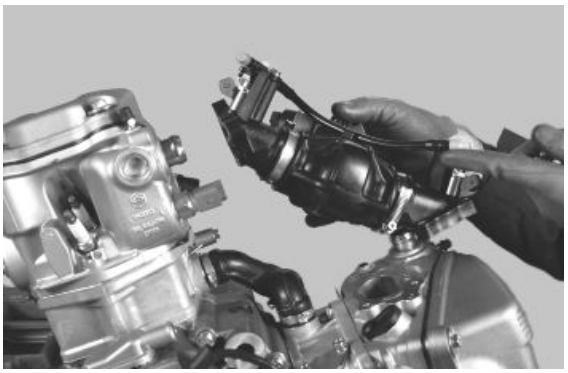
- Remove the coolant pipes.



- Undo the six fixing screws.



- Remove the inlet manifold.



## Removing the rocker-arms cover

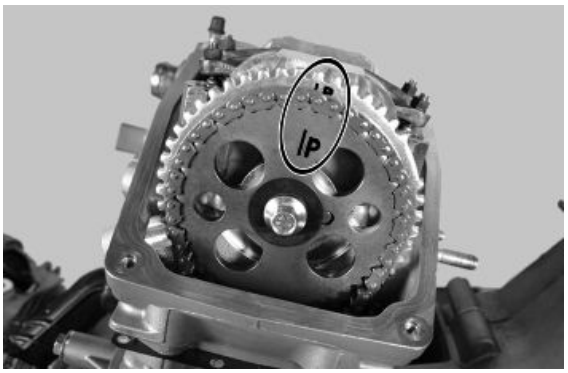
- Loosen the 6 special screws with stop and the relevant rubber gaskets.
- Remove the tappet cover with relevant gasket.

## Removing the timing system drive

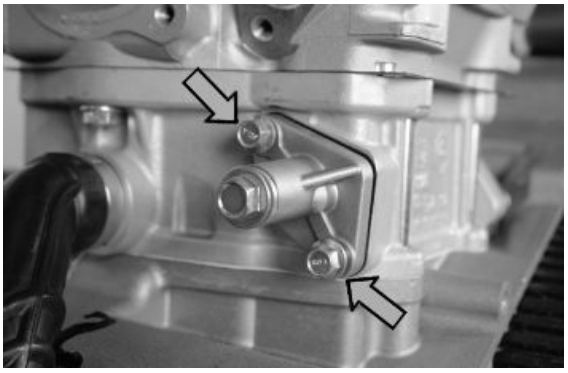
- As indicated in the photograph, align the references on the timing system gear of the rear cylinder with the reference on the cam cap valves.

**N.B.**

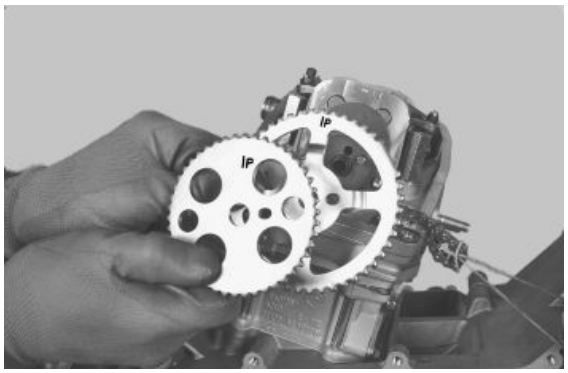
**PLACING THE ENGINE AS INDICATED, IT IS IN THE COMBUSTION PHASE AND ALL THE VALVES ARE CLOSED. THIS HELPS FITTING-REMOVAL OPERATIONS.**




- Loosen the central screw on the tensioner.
- Unscrew the two retainers indicated in the photograph and remove the tensioner with the relevant gasket.



- Lock the timing system gear with the specific tool, undo the central fixing screw and collect the washer.
- Release the chain from the sprocket and be careful that it does not fall inside the transmission housing.
- Remove the timing system gear and the tone wheel from the camshaft.



**CAUTION**

**THE TONE WHEEL IS ONLY ON THE REAR CYLINDER. IN THE FRONT CYLINDER IT IS REPLACED BY A SPACER.**

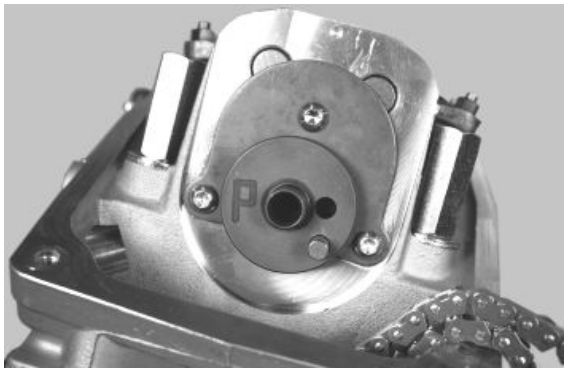
### Specific tooling

**020565Y Flywheel lock calliper spanner**

- Repeat the operations for the front cylinder timing system gear.

## Removing the cam shaft

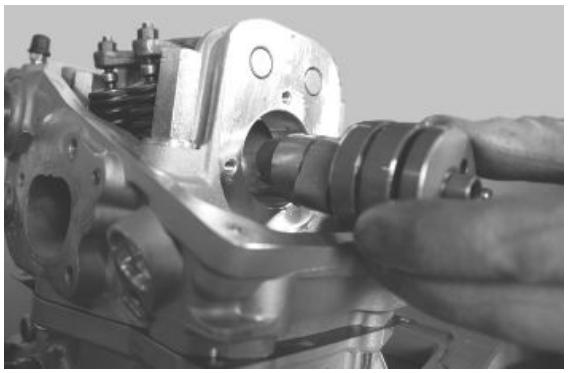
- Unscrew the 3 fastening screws and remove camshaft retaining bracket.



**N.B.**

**REMOVING THE FASTENING SCREWS MAY BE DIFFICULT. BE CAREFUL NOT TO DAMAGE THE INSIDE HEXAGON. IF NECESSARY, SEPARATE THE THREADS IN ADVANCE.**

- Remove the cam shaft.



- Remove pins and rocking levers by the transmission side holes.

## Removing the cylinder head

- The head removal operation is carried out in two separate stages, first on the rear cylinder, then on the front one.

- If the heads are removed with the valves and the camshaft, follow the recommendations.

**N.B.**

**THE PROPER TIMING IS NECESSARY DURING THE FITTING PHASE. THE HEADS MUST BE CORRECTLY REMOVED WITH THE PISTONS AT TDC AND THE VALVES CLOSED.**

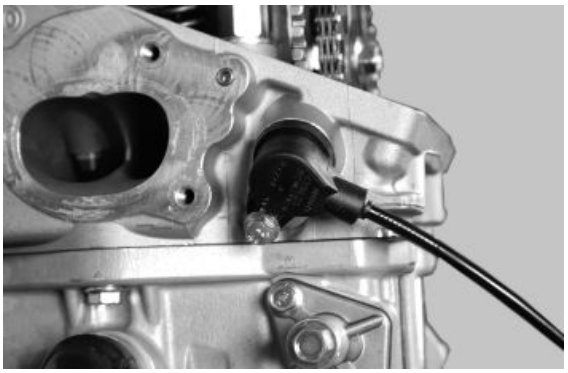
- Remove the rear cylinder head following the indicated operations.

**CAUTION**

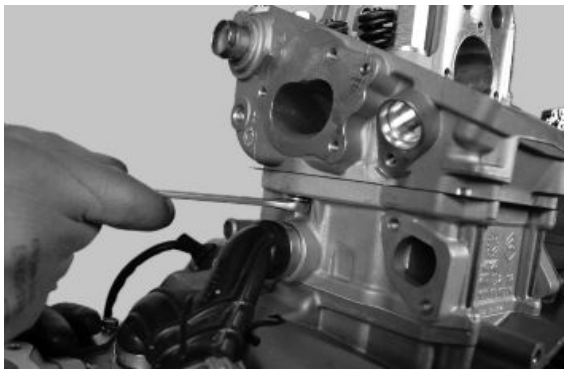
**REMOVE THE HEADS AFTER PERFORMING THE TIMING OPERATION.**

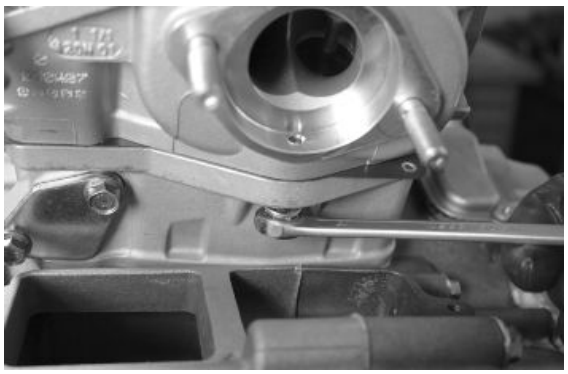
- Perform timing of the front cylinder (rotate the crankshaft by 270° towards the engine direction of rotation), then remove the head following the indicated operations.

- Remove the engine rpm sensor and water temperature sensor, these two components are only fitted on the rear cylinder head.

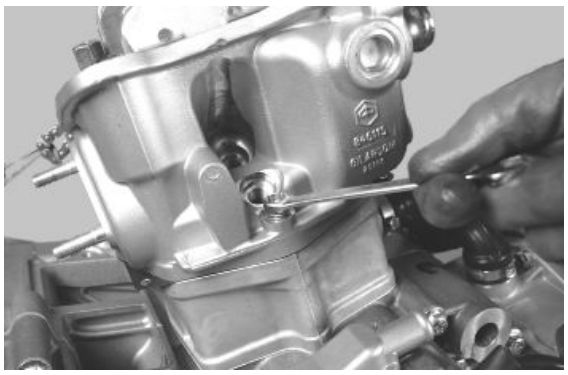


- These operations are described once but apply to both heads.
- Remove the spark plugs.
- Undo the two fixing nuts and collect the washers.





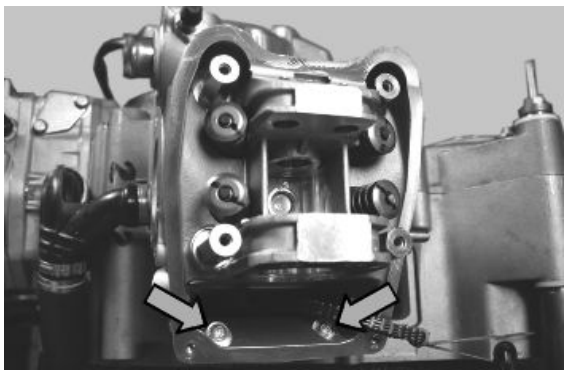
- Undo the spark plug side screw.



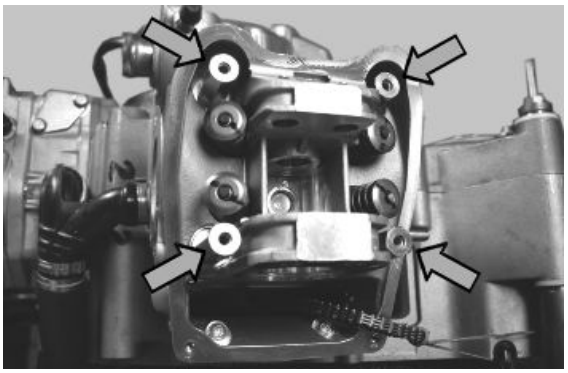
- Undo the two screws inside the timing system side head.

**N.B.**

**THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, ROCKING LEVER PINS AND FITTING BRACKET IF NECESSARY.**



- Loosen the 4 head-cylinder fixing nuts in two or three stages and in a criss-crossed sequence.
- Remove the head, the two centring dowels, the gasket and the lower chain guide slider



## Removing the valves

- Using the appropriate tool fitted with an adaptor, remove the cotters, caps, springs and valves.

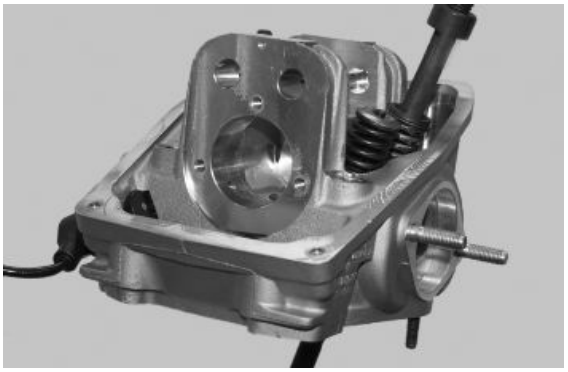
### Specific tooling

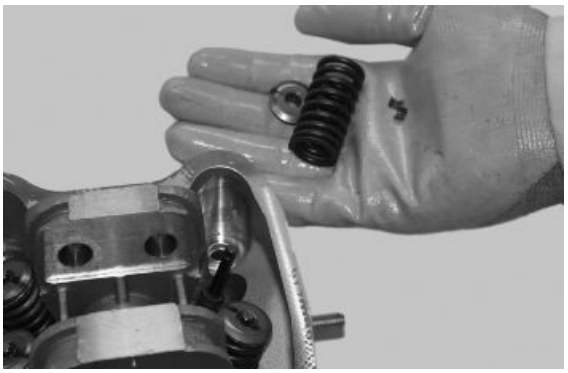
**020382Y Valve cotters equipped with part 012 removal tool**

**020382Y012 bush (valve removing tool)**

**CAUTION**

**ARRANGE THE VALVES SO AS TO RECOGNISE THE ORIGINAL POSITION ON THE HEAD (FLYWHEEL SIDE AND TRANSMISSION SIDE).**

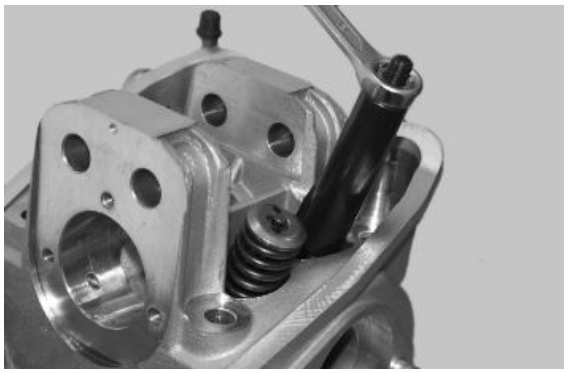


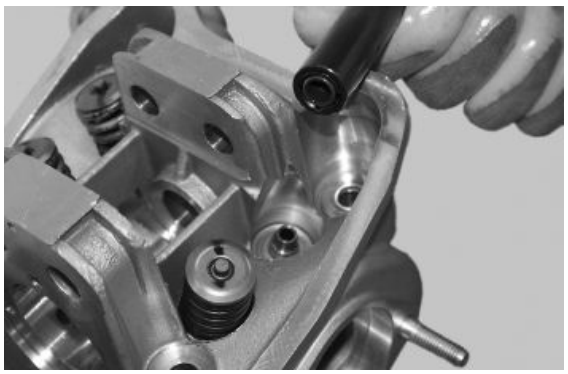


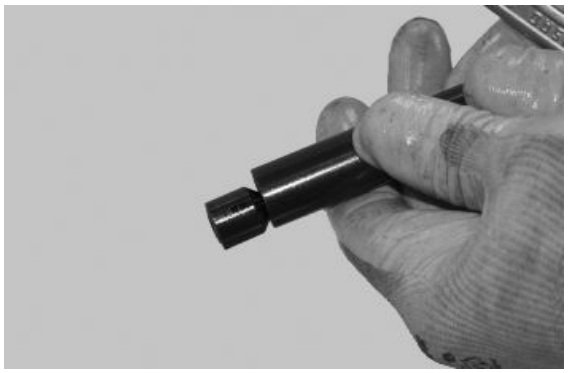
- Remove the oil guards using the special tool.

**Specific tooling**

**020431Y Valve oil seal extractor**



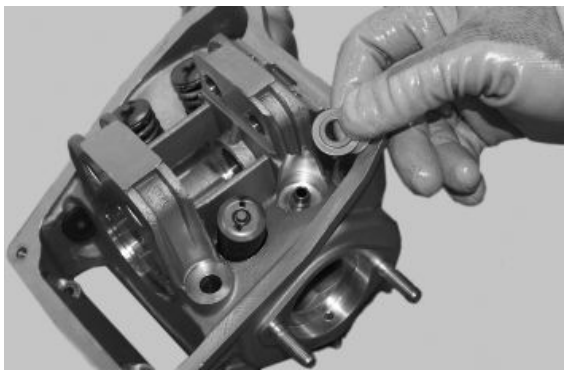




- Remove the spring supports.

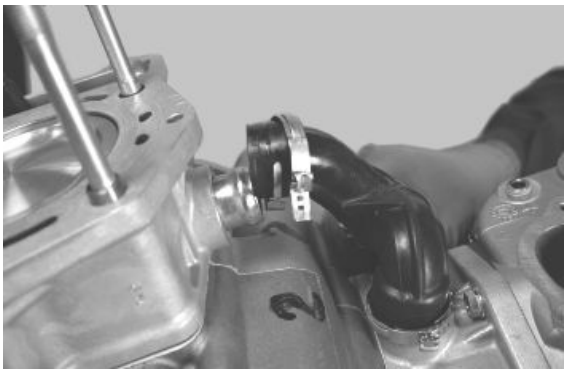
**N.B.**

**BLOW THE SEATS WITH COMPRESSED AIR TO FACILITATE THE SPRING SUPPORT REMOVAL.**



## Removing the cylinder - piston assy.

- Remove the coolant inlet pipes.
- The described operations refer to one cylinder but apply to both.



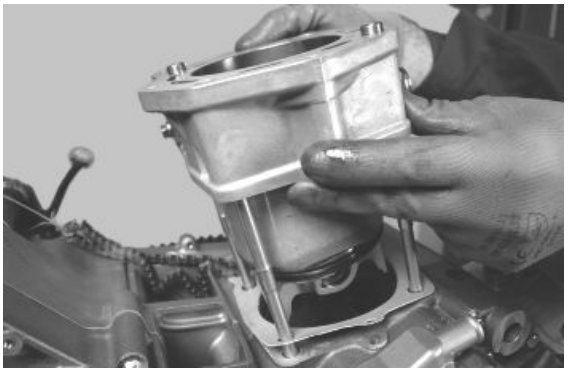
- Extract the cylinder with the relevant gasket and the centring dowel.

**N.B.**

**THE SECOND CENTRING IS ENSURED BY A DOWEL SET INTO THE CYLINDER.**

**CAUTION**

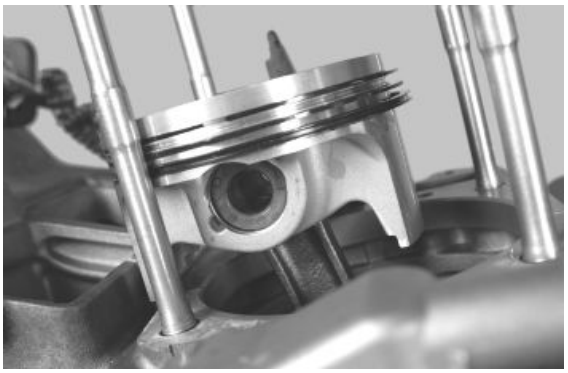
**TO PREVENT DAMAGES TO THE PISTON, SUPPORT IT WHILE REMOVING THE CYLINDER.**



- Remove the 2 piston pin locking rings by the specific housings.
- Extract the pin and remove the piston.

**N.B.**

**USE PAPER OR A CLOTH TO CLOSE THE CYLINDER HOUSING MOUTH ON THE CRANKCASE TO PREVENT SLIPPAGE OF ONE OF THE PIN LOCKING RINGS INTO THE CASE.**



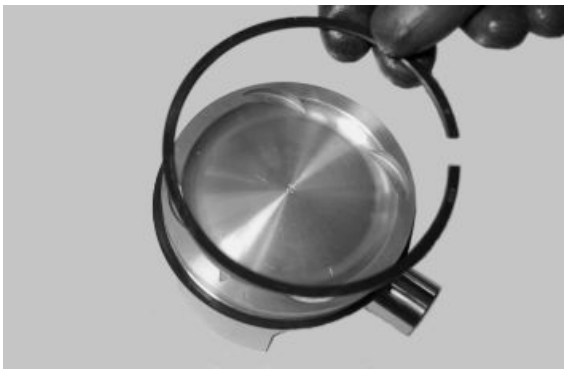
- Remove the piston sealing rings and the oil scraper.

**CAUTION**

**NOTE THE ASSEMBLY POSITIONS OF THE LININGS TO PREVENT INVERTING THE POSITION IN CASE OF REUSE.**

**N.B.**

**BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.**



## Inspecting the small end

**N.B.**

**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

**See also**

Crankcase - crankshaft - connecting rod

## Inspecting the wrist pin

**N.B.**

**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

**See also**

Cylinder - piston assy.

## Inspecting the piston

**N.B.**

**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

**See also**

Cylinder - piston assy.

## Inspecting the piston rings

**N.B.**

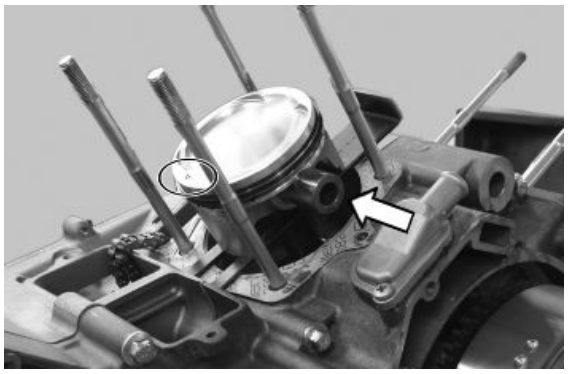
**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

**See also**

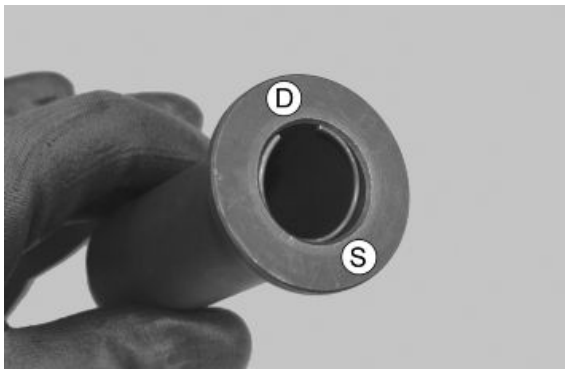
Piston rings

## Removing the piston

- Fit the piston and pin onto the connecting rod, aligning the piston arrow towards the engine direction of rotation.



- Insert the locking ring into the special tool, with the opening in the position indicated on the tool.
S = left
D= right

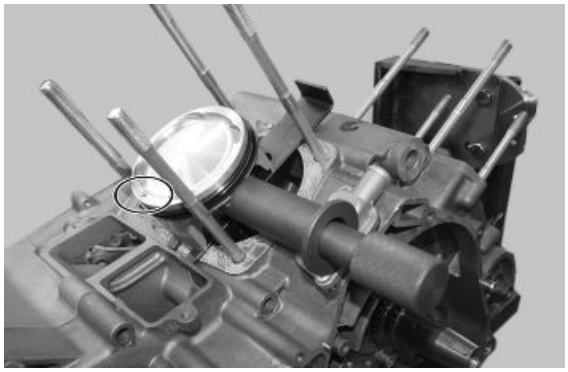



- Place the wrist pin stop ring into position using a punch

- Install the pin lock using the key shown in the figure.

**Specific tooling**

**020470Y Pin retainers installation tool**



**N.B.**

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

**CAUTION**

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

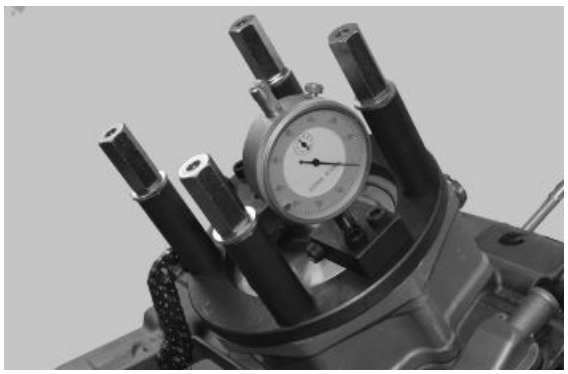
## Choosing the gasket

- Provisionally fit the piston into the cylinder, without any base gasket.
- Install a comparator on the special tool using the short union, as shown in the figure.

**Specific tooling**

**020475Y Piston position checking tool**

- Using an abutment plane, reset the comparator with a preload of a few millimetres.
- Finally fix the comparator.
- Check the perfect sliding of the feeler pin.
- Install the tool on the cylinder without changing the comparator position.
- Lock the tool using the original head fixing nuts.
- Rotate the crankshaft until TDC (the inverted point of the dial gauge rotation)
- Measure the deviation from the reset value.



- By means of the table, see the Specifications chapter identify the cylinder base gasket thickness to be used for refitting. Correctly identify the cylinder base gasket thickness to keep the correct compression ratio.
- Remove the special tool and the cylinder.

**N.B.**

**IF DEVIATIONS (OR RECESSES OR PROJECTIONS) CLOSE TO THE CHANGE OF CATEGORY ARE MEASURED, REPEAT THE MEASUREMENT AT THE OPPOSED SIDE. TO DO SO, REPEAT THE TOOL INSTALLATION BY INVERTING ITS POSITION.**

### See also

Slot packing system

## Refitting the piston rings

- Place the scraper ring spring on the piston.
- Install the scraper ring keeping the opening opposed to the spring junction and with the writing "top" facing the piston top. The chamfered side of the oil scraper ring should always be facing the piston crown.
- Fit the second lining with the identification letter or the writing "top" facing the piston crown. In any case, the step must be facing opposite the piston top.

- Install the first compression lining in the direction imposed by the housing.
- It is advisable to use a fitter to facilitate the installation of the linings.

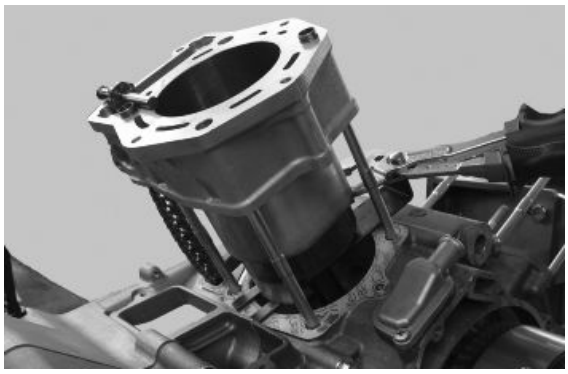
**N.B.**

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

- Misalign the lining openings at 120° as shown in the figure.
- Lubricate the components with engine oil.
- The engine uses the first compression lining with an L section.

## Refitting the cylinder

- Insert the cylinder base gasket with the thickness determined above.
- Using the fork and the ring clamp, fit the cylinder as shown in the figure.



**N.B.**

**BEFORE FITTING THE CYLINDER, CAREFULLY BLOW THE LUBRICATION DUCT AND LUBRICATE THE CYLINDER LINER. CHECK THE PRESENCE OF THE TWO REFERENCE DOWELS.**

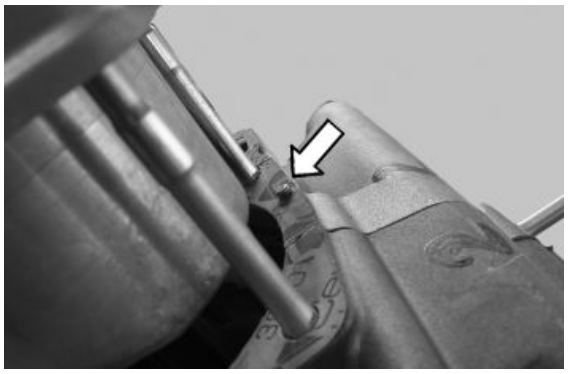
### Specific tooling

**020468Y Piston fitting ring**

**020512Y Piston fitting fork**

- Remove the specific tool.

- Make sure that the centring dowel is properly fitted and insert the cylinder until it stops.



## Inspecting the cylinder head

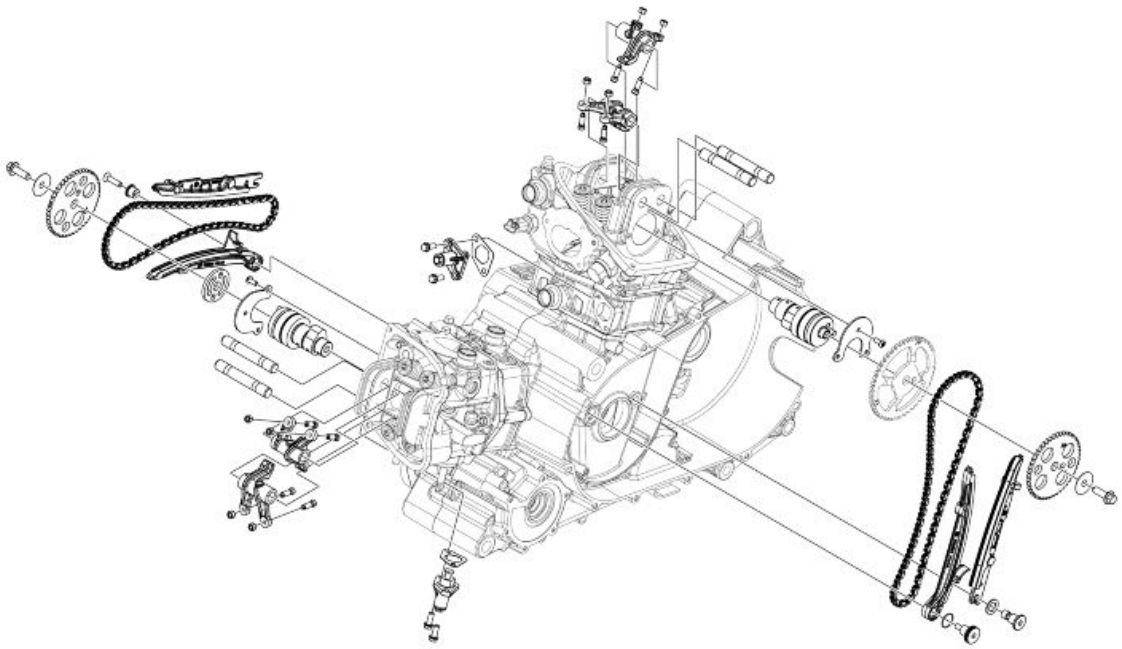
**N.B.**

**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

### See also

Cylinder Head

## Inspecting the timing system components



- Check that the guide shoe and the tensioner shoe are not worn out.
- Check that the crankshaft pinion and the camshaft timing gear and crankshaft pinion exhibit no wear.

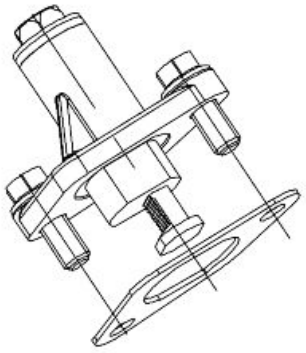
In case of wear of the sliding blocks, replace them. In case of wear of the chain or rim, replace the entire unit.

**N.B.**

**IF THE CHAIN HAS DAMAGED THE PINION, REPLACE THE CRANKSHAFT AS DESCRIBED IN CHAPTER CRANKCASE AND CRANKSHAFT.**

**Chain tensioner:**

- 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.



## Inspecting the valve sealings

**N.B.**

**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

**See also**

Cylinder Head

## Inspecting the valves

**N.B.**

**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

### See also

Cylinder Head

## Inspecting the valve stem guide clearance

**N.B.**

**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

### See also

Cylinder Head

## Inspecting the springs and half-cones

- Check that the upper and lower supporting spring washers, the cotters and the oil seal show exhibit no signs of abnormal wear. Replace a component when worn.

- Measure the unloaded spring length.

**N.B.**

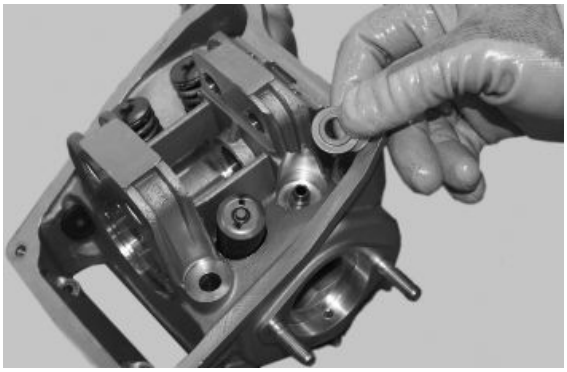
**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

### See also

Cylinder Head

## Refitting the valves

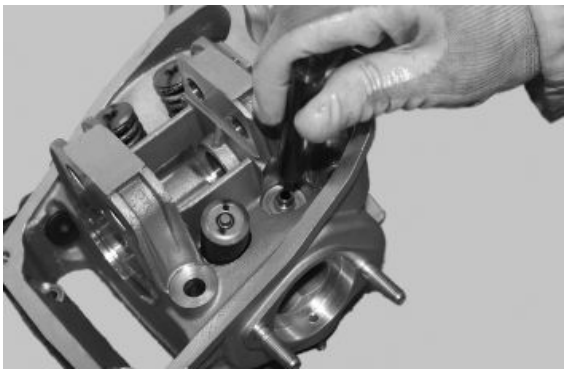
- Place the valve spring support washers on the head.



- Fit the four oil seals alternately with the specific tool.

### Specific tooling

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



- Lubricate the oil guards and the valve guides.

- Fit the valves, the springs and the caps.

- With the specific tool equipped with the appropriate adaptor, compress the springs and fit the cotters in their seats.

### Specific tooling

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

**020382Y012 bush (valve removing tool)**

**N.B.**

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

## Inspecting the cam shaft

**N.B.**

**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

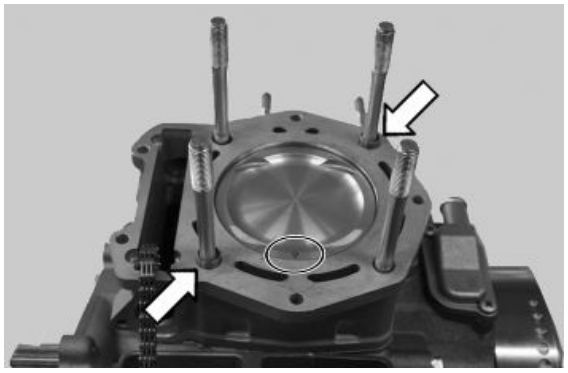
### See also

Cylinder Head

## Refitting the head and timing system components

- Heads are fitted in two separate stages.
- Fit the rear cylinder head and then the front cylinder head, following the indications described.

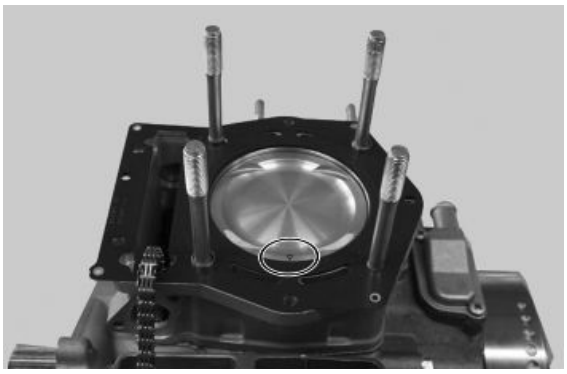
- Insert the chain guide sliding block.
- Insert the two centring dowels between head and cylinder.



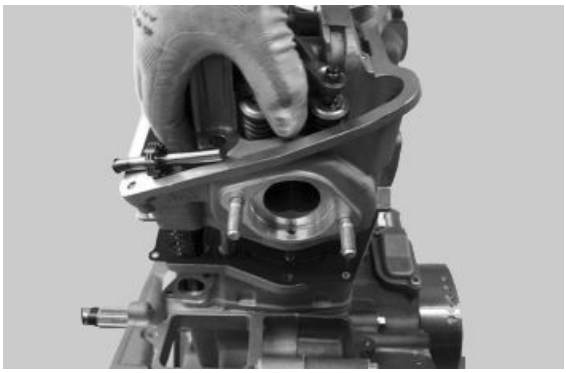
**N.B.**

**THE FIGURE SHOWS THE INSERTION POSITION OF THE TWO CENTRING DOWELS BETWEEN HEAD AND CYLINDER. THE DIRECTION OF INSTALLATION FOR THE GASKET IS FORCED BY THE DOWELS.**

- Fit the head gasket.
- The head gasket is made of steel and has a standard thickness.



- Check that the head lubrication channel is perfectly clean. Clean with compressed air jets, if required.
- Insert the head.
- Lubricate the stud bolts and the 4 fixing stud bolts.

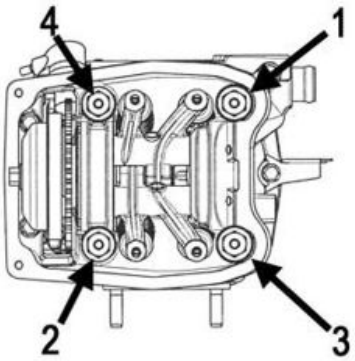


- Tighten the 4 fixing stud bolts crosswise to the prescribed torque as shown in the figure.

## Locking torques (N*m)

**Head fixing stud bolts: *****

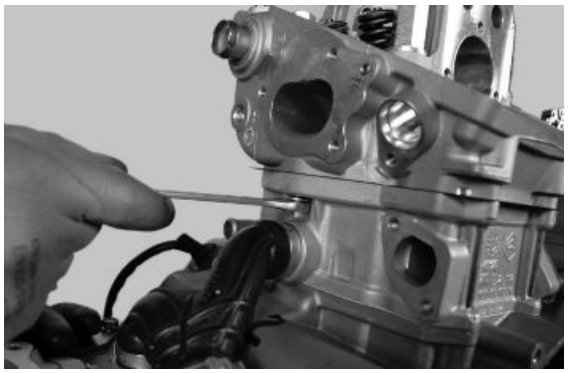
******* Apply a preliminary torque of 10 Nm in a crossed sequence.
- tighten with a torque of 13 N·m + 90° in a crossed sequence.
- tighten again by 90° in a crossed sequence.

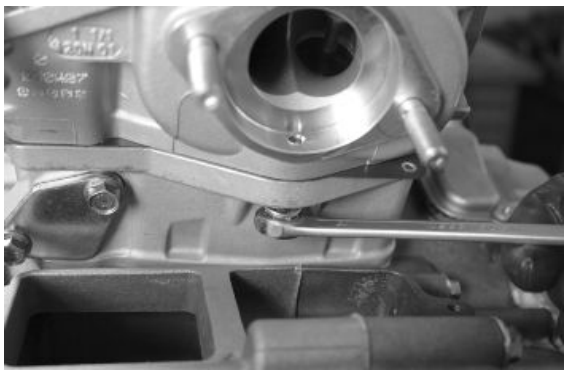


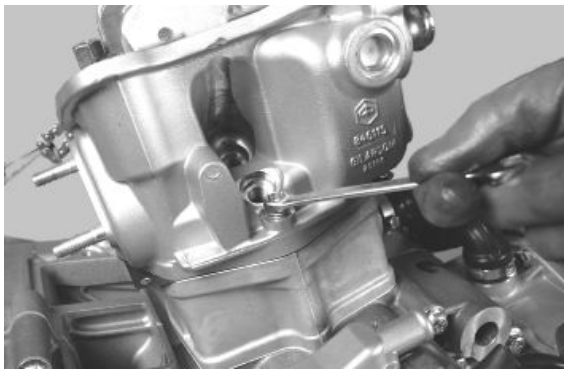
- Tighten the fastening nuts on the exhaust and on the intake side to the prescribed torque.

**Locking torques (N*m)**

**Exhaust / intake head fixing nuts: 10 - 12**



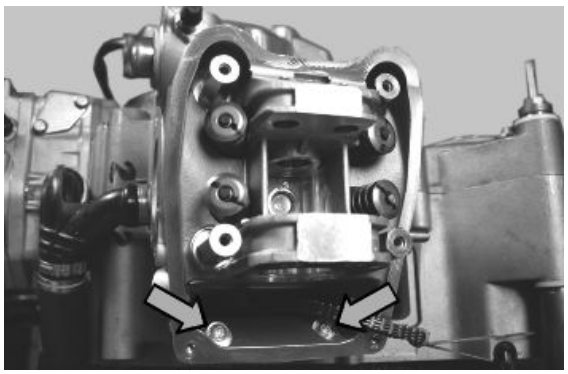




Undo the two screws inside the timing system side head to the prescribed torque.

**Locking torques (N*m)**

**Exhaust / intake head fixing nuts: 10 - 12**



- Install the coolant temperature sensor with the washer and tighten to the prescribed torque.

**CAUTION**

**FAILURE TO OBSERVE THE TIGHTENING TORQUE CAN DAMAGE THE SENSOR.**

### Locking torques (N*m)

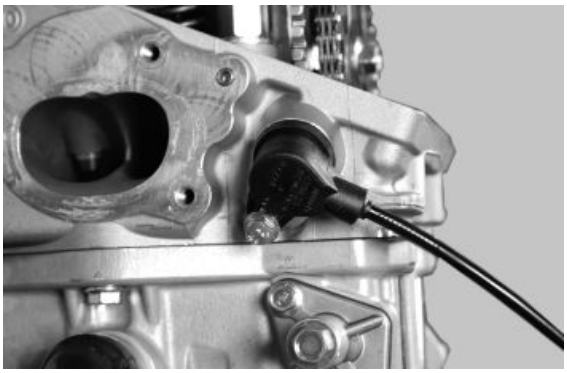
**Coolant temperature sensor 21 ÷ 23**

- Fit the spark plugs and tighten them to the prescribed torque.

### Locking torques (N*m)

**Spark plug 12 ÷ 14**

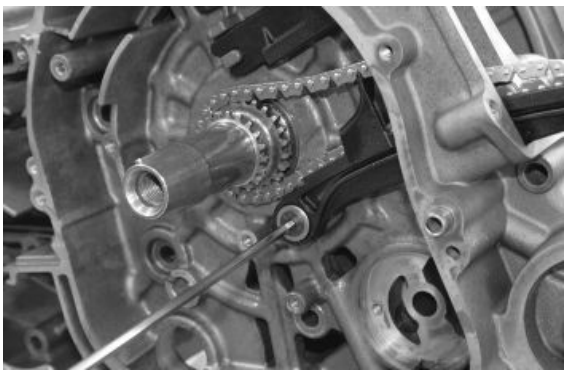
- Fit the rpm timing sensor and tighten to the prescribed timing.



### Locking torques (N*m)

**Rpm timing sensor screw 7.5 ÷ 8.5 Nm**

- Insert the timing control belt on the crankshaft according to the initial direction of rotation.
- Install the tensioner shoe with its spacer, tightening the bolt to the prescribed torque, using the recommended product.



### Recommended products

**Loctite 243 Medium strength threadlock**

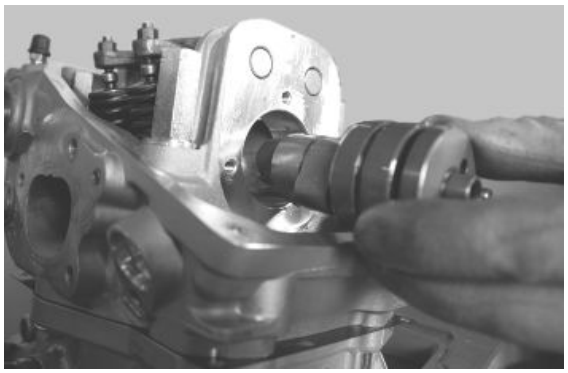
Loctite 243 medium-strength threadlock

### Locking torques (N*m)

**Tensioner sliding block fixing screw: 10 - 14**

- Fit the pins and the rocking levers operating on the transmission side.
- Lubricate the two rocking levers through the holes at the top.

- Clean the camshaft by blowing with little compressed air jets, especially the retaining plate housing.
- Lubricate the 2 shafts.
- Insert the camshaft into the head with the cams opposite the rocking levers.



- Remove any LOCTITE residues from the screws fixing the camshaft retaining bracket using a brush.
- Apply the recommended product to the fixing screws and tighten to the prescribed torque.

### Recommended products

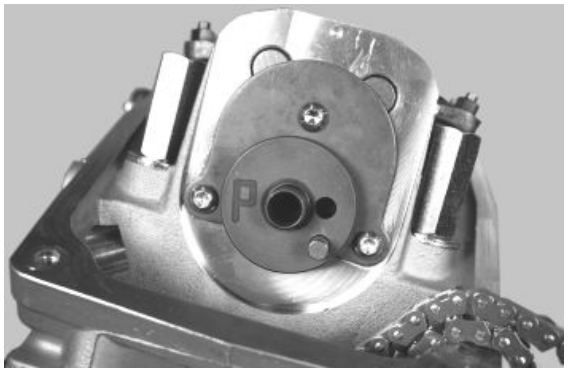
**Loctite 243 Medium strength threadlock**

Loctite 243 medium-strength threadlock

- Insert the camshaft retain bracket with visible countersinks and tighten the 3 fastening screws to the prescribed torque, being careful not to damage the inside hexagon.

### Locking torques (N*m)

**Camshaft retaining bracket screws: 4 ÷ 6**

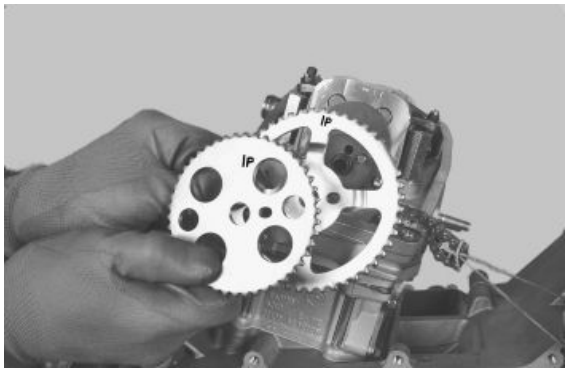


- Finish closing the flywheel side crankcase with the components following the instructions described in the specific sections.

- Using the TORX wrench, remove the timing check cap.

- With the references aligned, operate on the driving pulley to turn the crankshaft until, the rear cylinder timing reference mark «**1**» on the flywheel is aligned to the crankcase reference mark.

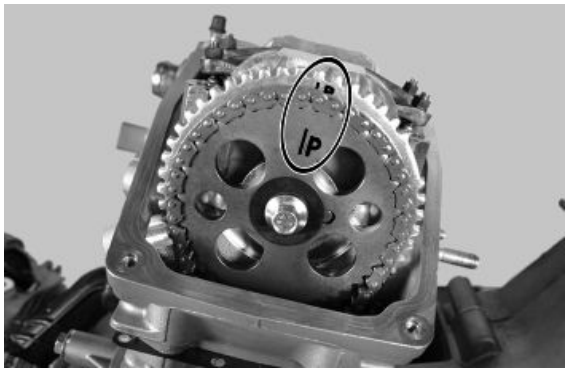
- Fit the tone wheel, the timing system gear with the chain and align the reference marks.




- Once the reference marks are aligned as indicated with the reference marks on the valve cam cap, tighten the screw with the washer to the prescribed torque.

**Locking torques (N*m)**

**Timing system gear on camshaft screw 12 ÷ 14**

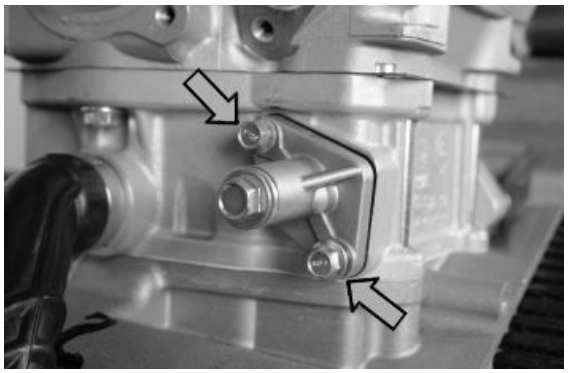



- Place the tightener cursor in the rest position, keeping the retain tab pressed.

- Insert the chain tensioner in the cylinder together with the gasket and tighten the screws to the prescribed torque.

**Locking torques (N*m)**

**timing chain tensioner screws 11 ÷ 13**



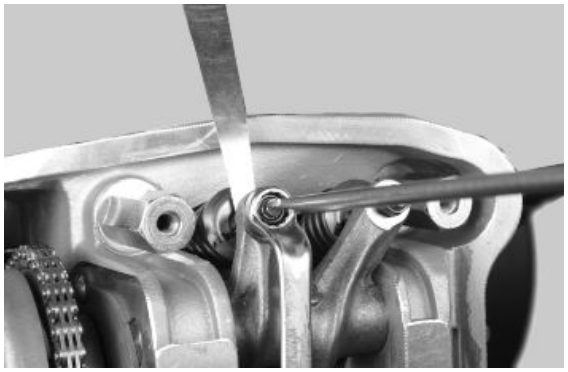
- Check and restore the correct clearance of the valves if necessary.

**Characteristic**

**Valve clearance**

Inlet: 0.15 mm

Outlet: 0.15 mm



- Turn the crankshaft , acting on the driving pulley by 270° so as to align the front cylinder timing reference mark **«2»** on the flywheel with the crankcase reference mark.


- Repeat the fitting operations of the rear cylinder for the front cylinder timing head and components.

## Refitting the timing chain

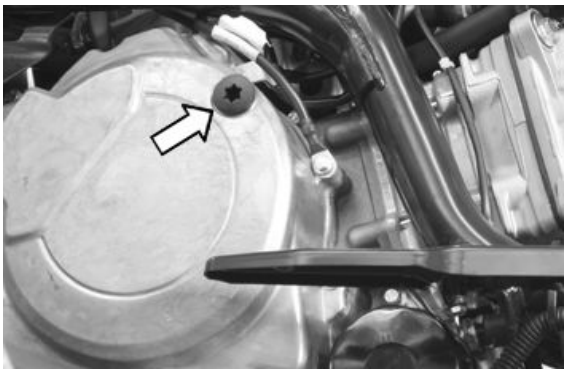
The ignition advance is determined electronically on the basis of parameters known by the control unit.
For this reason it is not possible to declare the reference values based on the engine rpm.
The ignition timing value is detectable any time using the diagnostic tester.
It is possible to check whether the ignition advance determined by the system does in fact correspond with the value actually activated on the engine, by means of the stroboscopic light.

### Specific tooling

**020460Y Scooter diagnosis and tester**

**020330Y Stroboscopic light for timing control**

- Unscrew the TDC reference inspection cap.
- Connect the stroboscopic light.



- Connect the diagnostic tester.
- Start the engine.
- Select the «parameter» function in this menu.
- Select the stroboscopic light command in the traditional four-stroke engine position (1 spark 2 revs).
- Check that the real values of rpm and ignition advance match those measured using the diagnostic tester.
- Replace the inspection cap on the flywheel side.

### Specific tooling

**020460Y Scooter diagnosis and tester**

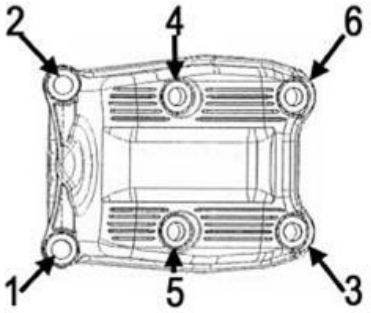
**If the values do not match, check:**

- distribution timing
- revolution-timing sensor
- Injection control unit

## Refitting the rocker-arms cover

- Check that the gasket is in good working order.

- Tighten the two screws indicated in the figure with "**1**" and "**2**" to limit the reciprocal sliding of the cover surface with the head surface.
- Tighten the remaining 4 screws in a crossed sequence (**3**, **4**, **5**, **6**).




**N.B.**

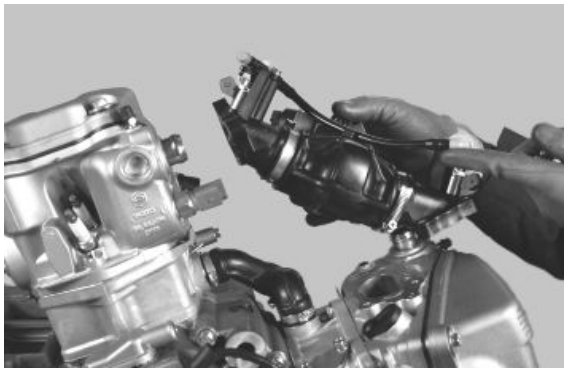
**CHECK THE PROPER POSITION OF THE GASKET.**

### Locking torques (N*m)

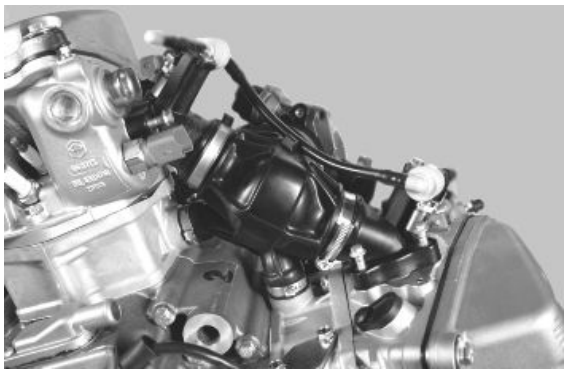
**Tappet cover fixing screws: 7 - 9**

## Refitting the intake manifold

- Fit the intake manifold on the engine.



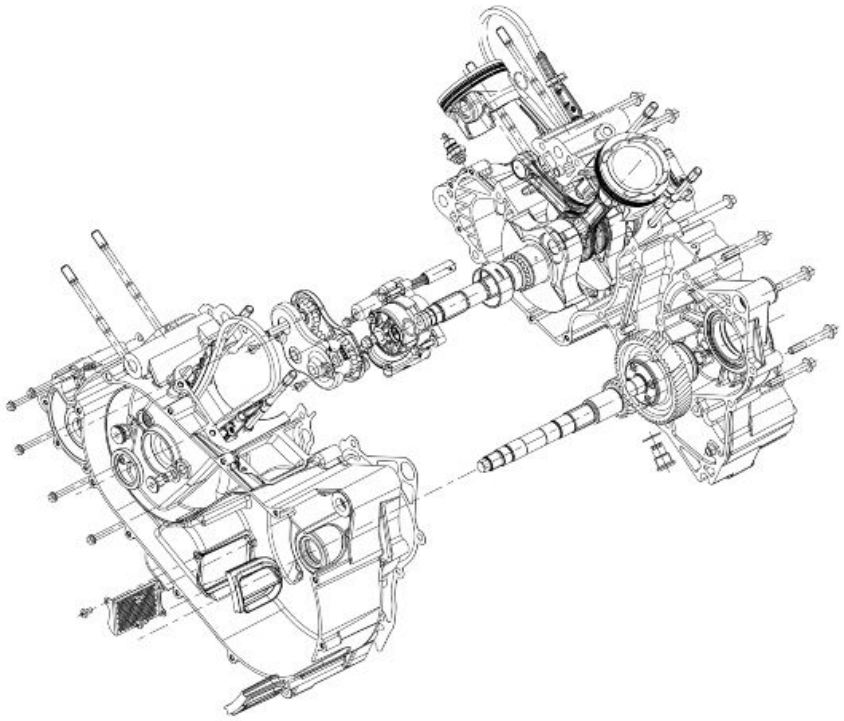
- Fit the six fixing screws and tighten to the prescribed torque.



### Locking torques (N*m)

**inlet manifold fixing screws 11 - 13**

## Crankcase - crankshaft



- Remove the transmission cover, the driving and the driven pulleys, as described in the «Automatic transmission» chapter.

- Remove the flywheel cover as described in the «Flywheel cover» chapter.

- Remove the flywheel with the starting system following the instruction given in "Flywheel and Starting system".

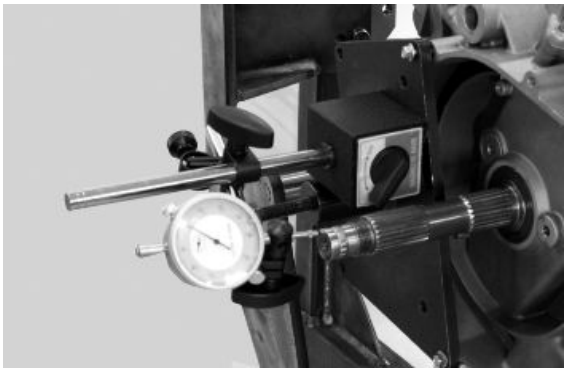
- Remove the thermal parts (cylinders, heads, pistons) as described in the «Thermal group and Timing system» chapter.

- Before opening the crankcase, check the crankshaft axial clearance.

### Specific tooling

**020262Y Crankcase splitting strip**

**020335Y Magnetic support for dial gauge**



### Characteristic

**Standard clearance:**

0.10 - 0.50 mm

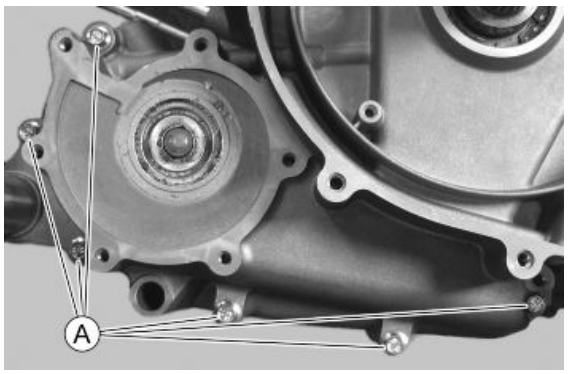
**Admissible increase limit after use:**

0.60 mm

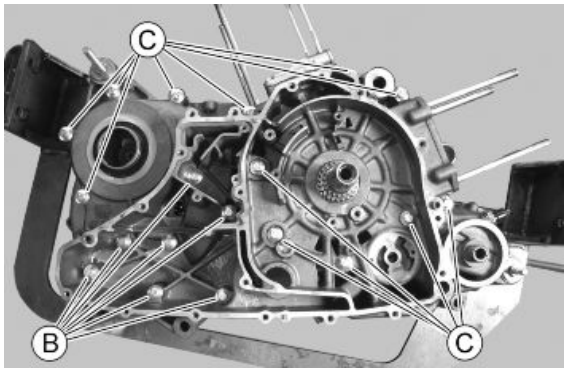
- Upper clearances are an indication of wear on the surfaces of the crankshaft casing support.
- To carry out an accurate measurement, measure the clearance in both directions between crankcase and crankshaft.

## Splitting the crankcase halves

- Working from the transmission side, undo the six screws «**A**» and collect the washers.




- Turn the support so as to operate on the flywheel side.
- Undo the three nuts fixing it to the support, collect the washers and remove the three centring bushings.
- Undo the seven screws «**B**» and collect the copper washers.
- Undo the twelve screws «**C**» and collect the washers.



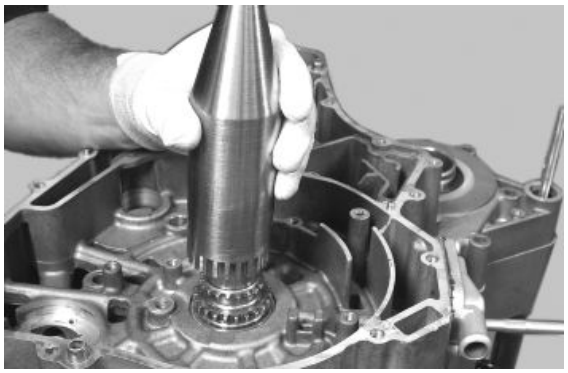

- Fit the specific tool on the flywheel-side crankshaft, being particularly careful that the tool matches the shaft perfectly.

**CAUTION**

**FAILURE TO OBSERVE THIS RULE CAN DAMAGE THE MAIN BUSHINGS.**

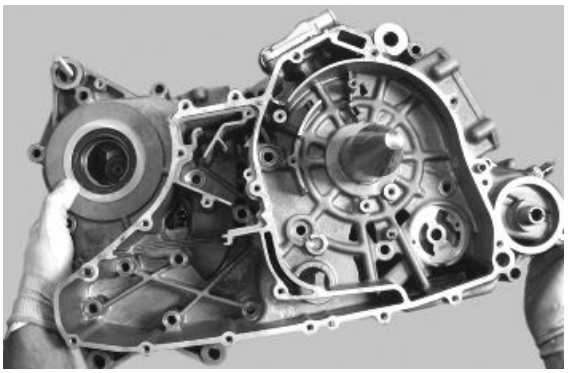
### Specific tooling

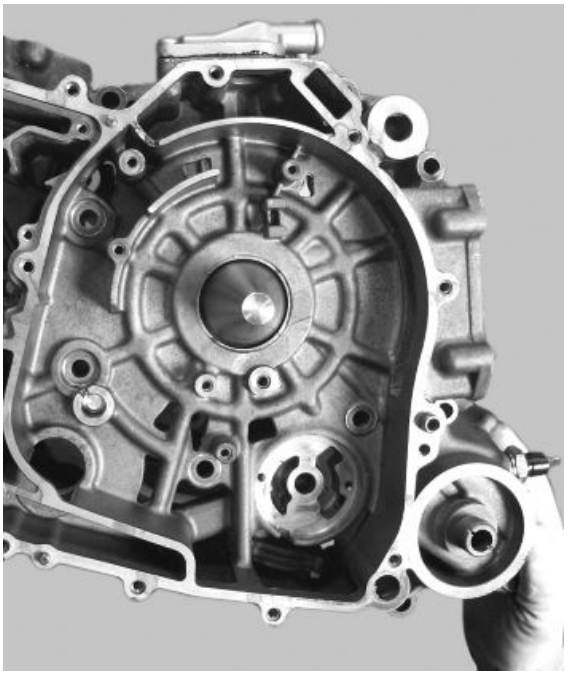
**020664Y Flywheel side crankshaft fitting tip**

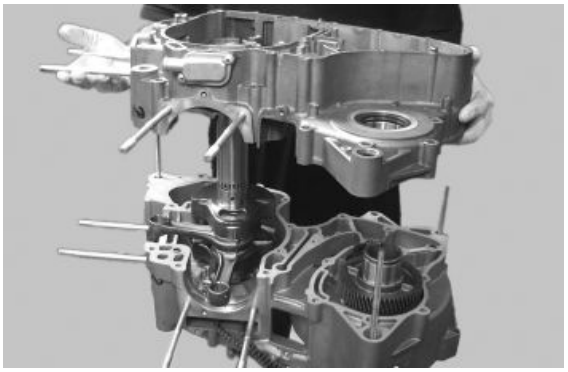


- Lubricate the external surface of the tip with petroleum jelly grease.

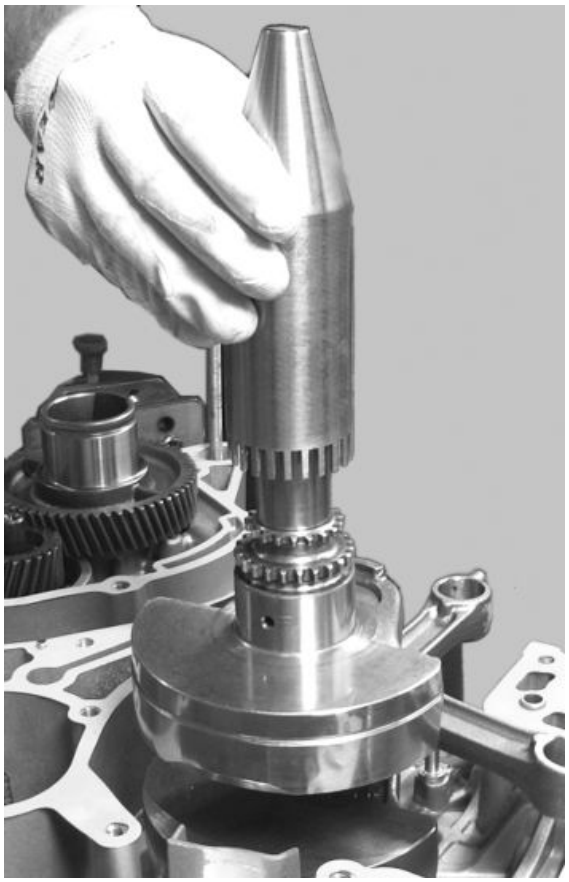
- Detach the crankcase halves while keeping the crankshaft inserted on the transmission-side crankcase half.
- Remove the coupling gasket.







- Remove the tip.



### Specific tooling

**020664Y Flywheel side crankshaft fitting tip**

- Fit the specific tool on the transmission-side crankshaft, being particularly careful that the tool matches the shaft perfectly.

**CAUTION**

**DUE TO THE TIP WEIGHT, BE CAREFUL THAT THE TOOL FIT ADEQUATELY AND DOES NOT FALL; ALWAYS HOLD IT WITH BOTH HANDS.**

**CAUTION**

**FAILURE TO OBSERVE THIS RULE CAN DAMAGE THE MAIN BUSHINGS.**

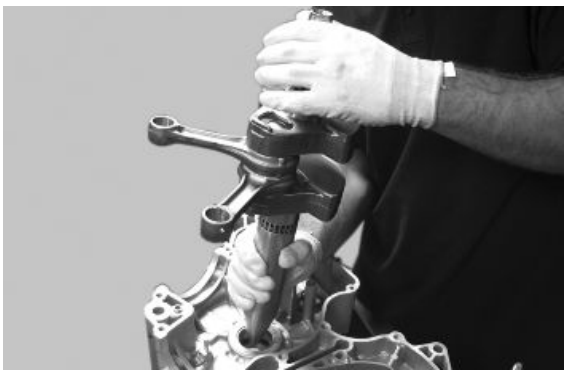
### Specific tooling

**020665Y Transmission side crankshaft fitting tip**

- Lubricate the external surface of the tip with petroleum jelly grease.

- Hold the tip with one hand and the crankshaft with the other, pull the crankshaft upwards.

- Remove the crankshaft once the tip has been removed from the bushings.



- Once the crankshaft has been removed it is possible to remove the transmission-side timing chain.

## Inspecting the crankshaft components

**N.B.**

**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

### See also

Crankcase - crankshaft - connecting rod

## Inspecting the crankshaft alignment

**N.B.**

**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

### See also

Crankcase - crankshaft - connecting rod

## Inspecting the crankcase halves

- Before proceeding to check the crankcase halves, thoroughly clean all surfaces and oil ducts.

- Clean the jets and contacts carefully.

**N.B.**

**THE JET IS FED THROUGH THE MAIN BUSHINGS. PROPER OPERATION OF THIS COMPONENT IMPROVES PISTON CROWN COOLING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAKS CAN CAUSE A CONSIDERABLE DROP IN THE LUBRICATION PRESSURE FOR MAIN BUSHINGS AND CONNECTING ROD .**

**N.B.**

**AS ALREADY DESCRIBED IN THE LUBRICATION CHAPTER, IT IS ESPECIALLY IMPORTANT THAT THE BY-PASS HOUSING SHOWS NO WEAR THAT MAY IMPAIR THE PROPER SEALING OF THE LUBRICATION PRESSURE ADJUSTMENT PISTON. THE HEAD LUBRICATION CHANNEL IS EQUIPPED WITH A SHUTTER JET; THIS GIVES A "LOW PRESSURE" HEAD LUBRICATION. THIS CHOICE WAS MADE TO REDUCE THE OIL TEMPERATURE IN THE SUMP.**

Jet clogging impairs the head lubrication and the timing mechanisms.

A jet failure causes a decrease in the main bearing and connecting rod lubrication pressure.

- Check that the surfaces exhibit no dents or deformations, with special attention to the crankcase coupling and the crankcase-cylinder surfaces.

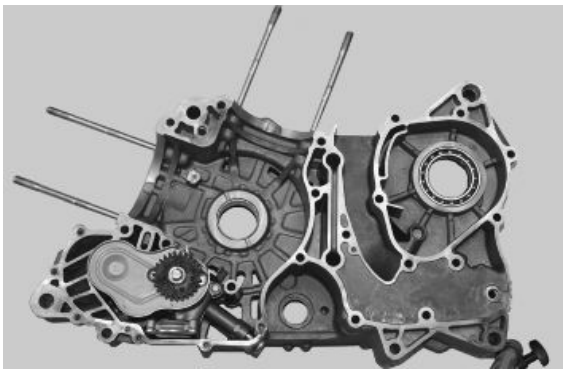
- Defects in the crankcase coupling surface gasket can cause a drop in the oil pressure, thus affecting the lubricating pressure.

- Check the main bearing seats that limit axial clearance in the crankshaft exhibit no wear. For the dimensional check, refer to the instructions about checking the axial clearance and the dimensions on the crankshaft

## Inspecting the crankshaft plain bearings

- To obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure (4 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.

**N.B.**

**TO KEEP THE BUSHINGS ON THE CRANKCASE IN SUCH POSITION, DRIVING IS FORCED ON CAST-IRON RINGS INSERTED IN THE CASTING OF BOTH CRANKCASE HALVES.**

**N.B.**

**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

### See also

Crankcase - crankshaft - connecting rod

## Coupling chart

**N.B.**

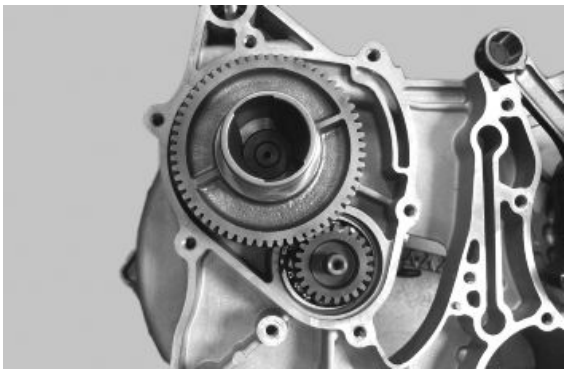
**TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.**

### See also

Crankcase - crankshaft - connecting rod

## Refitting the crankcase halves

- Fit the driven pulley shaft and the pinion unit axis.



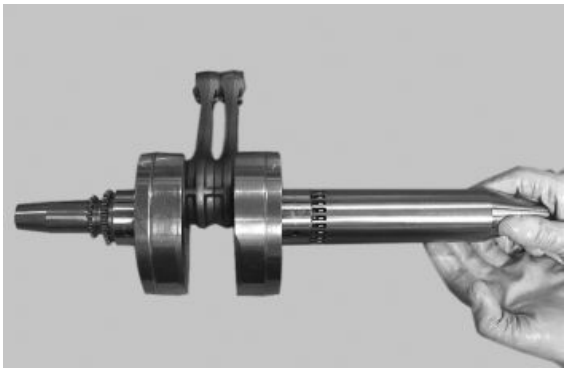
- Fit the specific tool on the transmission-side crankshaft, being particularly careful that the tool matches the shaft perfectly.

**CAUTION**

**FAILURE TO OBSERVE THIS RULE CAN DAMAGE THE MAIN BUSHINGS.**

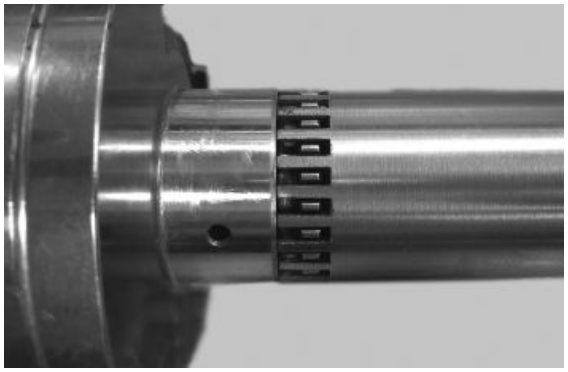
**CAUTION**

**DUE TO THE TIP WEIGHT, BE CAREFUL THAT THE TOOL FIT ADEQUATELY AND DOES NOT FALL; ALWAYS HOLD IT WITH BOTH HANDS.**



### Specific tooling

**020665Y Transmission side crankshaft fitting tip**



- Lubricate the external surface of the tip with petroleum jelly grease.

**N.B.**

**LUBRICATE THE BUSHINGS WITH ENGINE OIL BEFORE FITTING THE CRANKSHAFT.**

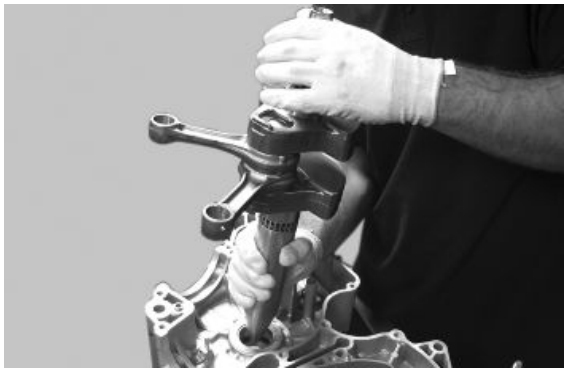
**CAUTION**

**FIT THE TRANSMISSION-SIDE TIMING CHAIN.**
**FIT THE DRIVE CHAIN BEFORE THE CRANKSHAFT.**

- Fit the crankshaft with the driving pulley shaft inside the transmission-side crankcase half.

**CAUTION**

**PLACE THE CONNECTING RODS PROPERLY.**

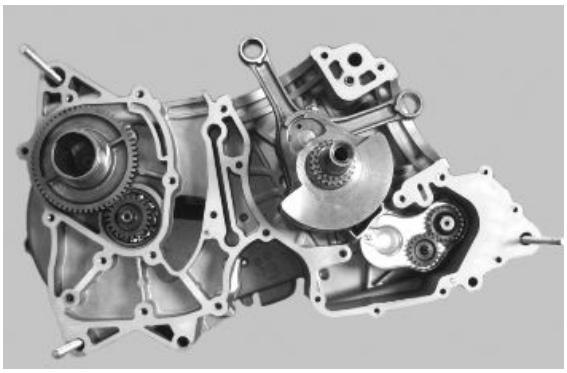


- Simultaneously hold the crankshaft with one hand and the tip with the other until the crankshaft stops on the crankcase half.
- Remove the tip.

### Specific tooling

**020665Y Transmission side crankshaft fitting tip**

- Place the coupling gasket.



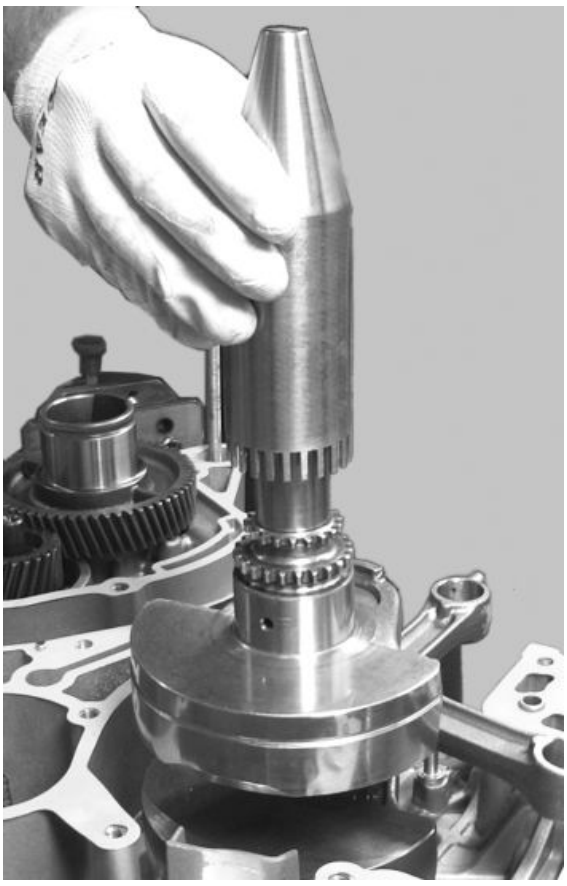
- Fit the specific tool on the flywheel-side crankshaft, being particularly careful that the tool matches the shaft perfectly.

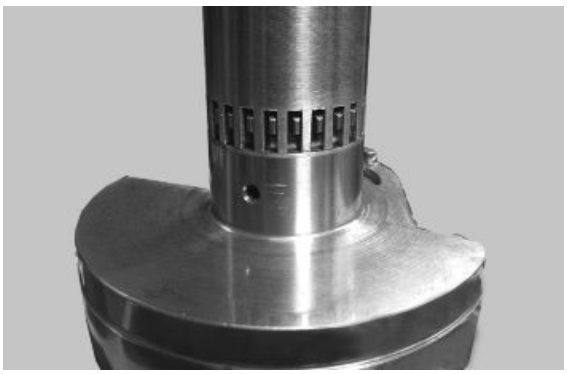
**CAUTION**

**FAILURE TO OBSERVE THIS RULE CAN DAMAGE THE MAIN BUSHINGS.**

### Specific tooling

**020664Y Flywheel side crankshaft fitting tip**



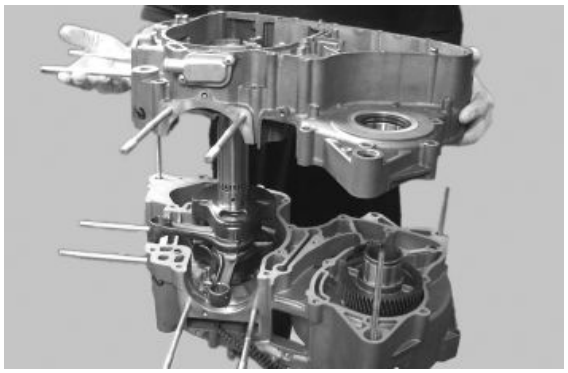


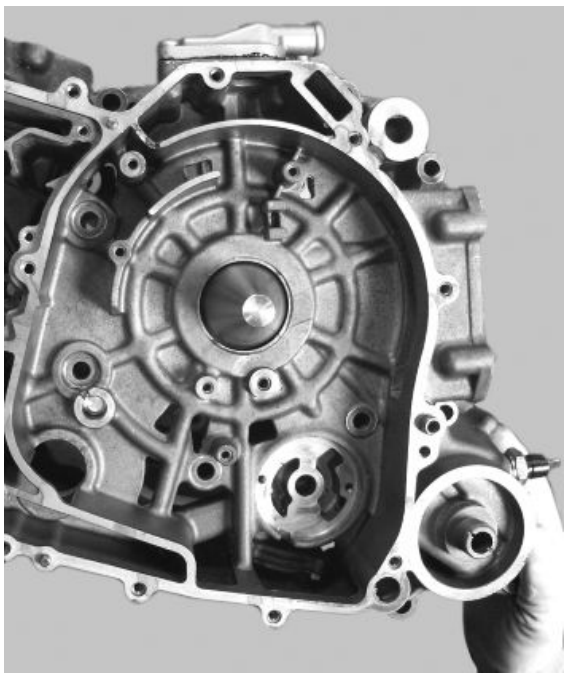
- Lubricate the external surface of the tip with petroleum jelly grease.

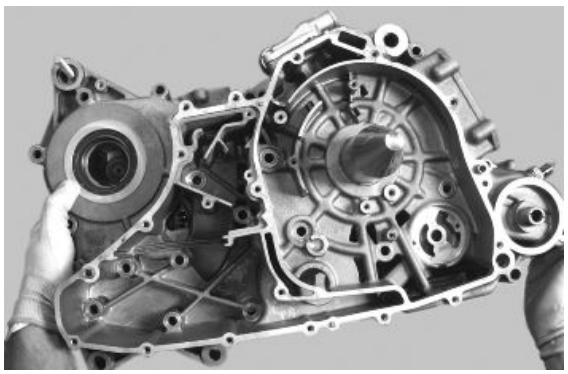
**N.B.**

**LUBRICATE THE BUSHINGS WITH ENGINE OIL BEFORE FITTING THE CRANKSHAFT.**

- Be careful and fit the flywheel-side crankcase half until there is a complete coupling.



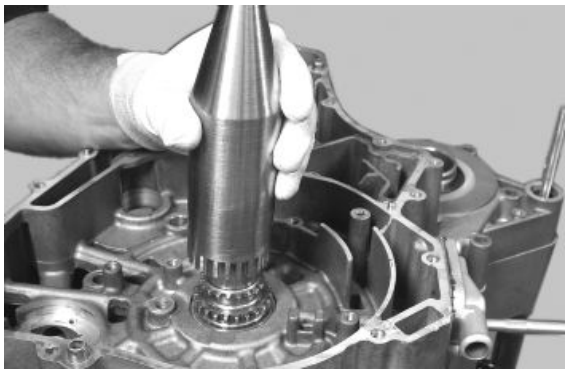




- Remove the tip.

### Specific tooling

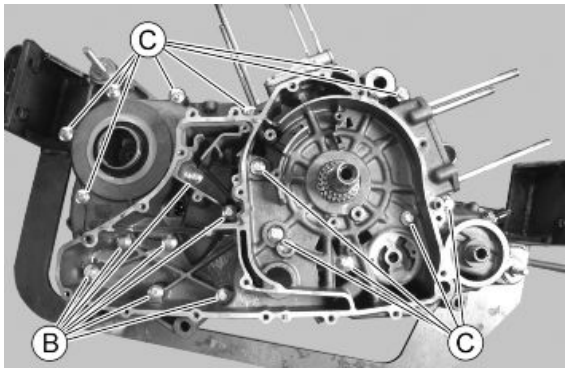
**020664Y Flywheel side crankshaft fitting tip**



- Tighten the seven screws «**B**» with the copper washers as far as they will go.
- Tighten the twelve screws «**C**» with the washers as far as they will go.
- Tighten to the prescribed torques.

### Locking torques (N*m)

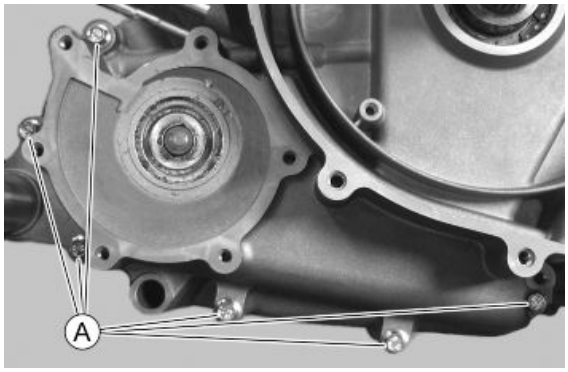
**Engine crankcase coupling screws (M8) 25 ÷ 28**



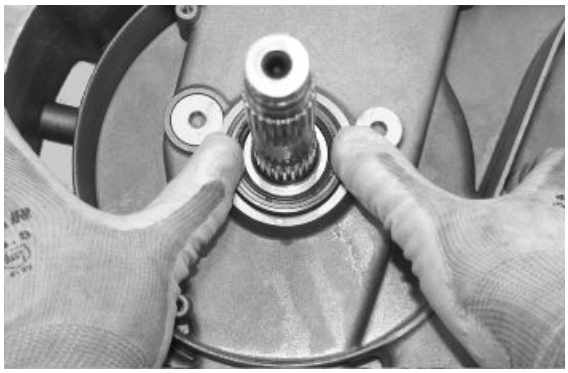

- Fit the centring bushings, the washers and screw the fixing nuts to the support.
- Turn the support so as to operate on the transmission side.
- Screw the six screws «**A**» with the washers and tighten to the prescribed torque.

### Locking torques (N*m)

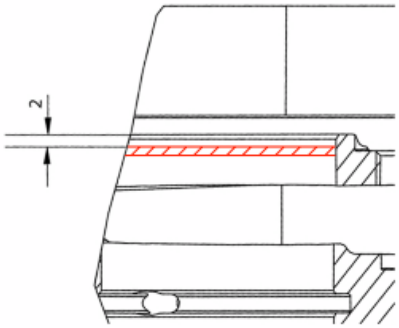
**Engine crankcase coupling screws (M6) 11 ÷ 13**




- Fit a new oil seal in the transmission-side crankcase half on the driving pulley shaft.
- Fit the oil seal manually being careful that the internal lips are correctly placed on the crankshaft.



- With a pipe of the indicated size (inside Ø: 36.5 mm - outside Ø: 49.5 mm) set the oil seal at the indicated distance; with a gauge check the driving depth following the indications described in the figure.




## Lubrication

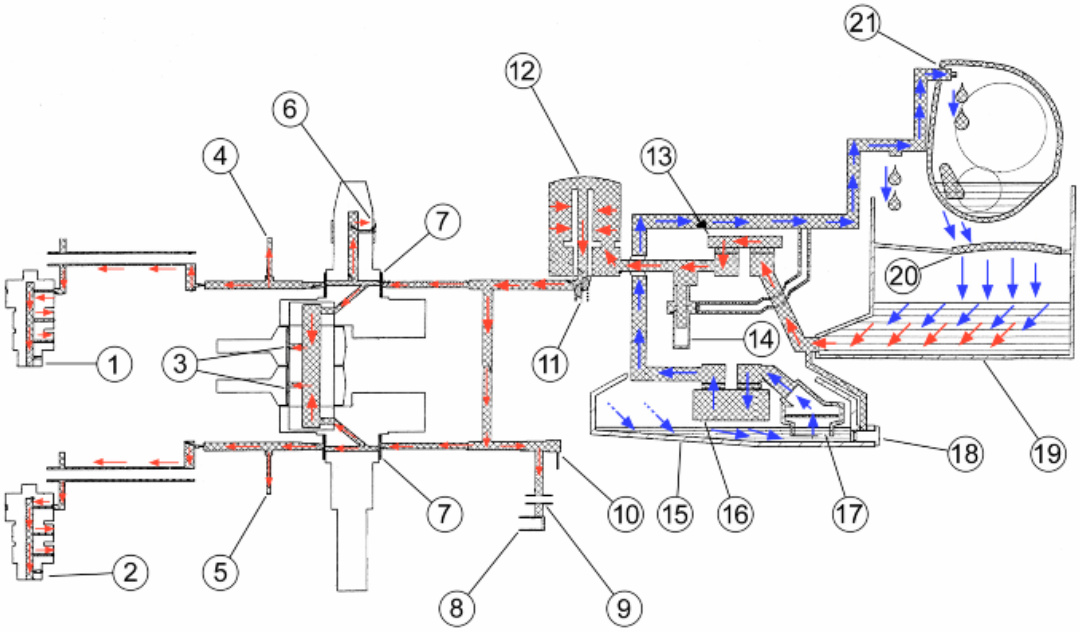
**N.B.**

**REFER TO THE SPECIFICATIONS CHAPTER FOR THE LUBRICATION SYSTEM SPECIFICATIONS, .**

### See also

Engine

## Conceptual diagrams




**LUBRICATION CIRCUIT**

| Specification | Desc./Quantity |
|---|---|
| 1 | FRONT HEAD CAMSHAFTS |
| 2 | REAR HEAD CAMSHAFTS |
| 3 | CONNECTING ROD BUSHINGS |
| 4 | FRONT PISTON LUBRICATION JET |

| Specification | Desc./Quantity |
|---|---|
| 5 | REAR PISTON LUBRICATION JET |
| 6 | STARTING RING GEAR BUSHING LUBRICATION |
| 7 | CRANKSHAFT BUSHINGS |
| 8 | WATER PUMP CONTROL DRIVING GEAR SHAFT LUBRICATION |
| 9 | WATER PUMP SHAFT LUBRICATION |
| 10 | MINIMUM OIL PRESSURE SENSOR |
| 11 | NON-RETURN VALVE |
| 12 | OIL CARTRIDGE FILTER |
| 13 | POMPA MANDATA OLIO |
| 14 | BY-PASS VALVE |
| 15 | POZZETTO OLIO |
| 16 | SCAVENGE OIL PUMP: |
| 17 | SUCTION ROSE |
| 18 | OIL DRAINAGE PLUG |
| 19 | OIL RESERVOIR |
| 20 | OIL RESERVOIR FILTER |
| 21 | OIL PASSAGE FROM HUB TO RESERVOIR |

*The RED arrows indicate the oil pressure circuit.*
*The BLUE arrows indicate the oil scavenge circuit.*

## General characteristics

The lubrication system is divided into two sections:

- **high pressure**
- **low pressure**

The high pressure section includes all components located on the engine crankcase whereas the low pressure section only refers to the thermal group.

The trochoidal pump is fitted into the sump and controlled by the chain.

To guarantee the integrity of the pump, a pre-filter is fitted.

Pump delivery is controlled by means of a piston-type by-pass calibrated to 4.5 bar. This valve is located upline the cartridge filter.

The by-pass located before the cartridge filter improves the operating conditions for the filter, particularly with cold oil.

The filter is equipped with an anti-drain back valve and a pressure relief valve; the latter intervenes when the filtering mass causes a pressure drop above 1 ± 0.2 bar.

These conditions naturally occur only with cold oil and at high engine revs or if the filter is clogged.

The filtered oil is used to lubricate the water pump shaft and the driving gear shaft, to lubricate the main bearings, the connecting rod head and the piston cooling nozzle, on the transmission-side bearing.

The main bearing on the transmission side is fitted with an oil seal and the respective drain line.

The supply line for the timing system comes from the flywheel-side bearing; delivery to the head is controlled by the specific jet screwed on the engine crankcase; the supply line for the timing system to the rear cylinder comes from the transmission-side bearing.

The components of the timing system function with low-pressure oil lubrication.
The camshaft bearings are installed directly on the aluminium of the head; the camshaft axial clearance is partially compensated by the oil supplied to the smaller diameter bearing.
The camshaft supplies the lubricant to the rocking levers via the holes provided; these are installed in a position to ensure that the lubrication is maintained even after the scooter has stopped. This is achieved when the camshaft reaches its most usual and likely position when the engine is shut off.
The oil used to lubricate the head returns to the sump via the chain casing channel and therefore it also provides lubrication for the chain.
A one-way valve and a decantation chamber are used so that gases from the crankcase do not carry any oil. The one-way valve is a metal reed valve; the decantation chamber has a drainage hole. A failure in these components implies oil getting into the line supplying air to the engine.
Excessive oil vapours may result in clogged ducts on the throttle body.
In order to signal low oil pressure in the system, a pressure switch is used, located immediately after the oil filter outlet.
The lubrication circuit does not include the piston or the pin, also in this case the cooling nozzle is particularly important.

## Diagnosis guide

**1** - Minimum oil pressure warning light on with hot engine.

AHEAD - go to 2

**2** - Remove the minimum pressure switch electric connector.

Check that the warning light turns off.

YES - go to 3 NO go to 11

**3** Check the actual oil pressure.

AHEAD - go to 4

**4** - Remove the switch and fit the special tool with the relevant gasket.

### Specific tooling

**020193Y Oil pressure gauge**

**020434Y Oil pressure control fitting**

- Remove the dipstick with the oil filling cap and insert a cap fitted with the temperature probe supplied with the special tool. Insert the probe to feel contact with the crankcase bottom and pull back a few millimetres.

### Specific tooling

**020331Y Digital multimeter**

AHEAD - go to 5

**5** - Measure the pressure with cold and idling engine.

**STANDARD VALUES**

| Specification | Desc./Quantity |
|---|---|
| 20°C Temperature | |
| 1200 rpm | |

*approx. 4.5 bar*

## Specific tooling

**020460Y Scooter diagnosis and tester**

YES go to 6 NO go to 12

**6** - Let the engine warm up and repeat the check with hot oil.

**STANDARD VALUES**

| Specification | Desc./Quantity |
|---|---|
| 80°C Temperature | |
| 1200 rpm | |

*approx. 1.5 bar*

YES go to 7 NO go to 8

**7** - Replace the oil minimum pressure switch.

**8** - If pressure lower than 1.3 ÷ 1.5 bar is measured.

AHEAD go to 9

**9** - Replace the oil filter and repeat the pressure check with oil at 80°C.

YES go to 10 NO go to 13

**10** - The failure was fixed.

It is recommended to respect the suggested number of kilometres covered.

**11** - Check and restore the electrical system.

**12** - If pressure lower than 4 bar is measured.

AHEAD go to 9

**13 -** Open the engine crankcase and check the by-pass efficiency.

YES go to 14 NO go to 15

**14** - Check whether there is an irregular clearance on the crankshaft:

- axial clearance (see the "Crankcase and crankshaft" chapter)

- radial clearance, especially in the direction of the cylinder axis

- clearance according to the direction of rotation with the connecting rod in quadrature

YES go to 16 NO go to 17

**15 -** Replace damaged components.

**16-** Proceed with engine service operations.

**17** - Open the engine crankcase and remove the oil pump as described in the "Crankcase and crankshaft" chapter.

- Check the oil pump as described in the following pages.

- Check that the cooling nozzle and the timing system feeding jet are properly installed.

- Visually inspect the crankshaft couplings and their sizes as per the «Specifications Chapter».

**N.B.**

**POTENTIAL IRREGULARITIES IN COUPLINGS AND THE TIMING SYSTEM COMPONENTS CANNOT BE DETECTED WHEN INSPECTING THE LUBRICATION PRESSURE. THEY MAY BECOME EVIDENT BY AN INCREASE IN NOISE.**

**N.B.**

**IN CASE OF IRREGULAR PRESSURE ON THE CRANKCASE, CARRY OUT A VISUAL AND DIMENSIONAL INSPECTION OF THE TIMING SYSTEM COMPONENTS (SEE "THERMAL GROUP AND TIMING SYSTEM" CHAPTER).**

## Oil pressure check

**1 -** In case of oil or oil filter leaks, check the lubrication pressure.

AHEAD go to 2

**2** - Install the special tool.

### Specific tooling

**020193Y Oil pressure gauge**

**020434Y Oil pressure control fitting**

AHEAD go to 3

**3** - Check the system pressure with cold engine and medium - high speed.

Standard pressure < 6 bar

YES go to 4 NO go to 5

**4** - Replace the damaged components.

**5** - Check the working order of the adjustment by-pass (see "flywheel cover" chapter) and restore proper sliding.

**N.B.**

**STANDARD PRESSURES ARE OBTAINED USING OIL WITH THE PRESCRIBED VISCOSITY. A HIGHER VISCOSITY CAUSES AN INCREASE OF THE SYSTEM PRESSURE.**

**1** - If oil consumption is above 250 g/1000 km on a run-in engine, proceed as follows.

AHEAD go to 2

**2** - Check the presence of oil at the scavenge duct on the filter box.

YES go to 3 NO go to 4

**3** - Check the one-way reed valve and the decantation chamber drainage hole.

YES go to 5 NO go to 4

**4** - Check the thermal group seals (piston rings, valve guides and oil guards), see "Thermal group and Timing system" chapter.

**5** - Restore the valve or the drainage hole efficiency.

## Oil pump

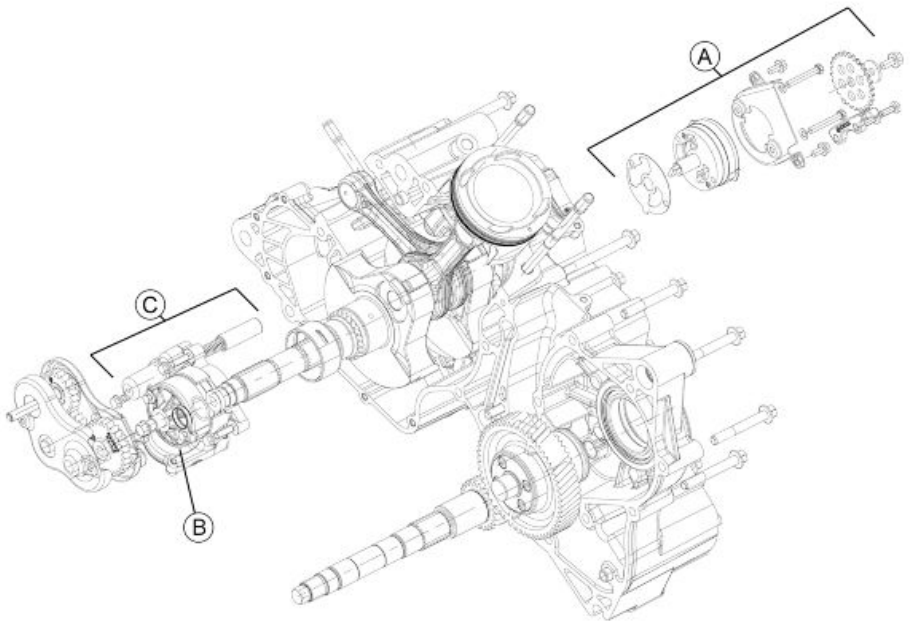
## Removal

**KEY:**

**A.** Pressure pump

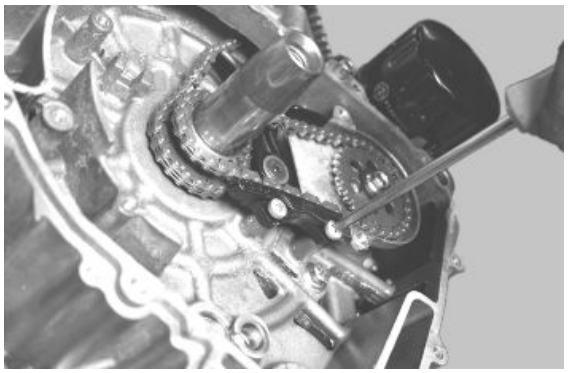
**B.** Scavenge oil pump

**C.** By-pass




- The lubrication system includes the pressure and scavenge oil pumps.
- To act on the pressure pump, remove the casing of the oil anti-backflow plate under the flywheel.
- To act on the scavenge oil pump, open the crankcase, and operate inside the flywheel-side crankcase half.

- Operating from the outside undo the chain tensioner pad fixing screws.
- Remove the chain tensioner pad.



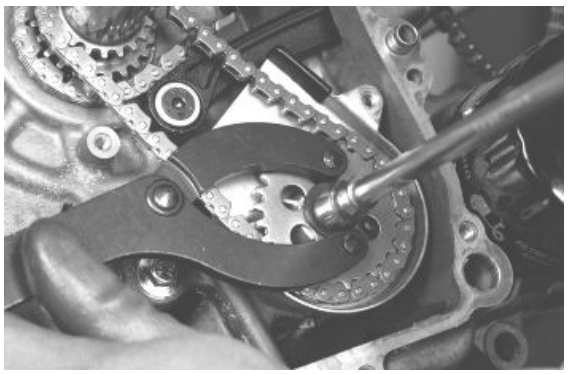
- With the specific tool, lock and undo the fixing screw and collect the washer.
- Remove the oil pump control crown.

**N.B.**

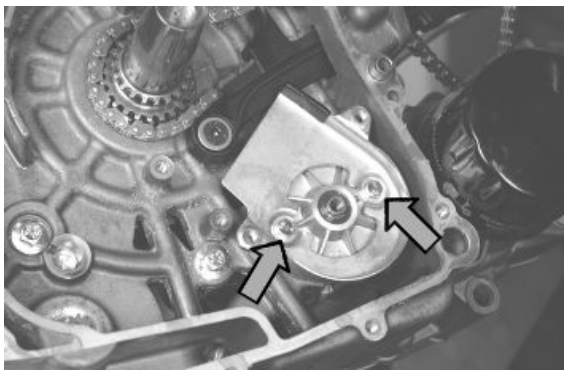
**IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.**

### Specific tooling

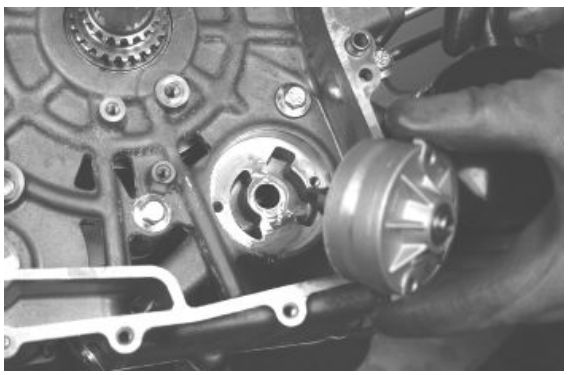
**020565Y Flywheel lock calliper spanner**



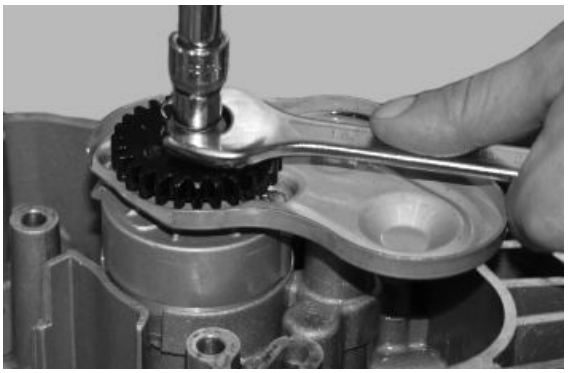
- Undo the two fixing screws and remove the oil pump cover casing.



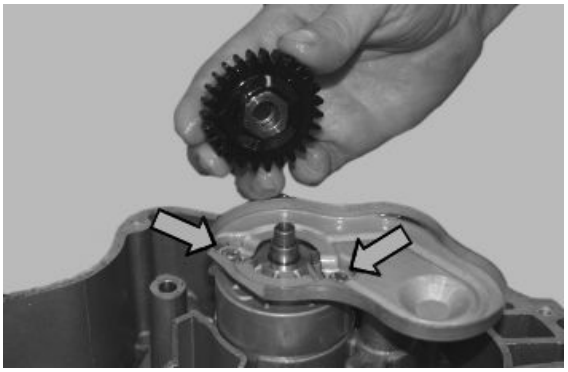
- Remove the pressure oil pump together with the gasket.



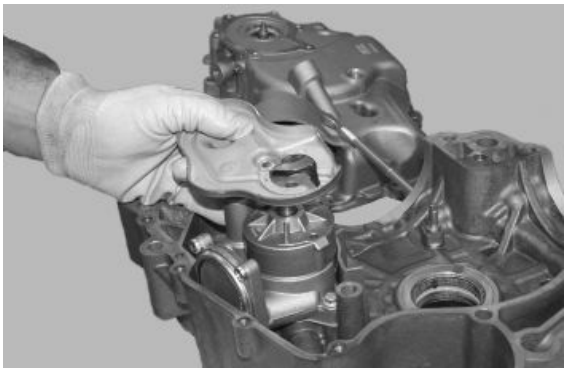
- Operating from inside:
- Lock the scavenge oil pump shaft, undo the fixing screw and collect the washer.



- Remove the water pump control gear, undo the two screws indicated and collect the washers.

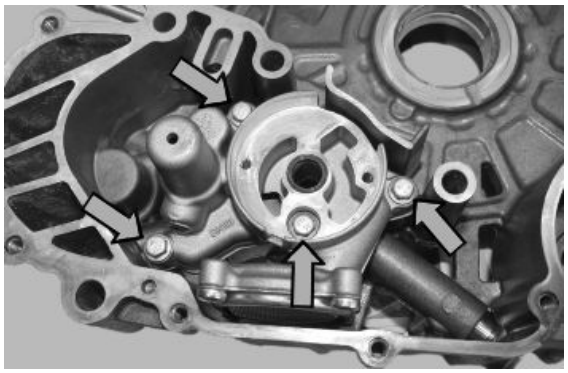


- Remove the casing of the oil anti-backflow plate.

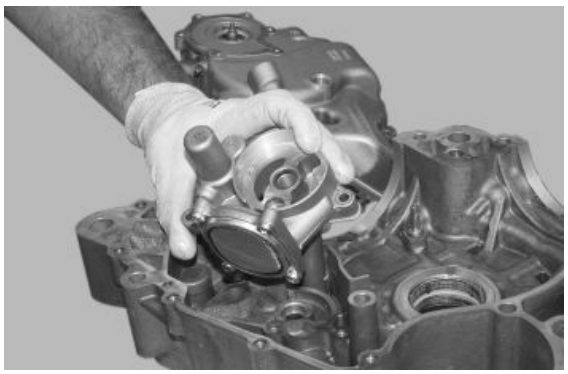


- Remove the oil pump and the relevant gasket.

- Undo the four screws indicated.

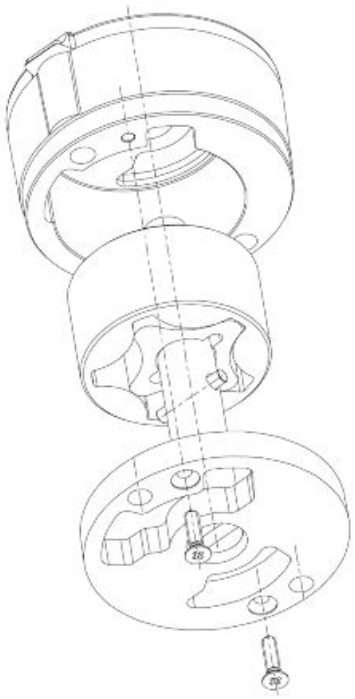


- Remove the by-pass scavenge duct together with its gasket.

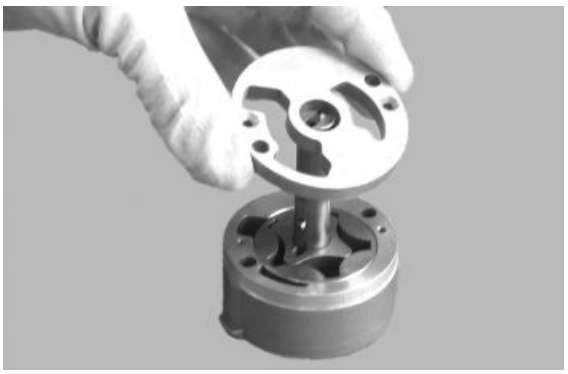


## Inspection

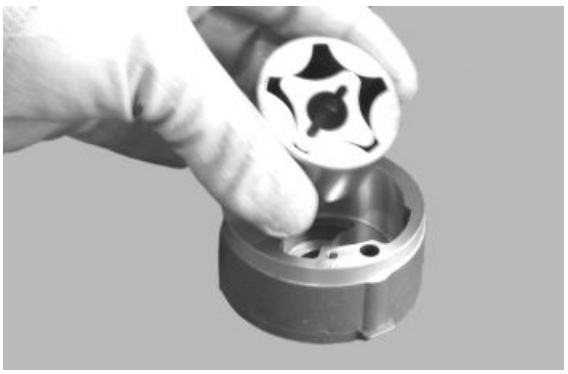
- The procedure is described once but applies to both pumps.



- Undo the two screws and remove the oil pump cover.

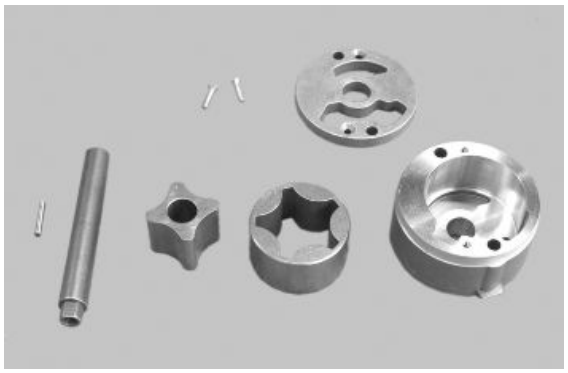


- Slide off the shaft together with the driving pins of the rotors.
- Remove the two rotors and wash them thoroughly.

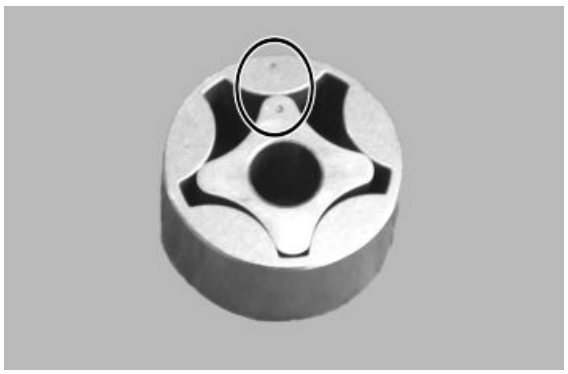


**N.B.**

**VISUALLY INSPECT THAT ALL THE COMPONENTS ARE IN GOOD CONDITIONS. MAKE SURE THERE ARE NO SIGNS OF WEAR OR SCRATCHES. REPLACE THE COMPONENTS IF THERE ARE EVIDENT SIGNS OF WEAR.**



- Once you check that the components are in good conditions, fit the pump and check size.
- Fit the two rotors and align them following the reference marks.



- Fit the assembled rotors inside the pump body, with the reference marks facing the inside.

**CAUTION**

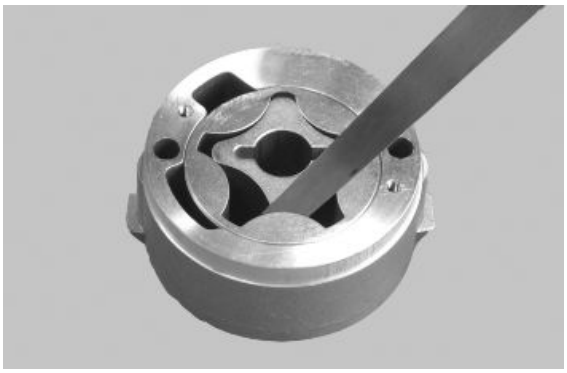
**ONCE THE ROTORS ARE FITTED IN THE PUMP BODY, THE REFERENCE MARKS ON THEM MUST NOT BE VISIBLE.**

- Measure the distance between rotors with a thickness gauge at the position indicated.

### Characteristic

**Standard clearance:**

0.04 - 0.1 mm

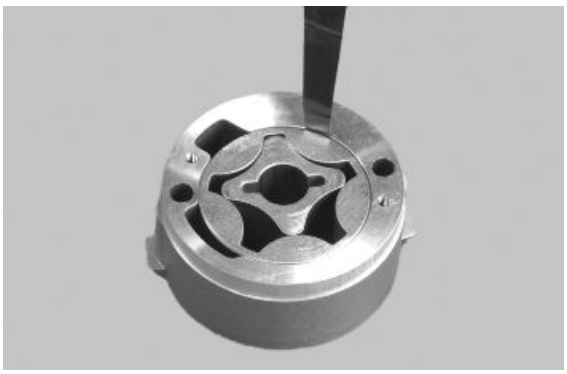


- Check the distance between external rotor and pump body; see figure.

### Characteristic

**Standard clearance:**

0.05 - 0.12 mm



- Check the levelness of the two rotor surfaces and the pump body with a trued bar as a contrasting plane as indicated in the figure.

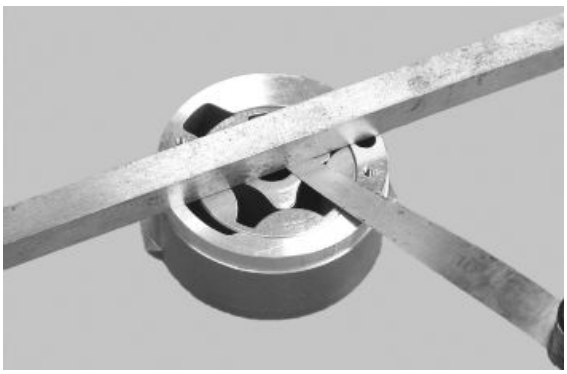
**CAUTION**

**FAILURE TO OBSERVE THESE RULES CAN SERIOUSLY DAMAGE THE ENGINE. IF THE VALUES ARE NOT WITHIN THE PRESCRIBED LIMITS, REPLACE THE COMPONENTS.**

### Characteristic

**Limit values admitted:**

0.1 mm



- Check all the conditions indicated above, afterwards fit the plug and tighten the fixing screws to the prescribed torque.

### Locking torques (N*m)

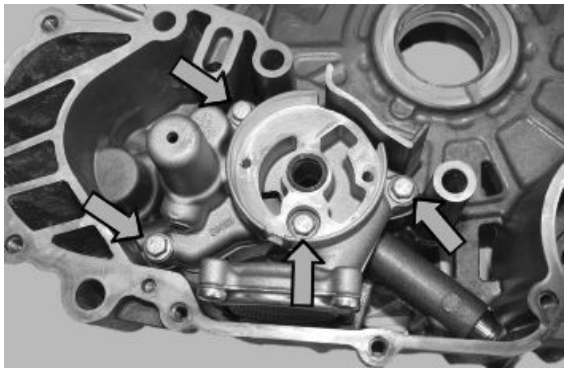
**Cover screws 0.7 ÷ 0.9 Nm**

## Refitting

- Operating from inside the flywheel-side crankcase half:
- Fit the by-pass scavenge duct together with the gasket and tighten the four fixing screws to the prescribed torque.

**Locking torques (N*m)**

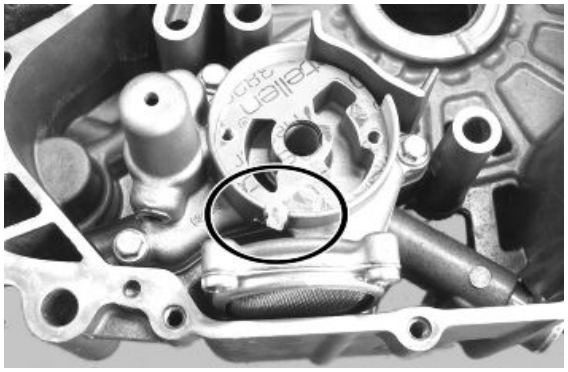
**By-pass scavenge duct fixing screws 11 ÷ 13**



- Make sure the gasket is in the correct position.

**N.B.**

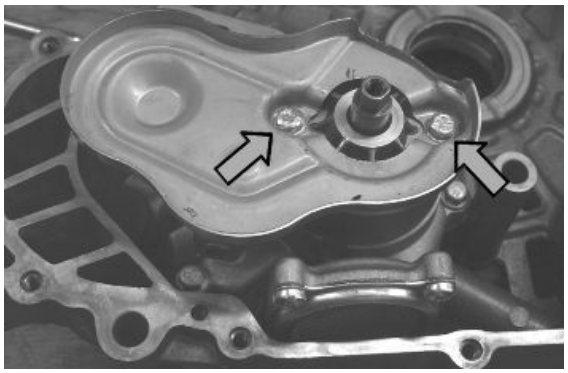
**THE TOOTH OF THE GASKET MUST BE IN ITS SEAT.**



- Fit the scavenge oil pump and the casing of the oil anti-backflow plate.
- Tighten the two screws indicated to the prescribed torque.

**Locking torques (N*m)**

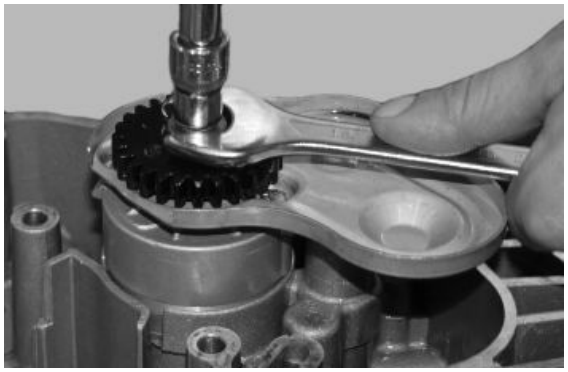
**Screws fixing oil pump to the crankcase 5 - 6**



- Fit the water pump control gear on the oil pump shaft.
- Tighten the locking screw with the washer to the prescribed torque.

**Locking torques (N*m)**

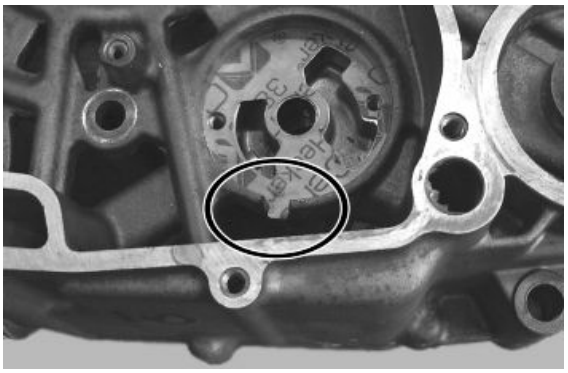
**Water pump gear fixing screw 5 - 6**



- Once the scavenge oil pump fitting is finished, operate from outside the flywheel-side crankcase half.
- Make sure the gasket is in the correct position.

**N.B.**

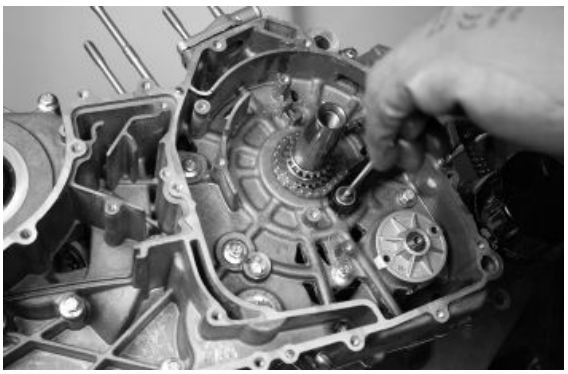
**THE TOOTH OF THE GASKET MUST BE IN ITS SEAT.**



- Fit the timing chain and the timing chain tensioner pad.
- Tighten the fixing screw to the prescribed torque.

### Locking torques (N*m)

**Tensioner sliding block fixing screw: 10 - 14**



- Fit the pressure oil pump.

- Fit the oil pump cover casing and tighten the two screws to the prescribed torque.

### Locking torques (N*m)

**Screws fixing oil pump to the crankcase 5 - 6**

- Fit the oil pump control crown and the driving chain.
- Using the specific tool tighten the fixing screw with the belleville washer to the prescribed torque.

**CAUTION**

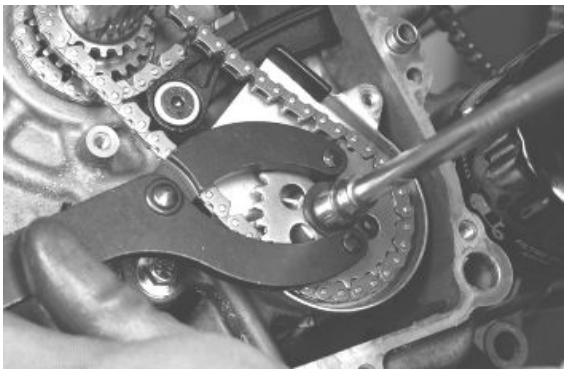
**PLACE THE BELLEVILLE WASHER WITH THE CONVEX PART FACING THE OIL PUMP CONTROL CROWN.**

### Specific tooling

**020565Y Flywheel lock calliper spanner**

### Locking torques (N*m)

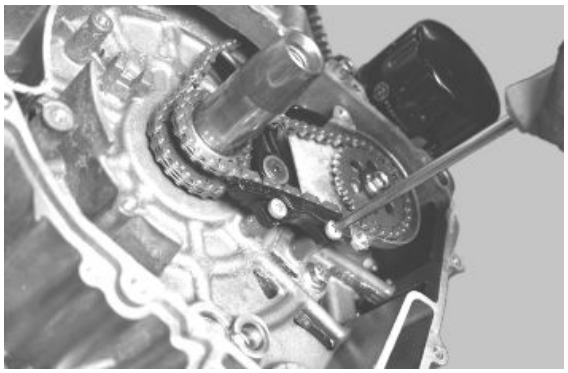
**Oil pump crown screw 10 ÷ 14**



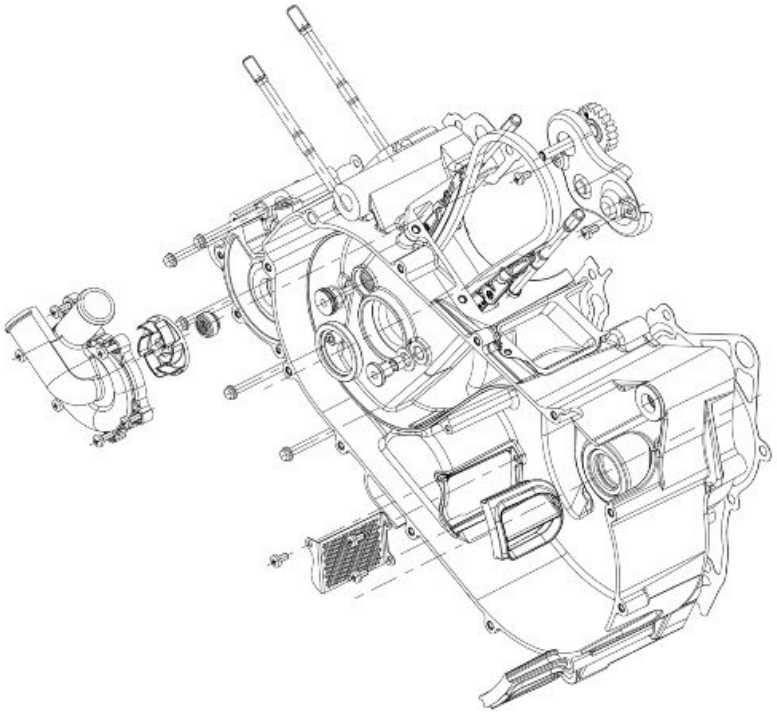
- Fit the tensioner pad and tighten the two screws to the prescribed torque.

**Locking torques (N*m)**

**Oil pump chain tensioner pad 2 ÷ 3**



## Water pump



## Removal

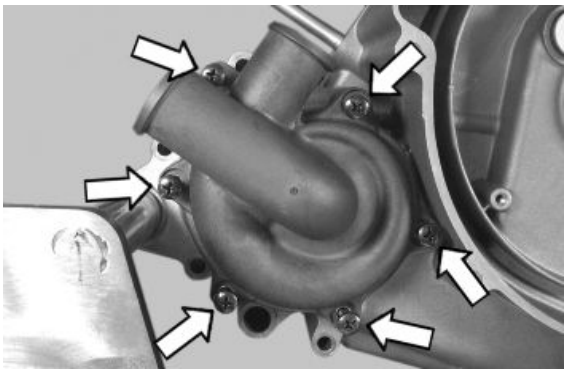
**N.B.**

**REPLACEMENT OF THE OVERALL SEALING CAN BE CARRIED OUT WITH ENGINE INSTALLED ON THE VEHICLE, SEE «HIGHLIGHTED PROCEDURES».**

### Specific tooling

**020661Y Water pump overall seal replacement kit**

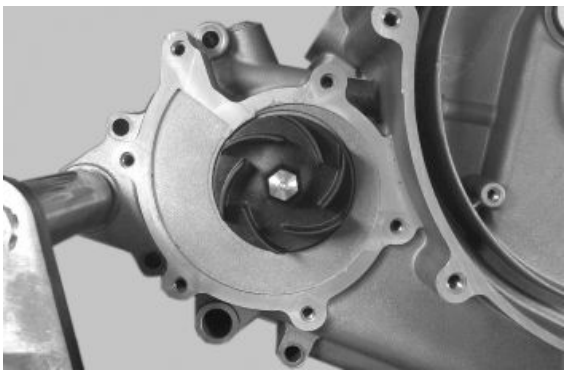
- Remove the six screws, the water pump cover and the gasket with a screwdriver.



- Unscrew the water pump rotor with a 10-mm wrench.

**CAUTION**

**THE ROTOR THREAD IS ANTICLOCKWISE. THE PUMP SHAFT HELPS REMOVING THE ROTOR AS THE GEARED CONTROL CANNOT ROTATE IN REVERSE SENSE.**

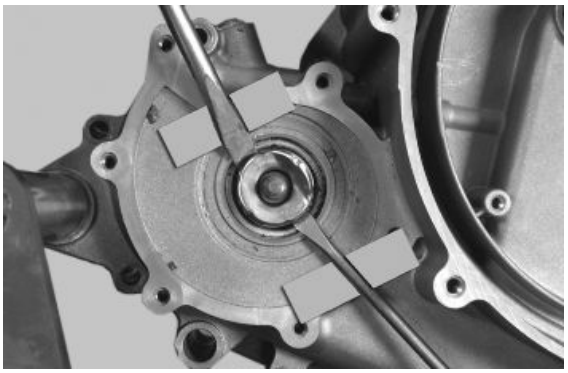


- Place two flat blade screwdrivers as shown in the figure so as to lever on the marked crankcase edge and disassemble the overall seal, pressure-fitted on the rotor shaft.

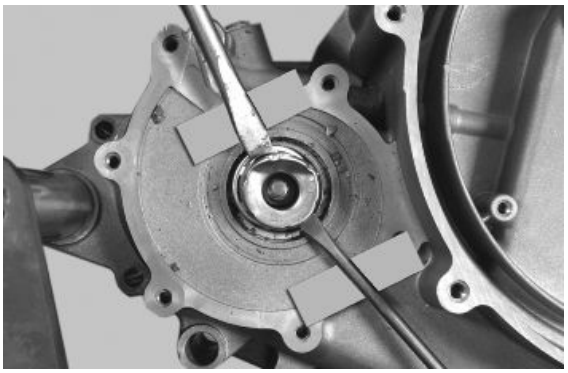
**CAUTION**

**USE TEFLON AS SHOWN IN THE FIGURE SO AS NOT TO DAMAGE THE WATER PUMP COVER SEALING SURFACE.**

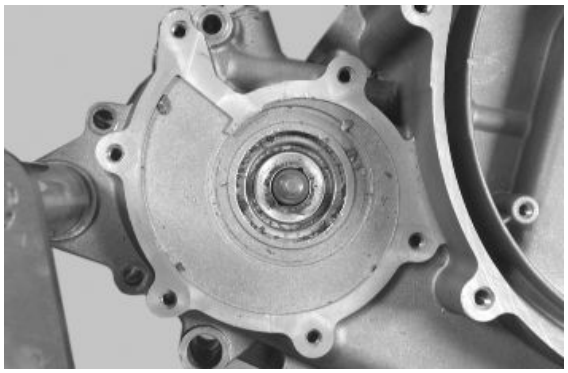
Small scratches on the seat edge do not pose functional problems.



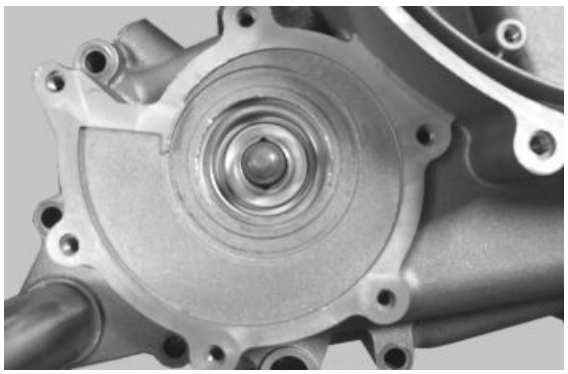
Change the position of the screwdrivers if necessary.



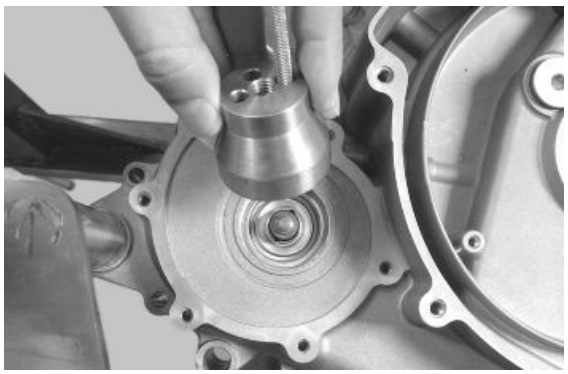
During seal disassembly, the ceramic may split.



- Clean all the parts thoroughly before removing them.



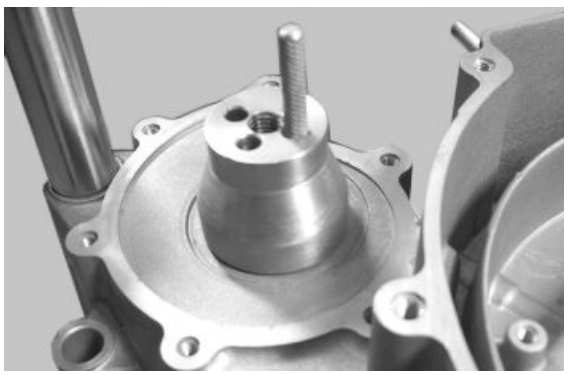
- Place the extractor together with the pin on the fixed part of the ceramic seal.



- Without modifying the extractor position, make three holes on the fixed part of the seal using the pin supplied and a hammer.

**N.B.**

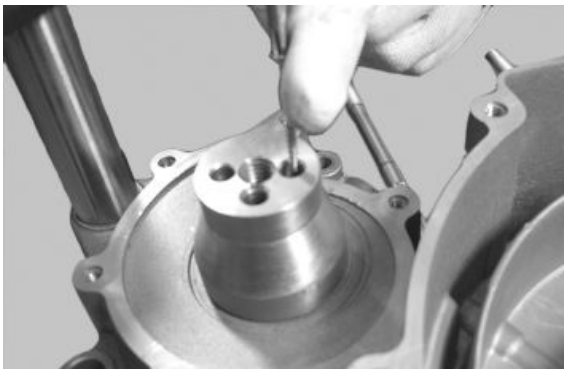
**MAKE THE HOLES WITH A STRONG HIT. MULTIPLE LIGHT BLOWS COULD DEFORM THE PART WITHOUT PASSING THROUGH.**



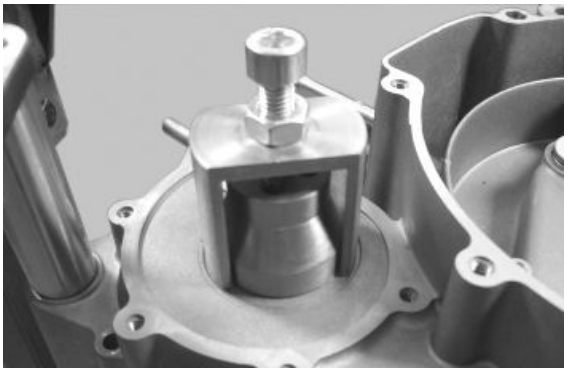
- Fix the extractor to the fixed part of the sealing using the screws supplied with the tool.

**CAUTION**

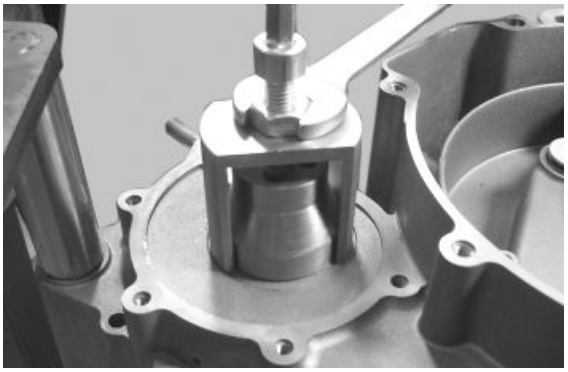
**FIX IT PROPERLY WITHOUT "TEARING" THE PLATE**



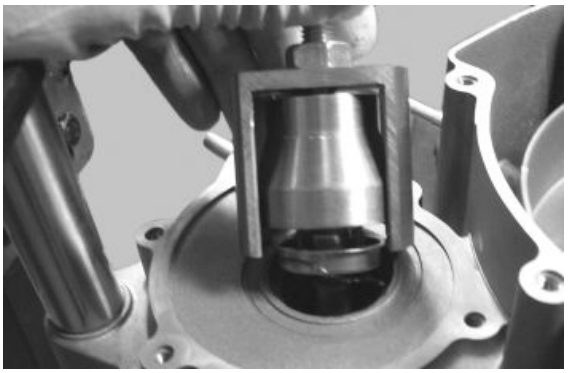
- Complete the tool by fitting the bracket, the screw and the nut.



- Hold the screw in position and operate the nut until the fixed part of the sealing is completely removed.



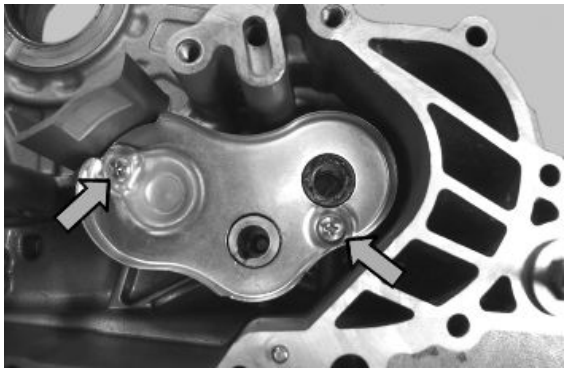
- Remove the extractor with the fixed part of the overall seal.



- To work on the water pump shaft and the relevant oil seal, open the engine crankcase and work from inside the transmission-side crankcase half.
- Slide off the idle gear.


- Slide off the water pump control gear together with the shaft.

- Undo the two screws indicated and remove the gear protection plate.



- Insert a punch on the water pump shaft seat and remove the oil seal.

**See also**

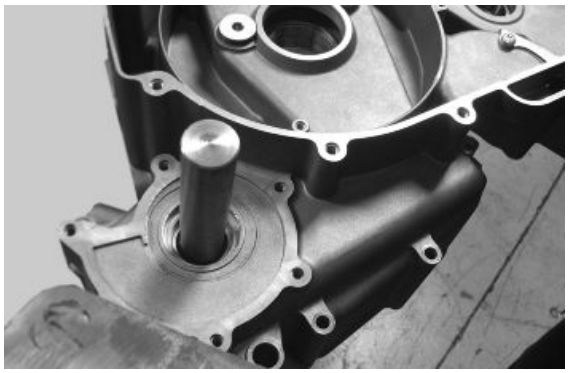
Splitting the crankcase halves

## Fitting

- Fit the oil seal from the outside being careful not to grease the contact surfaces.
- With the specific tool fit the seal until it stops.

### Specific tooling

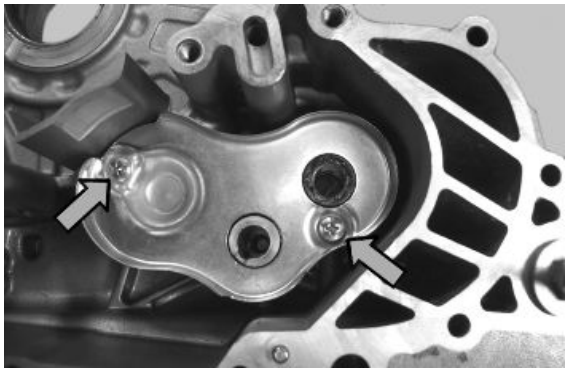
**020663Y Water pump shaft oil seal punch**



- Fit and lock the plate in its position by tightening the two screws indicated to the prescribed torque.

### Locking torques (N*m)

**Screws tightening water pump gear protection plate 3 ÷ 4**



- Fit the water pump shaft together with the control gear.

- Fit the idle gear.


### Overall seal fitting

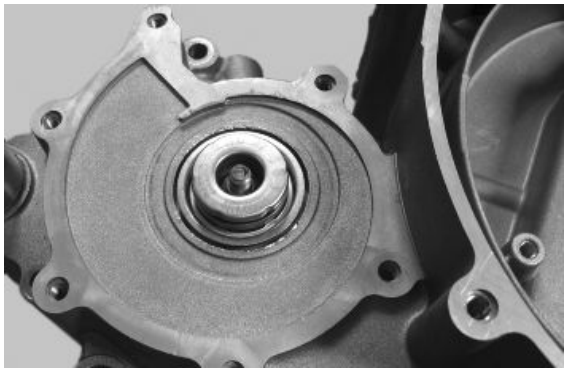
**CAUTION**

**CLEAN ALL THE COMPONENTS THOROUGHLY.**

**CAUTION**

**LUBRICATE THE ROTOR SHAFT WITH ENGINE OIL.**

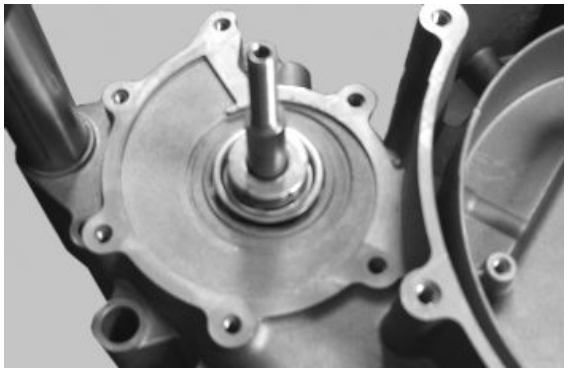
- Place the overall seal on the shaft.



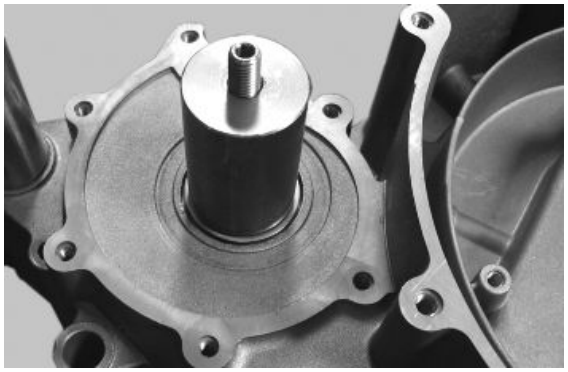
- Fit the tie rod by screwing it to the rotor shaft.

**CAUTION**

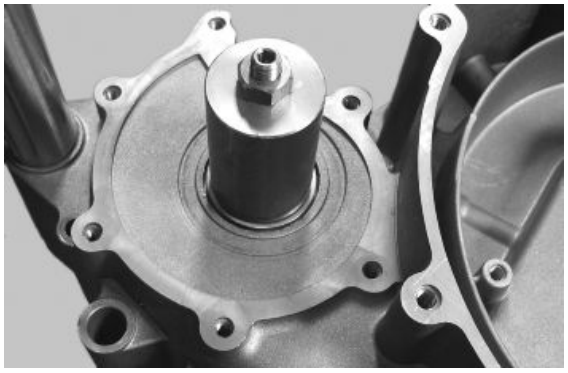
**THE SHAFT THREAD IS ANTICLOCKWISE. SCREW IT MANUALLY UNTIL IT STOPS.**



- Place the calibrated punch (at preloading value).



- Fit the nut to the tie rod.

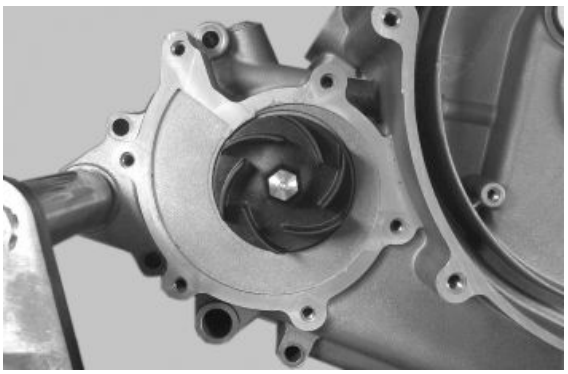


Keep the tie rod in position and screw the nut up to the end of stroke.
The tool will drive the fixed part seat on the crank-case and the movable part seat on the shaft, thus obtaining the correct ceramic seal preloading.

- Screw the rotor. (anticlockwise thread).

**Locking torques (N*m)**

**Water pump impeller 4 ÷ 5**



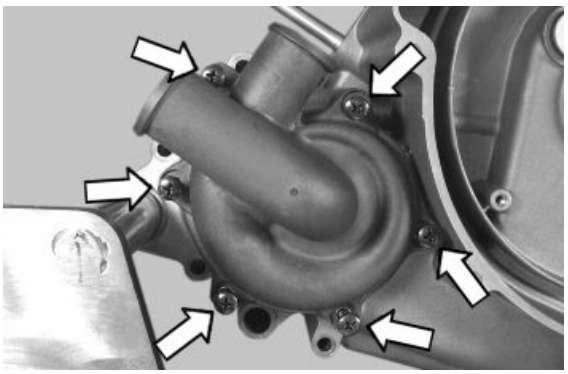
- Fit the pump cover with a new gasket, lubricate the gasket previously with petroleum jelly grease.
- Tighten the six cover screws to the prescribed torque.

**N.B.**

**TO AVOID DEFORMATION, DO NOT LUBRICATE THE O-RING WITH PETROLEUM GREASE.**

**Locking torques (N*m)**

**Water pump rotor cover 3 ÷ 4**



# INDEX OF TOPICS

**Sistema di iniezione EMS**

Il sistema di iniezione è del tipo sequenziale fasata con iniezione e accensione integrate.

L'iniezione è del tipo indiretta nel collettore mediante elettroiniettori.

L'iniezione e l'accensione sono fasate sul ciclo 4T mediante una ruota fonica calettata sul comando dell'albero a camme del cilindro posteriore ed un sensore a variazione di riluttanza.

La carburazione e l'accensione sono gestite in funzione dei giri del motore e dell'apertura della valvola gas. Ulteriori correzioni vengono attuate in base ai seguenti parametri:

- Temperatura del liquido di raffreddamento
- Temperatura dell'aria aspirata
- Pressione ambiente

Il sistema attua una correzione della alimentazione del minimo con motore freddo mediante un motorino passo-passo (stepper motor) inserito su un circuito by-pass della valvola gas. La centralina gestisce il motorino passo-passo ed il tempo di apertura degli iniettori garantendo così la stabilità del minimo e la carburazione corretta.

In tutte le condizioni di funzionamento, grazie anche ai valori rilevati dalla sonda lambda, la carburazione viene gestita modificando il tempo di apertura dell'iniettore.

La pressione di alimentazione della benzina viene mantenuta costante in funzione della pressione ambiente.

Il **circuito di alimentazione** di tipo multipoint è costituito da:

- Pompa benzina
- Filtro benzina
- Iniettori
- Regolatore di pressione

La pompa, il filtro ed il regolatore sono inseriti nel serbatoio carburante mediante un supporto unico.

Gli iniettori sono collegati mediante tubi provvisti di attacchi rapidi. Ciò permette di ottenere una circolazione continua evitando così il rischio di ebollizione del carburante. Il regolatore di pressione è posto alla fine del circuito.

La pompa della benzina viene comandata dalla centralina EMS; ciò garantisce la sicurezza del veicolo.

Il **circuito di accensione** è costituito da:

- Bobine A.T con doppia candela di accensione.
- Cavetti A.T.
- Cappucci schermati
- Centralina EMS
- Candele

La centralina EMS gestisce l'accensione con l'anticipo ottimale garantendo nel contempo la fasatura sul ciclo 4T (accensione solamente in fase di compressione).

L'impianto di iniezione-accensione EMS gestisce la funzionalità del motore mediante un programma preimpostato.

Nel caso in cui venissero a mancare alcuni segnali in entrata, viene comunque garantito un funzionamento accettabile del motore, per permettere all'utente di raggiungere l'officina di riparazione.
Naturalmente ciò non può accadere quando viene a mancare il segnale di giri-fase oppure quando l'anomalia interessa i circuiti di comando:

- Pompa benzina
- Bobine A.T.
- Iniettori

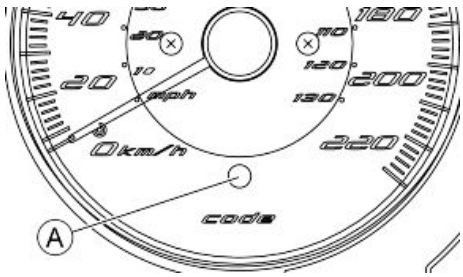
The control unit is provided with a self-diagnosis system connected to an indicator light in the instrument panel.


Failures are detected and restored by the diagnostic tester.
In any case, when the fault is no longer present, the data storage is automatically cleared after 16 cycles of use (cold start, running at regular engine temperature, stop).
The diagnostic tester is also required to adjust the idle mixture.


## Specific tooling

**020460Y Scooter diagnosis and tester**

The EMS injection-ignition system has a control function over the rpm indicator and the radiator cooling electric fan.
The EMS is connected to the antitheft immobilizer system decoder.
In turn, the decoder is connected to a flashing diagnostic LED that also serves as deterrent.



The EMS control unit power supply is further controlled by the emergency switch, side stand switch and the stop buttons; that is to provide further safety for the scooter.

## Precautions

1. Before fixing any part of the injection system, check to see if there are any registered faults. Do not disconnect the battery before checking for faults.
2. The fuel supply system is pressurised at 300 kPa (3 BAR). Before disconnecting the quick coupler of a pipe in the fuel supply system, check that there are no naked flames, and do not smoke. Act with caution to prevent spraying in the eyes.
3. When fixing electric components, operate with battery connected only when actually required.
4. When functional checks are performed, check that the battery voltage is over 12V.
5. Before trying to start the vehicle, check to make sure there is at least two litres of fuel in the tank. Failure to respect this norm will damage the fuel pump.
6. If the scooter is expected to remain unused for a long time, refill the tank up to a little over half the level. This will ensure the pump will be covered by fuel.
7. When washing the vehicle, be careful with the electric components and wiring.
8. When an ignition problem is detected, start the checks from the battery and the injection system connections.
9. Before disconnecting the EMS control unit connector, perform the following operations in the order shown:
- Set the switch to «OFF»
- Disconnect the battery

Failure to respect this norm may damage the control unit.
10. Do not invert the polarity when fitting the battery.
11. In order to prevent damages, disconnect and reconnect the EMS connectors only if actually required. Before reconnecting, check that the connectors are dry.
12. When carrying out electric inspections, do not force the tester probes into the connectors. Do not take measurements not specifically foreseen by the manual.
13. At the end of every check performed with the diagnostic tester, protect the system connector with its cap. Failure to observe this norm may damage the EMS control unit.
14. Before reconnecting the quick couplers of the power supply system, check that the terminals are perfectly clean.

**Troubleshooting hints**

1An EMS failure is more likely to be due to the connections than to the components.

Before troubleshooting the EMS, carry out the following checks:

**A**: Electrical power supply

a. Battery voltage

b. Blown fuse

c. Remote controls

d. Connectors

**B**: Chassis earthing

**C**: Fuel supply

a. Broken fuel pump

b. Dirty fuel filter

**D**: Ignition system

a. Faulty spark plug

b. Broken coil

c. Broken shielded cap

**E**: Intake circuit

a. Dirty air filter

b. Dirty by-pass circuit

c. Faulty Stepper motor

**F**: Other

a. Incorrect distribution timing

b. Wrong idle mixture

c.Incorrect reset of the throttle valve position sensor

2 EMS faults may be caused by loose connectors. Make sure that all connections have been correctly made.

Check the connections as follows:

**A** check that the terminals are not bent.

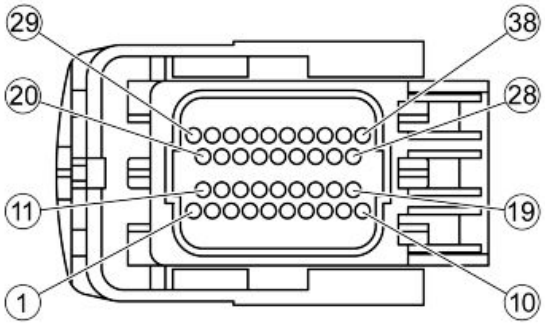
**B** check that the connectors have been properly connected.

**C** check whether the malfunction can be fixed by shaking the connector slightly.

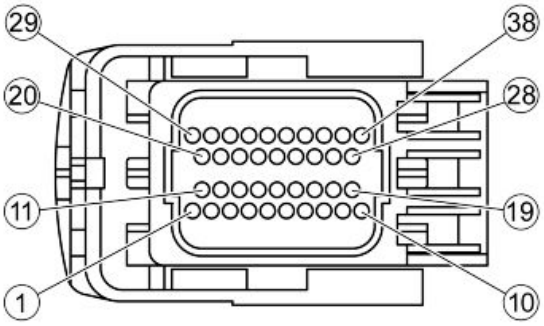
3 Check the entire system before replacing the EMS control unit.If the fault is fixed by replacing the EMS control unit, install the original control unit again and check whether the fault occurs again.

4 Use a multimeter with an internal resistance of more than 10K when troubleshooting. Ohm /V. Instruments that are not suitable might damage the EMS control unit. Instruments must be used with definitions over 0.1V and 0.5 W ; precision must be greater than 2%.

## Terminals setup




**VEHICLE CONTROL UNIT CONNECTOR**




**1.** Start-up remote control switch relay (Orange-White)

**4.**Battery positive (White-Red)

**6.** Injection load relay (Black-Purple)

**7.** Immobilizer decoder (Orange)

**8.** Low-beam light relay (Yellow-Grey)

**9.** Rpm indicator (Brown)

**11.** Lambda probe (Purple)

**13.** Injection telltale light (Brown-Black)

**14.** Electric fan relay (Blue-Yellow)

**16.** Diagnostics socket (Purple-White)

**17.** Live positive (White-Black)

**18.** Engine disabled warning light (Sky Blue-Yellow)

**22.** Lambda probe (White-Green)

**23.** Stop lights (Grey-Green)

**24.** Vehicle speed signal (Brown-Red)

**27.** Engine stop switch (Green)

**28.** Starter button (Grey-White)

**32.** Lambda probe (Grey-Red)

**35.** Roll-over sensor (Yellow)

**38.** Stand switch (White-Blue)

**ENGINE CONTROL UNIT CONNECTOR**

**3.** Throttle valve potentiometer (Orange-Sky Blue)

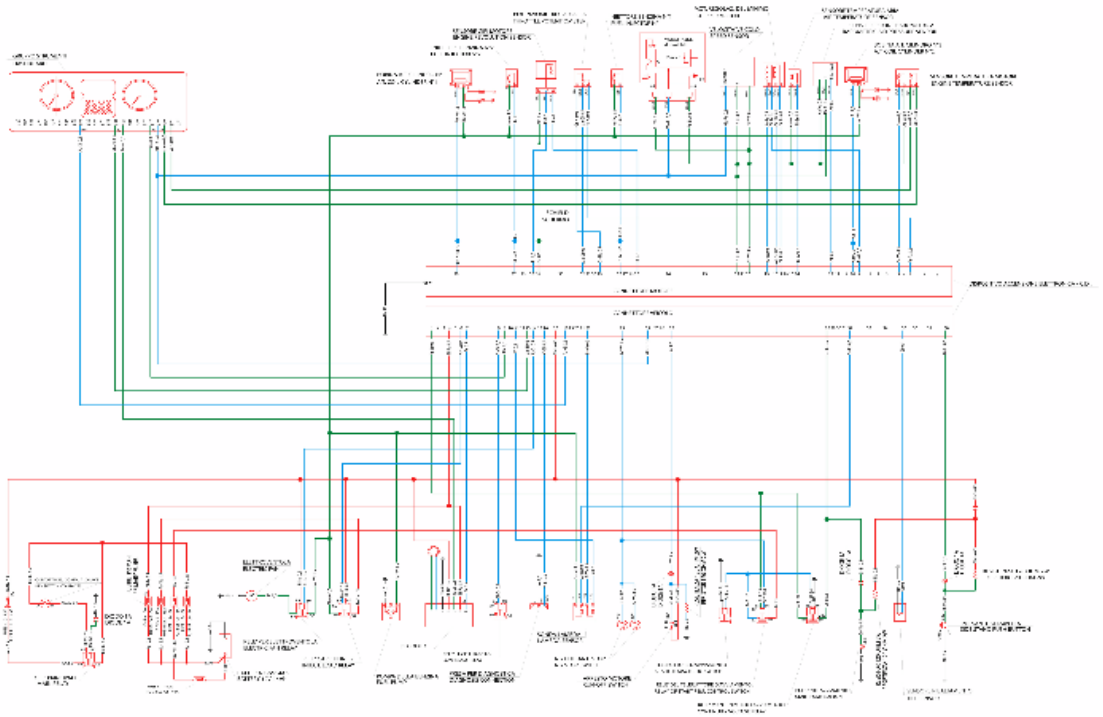
**5.** Engine temperature (Grey-Green)

**9.** Idle adjustment motor (Sky Blue-Yellow)

**10.** Cylinder 2 HV coil (Sky Blue)

**13.** Barometric pressure signal (Orange)
**14.** Air temperature sensor (White-Grey)
**17.** Idle adjustment motor (Sky Blue-Red)
**18.** Idle adjustment motor (Sky Blue-Black)
**19.** Idle adjustment motor (Orange-Red)
**20.** Sensor negative (Sky Blue-Green)
**22.** Sensor positive (Red-Blue)
**25.** Engine rpm sensor (White)
**28.** Cylinder 1 injector (Red-Yellow)
**29.**Throttle valve potentiometer (Grey-Black)
**32.**Throttle valve potentiometer (Brown-Yellow)
**34.** Engine rpm sensor shield (Black)
**35.** Engine rpm sensor (Red)
**37.** Cylinder 2 injector (Blue)
**38.** Cylinder 1 HV coil (Pink-Black)

## EMS circuit diagram



## Troubleshooting procedure

## Engine does not start

**ENGINE DOES NOT START IF ONLY PULLED**

| Possible Cause | Operation |
|---|---|
| Immobiliser enabling signal | System not encoded<br>System not efficient, repair according to the indications of the self-diagnosis |
| Presence of faults detected by the self diagnosis | Pump relay<br>HV coil<br>Injector<br>revolution timing sensor |
| Fuel supply | Fuel in the tank<br>Fuel pump activation<br>Fuel pressure (low)<br>Injector capacity (low) |
| Power to the spark plug | Shielded spark-plug cap HV coil (secondary insulation) |
| Parameter reliability | Coolant temperature<br>Distribution timing - injection ignition<br>Intake air temperature |
| End of compression pressure | End of compression pressure |

## Starting difficulties

**ENGINE START-UP PROBLEMS**

| Possible Cause | Operation |
|---|---|
| Presence of faults detected by the self diagnosis | Pump relay<br>HV coil<br>Injector<br>revolution timing sensor<br>Air temperature<br>Coolant temperature |
| Start-up speed | Starter motor and remote control<br>Battery<br>Ground connections |
| End of compression pressure | End of compression pressure |
| Power to the spark plug | Spark plug<br>Shielded cap<br>HV coil<br>Revolution timing sensor<br>Ignition advance |
| Fuel supply | Fuel pressure (low)<br>Injector capacity (low)<br>Injector sealing (poor) |
| Correctness of the parameters | Coolant temperature<br>Stepper throttle valve position intake air temperature (steps and actual opening)<br>Cleaning of the auxiliary air pipe and throttle valve; air filter efficiency |

## Engine stops at idle

**ENGINE DOES NOT HOLD IDLING/ IDLING IS UNSTABLE/ IDLING TOO LOW**

| Possible Cause | Operation |
|---|---|
| Presence of faults detected by the self diagnosis | Pump relay<br>HV coil<br>Injector<br>revolution timing sensor<br>Air temperature<br>Coolant temperature |
| Ignition efficiency | Spark plug<br>Ignition timing |
| Correctness of the parameters | Throttle valve position sensor<br>Stepper<br>Coolant temperature sensor<br>Intake air temperature sensor |
| Intake system cleaning | Air filter<br>Diffuser and throttle valve<br>Additional air pipe and Stepper |
| Intake system sealing (infiltrations) | Intake manifold - head<br>Throttle body - manifold<br>Intake sleeve<br>Filter box |
| Fuel feed (low pressure) | Fuel pump<br>Pressure regulator<br>Fuel filter<br>Injector capacity |

## Engine does not rev down

**ENGINE DOES NOT RETURN TO THE IDLING SPEED/IDLING SPEED TOO HIGH**

| Possible Cause | Operation |
|---|---|
| Presence of faults detected by the self diagnosis | Pump relay<br>HV coil<br>Injector<br>revolution timing sensor<br>Air temperature<br>Coolant temperature |
| Ignition efficiency | Ignition timing |
| Correctness of the parameters | Throttle valve position sensor<br>Stepper<br>Coolant temperature sensor<br>Intake air temperature sensor |
| Intake system sealing (infiltrations) | Intake manifold - head<br>Throttle body - manifold<br>Intake sleeve<br>Filter box |
| Fuel feed (low pressure) | Fuel pump<br>Pressure regulator<br>Fuel filter<br>Injector capacity |

## Exhaust backfires in deceleration

**EXHAUST BACKFIRES WHEN DECELERATING**

| Possible Cause | Operation |
|---|---|
| Presence of faults detected by the self diagnosis | Pump relay<br>HV coil<br>Injector<br>revolution timing sensor<br>Air temperature<br>Coolant temperature<br>Lambda sensor |
| Correctness of the parameters | Throttle valve position sensor<br>Stepper<br>Coolant temperature sensor<br>Intake air temperature sensor |
| Intake system sealing (infiltrations) | Intake manifold - head<br>Throttle body - manifold<br>Intake sleeve<br>Filter box |
| Fuel feed (low pressure) | Fuel pump<br>Pressure regulator<br>Fuel filter<br>Injector capacity |
| Exhaust system sealing (infiltrations) | Manifold - head<br>Manifold - muffler<br>Muffler welding |

## Engine revs irregularly

**ENGINE IRREGULAR PROGRESS WITH VALVE SLIGHTLY OPEN**

| Possible Cause | Operation |
|---|---|
| Intake system cleaning | Air filter<br>Diffuser and throttle valve<br>Additional air pipe and Stepper |
| Intake system seal | Intake sleeve<br>Filter box |
| Ignition system | Spark plug wear check |
| Parameter reliability | Throttle valve position signal<br>Coolant temperature indicator<br>Intake air temperature indicator<br>Ignition advance |
| TPS reset successful | TPS reset successful |
| Presence of faults detected by the self diagnosis | Pump relay<br>HV coil<br>Injector<br>revolution timing sensor<br>Air temperature<br>Coolant temperature<br>Lambda sensor |

## Poor performance at full throttle

**POOR ENGINE PERFORMANCE AT FULL POWER/ ENGINE IRREGULAR PROGRESS ON PICKUP**

| Possible Cause | Operation |
|---|---|
| Presence of faults detected by the self diagnosis | Pump relay<br>HV coil<br>Injector<br>revolution timing sensor<br>Air temperature<br>Coolant temperature<br>Lambda sensor |
| Spark plug power supply | Spark plug<br>Shielded cap<br>HV cable<br>HV coil |
| Intake system | Air filter<br>Filter box (sealing)<br>Intake sleeve (sealing) |
| Parameter reliability | Throttle valve position signal<br>Coolant temperature indicator<br>Intake air temperature indicator<br>Ignition advance |
| Fuel supply | Fuel level in the tank<br>Fuel pressure<br>Fuel filter<br>Injector capacity |

## Engine knocking

**PRESENCE OF KNOCKING (HEAD KNOCKING)**

| Possible Cause | Operation |
|---|---|
| Presence of faults detected by the self diagnosis | Pump relay<br>HV coil<br>Injector<br>revolution timing sensor<br>Air temperature<br>Coolant temperature<br>Lambda sensor |
| Ignition efficiency | Spark plug |
| Parameter reliability | Throttle valve position signal<br>Coolant temperature indicator<br>Intake air temperature indicator<br>Ignition advance |
| Intake system seal | Intake sleeve<br>Filter box |
| TPS reset successful | TPS reset successful |
| Fuel supply | Fuel pressure<br>Fuel filter<br>Injector capacity<br>Fuel quality |
| Selection of the cylinder base gasket thickness | Selection of the cylinder base gasket thickness |

## Fuel supply system

Fuel is fed to the injectors by a pump, a filter and a pressure regulator.

The fuel supply circuit includes the electric pump, the filter, the pressure regulator, injectors and the fuel delivery and reverse pipes.

The electric pump is located in the tank from which the fuel is pumped and sent to the injectors through the filter.

Pressure is controlled by the pressure regulator located in the pump assembly in the tank on the fuel reverse circuit.

The pump unit is connected to the injectors by:

3 semi-flexible pipes

6 fast-release couplings

**N.B.**

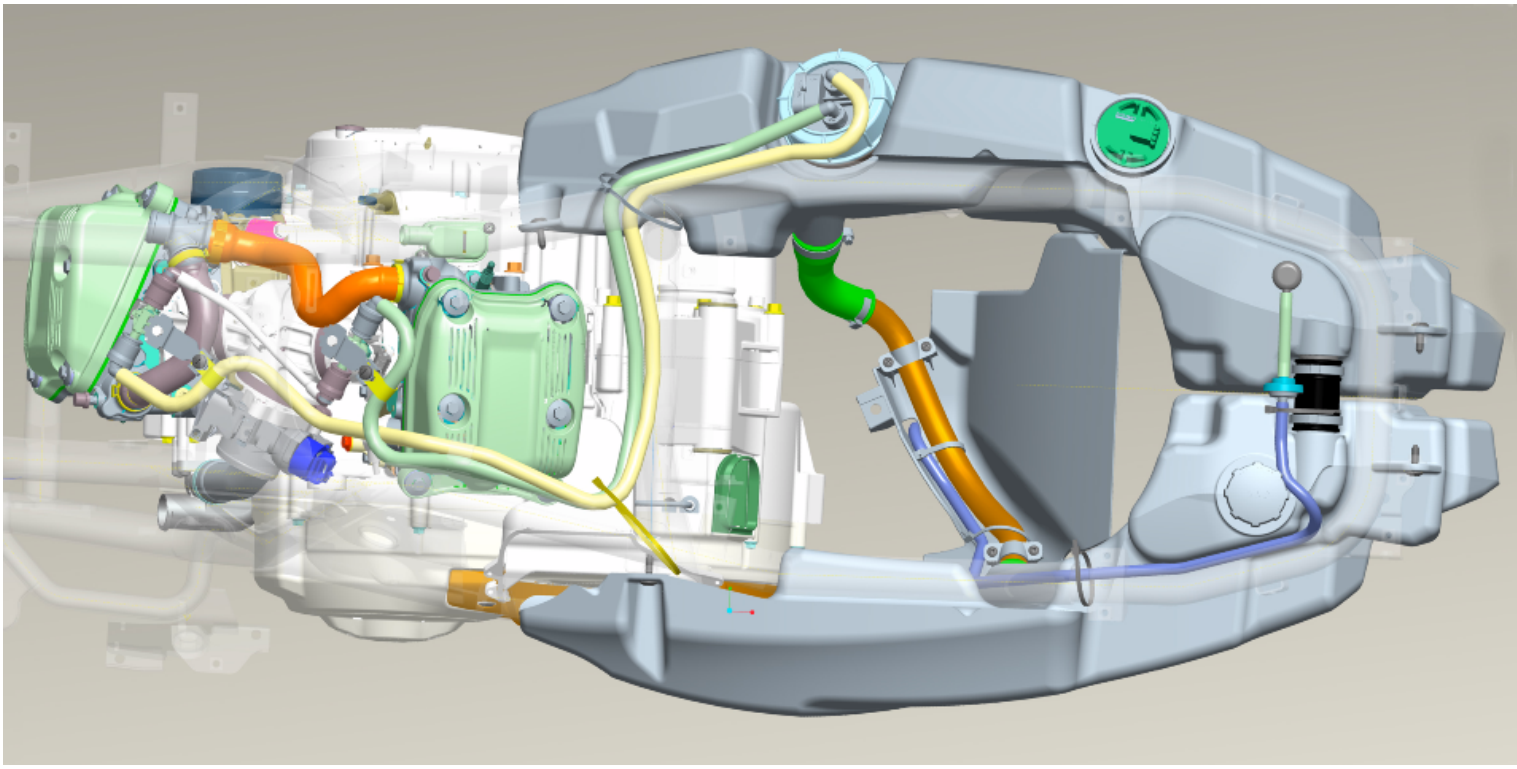
**BEFORE WORKING ON THE FUEL SUPPLY SYSTEM, CAREFULLY CLEAN THE PARTS TO PREVENT DAMAGING THE FAST-RELEASE COUPLING SEAL OR TO PREVENT DIRT GETTING INTO THE DUCTS.**

**CAUTION**

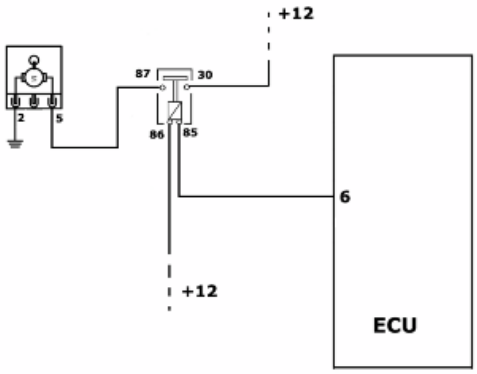
**THE SYSTEM IS UNDER PRESSURE.**
**DO NOT SMOKE DURING ANY OPERATION.**
**PREVENT ANY FUEL SPRAYING.**

**WARNING**

**- BEFORE STARTING THE ENGINE, CHECK WHETHER THERE IS FUEL IN THE TANK.**
**- DO NOT USE THE SCOOTER IN RESERVE FOR A LONG TIME, UP TO THE POSSIBILITY OF RUNNING OUT OF FUEL.**
**- IF THE SCOOTER IS EXPECTED TO REMAIN UNUSED FOR A LONG TIME, REFILL THE TANK AT LEAST TO HALF THE LEVEL.**
**FAILURE TO OBSERVE THESE RULES CAN DAMAGE THE PUMP.**



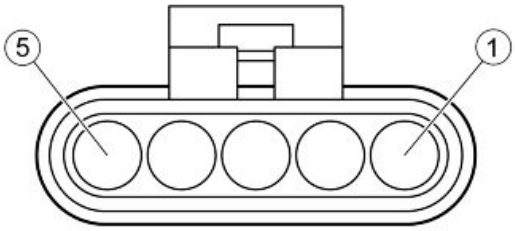
## Pump supply circuit



**FUEL PUMP CONNECTOR**

**2.** Ground (Black)

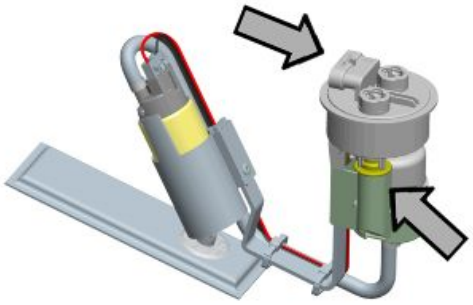
**5.** Injection load relay (Black-Green)




**FUEL PUMP UNIT**

Mechanical type pressure regulator operating at a pressure of 3 BAR

Pump winding resistance: ~ 1,5 Ohm



Verificare, commutando in «**ON**», la presenza di tensione batteria, per circa 2 secondi, tra il pin 5 del connettore pompa e massa con connettore pompa staccato. Altrimenti verificare la continuità del cavetto tra pin 5 connettore pompa e zoccolo del teleruttore carichi iniezione.

Verificare l'efficienza della linea di massa della pompa carburante misurando la continuità tra pin 2 connettore pompa e massa.

## Circuit leak test

Install the specific tool for checking the fuel pressure, with the pipe fitted with the gauge.

Check during regular operation by placing the appropriate tool between the pump and the injector. With battery voltage > 12 V check that the fuel pressure is 3 BAR and that the input current is ~2.8 A


With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. Get a graded burette with a flow rate of approximately 1 L. Rotate the pump using the active diagnoses of the palm top computer. Using a pair of long flat needle-nose pliers, choke the fuel pipe making the pressure stabilise at approx. 2.9 ÷ 3 BAR.

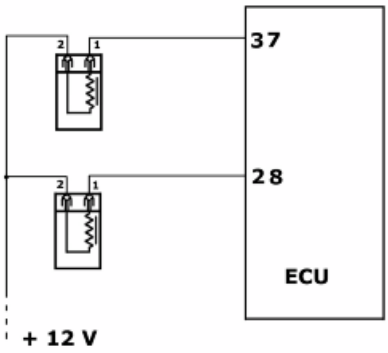
Be careful not to further choke pipes if pressure remains evenly at 3 BAR while flow rate decreases.

Check that within 15 seconds the pump has a flow rate of approx. 300 $cm^3$.

### Specific tooling

**020480Y Petrol pressure check set**

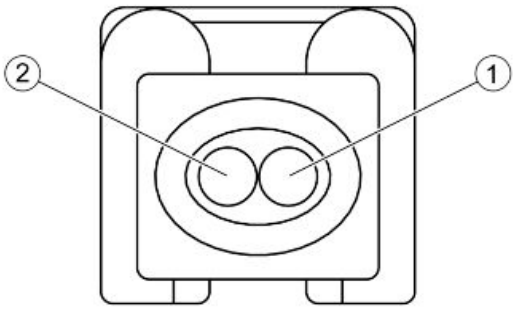
## Inspecting the injector circuit




**REAR CYLINDER INJECTOR CONNECTOR**

**1.** Control unit (Red-Yellow)

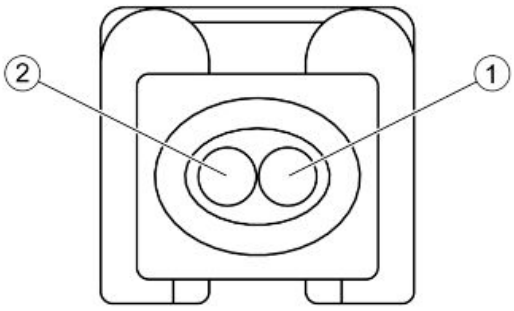
**2.** Injection load relay (Black-Green)



**FRONT CYLINDER INJECTOR CONNECTOR**

**1.** Control unit (Blue)

**2.** Injection load relay (Black-Green)




**FUEL INJECTOR**

Type: 4 holes

Conicity of the nozzle: 24°

Resistance at terminals: 13.7 ÷ 15.2 Ohm

Scollegare il connettore dell'iniettore.

Commutare in "ON".

Eseguire la diagnosi attiva iniettore tramite palmare.

Verificare la presenza di tensione 12V ai capi del connettore durante le attivazioni.

In caso contrario verificare la linea di massa tra pin 37 connettore centralina motore e il pin 1 del connettore iniettore cilindro anteriore e tra pin 28 connettore centralina e il pin 1 del connettore iniettore cilindro posteriore.

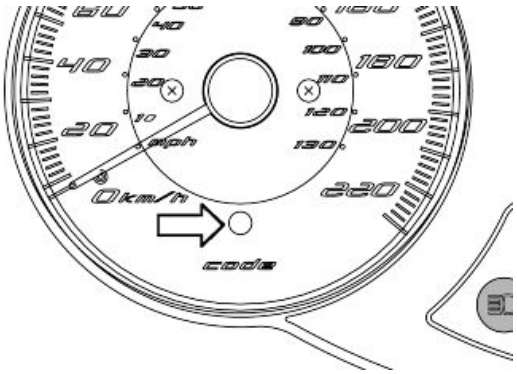
Verificare la linea +12V tra teleruttore carichi iniezione e pin 2 connettore iniettore.

## Immobiliser circuit

The EMS system is independent from the immobilizer antitheft device.

Its functions are:

- Start-up enabled by key recognition.
- Deterrent flashing.




The system consists of:

-EMS system control unit

- Decoder

- Aerial
- master key
- service key
- Deterrent and diagnosis LED

## Virgin circuit

When control unit (ECU) and decoder are not programmed, the following conditions occur:

- Key switch set to «**OFF**»:

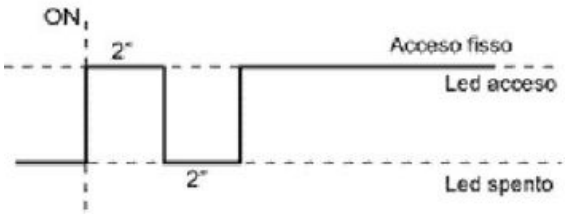
Deterrent flashing inactive.

- Key switch set to «**ON**»:

Ignition and injection disabled and LED on with solid light.

When the key switch is set to "**ON**", the LED switches on as shown in the figure.

The LED is turned on by the decoder.

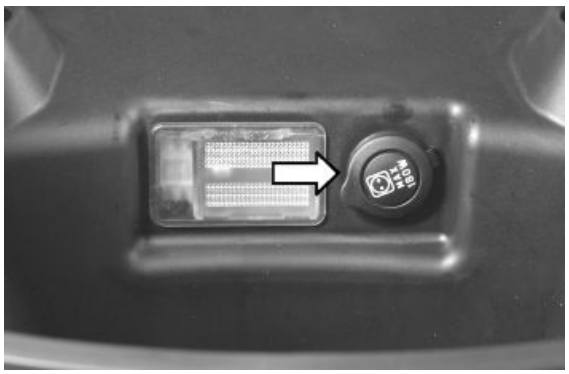



### Specific tooling

**020460Y Scooter diagnosis and tester**

To connect the diagnostic tester, open the battery inspection port and pull out the EMS diagnosis socket. Remove the protection cap and connect the tester terminal.


Power the diagnostic tester by connecting the terminals to the battery poles, or the specific connector to the socket inside the helmet compartment.



Set the switch to "**ON**" and select the diagnostic tester menu to the immobiliser function.

Scroll the pages to display the control unit data.

**N.B.**

**AN UNPROGRAMMED SYSTEM CANNOT BE DETECTED UPON FIRST FITTING, OR IN CASE THE DECODER AND THE CONTROL UNIT ARE REPLACED CONCURRENTLY.**

The information will be as follows:

Unprogrammed control unit «**ON**»

Start-up disabled «**ON**»

Key number Zero › 250

**1 Replacing the small cylinder**

- Remove the original master key transponder and install it on the master key of the new cylinder.
- Program the system again as described in the injection chapter.

**2 Decoder replacement**

When the decoder is replaced it is necessary to program the system again.

Programming is indispensable for the engine start-up. (see injection chapter).

**3 Control unit replacement**

Programming is indispensable when the control unit is replaced to enable the engine start-up.

In this case it is sufficient to switch to "**ON**" using the master key.

**N.B.**

**THE SERVICE KEY IS NOT USED FOR PROGRAMMING.**
**- WHEN NOT PROGRAMMED, THE CONTROL UNIT ALLOWS NO FUNCTIONAL DIAGNOSIS ON THE ENGINE.**

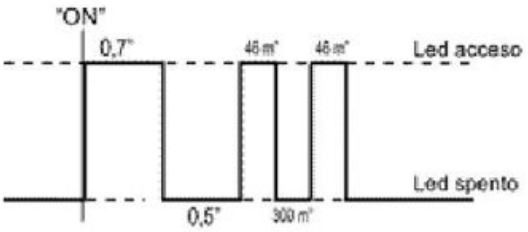
**4 Replacing or duplicating service keys**

Keys can be duplicated using the blank keys and the original master key.

**WITH MASTER KEY**

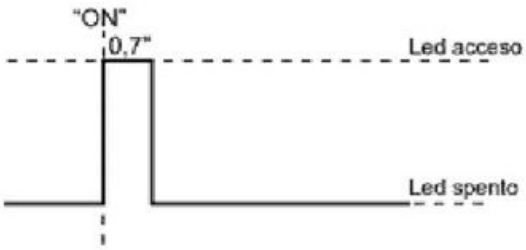
When the key switch is set to "**ON**" and programming is performed normally, the LED switches on as shown in the figure.

After the confirmation flash when switching to "**ON**", a number of flashes are emitted, equal to the number of keys used for programming.

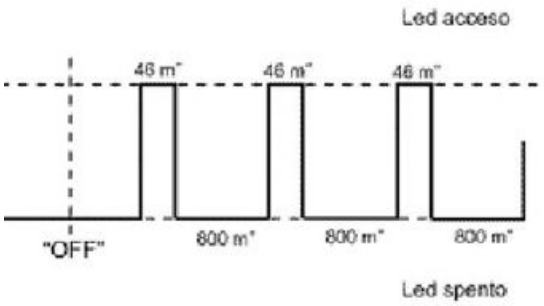


**WITH SERVICE KEYS**

After the confirmation flash when switching to «**ON**», the LED remains off.




Switching from «**ON**» to «**OFF**» with programmed system causes the intermittent switching on of the LED, with an antitheft effect.
This occurs with any key used for programming.



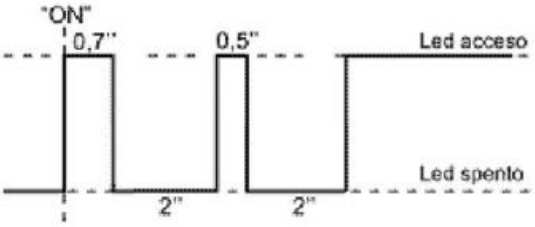

If the scooter is not used, the deterrent light stops automatically after 48 hours to prevent discharging the battery. A new 48-h cycle starts by switching from "**OFF**" to "**ON**" and "**OFF**" again.

## Diagnostic codes

The LED indication is divided into 3 steps:
1st step: A flash: "**ON**" switching recognition
2nd step: Series of flashes: diagnosis code indication
3rd step: Steady light on or off:
on = start-up disabled off = start-up enabled

## Code 1

Code 1 indicates a non-programmed system.
If the code is still displayed after having carried out the programming procedure, repeat the procedure carefully observing the "**ON**" times of each key.

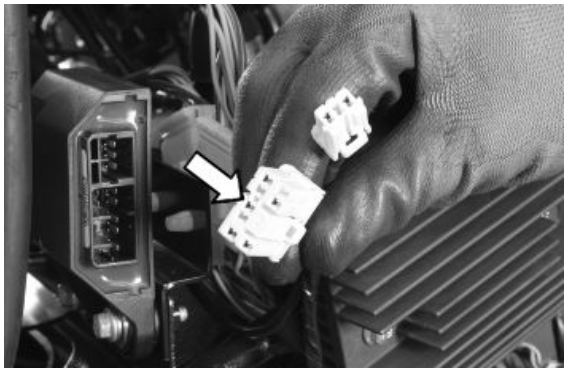



If the code is still displayed, proceed as follows:
- Disconnect the battery negative.
- Remove the control unit connector.
- Remove the main decoder connector.

**N.B.**

**TO ACCESS THE COMPONENTS, SEE THE COMPONENTS LAYOUT CHAPTER.**

**1**- With a multimeter, check the continuity between pin 7 of the vehicle side connector control unit and pin 6 of the decoder connector.
YES go to 3 NO go to 2



**2** - Repair or replace the wiring.

**3** - Check the connections carefully
YES go to 5 NO go to 4

**4** - Restore

**5** - Replace the decoder. Connect the battery. Repeat the programming. YES go to 7 NO go to 6

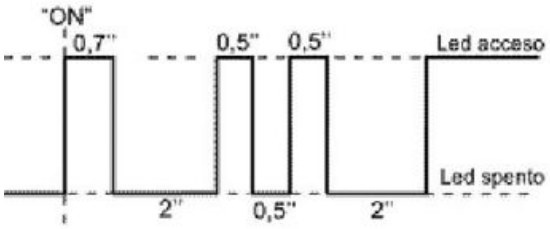
**6** - Disconnect the battery, replace the control unit, connect the battery. Repeat the programming.

**7** - The system is OK

## Code 2

Code no. 2 denotes a system where the decoder does not perceive the transponder signal.
- Start-up disabled
- Injection telltale light on, steady

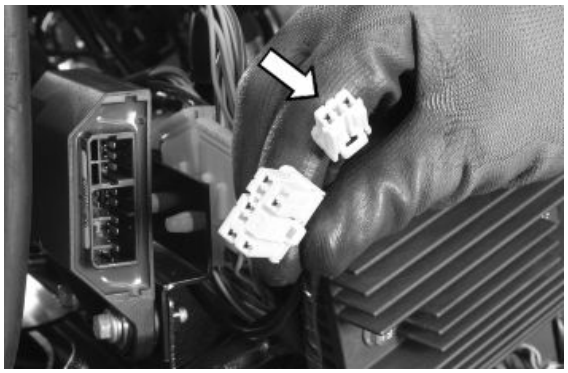
In this case, proceed as follows:




**1** - Check whether the code is repeated using the second key.
YES go to 3 NO go to 2

**2** - Failure detected with the service key Replace and program again. Failure detected with the master key.
Replace the transponder using one from the new cylinder kit.
Replace decoder and control unit.
Program again.

**3** - Check the proper connection of the aerial connector.

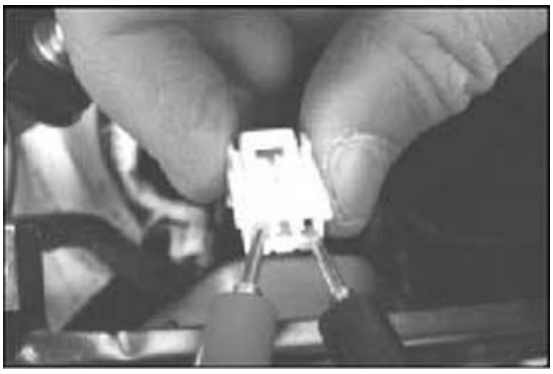


YES go to 5 NO go to 4

**4** - Restore the connection and check the presence of the code

**5** - Disconnect the aerial connector and check continuity (8 ± 2 W).

YES go to 7 NO go to 6



**6** - Replace the aerial.

**7** - Check the proper position of the aerial.

YES go to 9 NO go to 8

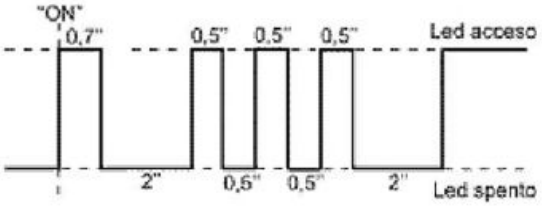
**8** - Place it in proper position

**9** - Replace the decoder and check the presence of the code

## Code 3

Code no. 3 denotes a system where the decoder perceives a transponder not provided for by programming.

- Start-up disabled
- Injection telltale light on, steady




**1**- Check whether the code is still displayed using the master key

YES go to 3 NO go to 2

**2** - Program again using all service keys

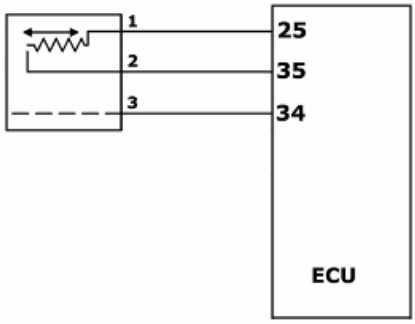
**3** - Check that all components (keys - decoder - control unit) are properly matched.

YES go to 5 NO go to 4

**4** - Restore

**5** - Replace decoders and control unit. Program the components again.

## Tachometer

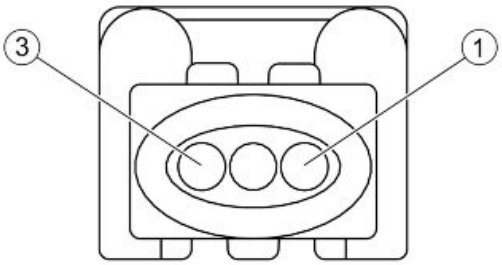



**ENGINE RPM SENSOR CONNECTOR**

**1.** Control unit (White)

**2.** Control unit (Red)

**3.** Sensor shield (Black)



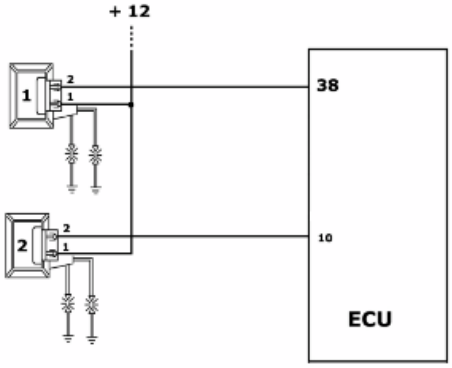

**REVOLUTION TIMING SENSOR**

Resistance between "**+** and **-"** = 890 ± Ohm (pins **35 - 25** , engine-side wiring)

Insulation between "**+** and **S**" and between "- and **S**" (pins **35 - 34** and **25 - 34**, engine-side wiring)

Check the continuity between pin 1 of the revolution timing sensor connector and pin 25 of the engine connector control unit. Check the continuity between pin 2 of the revolution timing sensor connector and pin 35 of the engine connector control unit. Check insulation between them and the ground lead of pin 1 and 2 of the connector and shielding. Check the continuity between pin 3 of the connector and pin 34 of the engine connector control unit.

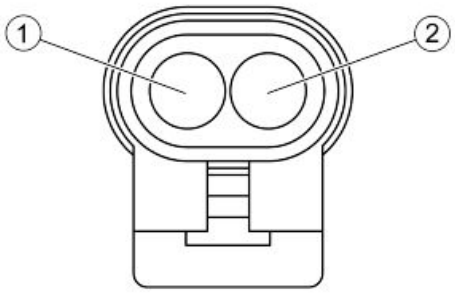
## HT coil




**REAR CYLINDER HV COIL CONNECTOR**

**1.** Injection load relay (Black-Green)

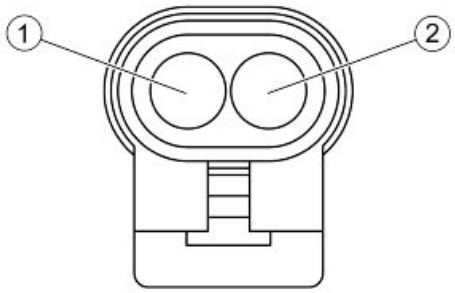
**2.** Control unit (Pink-Black)



**FRONT CYLINDER HV COIL CONNECTOR**

**1.** Injection load relay (Black-Green)

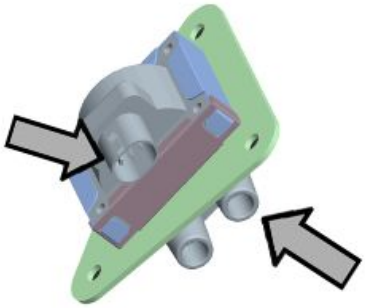
**2.** Control unit (Sky Blue)




**H.V. COIL**

Primary winding resistance: 520 ÷ 620 mOhm

Secondary resistance: 6830 ÷ 7830 Ohm



Check if there is voltage for 2 seconds, switching to "ON" between pin 1 of the coil connectors and ground lead.

Check the continuity between pin 2 of the cylinder 1 coil connector and pin 38 of the engine connector control unit.

Check the continuity between pin 2 of the cylinder 2 coil connector and pin 10 of the engine connector control unit.

## Inspecting the spark plug shielded cap

Measure the shielded cap resistance.

### Electric characteristic

**Resistance:**

5 KΩ

If different values are measured (<1; >20KΩ), replace the shielded cap.

**N.B.**

**A SHIELDLESS CAP OR SPARK PLUG CAN ADVERSELY AFFECT THE INJECTION SYSTEM. FOR INFORMATION ON THE SPARK PLUG, SEE THE «SPECIFICATIONS» AND «MAINTENANCE» CHAPTERS.**

## Spark advance

The ignition advance is determined electronically on the basis of parameters known by the control unit.

For this reason it is not possible to declare the reference values based on the engine rpm.

The ignition timing value is detectable any time using the diagnostic tester.

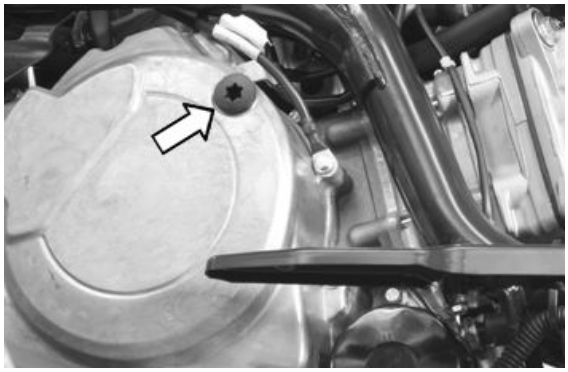
It is possible to check whether the ignition advance determined by the system does in fact correspond with the value actually activated on the engine, by means of the stroboscopic light.

### Specific tooling

**020460Y Scooter diagnosis and tester**

**020330Y Stroboscopic light for timing control**

- Unscrew the TDC reference inspection cap.
- Connect the stroboscopic light.



- Connect the diagnostic tester.
- Start the engine.
- Select the «parameter» function in this menu.
- Select the stroboscopic light command in the traditional four-stroke engine position (1 spark 2 revs).
- Check that the real values of rpm and ignition advance match those measured using the diagnostic tester.
- Replace the inspection cap on the flywheel side.

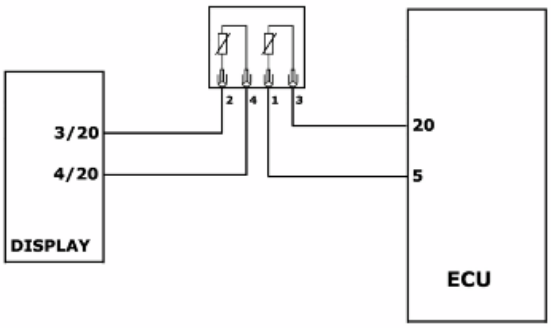
### Specific tooling

**020460Y Scooter diagnosis and tester**

**If the values do not match, check:**

- distribution timing
- revolution-timing sensor
- Injection control unit

## Coolant temperature sensor



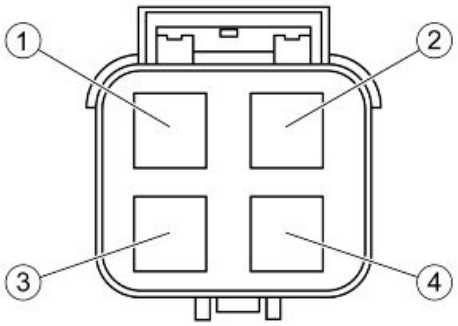

**WATER TEMPERATURE SENSOR CONNECTOR**

**1.** Control unit (Grey-Green)

**2.** Instrument panel (Green-Yellow)

**3.** Control unit negative (Sky Blue-Green)

**4.** Instrument panel (Brown-Black)




**ENGINE TEMPERATURE SENSOR**

0° = 5900 Ohm

+10° = 3800 Ohm

+20° = 2500 Ohm

+30° = 1700 Ohm

+80° = 300 Ohm

With the switch set to "ON", check if there is 5V voltage between pin 1 and 3 of the sensor connector.

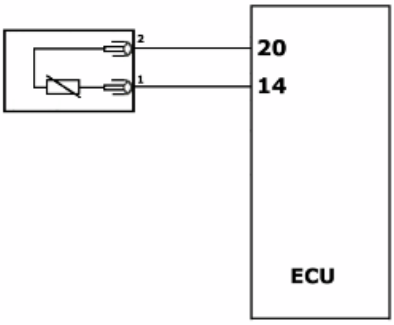
Check the continuity between pin 1 of the sensor connector and pin 5 of the engine connector control unit.

Check the continuity between pin 3 of the sensor connector and pin 20 of the engine connector control unit.

Check the ground insulation of the lines.

Repeat checks between pin 2 of the connector and pins 3/20 of the instrument panel, also between pin 4 of the connector and pins 4/20 of the instrument panel

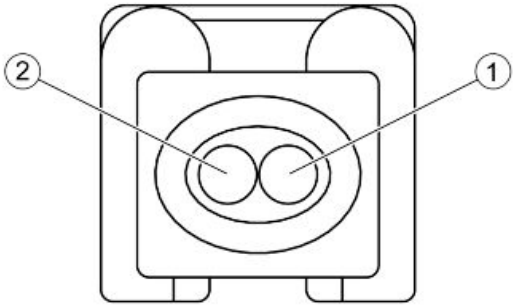
## Intake air temperature sensor




**AIR TEMPERATURE SENSOR CONNECTOR**

**1.** Control unit (White-Grey)

**2.** Control unit negative (Sky Blue-Green)




**INTAKE AIR TEMPERATURE SENSOR**

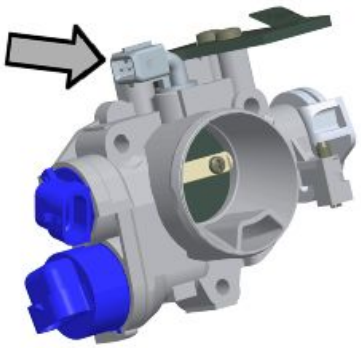
-10° = 9600 Ohm

0° = 5900 Ohm

+10° = 3800 Ohm

+20° = 2500 Ohm

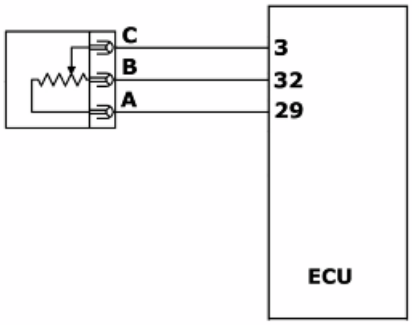
-30° = 1700 Ohm



With the switch set to "ON", check if there is 5V voltage between pins 1 and 2 of the sensor connector Check the continuity between pin 1 of the sensor connector and pin 14 of the engine connector control unit.

With the sensor connector disconnected, check that pin 2 of the sensor connector is earthed with the key set to "ON".
Check the continuity between pin 2 of the sensor connector and pin 20 of the engine connector control unit.
With the palm top computer, compare the value shown with the ambient temperature value.

## Throttle valve opening sensor

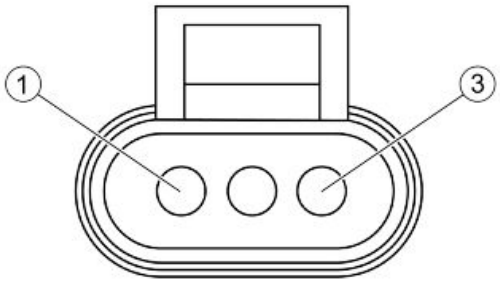



**THROTTLE SENSOR CONNECTOR**

**1.** Control unit (Grey-Black)

**2.** Control unit (Brown-Yellow)

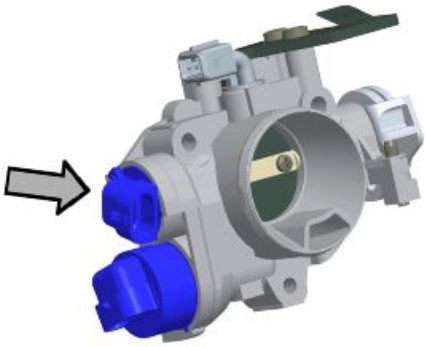
**3.** Control unit (Orange-Sky Blue)



**THROTTLE POSITION SENSOR**

With the switch set to "ON" at a variable voltage between 0.7V and > 4V between pins **23 - 3** on engine-side wiring.

Ground insulation of pins **29 - 32 - 3** on engine-side wiring



Pins 1(A) - 3(C): Throttle valve closed: approximately 2.5 kOhm; throttle valve open: approximately 1.5 kOhm

Pins 1(A) - 2(B): approximately 1.1 kOhm

Check the continuity between pin 3 of the sensor connector and pin 3 of the engine connector control unit.

Check the continuity between pin 2 of the sensor connector and pin 32 of the engine connector control unit.

Check the continuity between pin 1 of the sensor connector and pin 29 of the engine connector control unit.

Check that the three lines are ground insulated.

## Zeroing the throttle

**Resetting the throttle valve position signal (TPS reset)**

The MIU control unit is supplied with a throttle valve position sensor that is pre-calibrated.

Pre-calibration entails regulating the minimum opening of the throttle valve to obtain a certain flow of air under pre-set reference conditions.

Pre-calibration ensures optimal air flow to control idling.

**This regulation must not be tampered with in any way whatsoever.**

The injection system will complete the management of the idling through the Stepper motor and the variation of the ignition advance.

The throttle body after the pre-calibration has an opened valve with an angle that can vary depending on the tolerances of the machining of the pipe and the valve itself.

The valve position sensor can also assume various fitting positions. For these reasons the mV of the sensor with the valve at idle can vary from one throttle body to another.

To obtain the optimum fuel mixture, especially at small openings of the throttle valve, it is essential to match the throttle body with the control unit following the procedure known as TPS resetting.

With this operation we inform the control unit, as the starting point, of the mV value corresponding to the pre-calibrated position.

To reset, proceed as follows.

Connect the diagnostic tester.

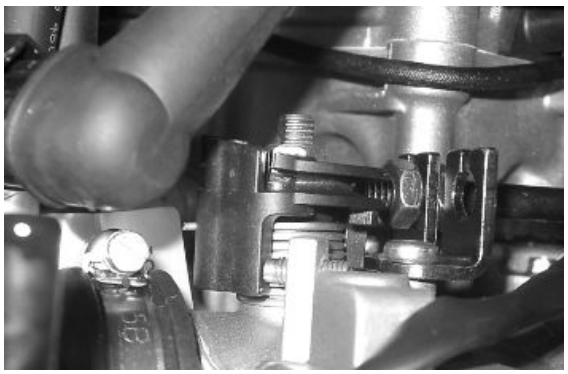
Switch to «**ON**».

Select the functions of the diagnostic tester on «**TPS RESET**».

### Specific tooling

**020460Y Scooter diagnosis and tester**


Make sure that the throttle valve with the control is supporting the stop screw.



Guaranteeing that this position will be kept, send a confirmation for the TPS reset procedure.



Reset should be performed in the following cases:

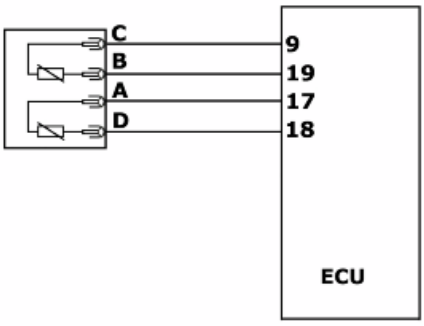
- on first fitting.

- if the injection control unit is replaced.

**N.B.**

**THE TPS RESETTING PROCEDURE MUST NOT BE CARRIED OUT WITH A USED THROTTLE BODY BECAUSE POSSIBLE VALVE WEAR AND STOP WEAR FOR THE MINIMUM OPENING MAKE THE AIR FLOW DIFFERENTLY FROM THAT OF PRE-CALIBRATION.**

## Step motor



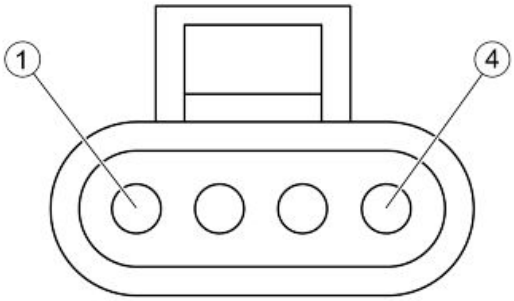
**IDLE ADJUSTMENT MOTOR CONNECTOR**

**1.** Control unit (Sky Blue-Red)

**2.** Control unit (Orange-Red)

**3.** Control unit (Sky Blue-Yellow)

**4.** Control unit (Sky Blue-Black)



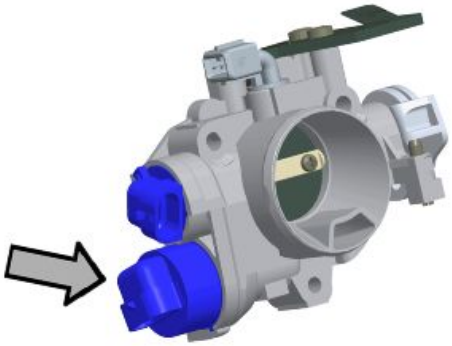

**STEPPER MOTOR**

Resistance engine-side connector between pins

**19 - 9** ~ 51 Ohm

Resistance engine-side connector between pins

**18 - 17** ~ 51 Ohm



With the palm top computer, while the engine is running and with at least one electric ventilation trip, perform the Stepper motor active diagnosis. Slight rpm variations must be detected.

Check the continuity of the 4 Stepper motor control lines.

Check the ground insulation of the 4 lines.

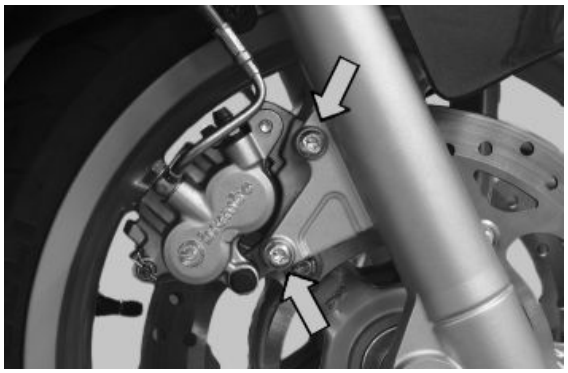
# INDEX OF TOPICS

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

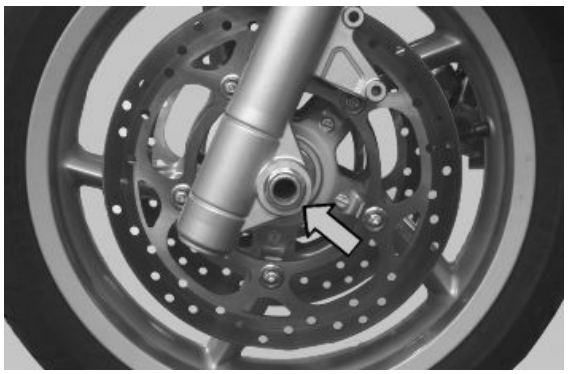
## Front

## Removing the front wheel

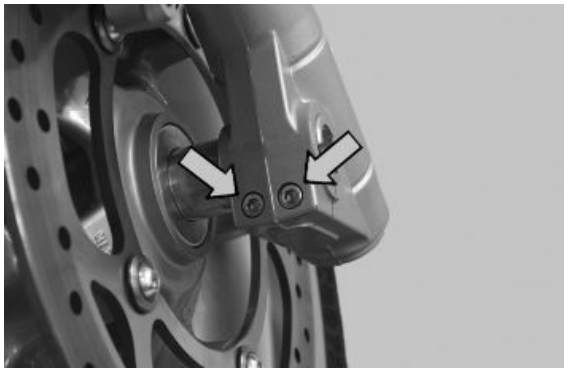
- Support the scooter adequately.
- Undo the screws indicated from both sides and release the front brake callipers from the discs.



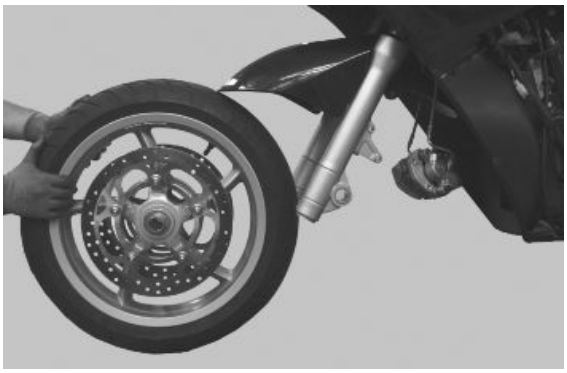
- Unscrew the wheel pin fixing nut.



- Loosen the two screws indicated on the right fork leg.



- Slide off the front wheel pin and remove the wheel.



## Front wheel hub overhaul

- Rimuovere da entrambi i lati lo scodellino di protezione e il distanziale, colpendo con un mazzuolo in più punti.

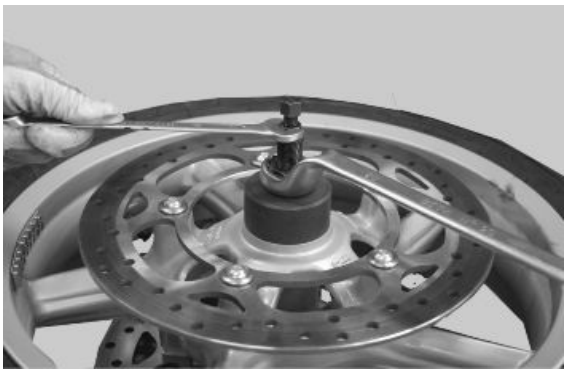
- Verificare visivamente il buono stato dei componenti, e che non siano presenti usure anomale.

- Agendo sull'attrezzatura specifica estrarre un cuscinetto.

### Specific tooling

**001467Y001 Pliers to extract 25 mm Ø bearings**

**001467Y007 Driver for OD 54 mm bearing**



- Rimuovere il distanziale interno.
- Dal lato opposto in modo analogo a quanto descritto sopra, ripetere l'estrazione dell'altro cuscinetto.
- Verificare visivamente che sul distanziale interno e nelle sedi dei cuscinetti non siano presenti usure anomale.

- Utilizzando l'attrezzatura specifica riscaldare la sede di un cuscinetto.

**Specific tooling**

**020151Y Air heater**

- Inserire un nuovo cuscinetto portandolo fino a battuta utilizzando l'attrezzatura specifica.

**Specific tooling**

**020376Y Adaptor handle**

**020364Y 25-mm guide**

- Dal lato opposto inserire il distanziale interno.
- In modo analogo a quanto descritto sopra, ripetere l'inserimento dell'altro cuscinetto.

- Inserire da entrambe le parti lo scodellino di protezione e il distanziale assemblati come indicato e portare a battuta.

## Refitting the front wheel

- To refit, carry out the removal operations but in reverse order and tighten to the prescribed torques.

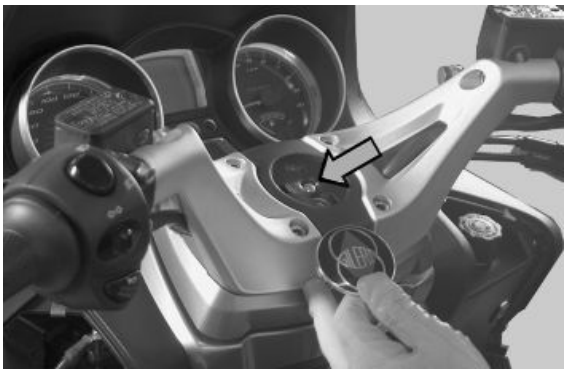
**Locking torques (N*m)**

**Screw fixing wheel pin on right fork leg 6 ÷ 7 Front wheel pin nut 60 ÷ 70 Screws fixing front brake calliper to fork 20 ÷ 25**

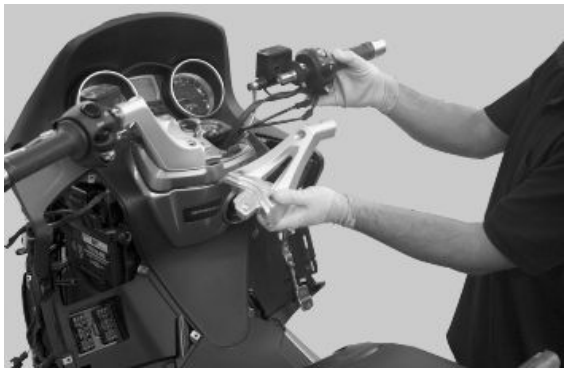
## Handlebar

## Removal

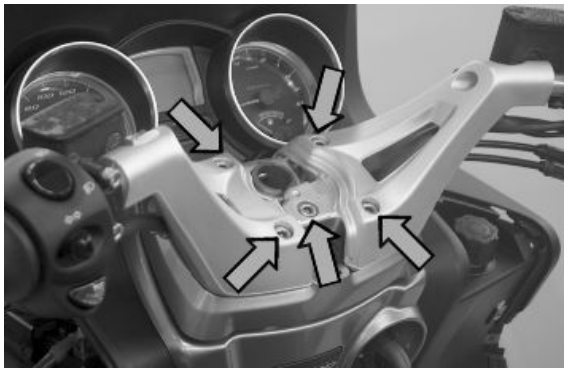
- Remove the Gilera clip-on badge, undo the screw indicated and remove the handlebar cover.



- The half-handlebar comprises two parts: undo the indicated screw to remove the handlebar insert.



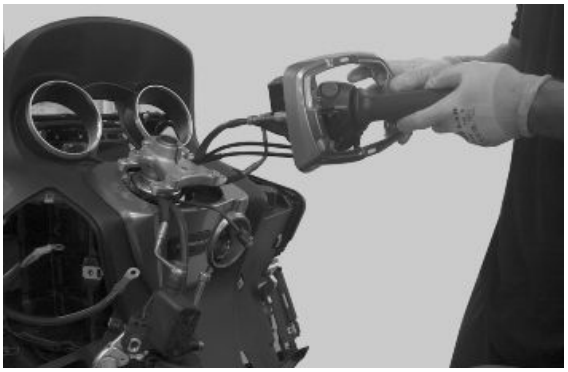
- Undo the five screws indicated to remove both half-handlebars.



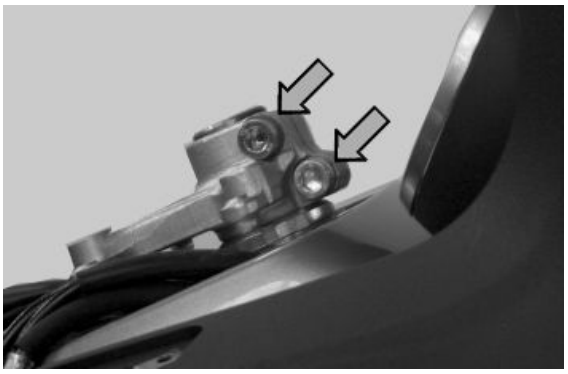
- Undo the four screws indicated, remove the frame by passing the inserts through to the inside.

**CAUTION**

**BE CAREFUL WITH THE SWITCH STOP CONNECTORS.**



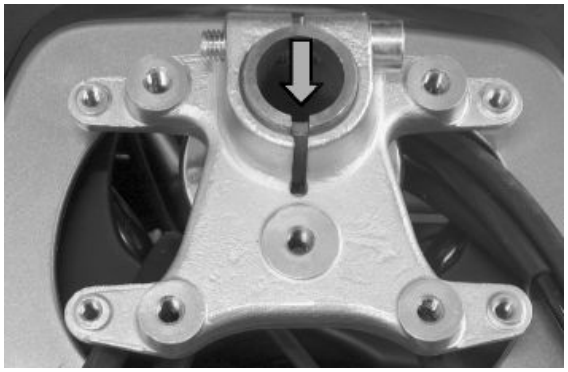
- Undo the two screws indicated.



- Remove the supporting plate.

## Refitting

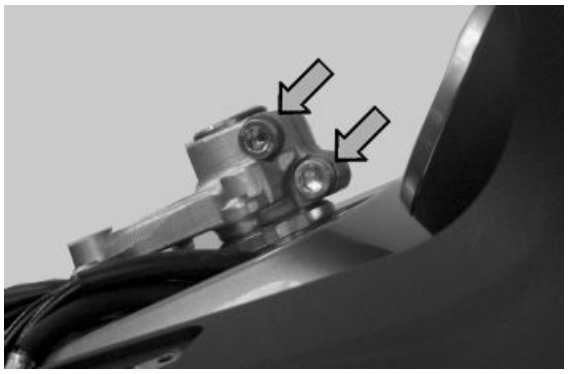
- Fit the supporting plate on the steering tube.
- Align the plate following the indicated reference so as to allow the upper fixing screw to fit into the hole on the steering tube.



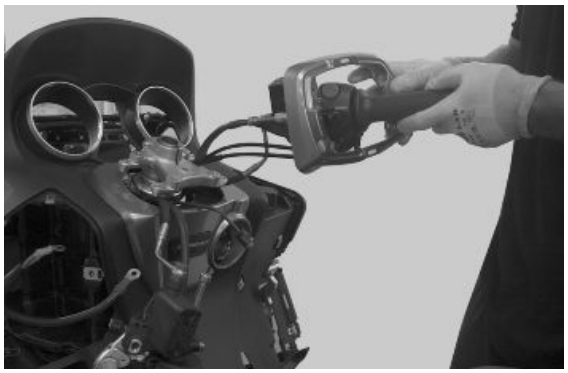
- Tighten the two screws indicated to the prescribed torque.

**Locking torques (N*m)**

**Screws fixing handlebar supporting plate - steering tube 50 ÷ 55**



- Fit both handlebar inserts inside the frame as indicated in the photograph.

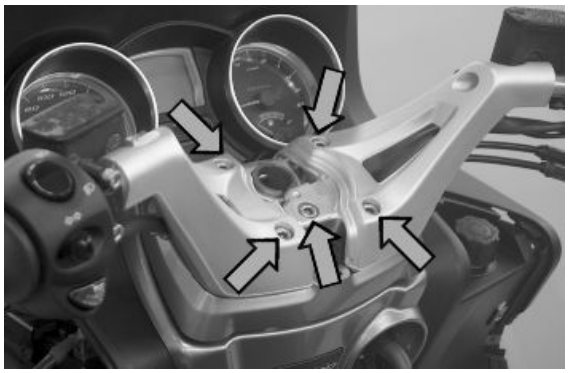


- Assemble the frame on the supporting plate .
- Fit the four fixing screws and tighten to the prescribed torque.

**Locking torques (N*m)**

**Screws fixing frame - supporting plate 4.5 ÷ 7**

- Assemble the half-handlebars to the supporting plate and tighten the five screws indicated to the prescribed torque using the recommended product.



### Recommended products

**Loctite 243 Medium strength threadlock**

Loctite 243 medium-strength threadlock

### Locking torques (N*m)

**Screws fixing half-handlebars - supporting plate 20 ÷ 25***

- Fit both handlebar inserts on the half-handlebars and tighten the screw indicated to the prescribed torque using the recommended product.

### Recommended products

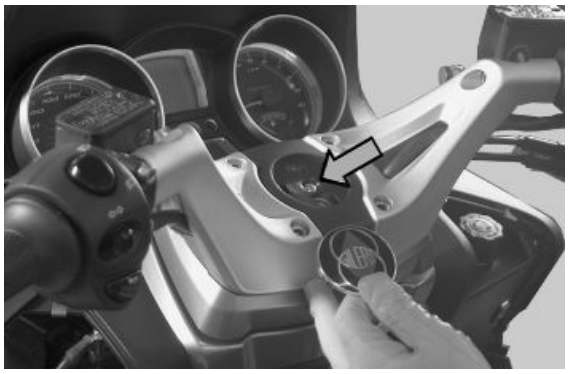
**(°) Loctite 243 Medium strength threadlock**

Apply LOCTITE 243 medium-strength threadlock

### Locking torques (N*m)

**Screw fixing half-handlebar insert - half-handlebar 20 ÷ 25***

- Fit the handlebar cover, tighten the screw indicated to the prescribed torque and fit the Gilera clip-on badge.



### Locking torques (N*m)

**Handlebar cover fixing screw 2.5 ÷ 4**

## Front fork

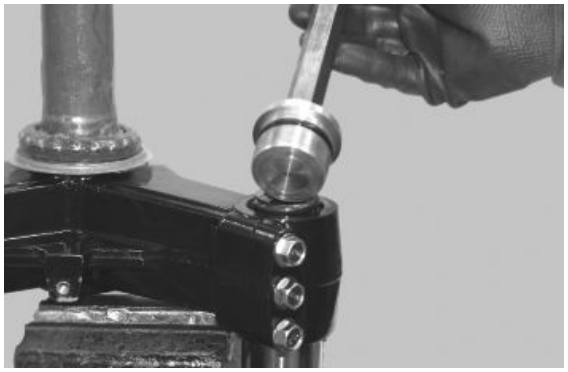
## Removal

### See also

Removal

## Overhaul

- Support the fork in a vice.
- Loosen the three screws tightening the stem supporting clamp.
- Unscrew the stem closing cap and slide off the fork leg together with the stem from the relevant support.

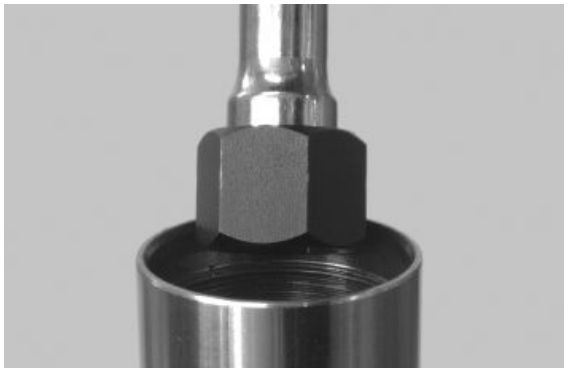


**CAUTION**

**THE STEM CLOSING CAP KEEPS THE MAIN SPRING PRELOADED. KEEP THE CAP PROPERLY FITTED DURING THE REMOVAL FINAL STAGE TO AVOID ACCIDENTS.**

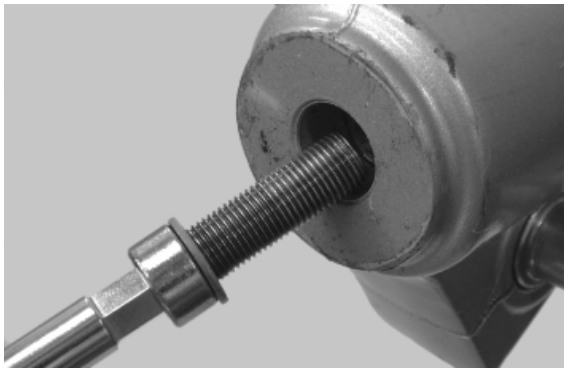
- Support the fork leg properly, remove the main spring and drain off the fork leg oil.

- Remove the screw fixing the hydraulic rod with the specific sealing gasket:
- Lock hydraulic rod rotation using the specific tool.
- Undo the fixing screw and collect the copper washers.

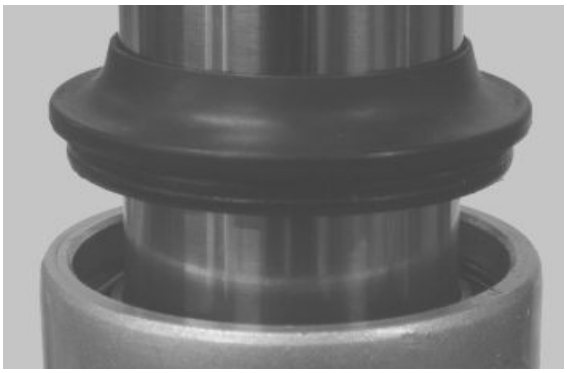


### Specific tooling

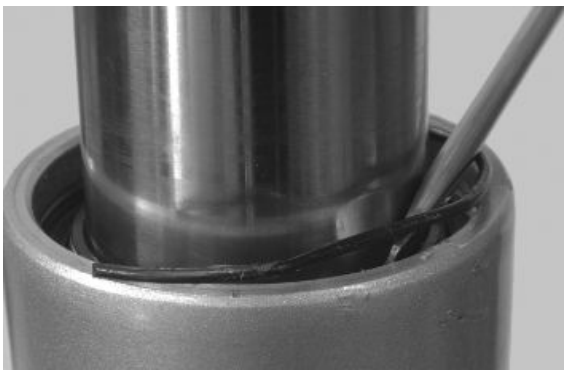
**020632Y 22-mm Hexagonal spanner**



- Remove the stem dust guard with a screwdriver.



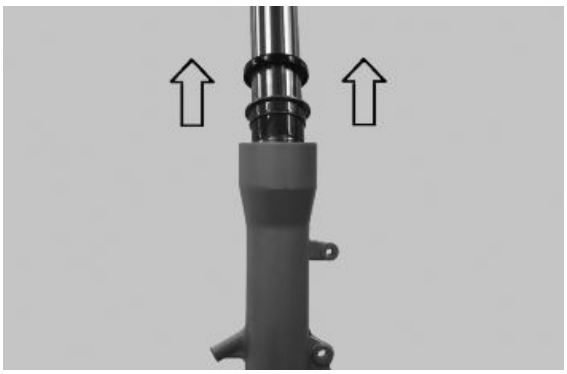
- Remove the circlip retaining the oil seal.



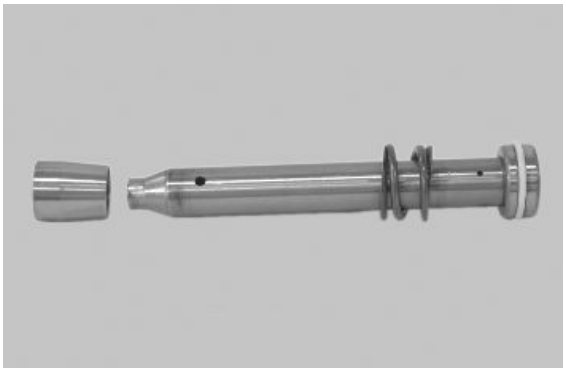
- Pull out the stem with force to the end of stroke.

**N.B.**

**THE STEM HAS A SLIDING BUSHING LOCATED IN THE UPPER PART. WHEN THE STEM IS BEING REMOVED, THE LOWER BUSHING WORKS AS AN EXTRACTOR AGAINST THE UPPER BUSHING, THE WASHER AND THE OIL SEAL ON THE FORK LEG.**



- Remove the hydraulic rod with the corresponding sealing gasket, the spring and the stop bushing.



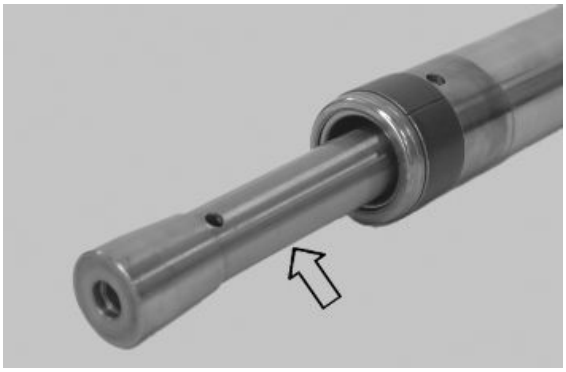
**COMPONENT CHECK**

**CAUTION**

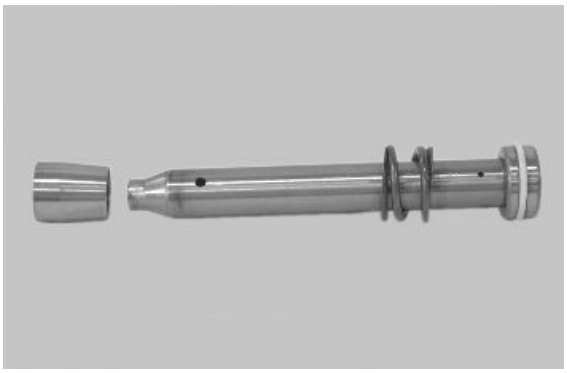
**CLEAN ALL THE COMPONENTS THOROUGHLY.**

- Check that the fork leg exhibits no dents or damage matching the couplings.
- Visually inspect that the upper sliding bushing exhibits no signs of abnormal wear on the internal surface.

- Check that the stem exhibits no scores, dents or distortions.
- Check that the stop bushing for the hydraulic rod is properly fixed through caulking.
- Visually inspect that the lower sliding bushing exhibits no signs of abnormal wear on the external surface.



- Check that hydraulic rod caulkings, the contrast spring to the unloaded the end of stroke and the hydraulic rod sealing ring are in good conditions.

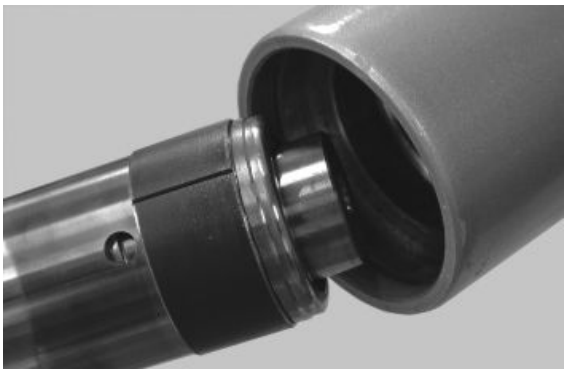


- Check that the main spring exhibits no signs of yielding or abnormal wear.

- Check that the closing cap O-ring of the stem is in good conditions.

## Refitting

- Preassemble the stem with the lower sliding bushing, the hydraulic rod with the spring and the stop bushing.
- Fit the pre-assembled components inside the fork leg.



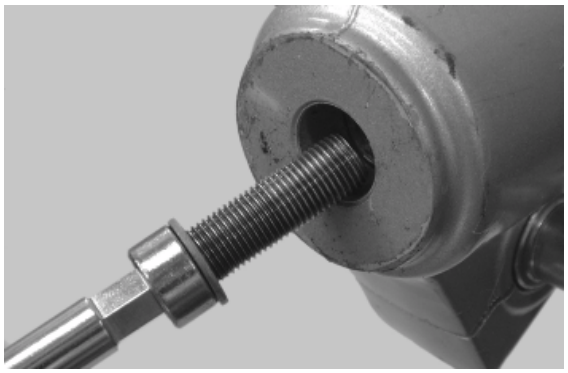
- Fit the hydraulic rod fixing screw with the copper sealing washer and tighten to the prescribed torque using the recommended product.

**CAUTION**

**ALWAYS USE NEW COPPER WASHER.**

**Locking torques (N*m)**

**Hydraulic rod fixing screw 25 ÷ 35***

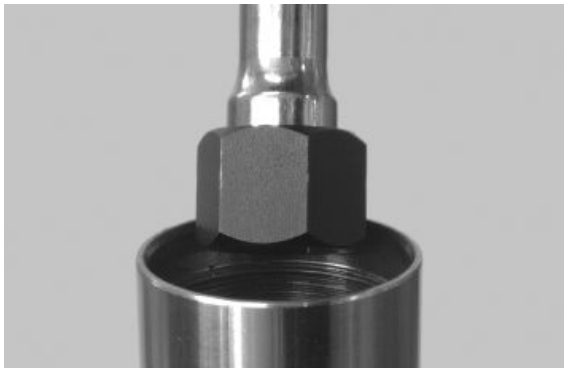


(°) Apply LOCTITE 243 threadlock

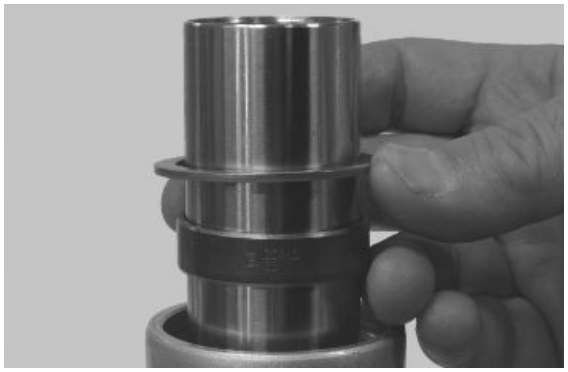
- Lock hydraulic rod rotation using the specific tool.

**Specific tooling**

**020632Y 22-mm Hexagonal spanner**



- Fit the upper sliding bushing and the bushing stop washer inside the fork leg.



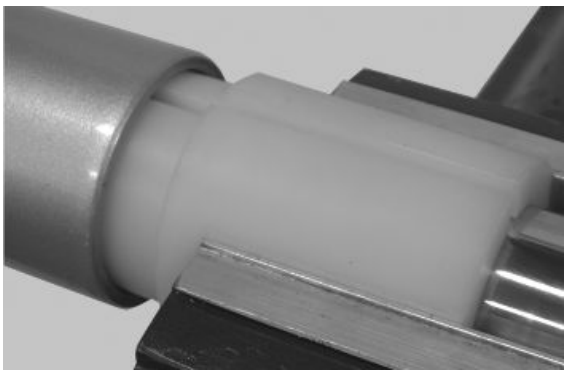
- First grease the splitting chamber of the two sealing lips of the new oil seal.
- Fit the sealing ring on the stem and keep the identification words facing upwards.

- Fit the specific tool in the sealing ring in the initial driving position.

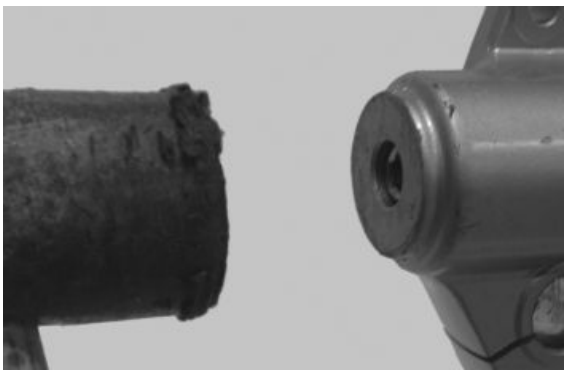
### Specific tooling

**020633Y Clamp for sealing ring driving of Kayaba 41-mm and Marzocchi 40-mm forks**

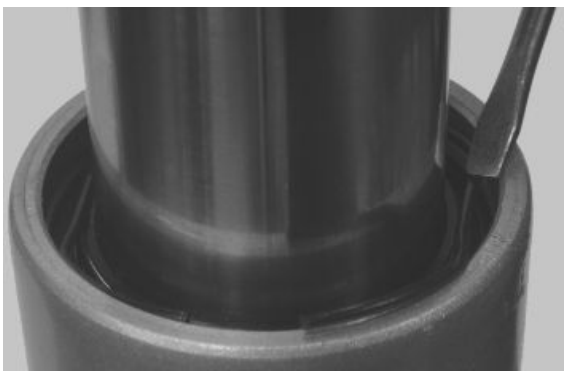
- Fix the specific tool in a vice with the stem placed at approximately halfway.



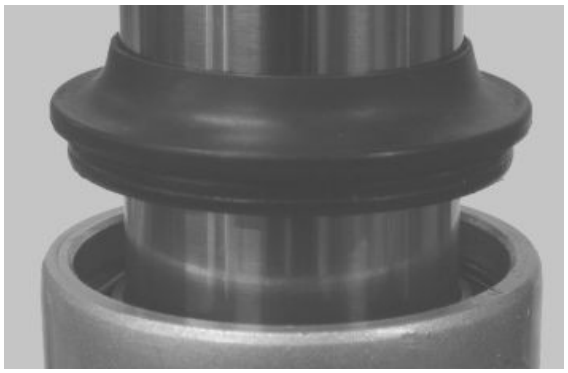
- Drive the sealing ring to the end of stroke acting on the fork leg with a mallet.



- Fit the oil seal retaining circlip.



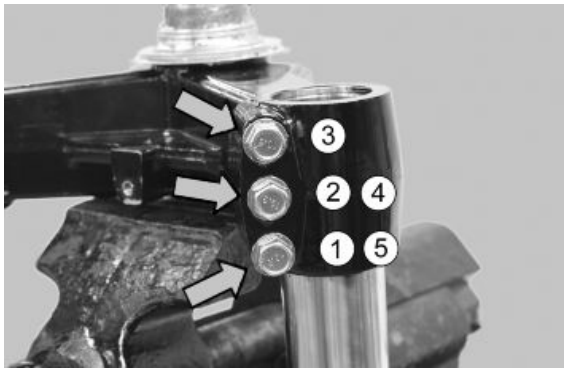
- Grease and fit a new dust guard.



- Fit the fork leg together with the stem on the fork support clamp until it stops.
- Tighten the three screws to the prescribed torque in the sequence indicated in the photograph.

### Locking torques (N*m)

**Stem support clamp tightening screws 20 ÷ 25**




- Refill the fork leg with the recommended product to the prescribed amount.

### Recommended products

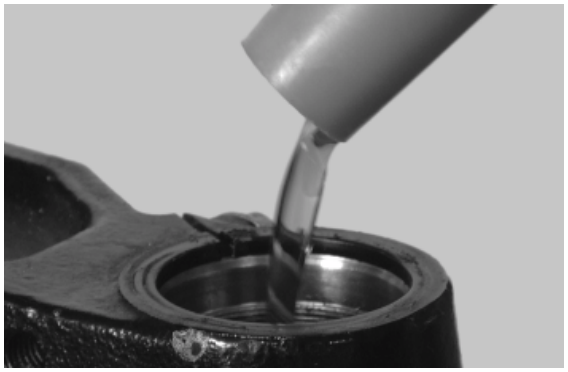
**AGIP FORK 7.5 W Oil for front fork**

Hydraulic fluid SAE 7.5 W

### Characteristic

**Oil quantity for stem**

295 ± 3 $cm^3$



- Bleed the hydraulic rod by actuating the stem repeatedly.
- Fit the spring into the stem.

- Lubricate the stem closing cap O-ring.
- Preload the spring; fit the closing cap and tighten to the prescribed torque.

**Locking torques (N*m)**

**Fork locking screws cap 35 - 55**

- Repeat the procedure for the other fork leg.

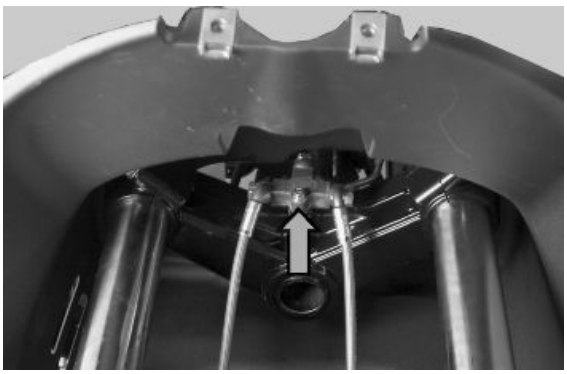
**N.B.**

**IF BOTH FORK LEGS ARE SERVICED AT THE SAME TIME, BE CAREFUL NOT TO INVERT THE RIGHT FORK LEG WITH THE LEFT ONE.**

## Steering column

## Removal

- Remove the front wheel.
- Undo the screw indicated and remove the brake-force distribution mechanism from the fork.



- Remove the half-handlebar supporting plate.
- Unscrew the steering ring nuts with the specific tool.

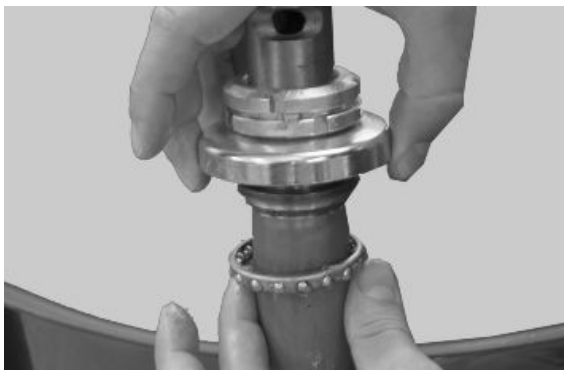
**Specific tooling**

**020668Y Steering ring nut wrench**

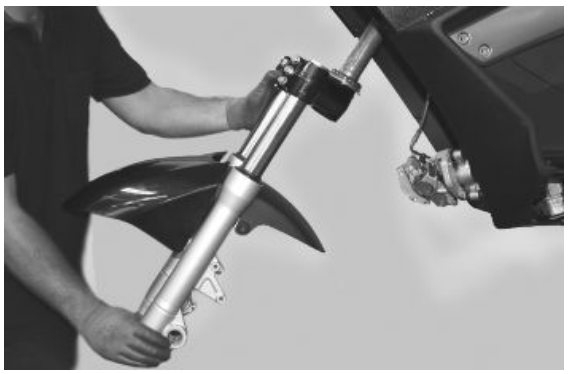
- Remove the upper steering fifth wheel and relevant components; the fork is now free.

**CAUTION**

**HOLD IT SO THAT IT DOES NOT COME OFF SUDDENLY.**



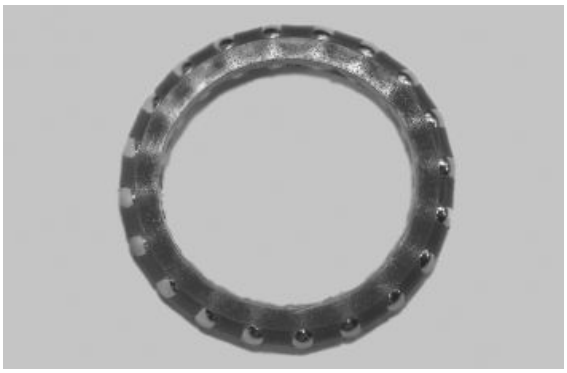
- Slide off the complete front fork, remove the lower steering fifth wheel.



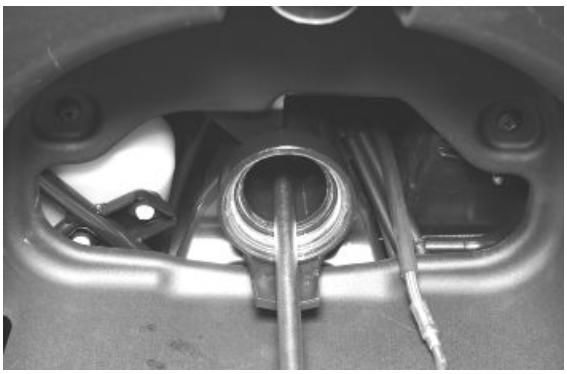
## Overhaul

- Clean thoroughly and visually inspect if the components are in good conditions.
- Check the upper steering fifth wheel for wear.

- Check the lower steering fifth wheel for wear.



- Visually inspect that the steering fifth wheel tracks, the headstock and the steering tube exhibit no scores or abnormal wear. Otherwise, replace them.



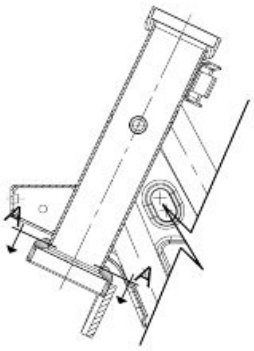
**STEERING FIFTH WHEEL TRACK REMOVAL**

- Remove the steering fifth wheel tracks on the chassis with the specific tool, following the indicated procedure.
- Fit the specific tool from the lower part of the headstock until it makes contact with the upper track.
- Hit with force the specific tool, placing it at different points diametrically opposed so as to remove the upper track.

### Specific tooling

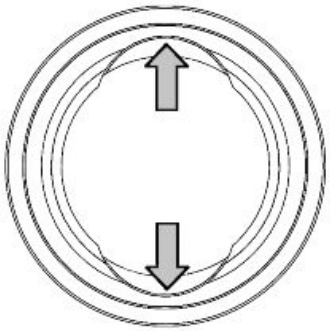
**020004Y Punch for removing fifth wheels from headstock**

- From the upper part, fit the specific tool in the two millings on the headstock (indicated in the figure) so as to make contact with the lower track.
- Hit with force the specific tool, placing it properly at both points so as to remove the lower track.

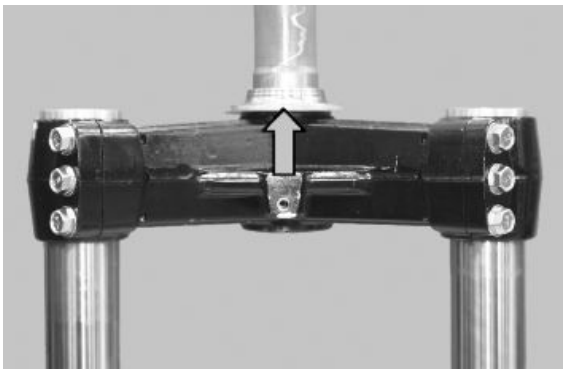


### Specific tooling

**020004Y Punch for removing fifth wheels from headstock**




- Remove the lower fifth wheel seat on the steering tube using the specific tool.



### Specific tooling

**020004Y Punch for removing fifth wheels from headstock**

**STEERING FIFTH WHEEL TRACK FITTING**

- Thoroughly clean the track seats on the headstock and the steering tube.
- Fit the new tracks of the headstock with the specific tool.
- Screw the nut until the tracks are fully inserted.

**N.B.**

**LUBRICATE THE STEERING FIFTH WHEEL TRACKS WITH RECOMMENDED GREASE BEFORE USE.**

### Specific tooling

**001330Y Tool for fitting steering seats**

**001330Y014 Tool for fitting steering seats**

**001330Y015 Tool for fitting steering seats**

### Recommended products

**AGIP GREASE PV2 Grease for steering bearings, bolt seatings for swinging arms and faying surface of driven pulley spring (only pulley side)**

Soap-based lithium and zinc oxide grease containing NLGI 2; ISO-L-XBCIB2

- Fit the lower fifth wheel seat on the steering tube.
- With a tube of the indicated sizes, fit the lower seat until it stops. Inside Ø: 40.5 mm; Outside Ø: 48 mm; Length: 350 mm.

**N.B.**

**LUBRICATE THE STEERING FIFTH WHEEL TRACKS WITH RECOMMENDED GREASE BEFORE USE.**

### Recommended products

**AGIP GREASE PV2 Grease for steering bearings, bolt seatings for swinging arms and faying surface of driven pulley spring (only pulley side)**

Soap-based lithium and zinc oxide grease containing NLGI 2; ISO-L-XBCIB2

## Refitting

- Fit the lower steering fifth wheel on the steering tube.
- Fit the fork together with the lower steering fifth wheel on the headstock and hold it so that it does not fall.

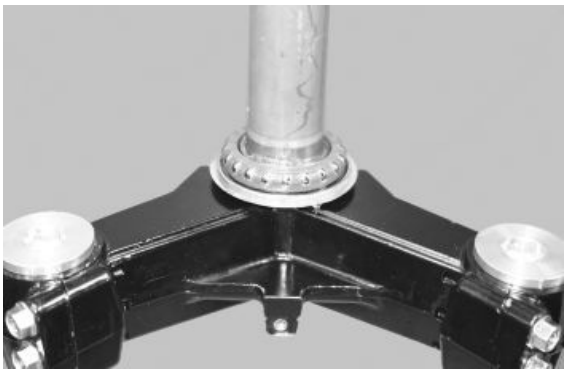
**N.B.**

**LUBRICATE THE STEERING FIFTH WHEEL TRACKS WITH RECOMMENDED GREASE BEFORE USE.**

### Recommended products

**AGIP GREASE PV2 Grease for steering bearings, bolt seatings for swinging arms and faying surface of driven pulley spring (only pulley side)**

Soap-based lithium and zinc oxide grease containing NLGI 2; ISO-L-XBCIB2



- Fit the upper steering fifth wheel.

- Fit the steering fifth wheel upper seat.

- Fit the cover plate.

- Fit the lower tightening ring nut with the chamfered side facing down, screw it until it stops and with the specific tool, tighten to the indicated torque.

### Specific tooling

**020668Y Steering ring nut wrench**

### Locking torques (N*m)

**Steering tube lower ring nut 20 ÷ 22**

- Fit the spacer between the two ring nuts on the steering tube in the position indicated.

- Fit the upper tightening ring nut with the chamfered side facing up, screw it until it stops and with the specific tool, tighten to the indicated torque.

### Specific tooling

**020668Y Steering ring nut wrench**

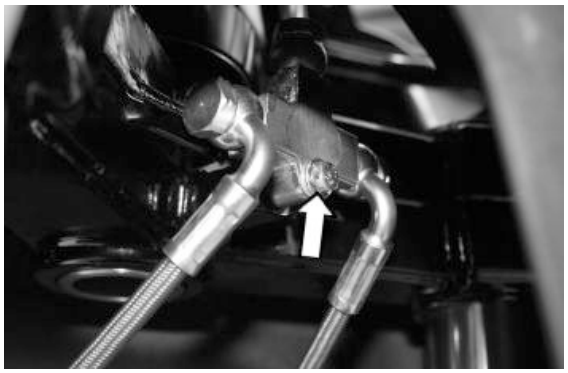
### Locking torques (N*m)

**Steering tube upper ring nut 48 ÷ 54**

- Fix the three-way union to the fork head.

**Locking torques (N*m)**

**Screw fixing three-way union to fork head 10 ÷ 12**



- Fit the front wheel.

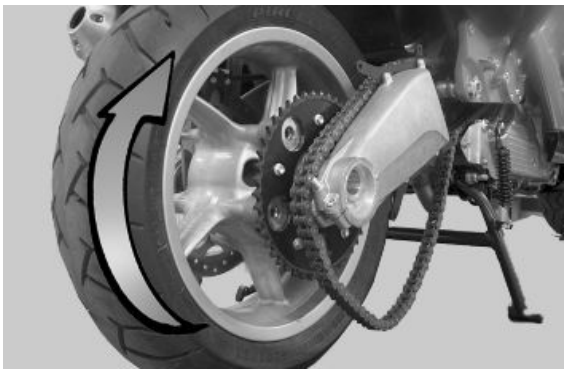
## Rear

## Removing the rear wheel

- Unscrew the wheel pin fixing nut.

- Remove the wheel pin and collect the spacer indicated.

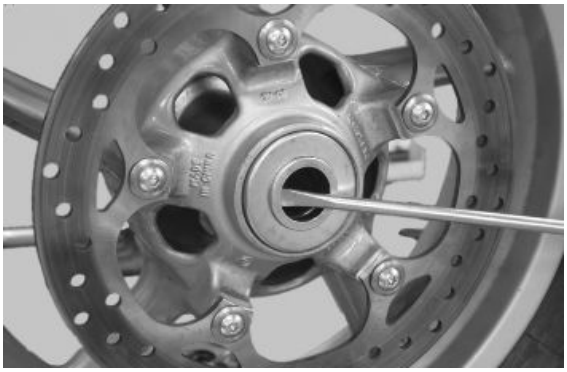
- Move the wheel to the front part of the vehicle so as to obtain chain clearance to remove it from the sprocket.



- Release the calliper holding plate from the disc.
- Remove the wheel.

**REAR WHEEL HUB SERVICE**

- Remove the protection sleeve and the spacer from both sides using a flat blade screwdriver as a lever.
- Visually inspect if the components are in good conditions and that they exhibit no signs of abnormal wear.



- Acting on the specific tool, pull out one bearing.

### Specific tooling

**020467Y020 Pliers to extract 30 mm bearings**

**001467Y002 Driver for OD 73 mm bearing**

- Remove the internal spacer.
- Repeat the previously described procedure to pull out the other bearing from the opposite side.
- Visually inspect that the internal spacer and the bearing seats exhibit no signs of abnormal wear.

- Heat the seat of one bearing with the specific tool.

**Specific tooling**

**020151Y Air heater**

- Insert a new bearing until it stops with the specific tool.

**Specific tooling**

**020376Y Adaptor handle**

**020483Y 30 mm guide**

**020655Y Adaptor 62x68 mm**

- Fit the internal spacer from the opposite side.
- Repeat the previously described procedure to fit the other bearing.

- Insert the assembled protection cap and spacer until they stop on both sides as described.

## Refitting the rear wheel

- Follow the removal steps but in reverse order and tighten to the prescribed torque.

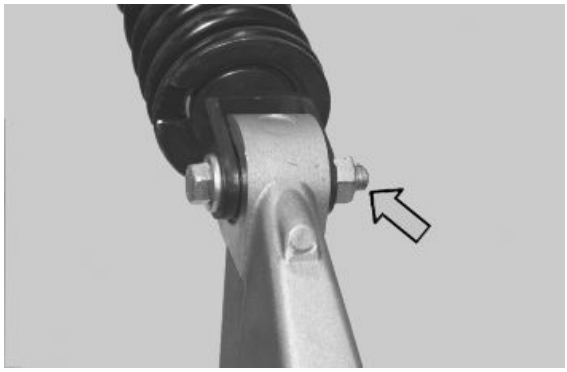
**Locking torques (N*m)**

**Rear wheel pin nut 70**

## Shock absorbers

## Removal

- Remove the fork.
- Unscrew the nut indicated to remove the pin.



**See also**

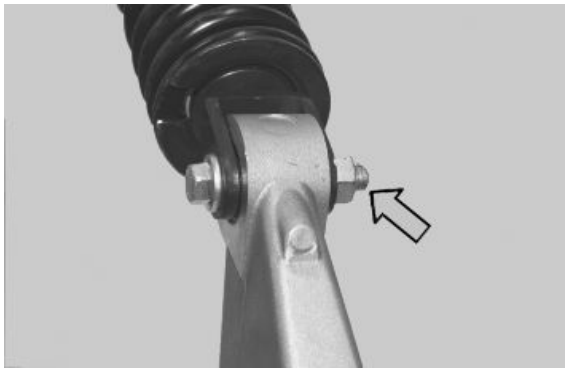
Removal

## Refitting

- Fix the fork to the shock absorber with a pin.
- Tighten the nut indicated to the prescribed torque.

**Locking torques (N*m)**

**Nut fixing shock absorber - fork 38 - 46**



- Following the operations indicated in the relevant section, fit the rear fork on the vehicle thus fixing the shock absorber to the chassis to the prescribed torque.

**Locking torques (N*m)**

**Screw fixing shock absorber - fork 38 - 46**

## Removal

**See also**

Exhaust assy. Removal

## Refitting

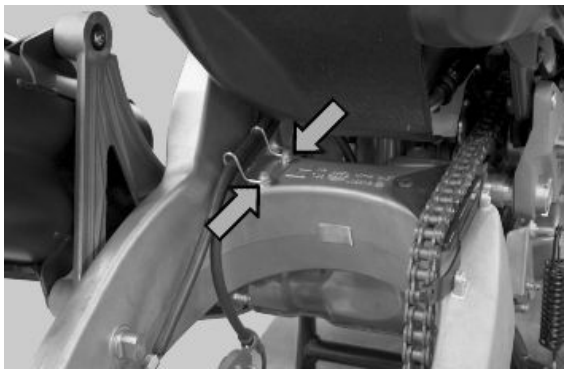
**See also**

Exhaust assy. Removal

## Fork

## Removal

- Remove the left side fairing.
- Remove the rear wheel.
- Undo the two screws indicated and collect the washers thus releasing the rear brake pipe retainer.



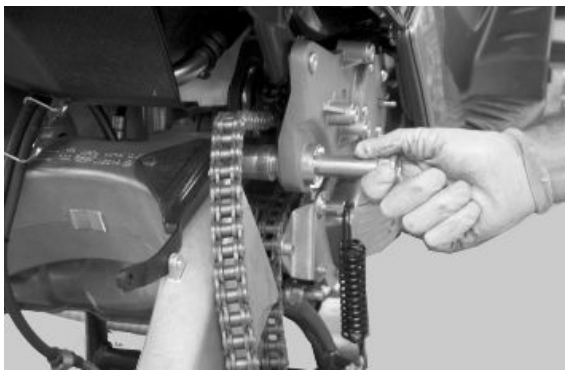
- Release the rear shock absorber front retainer.
- Undo the screw indicated and collect the washer.

**N.B.**

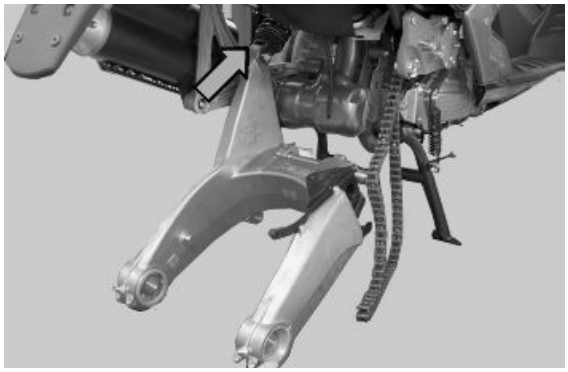
**THE NOW FREE FORK ROTATES DOWNWARDS.**

- Undo the fork pin tightening nut and collect the washer.

- Slide off the fork pin.

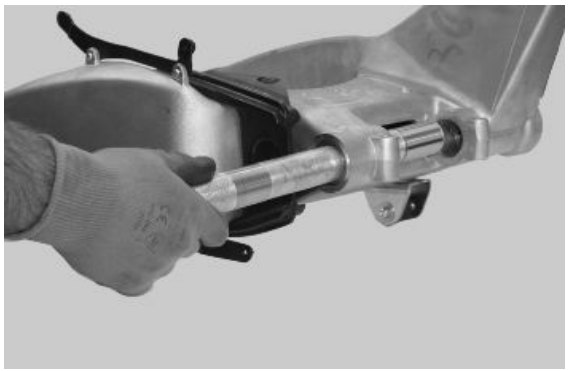


- Remove the fork paying attention to the shock absorber.

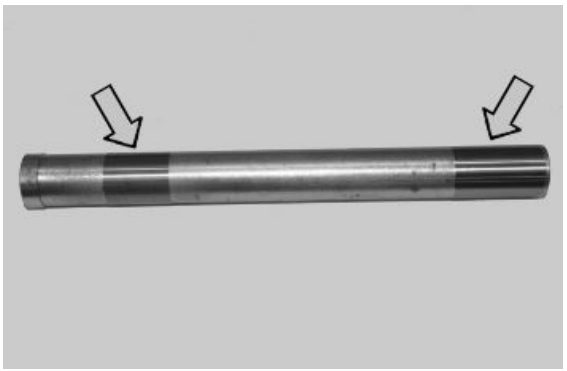


## Service

- Slide off the internal spacer from the right side and remove the stop bushing from the left side.



- Thoroughly wipe off any lubricating grease on the spacer.
- Check that the roller casing work surfaces exhibit no signs of scratches or abnormal wear.

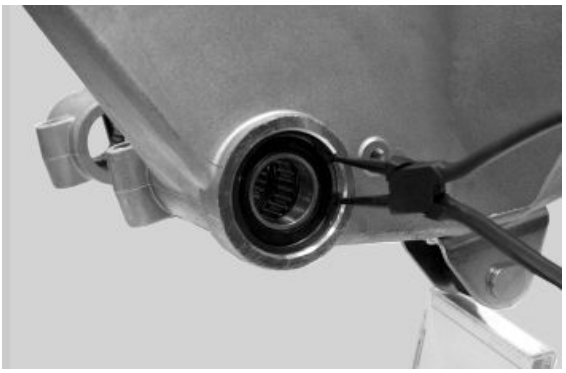


### Characteristic

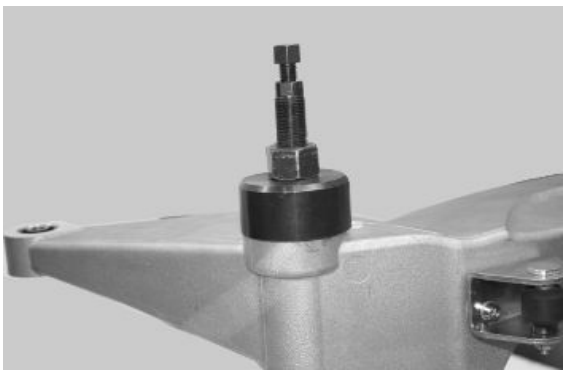
**Standard diameter**

30.0 mm -0.02 -0.041

- Remove the seeger ring.



- Take out the bearing using the specific tool.



### Specific tooling

**001467Y035 Bell Ø 42**

**001467Y001 Pliers to extract 25 mm Ø bearings**

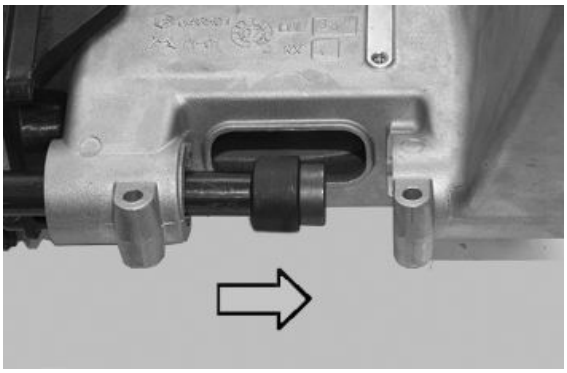
- Fit the adaptor handle from the left side, then prepare the adaptor and the guide.
- Pull out the two ball bearing cages with the specific tool.
- Visually inspect if the surfaces are in good conditions and that they exhibit no signs of scratches or abnormal wear.

### Specific tooling

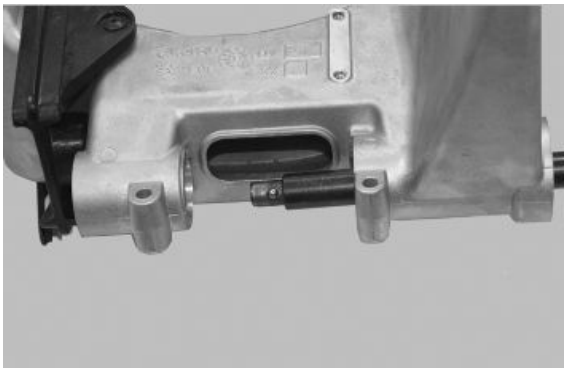
**020376Y Adaptor handle**

**020670Y Adaptor 34 mm**

**020483Y 30 mm guide**



- Fit the adaptor handle from the right side, then prepare the adaptor and the guide.
- Pull out the ball bearing cage with the specific tool.
- Visually inspect if the surfaces are in good conditions and that they exhibit no signs of scratches or abnormal wear.

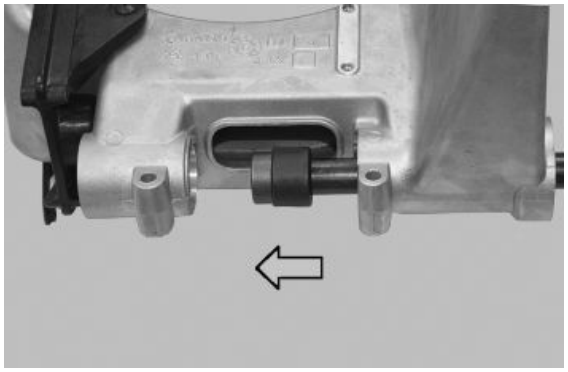


### Specific tooling

**020376Y Adaptor handle**

**020670Y Adaptor 34 mm**

**020483Y 30 mm guide**



- Drive the new ball bearing cages with the specific tool and a hydraulic press.
- Grease with the recommended product.

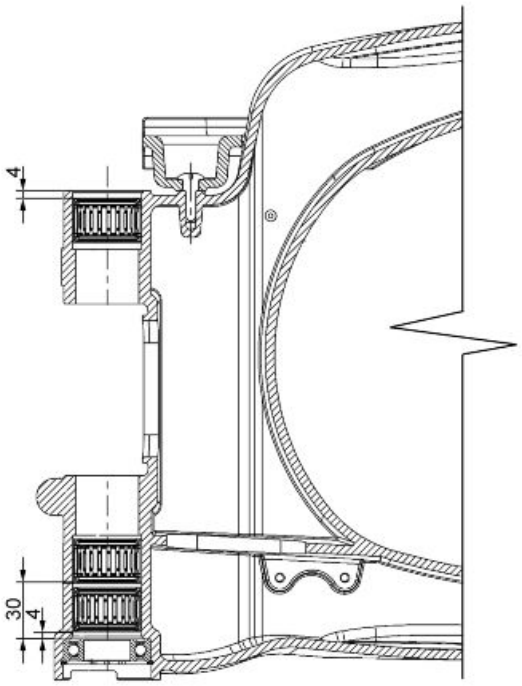
### Specific tooling

**020669Y roller casing fitting punch**

### 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




- Drive a new bearing with the specific tool and a hydraulic press.

### Specific tooling

**020376Y Adaptor handle**

**020359Y 42 x 47 mm Adaptor - For main bearings and wheel axle**

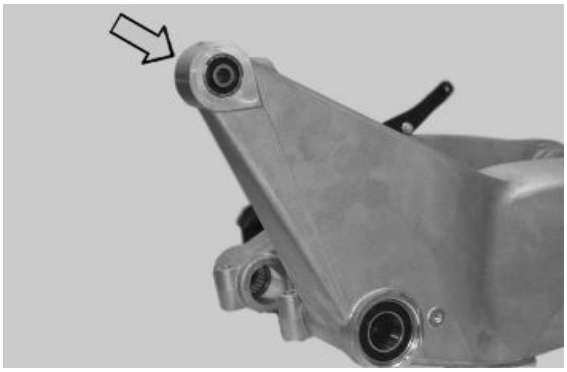
**020364Y 25-mm guide**

- Fit the seeger ring.

- Pull out the rear shock absorber silent-block with a hydraulic press
- Similarly to the removal operations, drive a new silent-block after heating with the specific tool.

### Specific tooling

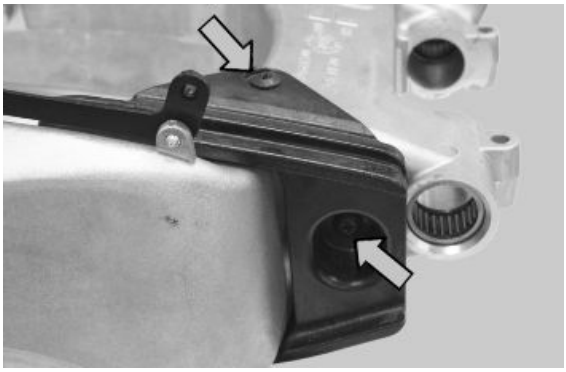
**020151Y Air heater**

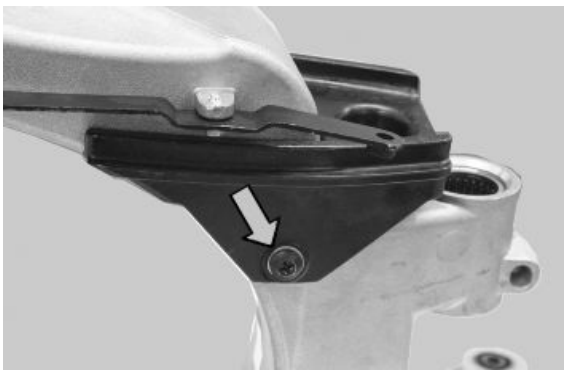


- Undo the three fixing screws to replace the chain stop slider.
- Upon fitting, tighten the three screws to the prescribed torque.

### Locking torques (N*m)

**Screw fixing chain stop slider - fork 5 ÷ 7**

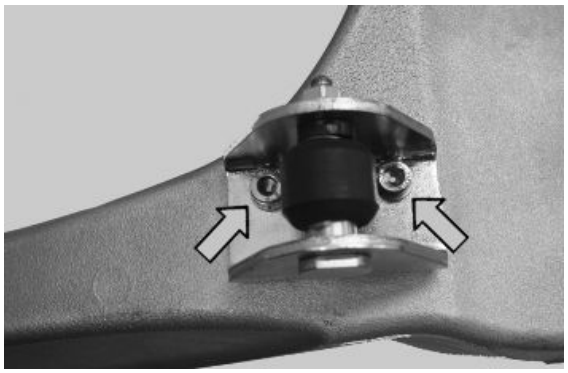




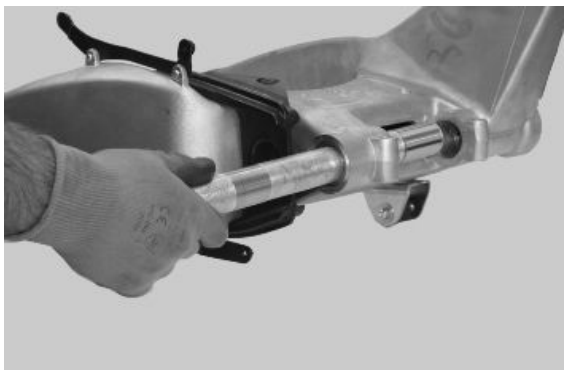
- Undo the two fixing screws and collect the washers to replace the stand stop buffer.
- Upon fitting, tighten the two screws to the prescribed torque.

**Locking torques (N*m)**

**Screw fixing centre stand stop buffer - fork 5 ÷ 7**



- Fit the pin and the stop bushing.



## Fitting

**N.B.**

**CLEAN ALL THE SURFACES AND THREADS THOROUGHLY BEFORE FITTING.**
**LUBRICATE ALL THE FRICTION AREAS THOROUGHLY.**

- Fit the fork together with the rear shock absorber.
- Tighten the screw fixing it to the chassis to the prescribed torque.

**Locking torques (N*m)**

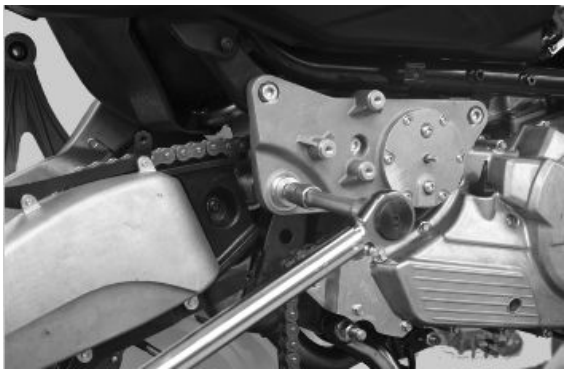
**Screw fixing shock absorber - fork 38 - 46**

- Fit the fork pin.

- Tighten the set screw to the prescribed torque.

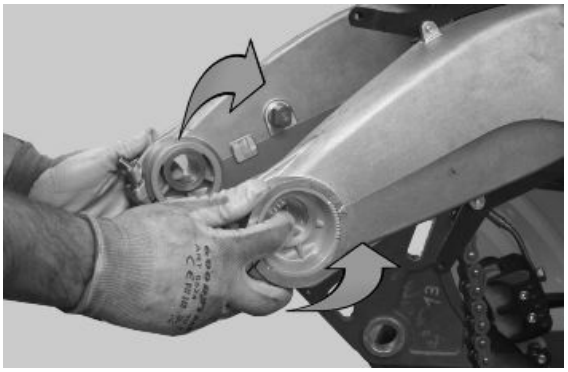
### Locking torques (N*m)

**Fork pin set screw 0.5**



**CAUTION**

**MAKE THE FORK SWING SLIGHTLY UPON TIGHTENING SO AS TO OBTAIN THE PROPER COUPLING ON THE FORK SHAFT.**

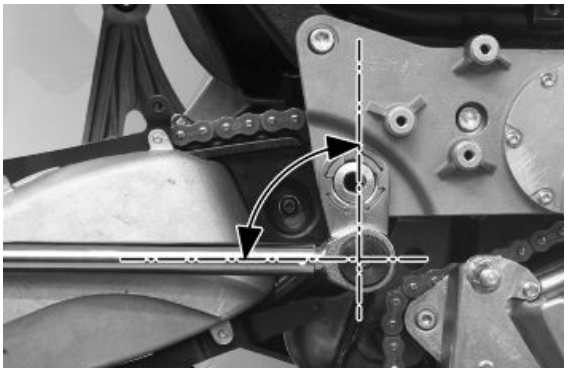


- Screw the set screw locking ring nut.

- Prepare the specific tool and the torque wrench for tightening.

**N.B.**

**PLACE THE WRENCH AT 90° REGARDING THE SPECIFIC TOOL. FAILURE TO OBSERVE THIS POSITIONING MAY ALTER THE PROPER LOCKING TORQUE.**



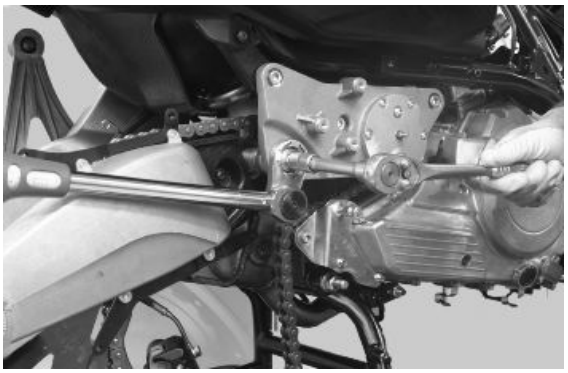
- Using the specific tool tighten the set screw locking ring nut to the prescribed torque while keeping the set screw locked.

### Specific tooling

**020667Y Wrench for fork pin adjustment ring nut**

### Locking torques (N*m)

**Fork locking ring nut 60 ± 3 Nm**

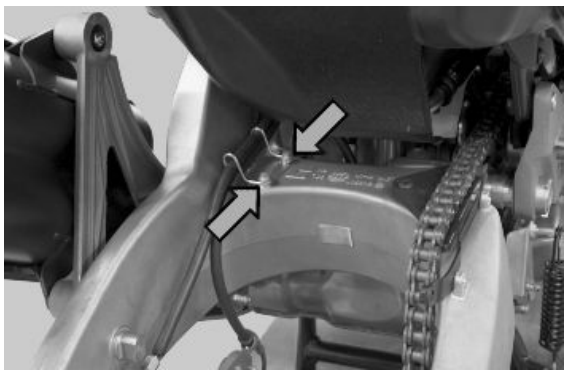


- Lock the pin from the vehicle right side, tighten the fork pin locking nut to the prescribed torque.

**Locking torques (N*m)**

**Fork pin nut 90 ± 5**

- Tighten the two screws together with the washers, thus fixing the rear brake pipes.



**CAUTION**

**UPON FITTING, BE PARTICULARLY CAREFUL WHEN INSERTING THE BREATHER PIPE IN THE FORK SLOT.**

## Centre-stand

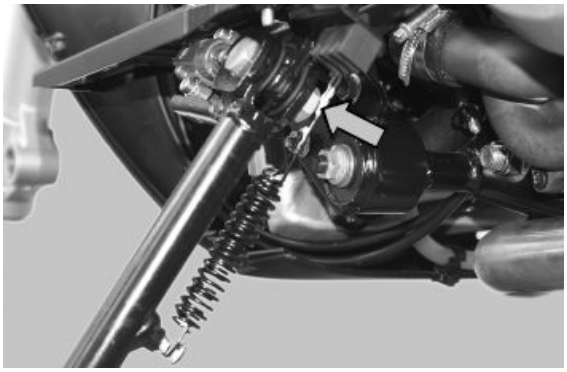
### See also

Exhaust assy. Removal

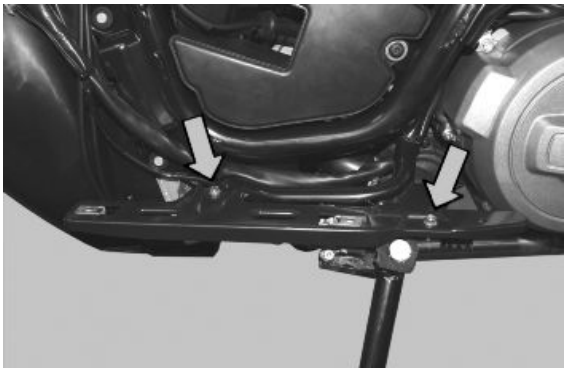
## Side stand

**REMOVAL**

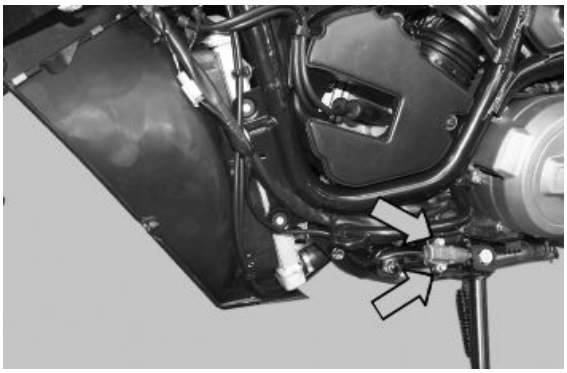
- Remove the left footrest.
- Remove the two return screws and unscrew the nut indicated.
- Slide off the pin and remove the side stand.



- Should the side stand button be replaced, undo the two screws indicated and remove the footrest support.



- Disconnect the connector, remove the two clamps, undo the two connecting screws to the chassis and remove the button.



**FITTING**

- Follow the removal steps but in reverse order and tighten to the prescribed torques.

### Locking torques (N*m)

**Screws fixing side stand button 6 Side stand bolt nut 37**

- Grease with the recommended product.

### Recommended products

**AGIP GP 330 Grease (brake lever, throttle grip)**

Calcium complex soap-based grease with NLGI 2; ISO-L-XBCIB2

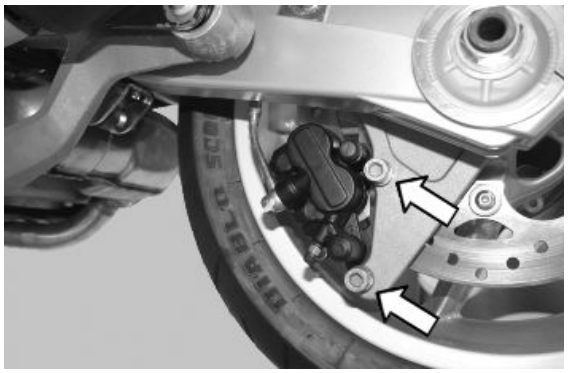
# INDEX OF TOPICS

This section è is devoted to the description of the braking system components.

## Rear brake calliper

## Removal

- Remove the two retainers fixing the brake calliper to the bracket.



- Remove the pads.

## Refitting

To refit, carry out the removal operations but in reverse order. Once these operations are completed, purge the braking system.

**Locking torques (N*m)**

**Screws fixing the calliper to the supporting plate 20 ÷ 25**

## Front brake calliper

## Removal

- Remove the two retainers fixing the brake calliper to the fork.

**N.B.**

**SHOULD THE BRAKE CALLIPER BE REPLACED, BEFORE REMOVING THE FITTINGS FIXING THE CALLIPER TO THE SUPPORTING BRACKET, FIRST LOOSEN THE OIL HOSE FITTING AFTER HAVING EMPTIED THE SYSTEM OF THE CIRCUIT BEING INSPECTED.**

## Refitting

- Fasten the brake calliper to the fork with the two screws.

**Locking torques (N*m)**

**Screws fixing front brake calliper to fork 20 ÷ 25**

- Fix the brake pipe coupling to the calliper.

**Locking torques (N*m)**

**Brake pipes / front brake calliper coupling 16 ÷ 20**

- Purge the system.

## Rear brake disc

## Removal

- Remove the rear wheel.
- Undo the five screws fixing the disc to the rim.

## Refitting

- Place the disc on the rim so that the words face the vehicle external side.
- Fasten the disc with the five screws and apply specific product on them.

### Recommended products

**Loctite 243 Medium strength threadlock**

Loctite 243 medium-strength threadlock

### Locking torques (N*m)

**Screws fixing rear brake disc to rim 25**

## Disc Inspection

Checking the disc is important; it must be perfectly clean, with no sign of rust, oil or grease or other dirt and must not show signs of deep scoring.

### Characteristic

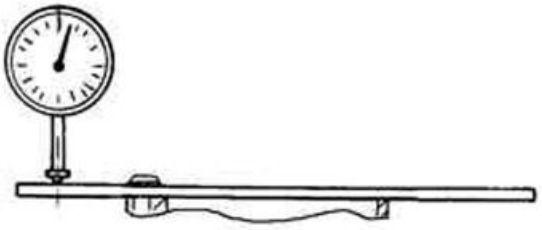
**New rear disc thickness**

5 mm

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

4.5 mm

- Remove the wheel and check using the appropriate tools that the axial run-out of the brake 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

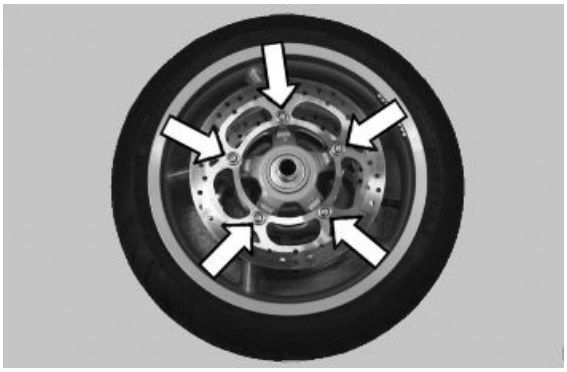
**Max. axial run-out**

0.1 mm

## Front brake disc

## Removal

- Remove the front wheel.
- Undo the five screws fixing the disc.



## Refitting

- Place the disc on the rim so that the words face the vehicle external side.
- Fasten the disc with the five screws.

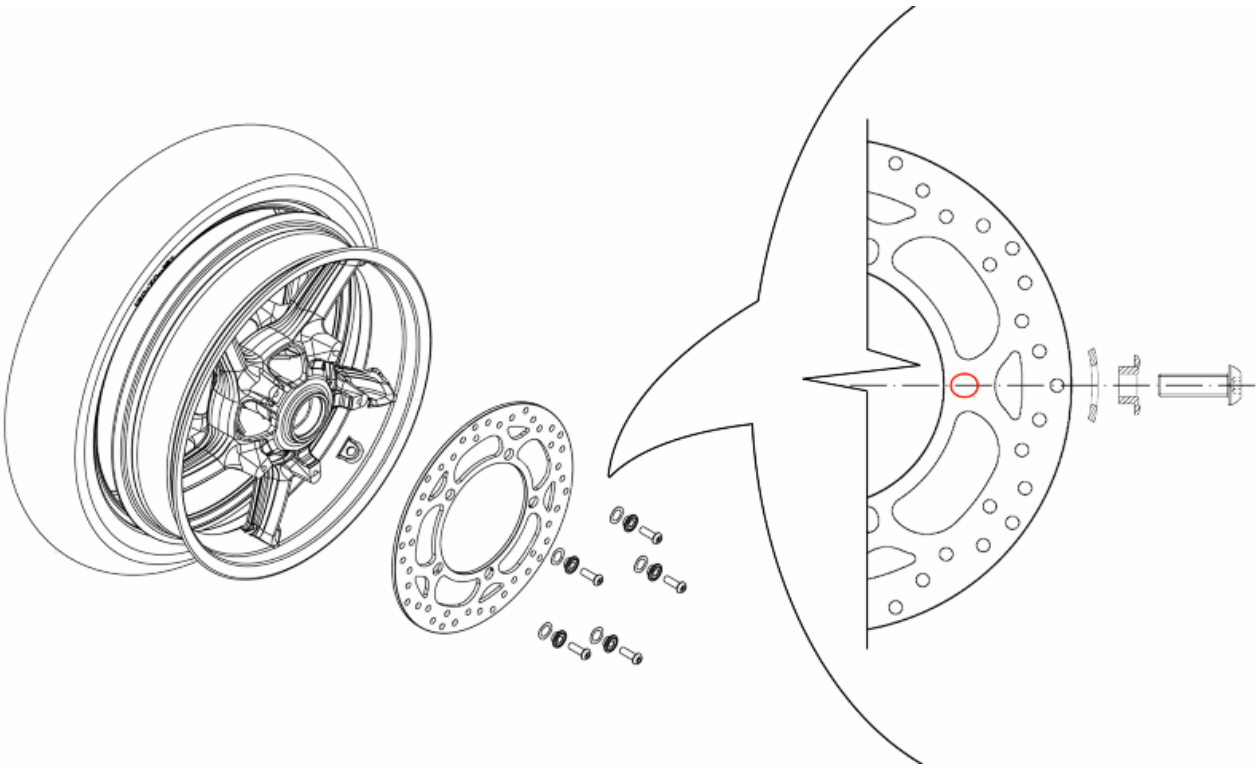
### Recommended products

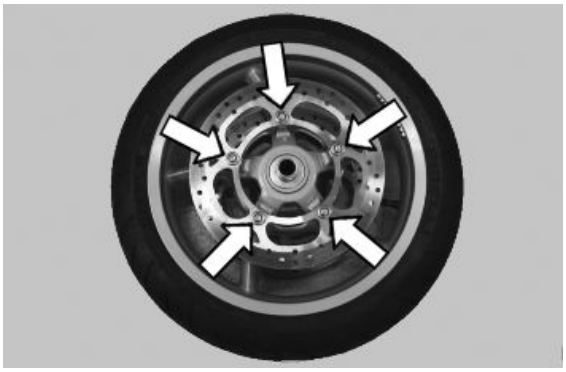
**Loctite 243 Medium strength threadlock**

Loctite 243 medium-strength threadlock

### Locking torques (N*m)

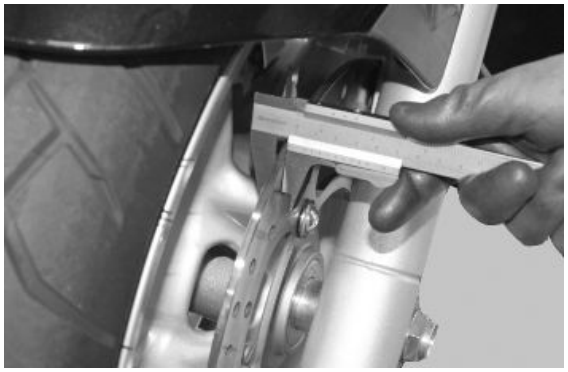
**Screws fixing front brake disc to rim 25**





## Disc Inspection

Checking the disc is important; it must be perfectly clean, with no sign of rust, oil or grease or other dirt and must not show signs of deep scoring.



### Characteristic

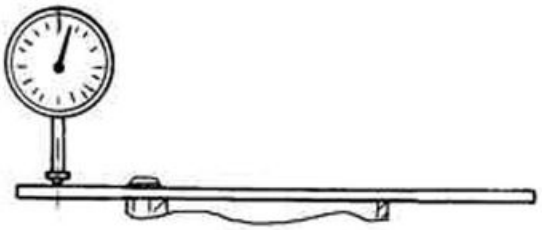
**Thickness of a new front disc**

5 mm

**Disc thickness at wear limit (front)**

4.5 mm

- Remove the wheel and check using the appropriate tools that the axial run-out of the brake 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

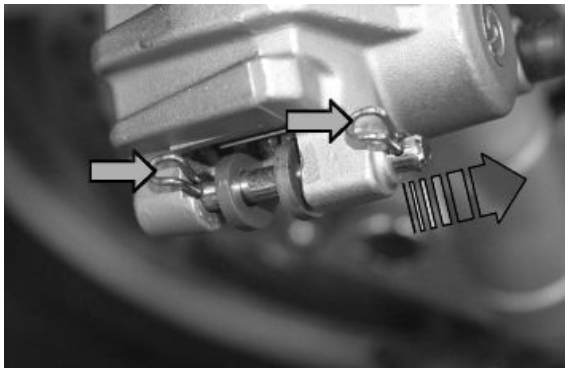
**Max. axial run-out**

0.1 mm

## Front brake pads

## Removal

- Remove the brake calliper.
- Remove the two stop clips and slide off the pin.



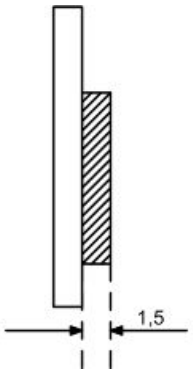
- Remove the two pads.

- Check the thickness of the friction material. Replace the pads if the thickness is below the minimum value.

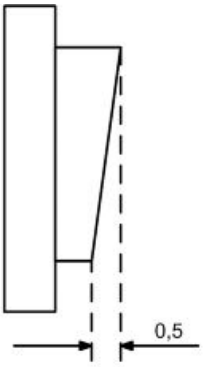
**Characteristic**

**Minimum friction material thickness**

1.5 mm

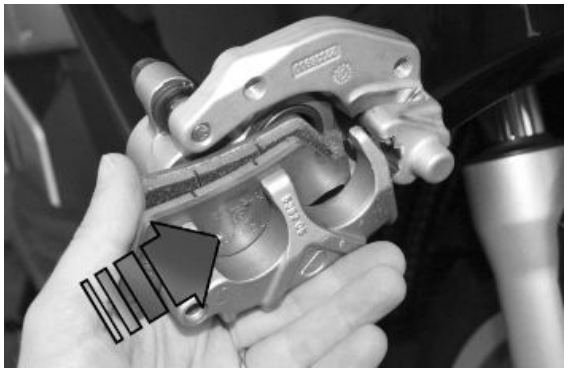



- In case of uneven wear, replace the pads when the thickness difference in the friction material is 0.5 mm.

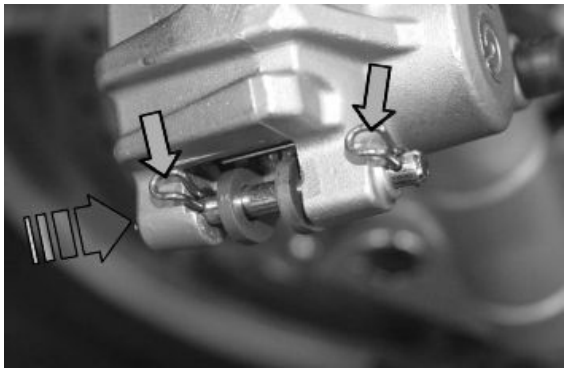


## Refitting

- Insert the two pads in the callipers.



- Lock the pads using the pin and fit the clips.



- Fit the calliper on the fork stem.

**Locking torques (N*m)**

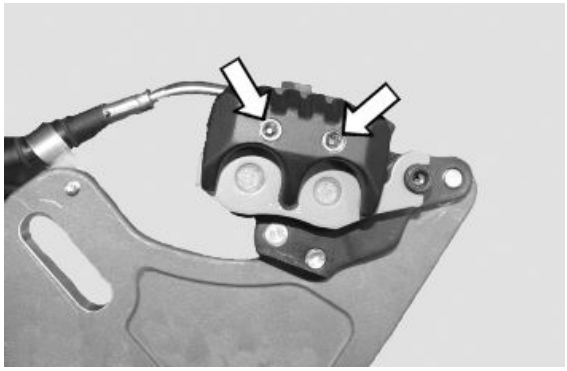
**Screws fixing front brake calliper to fork 20 ÷ 25**

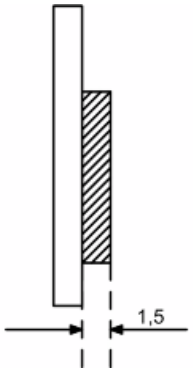
## Rear brake pads

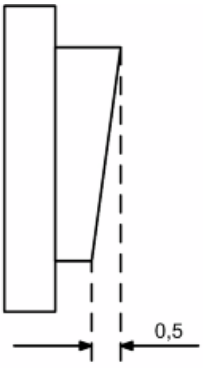
## Removal

Proceed as follows:

- Remove the rear brake calliper
- Loosen the two pins shown in the figure that lock the two pads.
- Remove the pads, being careful with the pad spring clamp.
- Check the thickness of the friction material of the pads.
- Replace the pads if the thickness is below the minimum value.
- The replacement must be made with greater residual thickness if the pad has not worn evenly. A 0.5 mm thickness difference in the residual friction material is permitted.






### Characteristic

**Minimum value**

1.5 mm

## Refitting

To fit, proceed as follows:

- Insert the two pads in the callipers.
- Screw the two pad lock pins to the correct torque, and apply the recommended product.
- Fit the calliper on its support, tightening the two screws to the prescribed torque.

**N.B.**

**IF IT IS NOT POSSIBLE TO CORRECTLY POSITION THE CALLIPER ON THE DISC DURING FITTING, GENTLY EXPAND THE PADS.**

### Recommended products

**Loctite 243 Medium strength threadlock**

Loctite 243 medium-strength threadlock

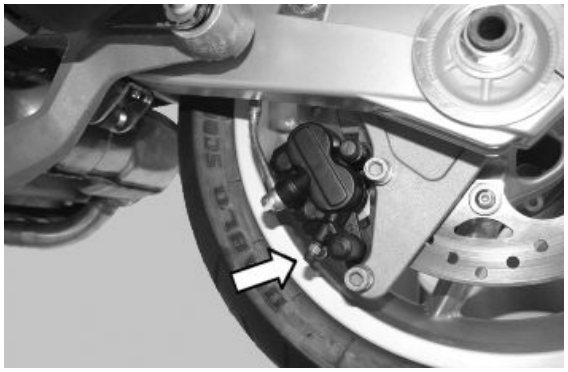
### Locking torques (N*m)

**Parking brake adjusting nut 10 Rear brake pad fixing pins 15 ÷ 20**

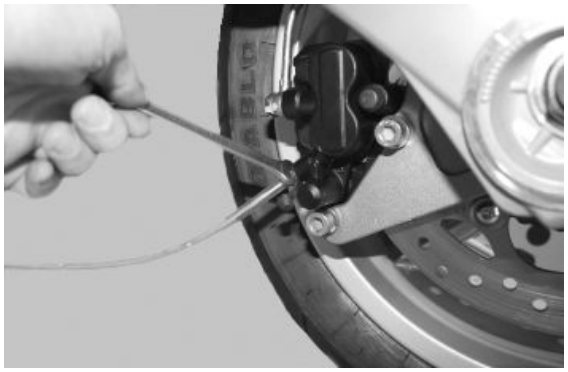
## Fill

## Rear - combined

- Remove the rubber cap from the bleed screw and insert a rubber pipe to collect the brake fluid.



- With the left-hand brake lever, load the system and bring it up to the required pressure.
- Keeping the left-hand brake lever pulled, loosen the bleed screw to permit the air in the system to escape.
- Repeat the operation until only brake fluid comes out of the rubber pipe.
- Tighten the bleed screw.
- Remove the fluid recovery pipe and refit the rubber cap over the bleed screw.
- Top up the brake fluid to the right level in the reservoir. If necessary, bleeding can be done using a special vacuum pump



**N.B.**

**DURING THE BLEEDING OPERATIONS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE BODYWORK SO AS NOT TO DAMAGE IT. FURTHERMORE, DURING THE BLEEDING OPERATIONS REGARDING THE BRAKE CALLIPERS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE DISC BRAKES AND WITH THE BRAKE PADS. FAILURE TO COMPLY WITH THIS NORM WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM**

### Specific tooling

**020329Y MityVac vacuum-operated pump**

### Locking torques (N*m)

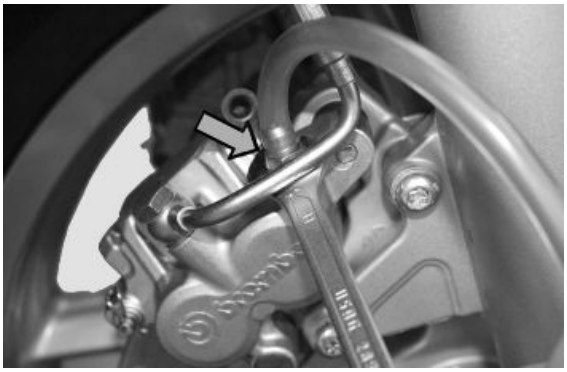
**Brake calliper bleed screws. 12 ÷ 16**

## Front

- Remove the rubber cap from the bleed screw and insert a rubber pipe to collect the brake fluid.

**CAUTION**

**CARRY OUT THE FOLLOWING OPERATIONS ON BOTH CALLIPERS**



- With the right-hand brake lever, load the system and bring it up to the required pressure.
- Keeping the right-hand brake lever pulled, loosen the bleed screw to permit the air in the system to escape.
- Repeat the operation until only brake fluid comes out of the rubber pipe.
- Tighten the bleed screw.
- Remove the fluid recovery pipe and refit the rubber cap over the bleed screw.
- Top up the brake fluid to the right level in the reservoir. If necessary, bleeding can be done using a special vacuum pump

**N.B.**

**DURING THE BLEEDING OPERATIONS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE BODYWORK SO AS NOT TO DAMAGE IT. FURTHERMORE, DURING THE BLEEDING OPERATIONS REGARDING THE BRAKE CALLIPERS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE DISC BRAKES AND WITH THE BRAKE PADS. FAILURE TO COMPLY WITH THIS NORM WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM**

### Specific tooling

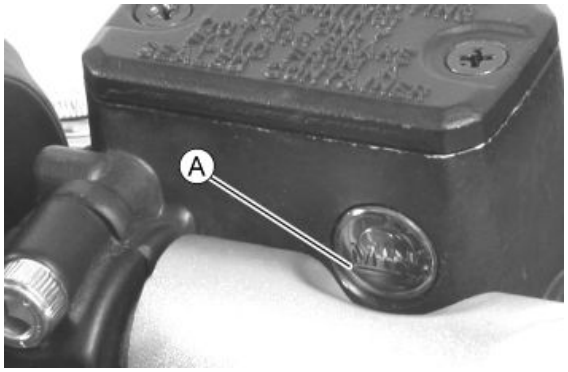
**020329Y MityVac vacuum-operated pump**

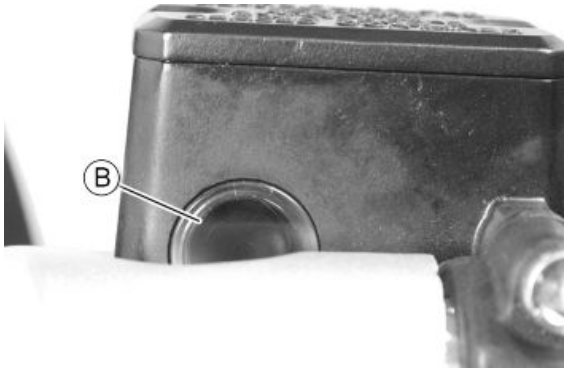
### Locking torques (N*m)

**Brake calliper bleed screws. 12 ÷ 16**

## Brake fluid level check

- Rest the vehicle onto the centre stand, with the handlebar centred.
- Check the fluid level through the specific sight glass.
- Top-up whenever the level is below the MIN reference «**A**» for the left reservoir, and reference «**B**» for the right reservoir.

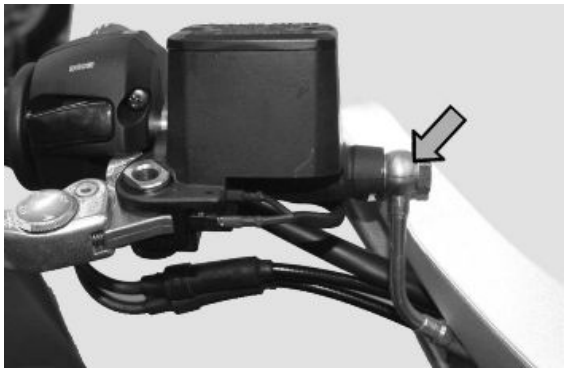


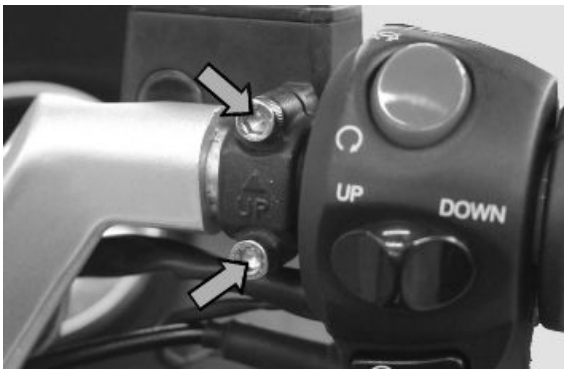

## Removal

- Remove the two contacts from the stop light switch.

- Drain off the braking system corresponding to the circuit being tested.
- Remove the oil pipe coupling.



- Remove the two screws fixing the pump to the handlebar.




## Refitting

- To refit, carry out the removal operations but in reverse order.

**CAUTION**

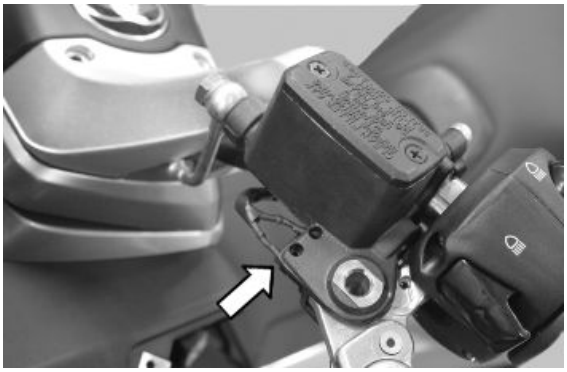
**ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.**

### Locking torques (N*m)

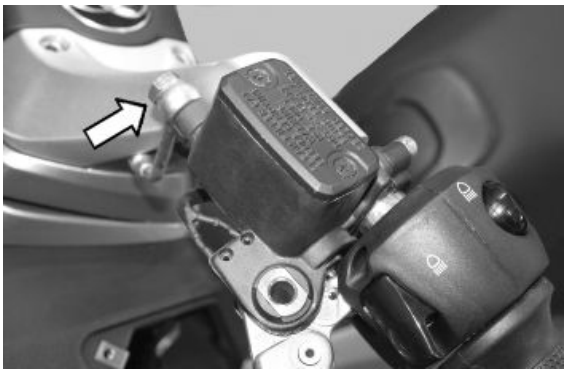
**Screws fixing brake pump to handlebar 7 ÷ 10 Brake pipes / brake pump coupling 16 ÷ 20**

## Removal

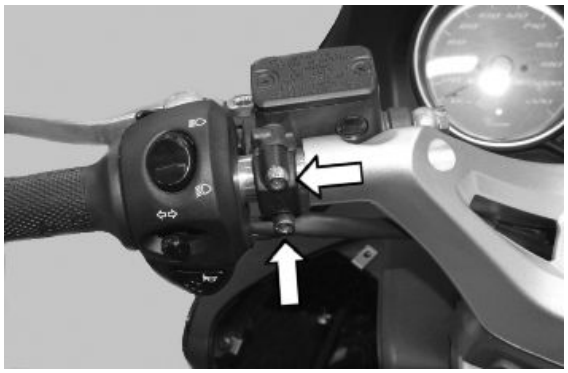
- Remove the two contacts from the stop light switch.



- Drain off the braking system corresponding to the circuit being tested.
- Remove the oil pipe coupling.



- Remove the two screws fixing the pump to the handlebar.



## Refitting

- To refit, carry out the removal operations but in reverse order.

**CAUTION**

**ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.**

### Locking torques (N*m)

**Screws fixing brake pump to handlebar 7 ÷ 10 Brake pipes / brake pump coupling 16 ÷ 20**

## Brake pipes

**FRONT BRAKE PIPE FITTING**

- Fix the three-way union to the fork head.

### Locking torques (N*m)

**Screw fixing three-way union to fork head 10 ÷ 12**

- Fit the front brake pipes to the right and the left.

### Locking torques (N*m)

**Brake pipes / three-way union coupling 18 ÷ 23 Brake pipes / front brake calliper coupling 16 ÷ 20**

- Remove the front shield.
- Thread the pipes through the right half-handlebar and lay it to the vehicle left side.
- Fix the coupling to the brake pump.

- Fix the coupling to the three-way union.

**Locking torques (N*m)**

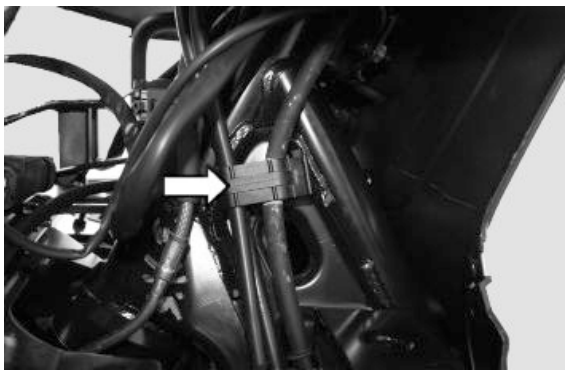
**Brake pipes / three-way union coupling 18 ÷ 23 Brake pipes / brake pump coupling 16 ÷ 20**

**REAR BRAKE PIPE FITTING**

To reach the rear brake pipes, thread the pipes through the left half-handlebar and afterwards fix the coupling to the brake pump.

- Thread the pipes through the left half-handlebar and afterwards fix the coupling to the brake pump.

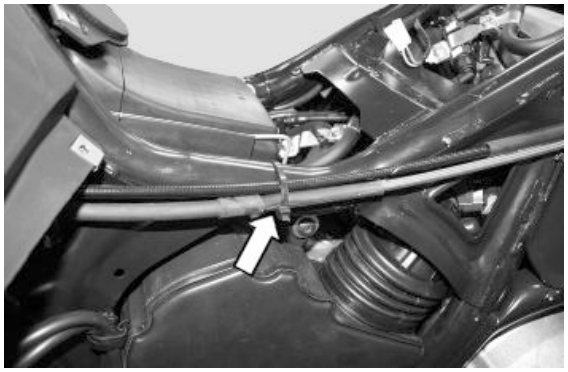
- Fasten the pipe to the clip.



- Fasten the pipe to the clamp.

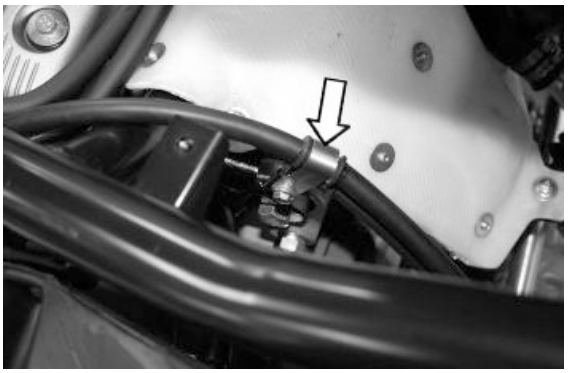
- Fasten the pipe to the clip.

- Fasten the pipes to the chassis with a strap.



- Fasten the pipes to the chassis with a strap.

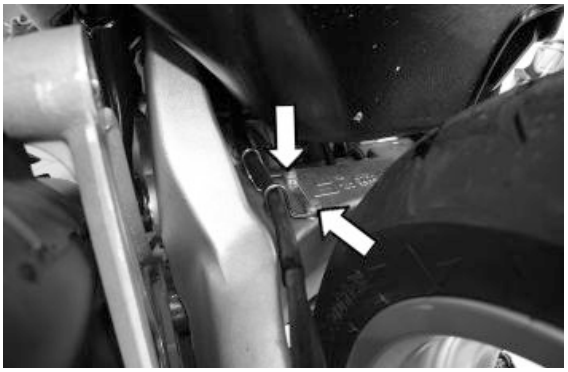
- Fasten the pipe to the clip.



- Fasten the pipe to the rear fork with the two clips.

**Locking torques (N*m)**

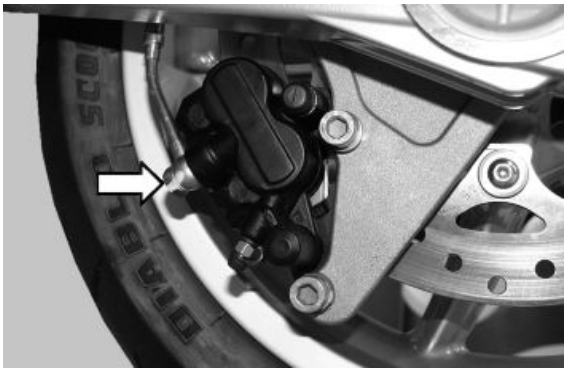
**Nut fixing rear brake pipe retaining clip 11 ÷ 13**



- Fix the brake pipe coupling to the brake calliper.

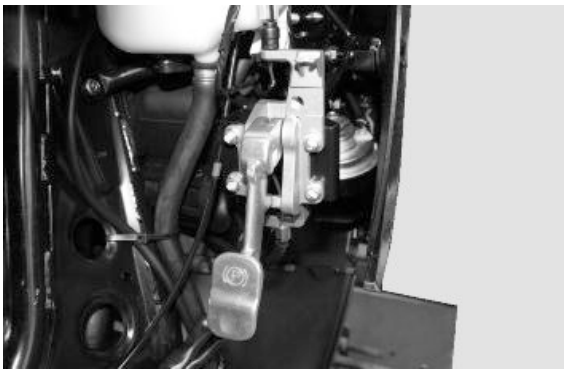
**Locking torques (N*m)**

**Brake pipe / rear brake calliper coupling 20 ÷ 25**

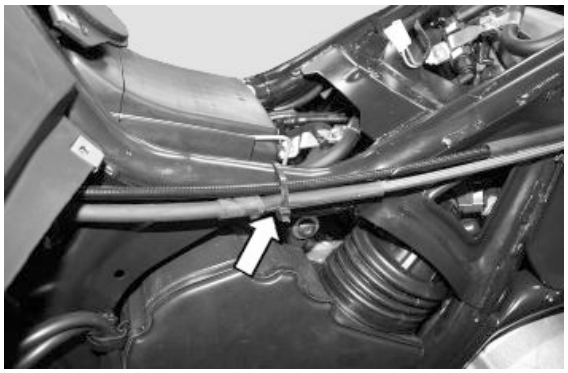


**PARKING BRAKE TRANSMISSION FITTING**

- Fit the transmission cable of the control lever and thread the transmission sheath to the other side of the vehicle as shown in the figure.

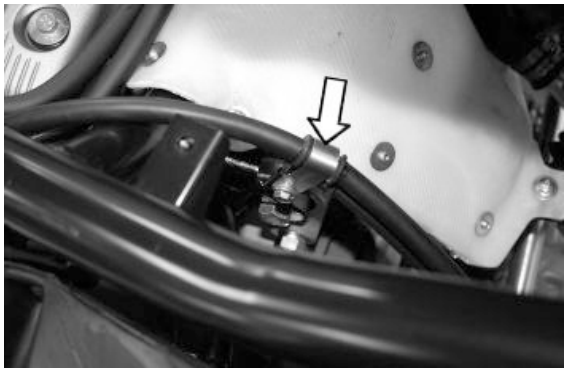


- Fasten the sheath to the chassis with a strap.



- Fasten the pipes to the chassis with a strap.

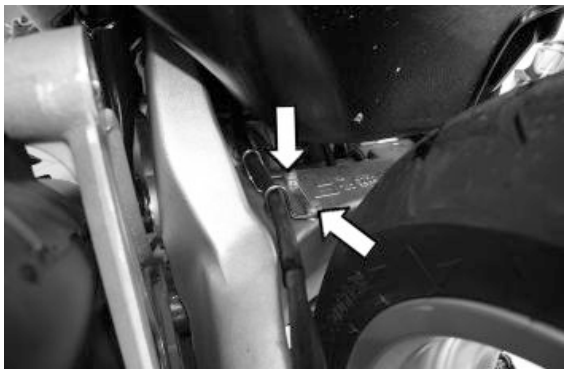
- Fasten the pipe to the clip.



- Fasten the pipe to the rear fork with the two clips.

**Locking torques (N*m)**

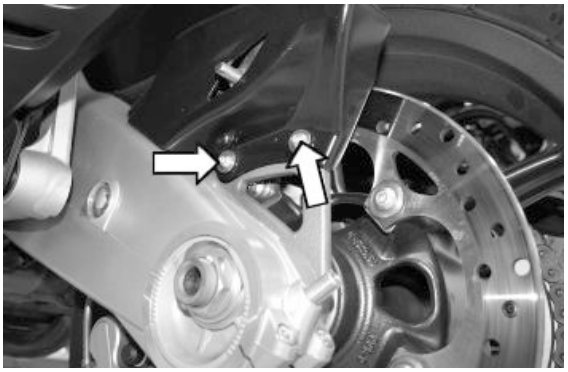
**Nut fixing rear brake pipe retaining clip 11 ÷ 13**



## Parking brake

**PARKING BRAKE CALLIPER REMOVAL**

- Undo the two screws and remove the protection.



- Loosen the nut indicated and remove the transmission.

- Undo the two screws and remove the calliper.

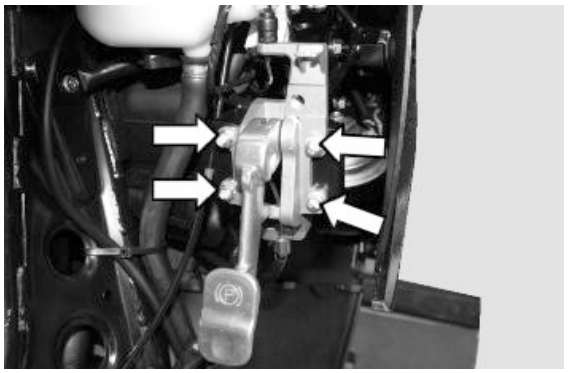
- To refit, carry out the previous operations but in reverse order. After adjustment, tighten the nut indicated to the prescribed torque.

### Locking torques (N*m)

**Screw fixing parking brake calliper to supporting plate 24 ÷ 27 Parking brake adjusting nut 10**

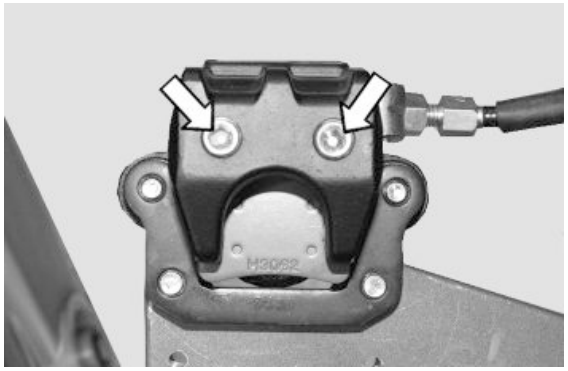
**PARKING BRAKE CONTROL REMOVAL**

- Remove the shield back plate.
- Undo the four fixing screws and remove the transmission cable.



**BRAKE PAD REPLACEMENT**

- Remove the brake calliper.
- Unscrew the two retaining pins and slide off the pads.
- To refit, carry out the previous operations but in reverse order.

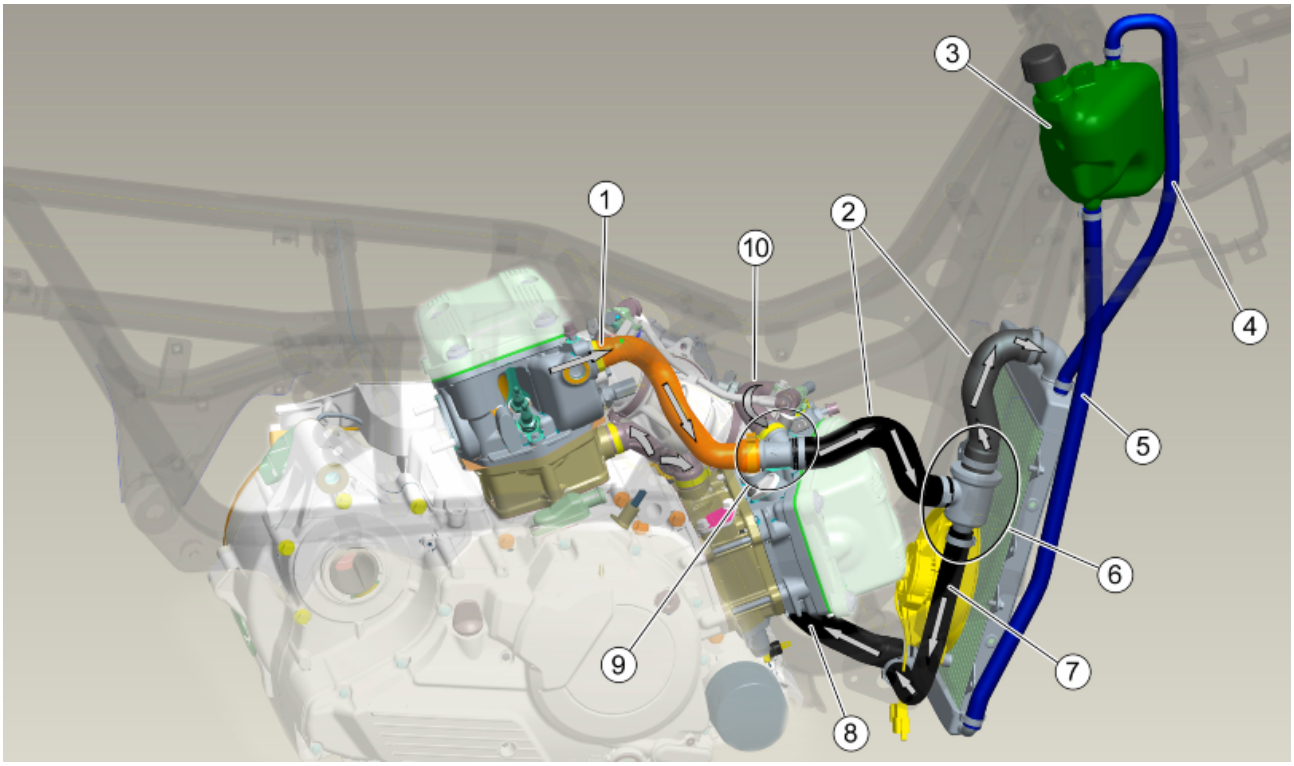


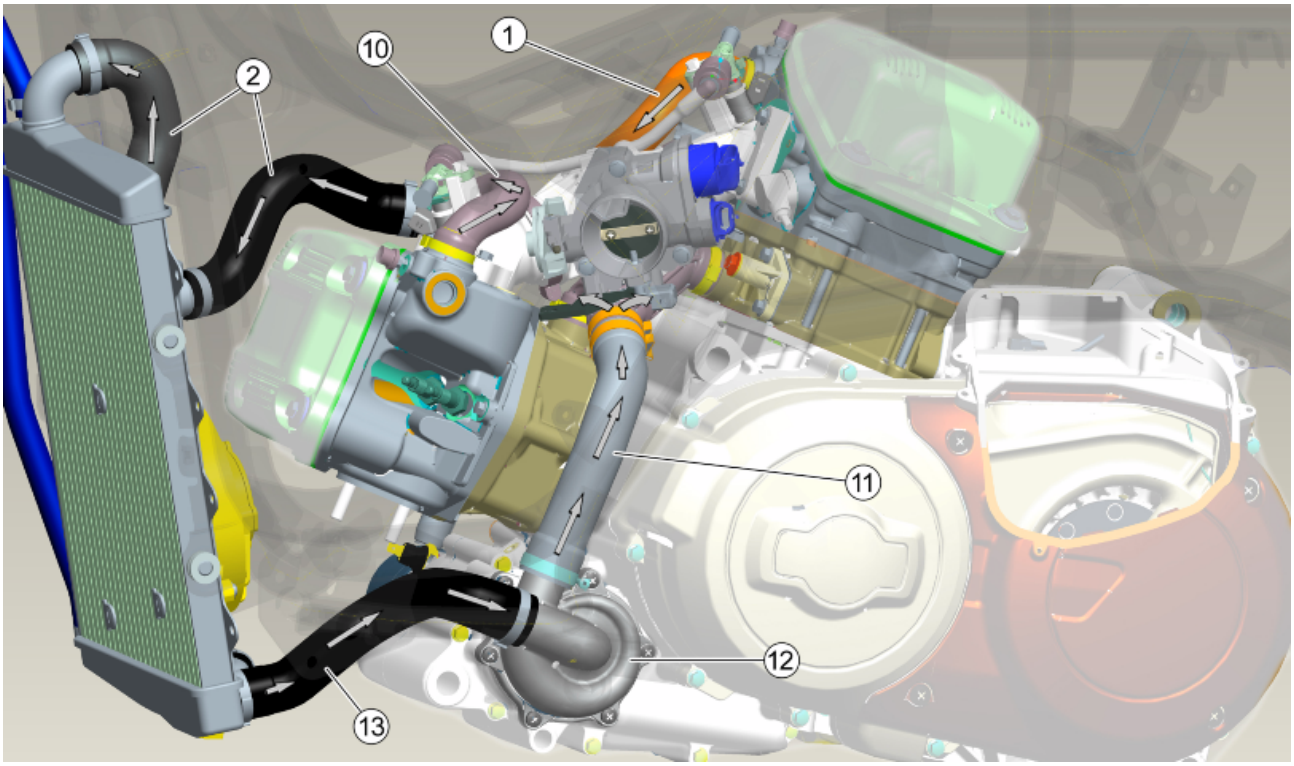
### Locking torques (N*m)

**Pin fixing parking brake pads 15 ÷ 20**

# INDEX OF TOPICS

## Circuit diagram




**KEY:**

**1.** Rear head outlet

**2.**To radiator

**3.**Expansion tank

**4.**Radiator breather pipe

**5.** Circuit filling pipe

**6.** Thermostat

**7.** By-pass pipe

**8.** Intake from radiator

**9.** Coupling (T-joint)

**10.**Front head outlet

**11.** Delivery to the cylinders

**12.** Pump

**13.** Intake from radiator

The cooling system is a forced circulation type system, with continuous venting and air pressurisation.
Circulation takes place by means of a centrifugal pump.
The pump delivers the coolant to the thermal units.
The two-way thermostat support is connected to the head outlet. One way is connected to the pump and the other to the radiator.
The radiator output is directly connected to the pump.
The expansion tank is connected in parallel to the radiator.
The radiator hot box is connected to the upper side of the expansion tank (in air).
The radiator cold box is connected to the lower side of the expansion tank (in the fluid).
When the engine is cold, the thermostat output to the radiator is closed, even though there is still a little flow for de-aeration obtained by a hole into the closing plate.
In this case, the circulation into the thermal units is active to ensure an even heating.
Once the working temperature has been reached, the main circulation on radiator and expansion tank starts.
With the small openings in the thermostat there is a flow overlapping (re-circulation and main one).
When the temperature is higher, the thermostat allows excluding the re-circulation to favour the main circulation.
In this case, the flow is consistent in the expansion tank as well, and this ensures a continuous automatic venting.
For the system venting during the circuit filling step, there is a special union at the top of the head (see filling rules).
To ensure cooling in case of poor dynamic ventilation, there is an electric fan controlled by the injection system.

## TECHNICAL SPECIFICATIONS

| Specification | Desc./Quantity |
|---|---|
| Cooling system capacity | 2.4 l |
| Prescribed fluid | AGIP PERMANENT SPEZIAL |

| Specification | Desc./Quantity |
|---|---|
| Sealing pressure | Cap calibrated at 0.9 bar |

**THERMOSTAT**

| Specification | Desc./Quantity |
|---|---|
| Type | Wax-type, with deviator |
| Starts opening | 85±2°C |

**ELECTRIC VENTILATION**

| Specification | Desc./Quantity |
|---|---|
| Type | With piston |
| Electric ventilation starts at | 105°C |
| Electric ventilation stops at | 100°C |

**WATER PUMP**

| Specification | Desc./Quantity |
|---|---|
| Type | Centrifugal |
| Control | Gear on oil delivery pump |

**RADIATOR**

| Specification | Desc./Quantity |
|---|---|
| Type | Aluminium, with vertical circulation |

**EXPANSION TANK**

| Specification | Desc./Quantity |
|---|---|
| Calibration | Automatic bleeding, in parallel with the radiator |

## Electric fan check

- Connect the injection diagnostic tester and select the «ERRORS» function in this menu.
- Check the electric fan control circuit for failures.

### Specific tooling

**020460Y Scooter diagnosis and tester**

- Select the «ACTIVE DIAGNOSIS» function in this menu and run a simulation of the electric fan operation.
- If the electric fan is certainly efficient, check the ventilation start and stop temperatures.
- Select the «PARAMETERS» function in this menu to display the coolant temperature.

Electric fan starts: 105°C

Electric fan stops: 100°C

- If non-conforming values are detected, replace the injection ECU..
- If the analogue instrument temperature is close to the red zone, but the degrees indicated by the diagnostic tester is below the electric ventilation temperature, check the temperature sensor on the head and check the relevant injection circuit;

**N.B.**

**THE ELECTRIC FAN TEMPERATURE AT 105° C CAN ONLY BE MANAGED BY A SYSTEM SUPPLIED WITH RECOMMENDED FLUID AND PRESSURISED AT 0.9 BAR.**

**AVOID STARTING THE ENGINE WITHOUT PRESSURISATION SINCE IT MAY REACH THE BOILING TEMPERATURE BEFORE THE ELECTRIC FAN STARTS WORKING.**
**IN CASE THE ELECTRIC VENTILATION TIME INCREASES, CHECK THE THERMOSTAT OPENING TEMPERATURE.**

### Recommended products

**AGIP PERMANENT SPEZIAL coolant**

Monoethylene glycol-based antifreeze fluid, CUNA NC 956-16 (*)

## System sealing check

- Check the proper circuit sealing when it is in pressure and at the temperature.
- For a more accurate check, wait until the system has cooled down since small leaks may not be visible due to evaporation
- The water pump is provided with a drainage hole in case of leaks from the cooling system mechanical seal, or from the shaft sealing oil guard.

- If coolant leaks are detected, replace the pump (see «Engine» Chapter).

## Coolant replacement

- Restore all the cooling system connections, remove the compartment cover giving access to the expansion tank and unscrew the cap.
- Remove the front section of the helmet compartment, remove the cap and undo the bleed screw on the rear cylinder.

- Fill the expansion tank with the recommended product up to the level indicated inside the expansion tank filler.

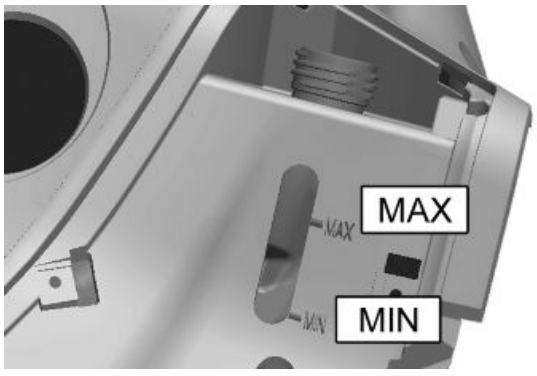
**N.B.**

**THE FLUID IS SUPPLIED READY FOR USE (ALREADY MIXED).**

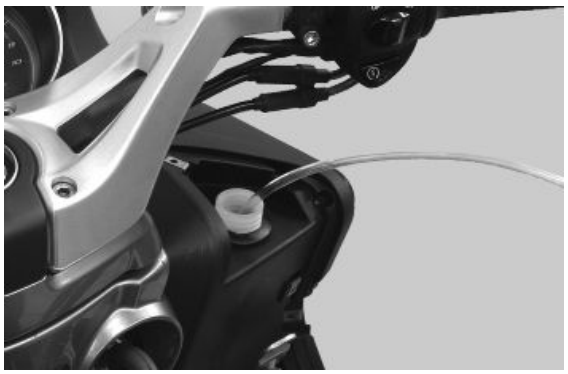
### Recommended products

**AGIP PERMANENT SPEZIAL coolant**

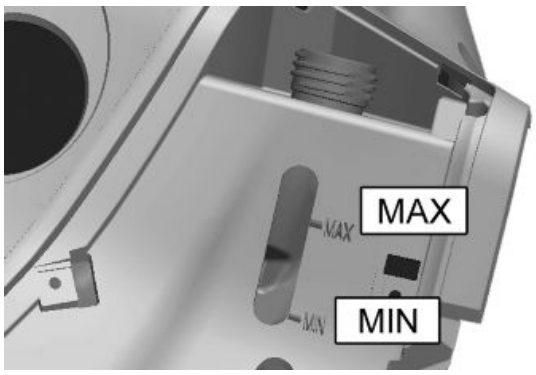
Monoethylene glycol-based antifreeze fluid, CUNA NC 956-16 (*)



- Connect the bleed screw to the expansion tank, using a transparent hose to be able to visually check that air is escaping.



- Start the vehicle.
- Keep it running at idle speed up to 30 sec max., causing the air to escape.
- Shut off the engine, close the bleed screw and screw the cap on the expansion tank.
- Restore the level in the expansion tank.




- Start the vehicle idle speed again and keep it running until the electric ventilation temperature is obtained.
- Shut off the engine and wait until it cools down.

**CAUTION**

**GIVEN REGULAR CONDITIONS OF USE, WITH ENGINE AT IDLE SPEED, THE TIME REQUIRED TO TAKE THE TEMPERATURE BELOW THE ELECTRIC FAN ACTIVATION LEVEL IS ~ 35 SEC. CHECK THAT THE ACTIVATION TIME AFTER BLEEDING THE SYSTEM DOES NOT DEVIATE MUCH FROM THE TIME SPECIFIED.**
**OTHERWISE, REPEAT THE BLEEDING PROCEDURE.**

- Once bleeding is complete, restore the level in the expansion tank.

## Water pump

**Water pump**

In case of noise or fluid leaks from the water pump drainage hole, inspect the water pump as described in the Engine Chapter.

Proceed to carry out a few preliminary operations as described below:

- Place the vehicle on its centre stand and on flat ground.
- Remove the bodywork components as described in the Bodywork Chapter.
- Empty the cooling system by removing the couplings on the pump cover and the filler plug on the expansion tank.

**CAUTION**

**THIS OPERATION MUST BE CARRIED OUT WHEN THE ENGINE IS COLD.**

## Characteristic

### Cooling system

~ 2.4 l

**Removing the water pump cover:**

- Loosen the six fixing screws and remove the water pump cover.
- Check that the water pump cover is not deformed or dented.
- Check that the sealing O-ring is in good working order.
- Otherwise, replace the component.

- Adequately fit a new O-ring, be careful to lubricate it with petroleum jelly grease.

**N.B.**

**TO AVOID DEFORMATION, DO NOT LUBRICATE THE O-RING WITH PETROLEUM GREASE.**

**CAUTION**

**FAILURE TO OBSERVE THIS ADVICE CAN IRRETRIEVABLY DEFORM THE O-RING.**

- Refit the water pump cover and tighten the 6 fixing screws to the prescribed torque.

**N.B.**

**FOR CHANGING THE COOLANT AND BLEEDING THE SYSTEM, SEE THE "COOLANT CHANGE" SECTION.**

## Locking torques (N*m)

### Water pump cover screws 3 ÷ 4

## See also

Water pump

## diagnosis

## Excessive system pressure

1 - Check the expansion tank cap efficiency.

**N.B.**

**THE CAP IS EQUIPPED WITH A PRESSURE RELIEF VALVE CALIBRATED AT 0.9 BAR.**

There is also a valve that must allow air inlet during the cooling step.

YES go to 2 NO go to 3

2 - Check the head gasket seal (see «Thermal group and timing system» chapter)

3 - Replace the cap.

## Cooling fluid consumption

1 - Check the system outside seals as described above.

YES go to 2 NO go to 3

2 - Check the head gasket seal (see «Thermal unit and timing system» chapter)

- If water leaks are detected in the engine oil, inspect the pad on the head cooling circuit.

3 - Fix any damaged seals.

## Oil in the fluid

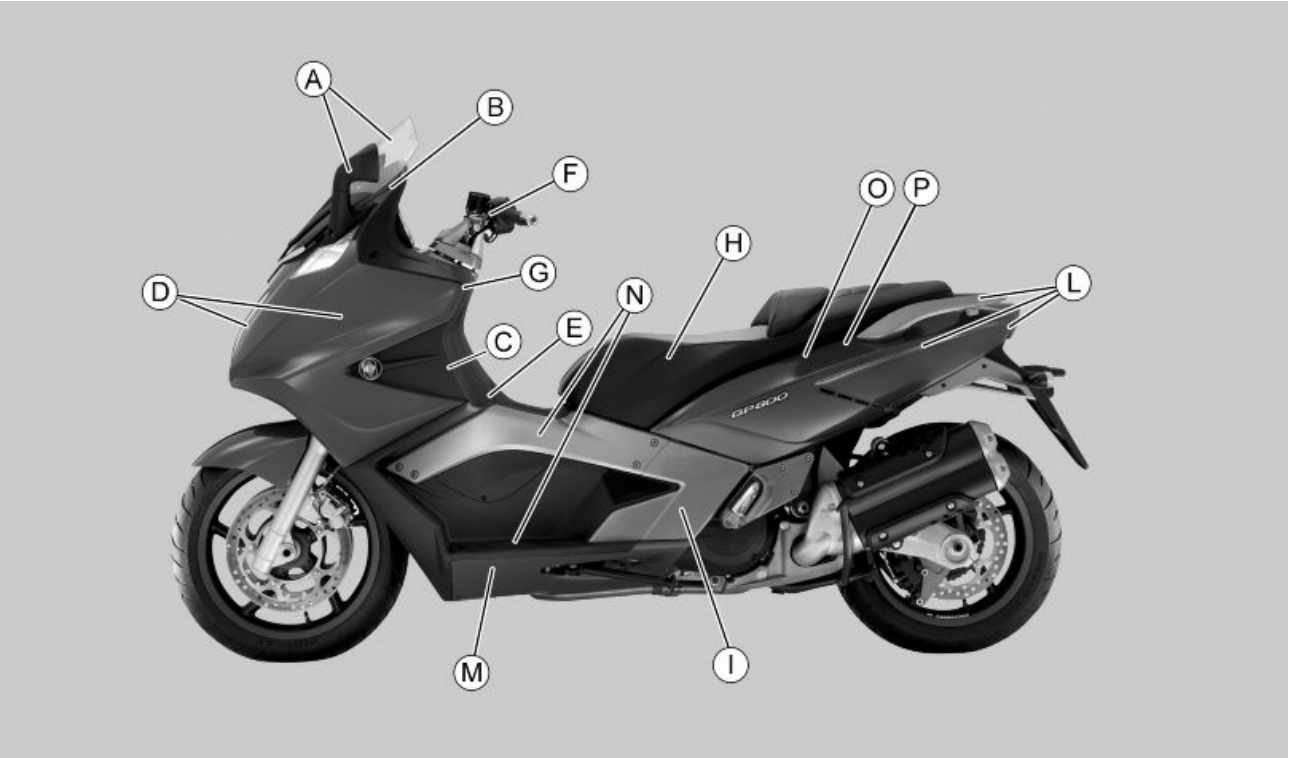
1 - Oil into the coolant.

YES go to 2

2 - Check the head gasket seal (see «Thermal group and timing system» chapter)

# INDEX OF TOPICS

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




To remove the bodywork, follow this order:

**Front part:**

**«A»** Rear-view mirrors - Adjustable windshield

**«B»** Front shield upper section

**«C»** Battery compartment cover - Expansion tank inspection compartment cover

**«D»** Front headlight assembly - Front shield

**«E»** Front central cover

**«F»** Handlebar

**«G»** Shield back plate

**Central/rear part**:

**«H»** Helmet compartment - front part

**«I»** Chassis side cover- rear part

**«L»** Grab handles and upper side fairings - Rear light unit

**«M»** Spoiler

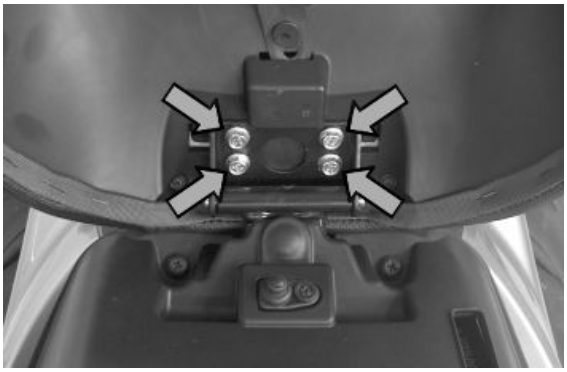
**«N»** Side fairings - Footrests

**«O»** Helmet compartment

**«P»** Fuel tank

## Seat

- Undo the four fixing screws and remove the saddle.

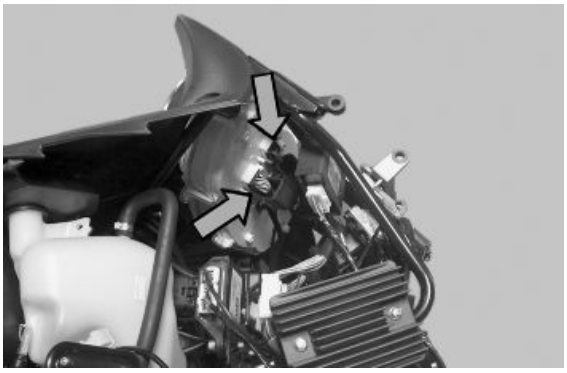


## Driving mirrors

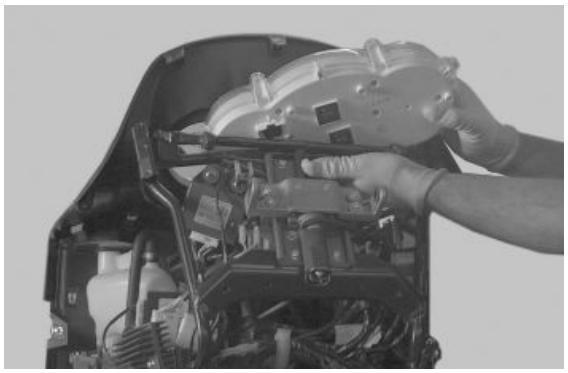
- Undo the two fixing screws on both sides and remove the rear-view mirrors.

## Instrument panel

- Remove the front shield.
- Disconnect the two connectors.

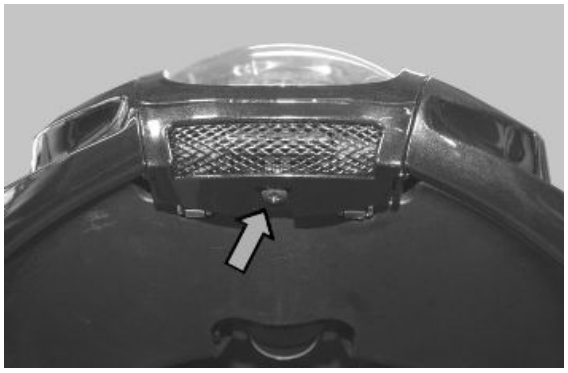


- Undo the six screws fixing it to the shield back plate.
- Remove the instrument panel.

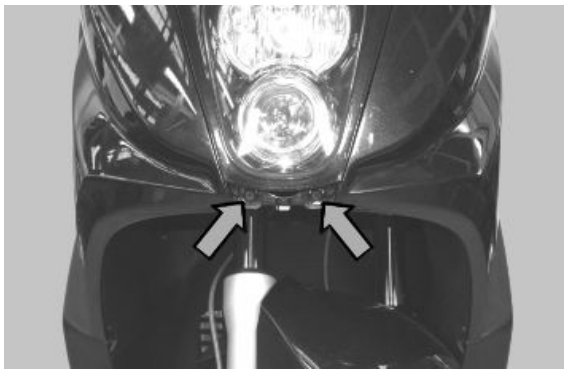


## Headlight assy.

- Undo the screw indicated and remove the grille.



- Undo the two screws indicated.



- Undo the five fixing screws and remove the headlight frame plus the gasket.

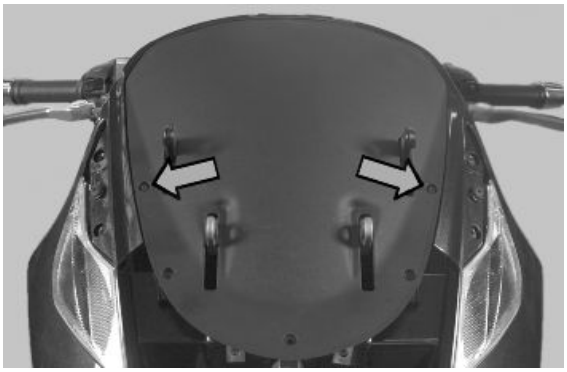
**CAUTION**

**UPON REFITTING, CHECK THE CORRECT POSITION OF THE GASKET OF THE HEADLIGHT FRAME.**

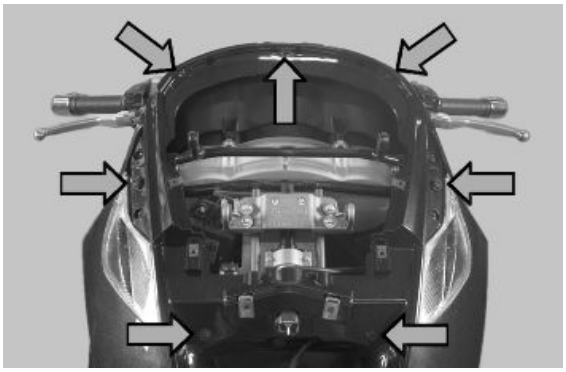
- Undo the two screws indicated and take out the front headlight assembly from its seat.
- Remove it once the connector has been disconnected.

## Legshield

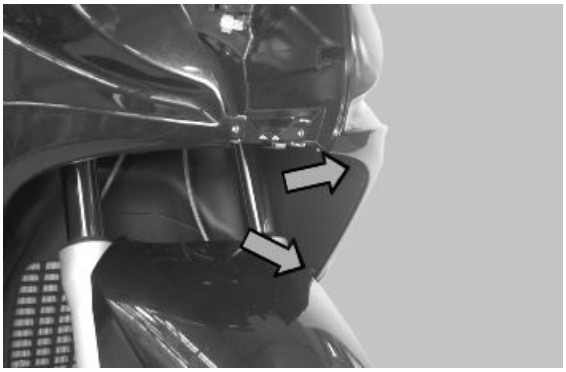
- Remove the windshield together with the brackets.
- Remove the rear-view mirrors.
- Remove the headlight assembly.
- Undo the two screws indicated and remove the front shield upper part.



- Undo the seven screws indicated.

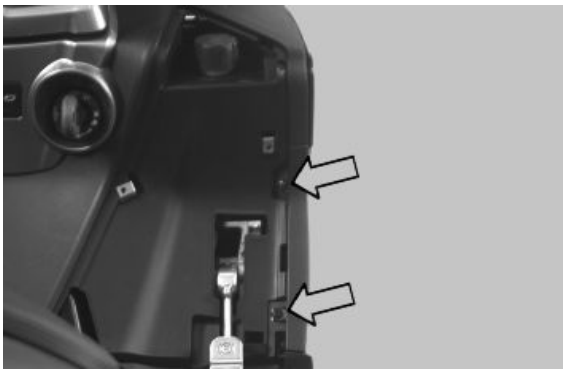


- Undo the two screws indicated on both sides of the wheel housing.

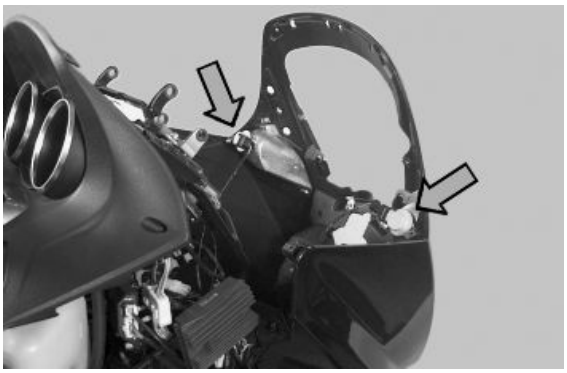


- Working on both sides, remove the Gilera clip-on badge and undo the screw underneath.

- Remove the battery compartment cover and the cover of the expansion tank cap.
- Undo the two screws indicated on both sides and remove side fairings.



- Detach the front shield from the vehicle, disconnect the turn indicator connectors and remove the front shield.

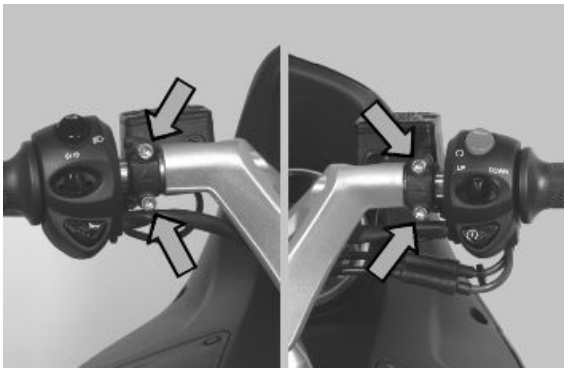


## Knee-guard

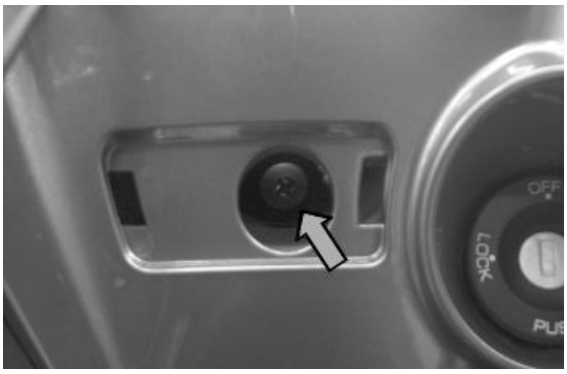
- Remove the front shield.
- Disconnect the stop switches and unscrew the retainers of the brake pumps U-bolts; release them from the half-handlebars.

**CAUTION**

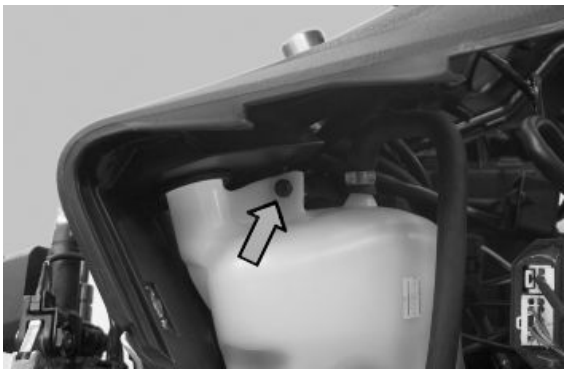
**BE CAREFUL WITH THE SWITCH STOP CONNECTORS.**



- Remove the handlebar together with the supporting plate.
- Remove the GP800 clip-on badge and undo the screw underneath that fixes the badge to the chassis.

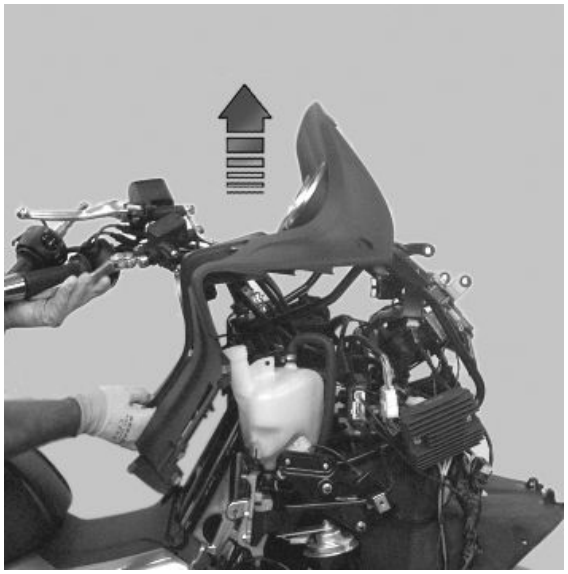


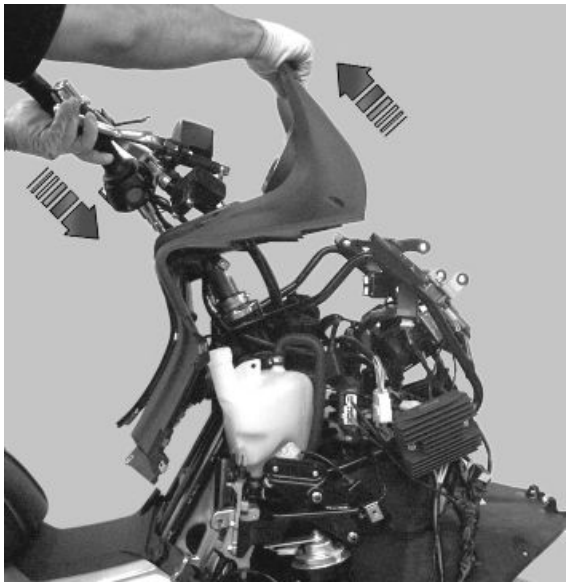
- Remove the key switch frame.
- Unscrew the expansion tank cap.
- Undo the screw fixing the expansion tank to the shield back plate.



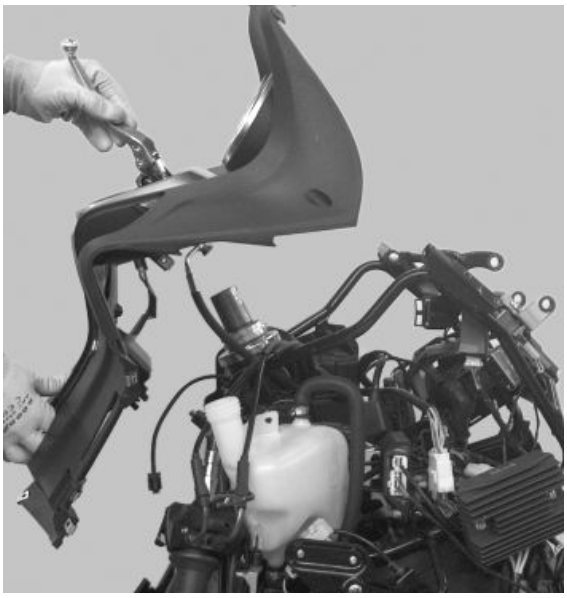
- Undo the two fixing screws to the front central cover.

- Remove both fuse terminal blocks.
- Disconnect the instrument panel connectors.
- Pull the shield back plate upwards to detach it from the vehicle.

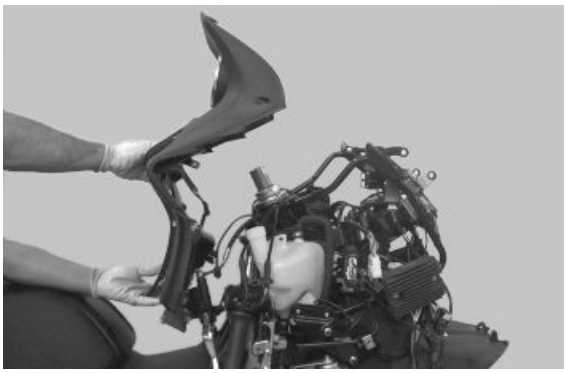




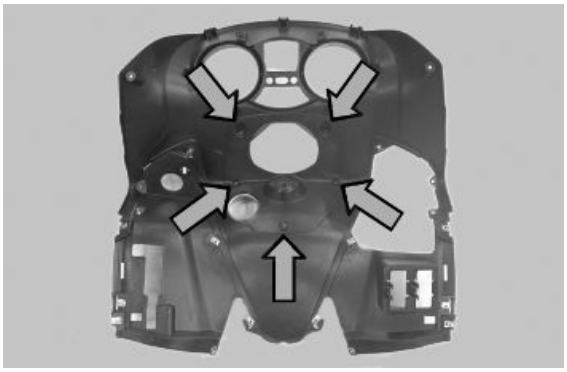
- Disconnect, one at a time, the brake pumps plus the pipes and the half-handlebar plus the controls, pass them through the central opening in the shield back plate.



- Remove the shield back plate.



- Once the shield back plate has been removed, remove the central frame by undoing the five screws indicated from the rear part:

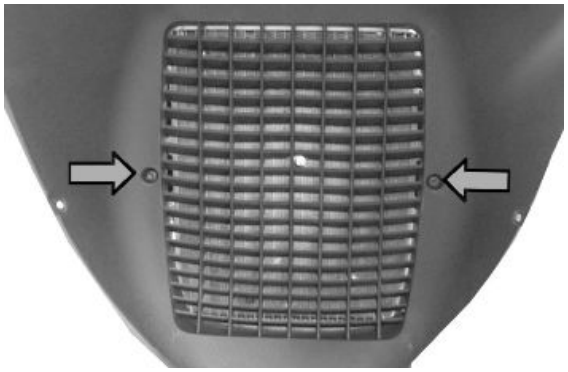


**See also**

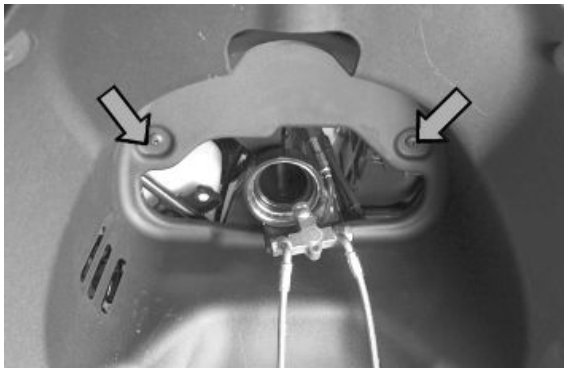
Removal

## Front wheel housing

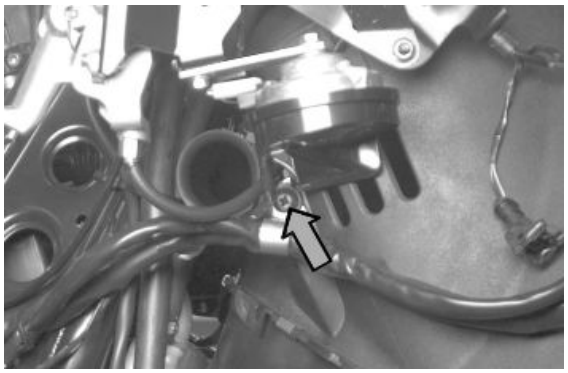
- Remove the fork
- Undo the two screws indicated.



- Undo the two screws indicated.



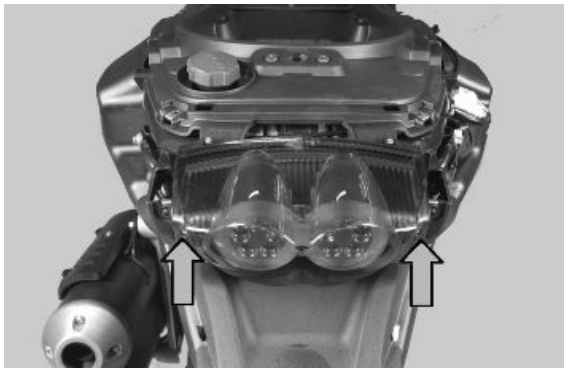
- Disconnect the ambient temperature sensor.
- Release the throttle control transmissions and the oil bleed pipe of the air filter from the clamps.
- Undo the screw fixing the electrical cable harness clamp.



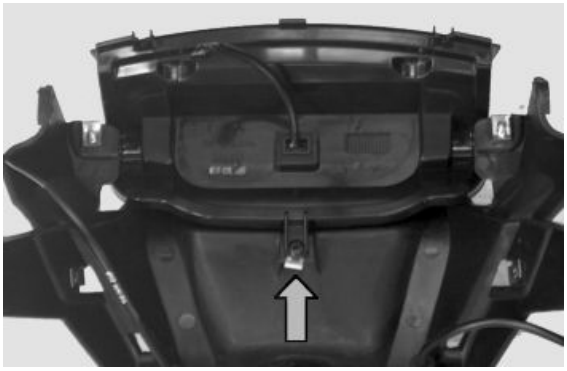
- Remove the front wheel housing together with the radiator cover.

## Taillight assy.

- Undo the two screws indicated.



- Remove the license plate support together with the rear light unit.
- Undo the screw indicated and detach the rear light unit from the license plate support



## Footrest

- These operations are described once but apply to both footrests.
- Remove the chassis side cover.
- Undo the two external screws.

- Undo the three screws from the internal side and collect the washers.

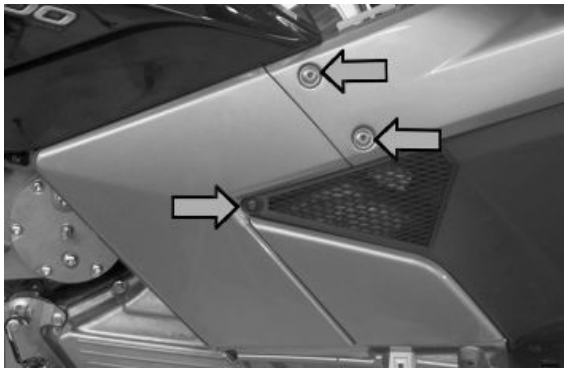
**See also**

Side fairings

## Side fairings

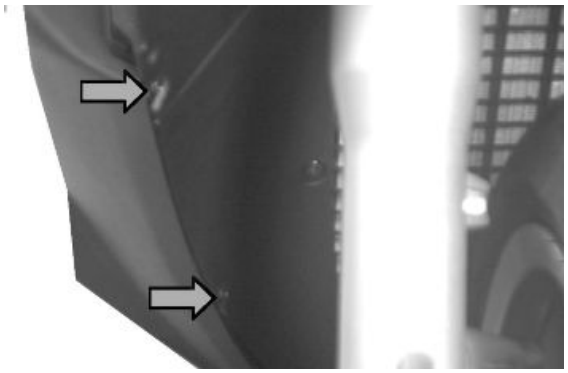
**COPERTURA LATERALE TELAIO**

- Le operazioni sono descritte una volta solo ma sono valide per entrambi i lati del veicolo.
- Rimuovere la copertura centrale anteriore.
- Rimuovere la parte anteriore del vano portacasco.
- Rimuovere lo spoiler.
- Svitare le tre viti indicate.



- Rimuovere il tappetino in gomma della pedana poggiapiedi.
- Svitare le due viti indicate.

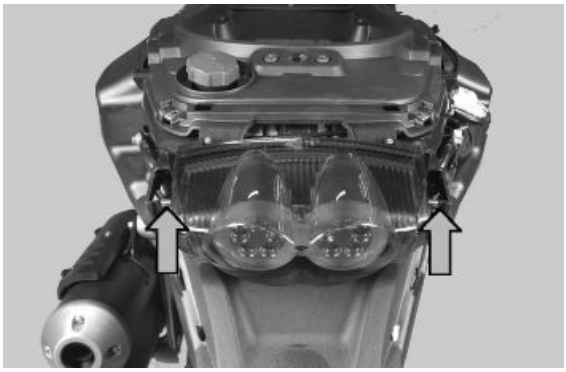
- Svitare le due viti di collegamento al vano ruota anteriore.



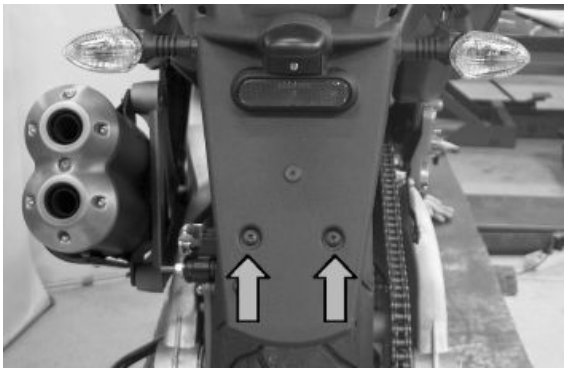
- Rimuovere la copertura centrale telaio completa di pedana poggiapiedi.

## License plate holder

- Remove the side fairings.
- Undo the two screws indicated from both fairings.

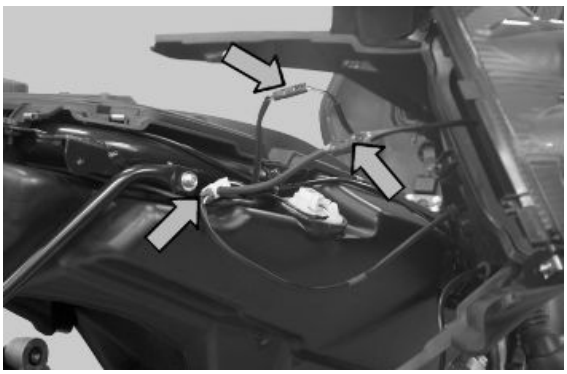


- Undo the two connecting screws to the support bracket.



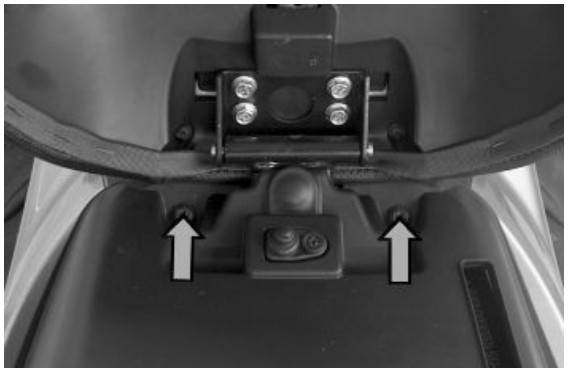
- Disconnect the connector of the left turn indicator.

- Detach the license plate support, disconnect the connectors of the right turn indicator, the license plate light and the rear light unit, and remove the license plate support together with the rear light unit.

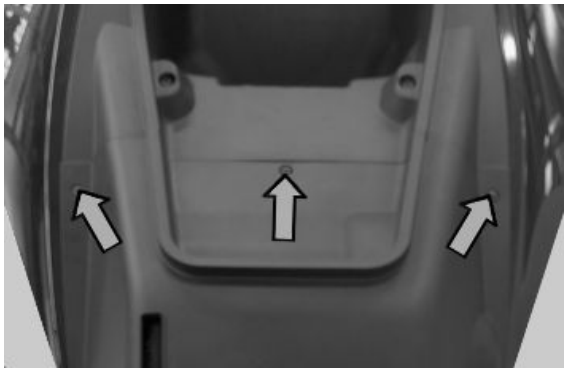


## Helmet bay

- Svitare le due viti indicate.

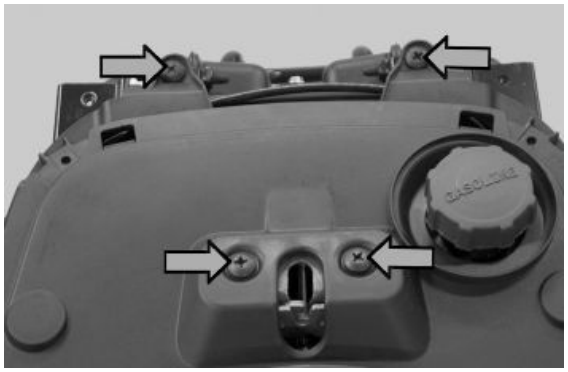


- Svitare le tre viti indicate.



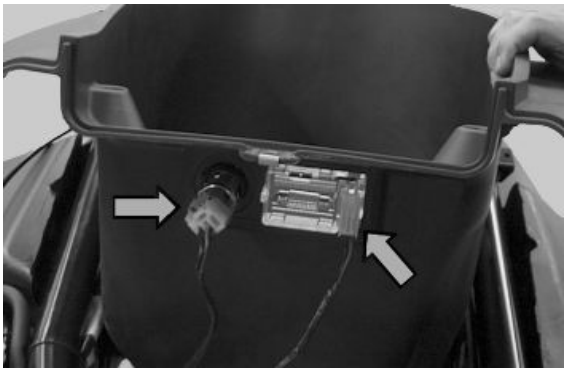
- Rimuovere la parte anteriore del vano portacasco.


- Rimuovere il gruppo ottico posteriore.
- Svitare il tappo serbatoio carburante e le quattro viti indicate.



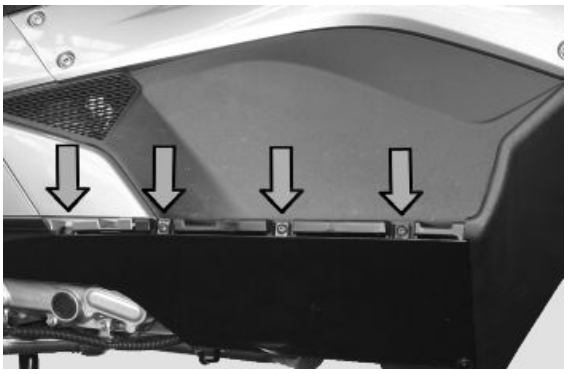
- Svitare le due viti indicate.

- Sollevare dalla parte anteriore il vano portacasco e scollegare i connettori indicati e rimuovere il vano portacasco.

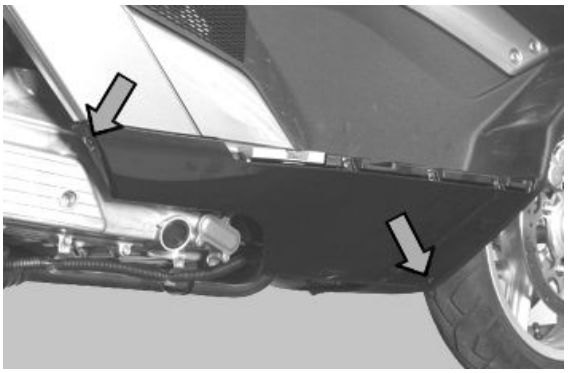


## spoiler

- These operations are described once but apply to both spoilers.
- Remove the rubber mat.
- Undo the four screws indicated.



- Undo the lower connecting screw to the wheel housing and the connecting screw to the chassis side cover, rear part.

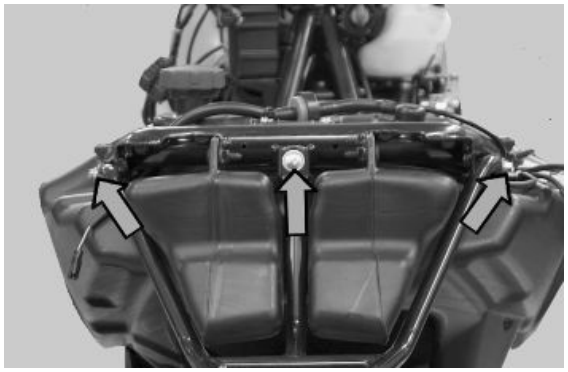


- Remove the spoiler.

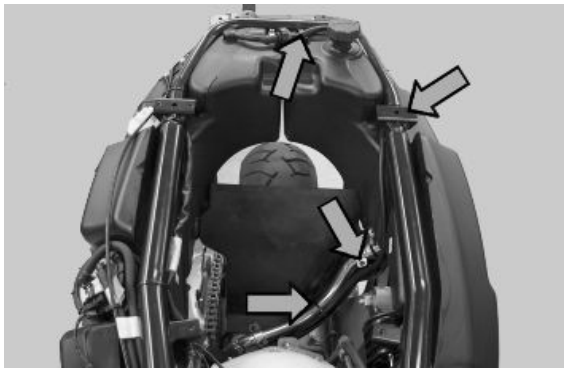
## Fuel tank

Il serbatoio carburante è composta da due semi-serbatoi situati sotto le fiancate destra e sinistra del veicolo, collegati da un tubo di compensazione nella parte inferiore e un manicotto di giunzione nella parte superiore. La rimozione dei semiserbatoi deve avvenire separatamente seguendo le indicazioni riportate:

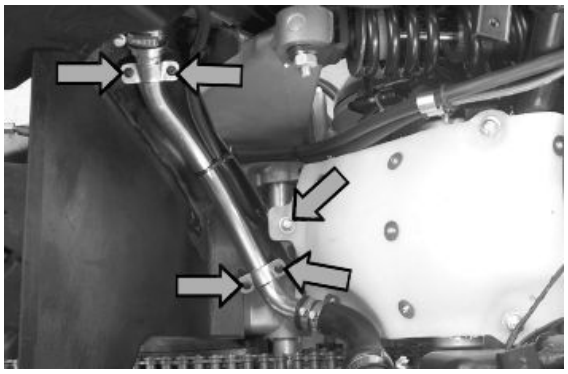
- Rimuovere il carburante contenuto all'interno del serbatoio.
- Rimuovere il vano portacasco.
- Svitare le tre viti indicate e rimuovere la staffa.

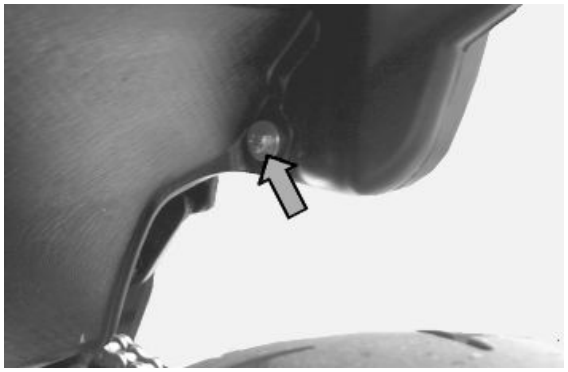


- Disimpegnare dalle fascette la tubazione di sfiato.

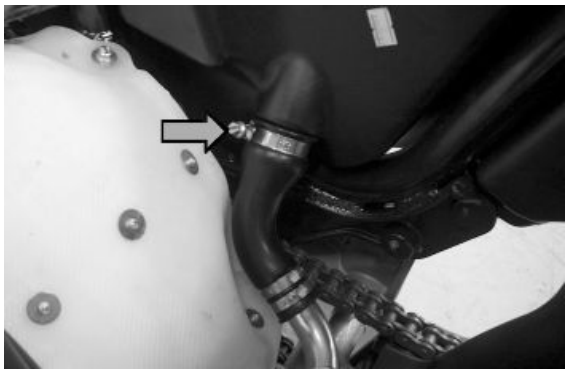


- Svitare le sei viti indicate e rimuovere la protezione in plastica del tubo di compensazione.





- Operando sul lato destro scollegare i connettori del sensore di livello e le tubazioni della pompa carburante.

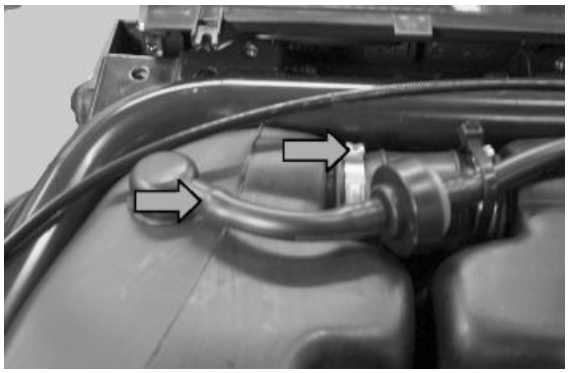


**N.B.**

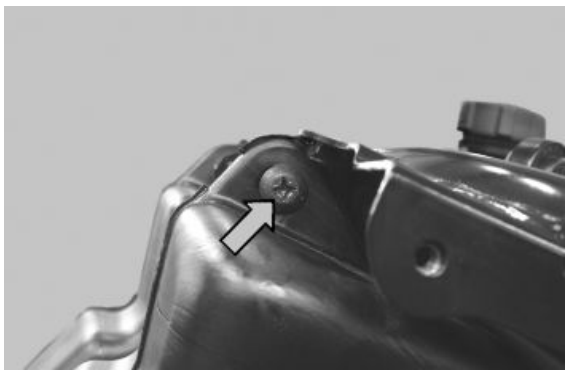
**PAY ATTENTION WHEN DISCONNECTING THE FUEL PIPES AS EXERTING EXCESSIVE FORCE COULD DAMAGE THE PLASTIC INSERTS ON THE PUMP BODY. UPON REASSEMBLY, IT IS THEREFORE NECESSARY TO SLIGHTLY PRESS THE PIPES AND THE RETAINING RING TOWARDS THE PUMP; THEN KEEP THE RING PRESSED AND PULL THE COUPLING UPWARDS.**

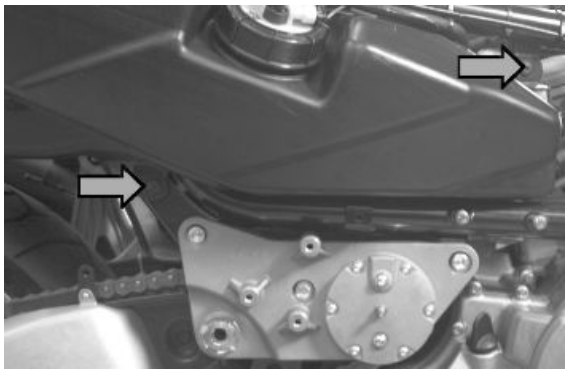
- Scollegare dal semiserbatoio destro la fascetta del tubo di compensazione.

- Scollegare dal semiserbatoio destro la fascetta del manicotto di giunzione e scollegare il tubo di sfiato.



- Svitare da entrambi i lati le tre viti indicate per rimuovere i semi serbatoi.



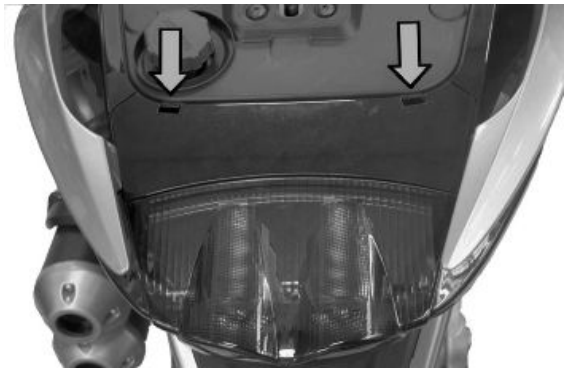


**CAUTION**

**UPON FITTING, BE PARTICULARLY CAREFUL WHEN INSERTING THE BREATHER PIPE IN THE FORK SLOT.**

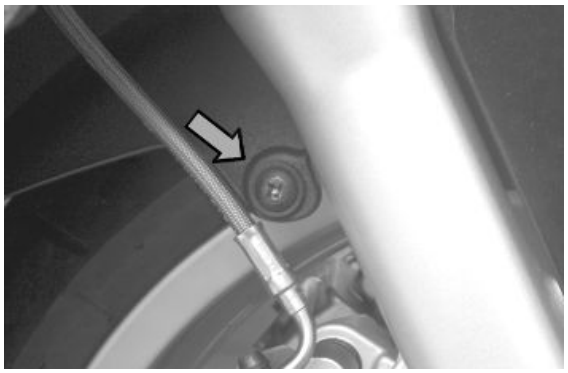
## Rear central cover

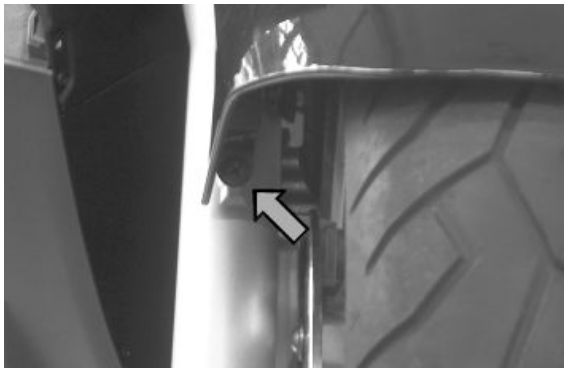
- Act on the two tongues indicated to detach the rear central cover.



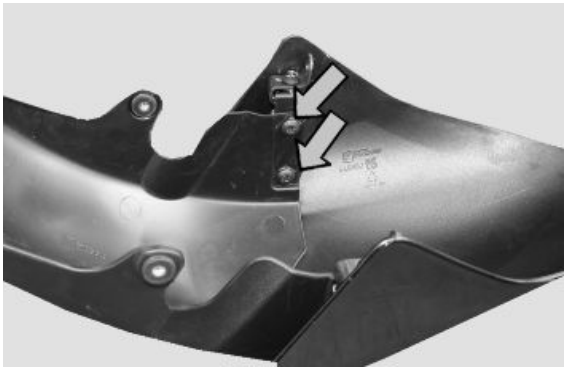
## Front mudguard

- Undo the two fixing screws on both sides.



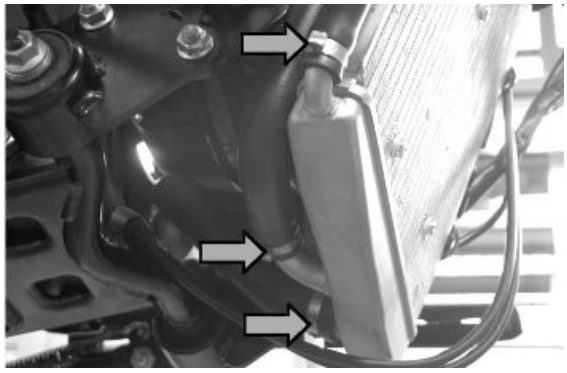


- Once the mudguard has been removed, detach the front part from the rear part by undoing the two screws indicated on both sides.

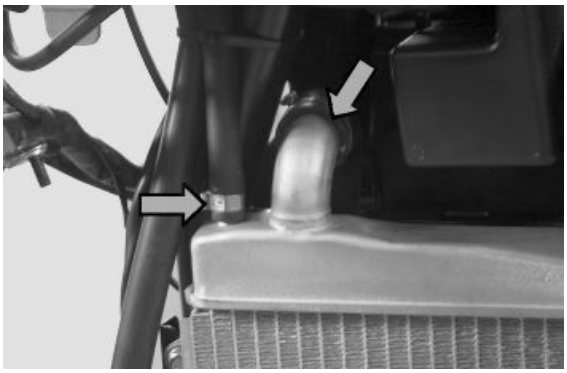


## Radiator fan

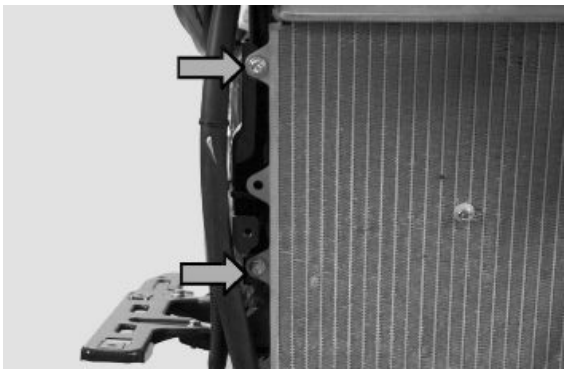
- Get a container of suitable capacity, disconnect the pipes indicated and let the fluid drain off the cooling system.



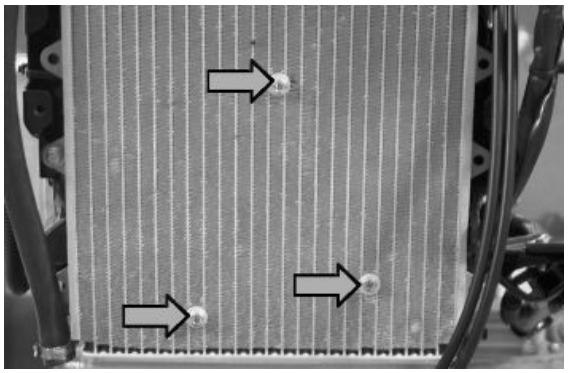
- Disconnect the pipes indicated.



- Disconnect the connector of the electric fan.
- Undo the two screws indicated and collect the washers.



- Remove the radiator by releasing it from its fittings.
- To remove the electric fan, first remove the radiator and afterwards undo the three screws indicated.



## Rear

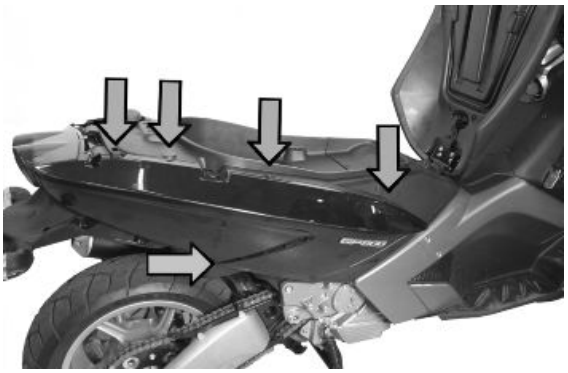
Remove the four fixing screws of the cover and release it from the two leverages.

## Handles and top side fairings

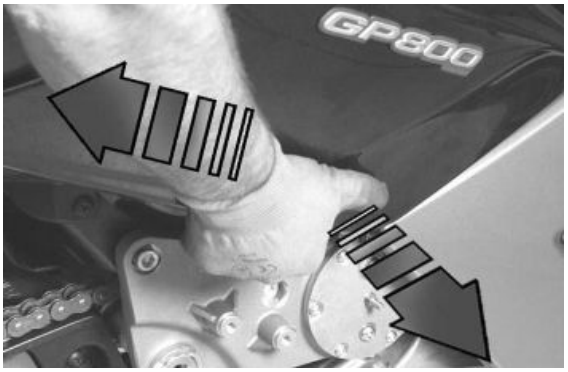
- These operations are described once but apply to both vehicle fairings.
- Remove the rear central cover.
- Undo the three screws indicated to remove the passenger grab handles.

- Undo the screws indicated and remove the license plate holder cover.

- Undo the five screws indicated.



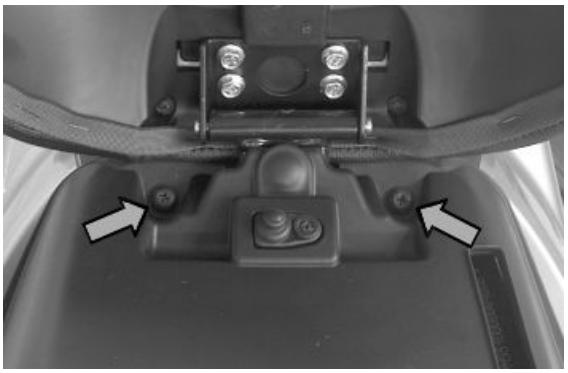
- Remove the side fairing by pulling it outwards and towards the rear part of the vehicle at the same time to release the tongues.




## Front central cover

- Remove the battery compartment cover and expansion tank compartment cover.
- Undo the two screws indicated.

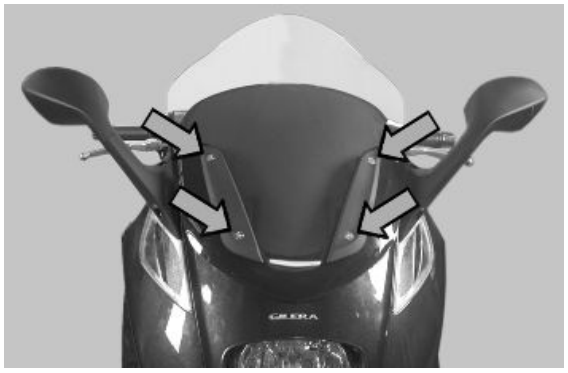
- Unscrew the two screws indicated from the helmet compartment.



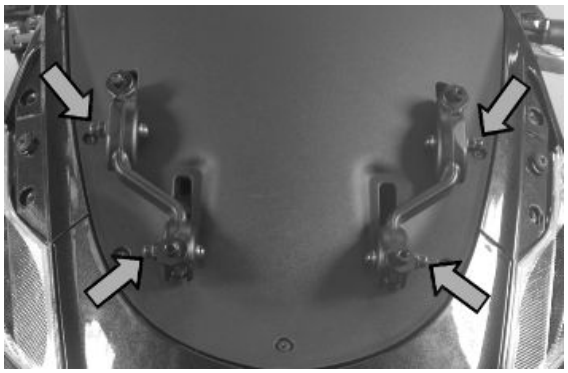
- Hold the front central cover as shown in the figure.
- Push the shield back plate and pull towards the vehicle rear part to release the tongue.

## Flyscreen

- Undo the fours screws indicated and remove the windshield.



- Undo the four nuts indicated and collect the washers. Remove the screws and the internal spacers in order to remove the connecting brackets to the windshield adjustment motor.



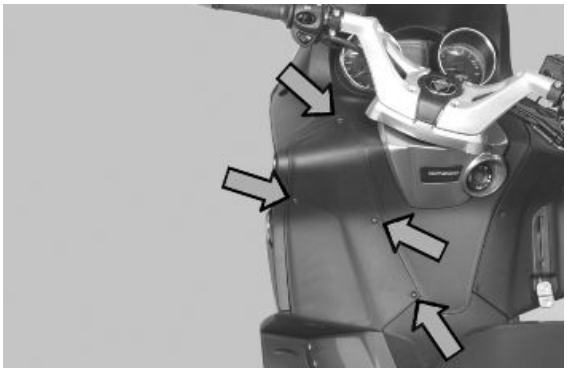
## Radiator cover

**See also**

Front wheel housing

## Battery

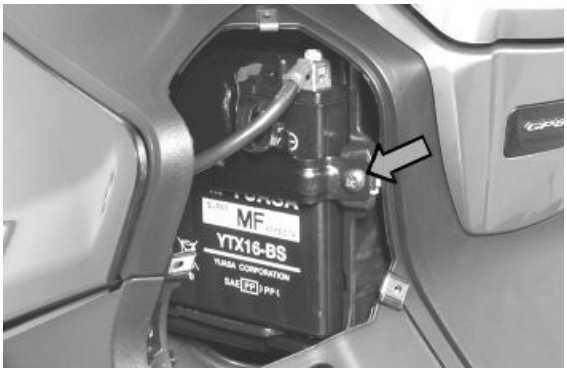
- Undo the four screws indicated and remove the battery compartment cover.



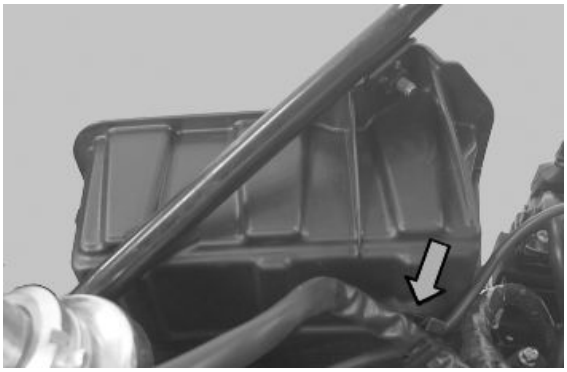
- Undo the screw and remove the battery fixing bracket.
- Undo the battery negative and positive wires.

**WARNING**

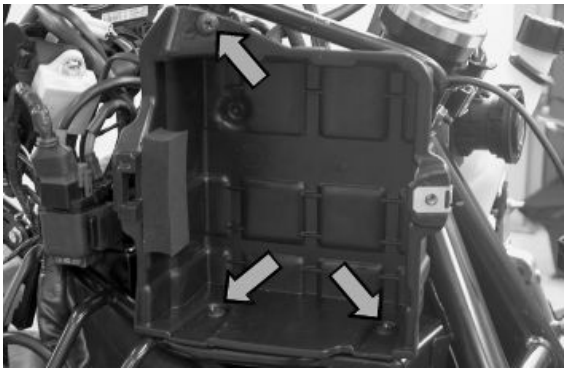
**IN ORDER TO AVOID DAMAGING THE ELECTRICAL SYSTEM, NEVER DISCONNECT THE WIRING WHILE THE ENGINE IS RUNNING.**




- To remove the battery from its housing, remove the shield back plate.
- Disconnect the cable harnesses at the back of the battery compartment.



- Undo the three screws indicated.



# INDEX OF TOPICS

Carry out the listed tests before delivering the vehicle.

Warning- be very careful when handling fuel.

## Aesthetic inspection

**Appearance checks:**

- Paintwork
- Fitting of plastics
- Scratches
- Dirt

## Tightening torques inspection

- Visually check that there is a yellow mark on the following clamps:

**HANDLEBAR**

- Screws fixing half-handlebars - supporting plate
- Screws fixing brake pump to handlebar
- Brake pipes / brake pump couplings
- Brake pipes / front brake pump couplings

**FRONT SUSPENSION**

- Front wheel pin nut
- Screw fixing wheel pin on right fork leg

**FRONT BRAKE**

- Screws fixing front brake calliper to forks
- Brake pipes / front brake calliper couplings

**REAR SUSPENSION**

- Rear wheel pin nut
- Screws tightening the fork pin cam

**REAR BRAKE**

- Screws fixing parking brake calliper to supporting plate
- Parking brake adjusting nut
- Screws fixing rear brake calliper to supporting plate
- Brake pipe / rear brake calliper coupling

**FORK**

- Fork pin nut
- Fork locking ring nut

**STAND**

- Centre stand bolt nuts
- Muffler support flange screw

## Electrical system

• Battery

• Main switch

• Lights: high beams, low beams, side/taillights (front and rear) and relevant warning lights

- Regulating the headlights according to the regulations currently in force

• Front and rear stop light buttons and bulb

• Turn indicators and their warning lights

• Instrument lighting

• instruments: fuel and temperature indicator

•Instrument panel lights

• Horn

• electric start up

• Engine stopping with emergency stop switch

• Electric opening of saddle with remote control

• Tilting system locking - unlocking button

**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 THE LIFE OF THE BATTERY.**

**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.**
**THE 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 brake system liquid level.

- Engine coolant level
- Engine oil level

## Road test

**Test ride**

- Cold start
- Instrument operations
- Response to the gas command
- Stability on acceleration and braking
- Rear and front brake efficiency
- Parking brake efficiency
- Rear and front suspension efficiency
- Abnormal noise

## Static test

**Static control after the test ride:**

• Hot engine restart
• Minimum seal (turning the handlebar)
• Uniform steering rotation
• Possible losses
• electric radiator fan operation

**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:

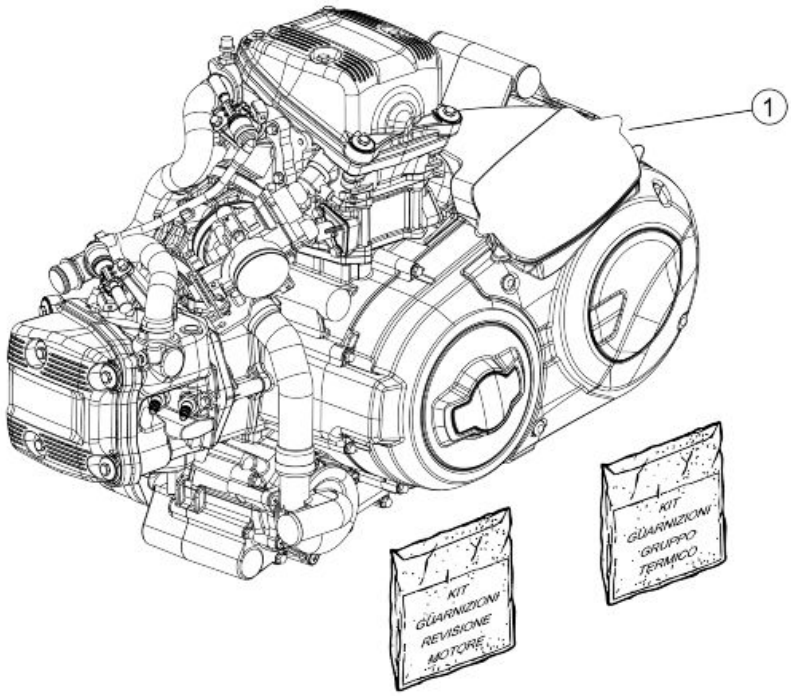
• Hydraulic braking system: lever travel
• Clutch: proper functioning check
• Engine: proper general functioning and no abnormal noise check
• Other: paper check, frame and engine number check, tools and equipment, licence plate fitting, lock check, tyre pressure check, rear-view mirrors and any accessory fitting

# INDEX OF TOPICS

This section is devoted to the time necessary to carry out repairs.

For each operation, the description, code and time envisages are specified.

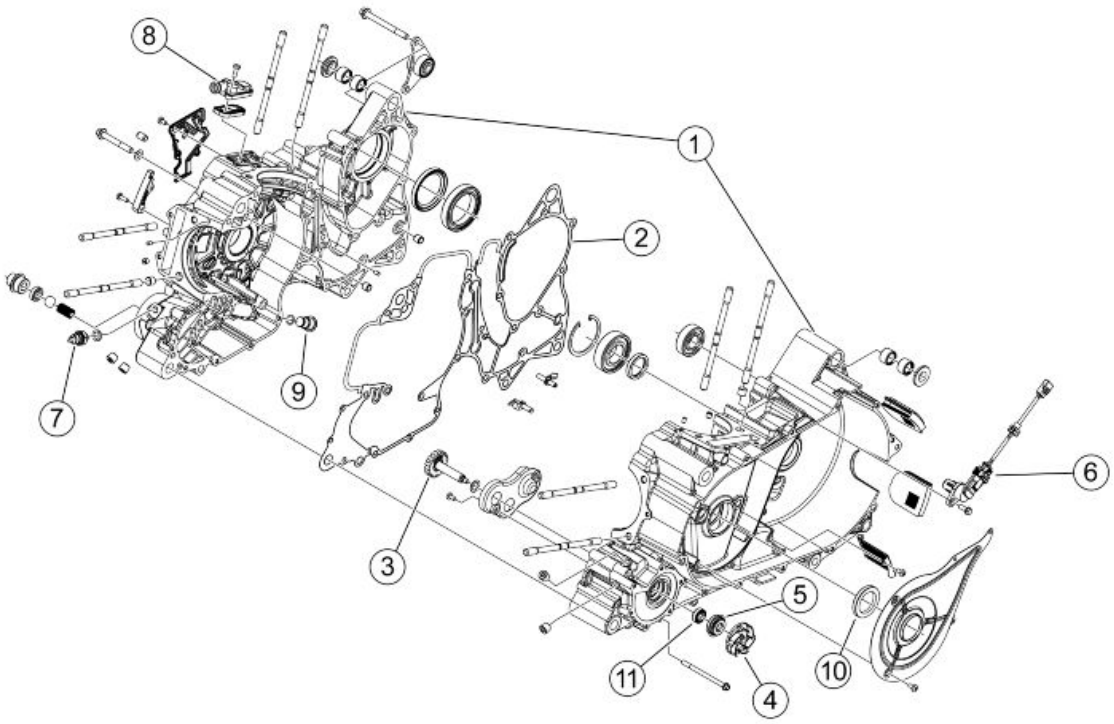
## Engine




**ENGINE**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001001 | Engine to chassis - Replacement | |

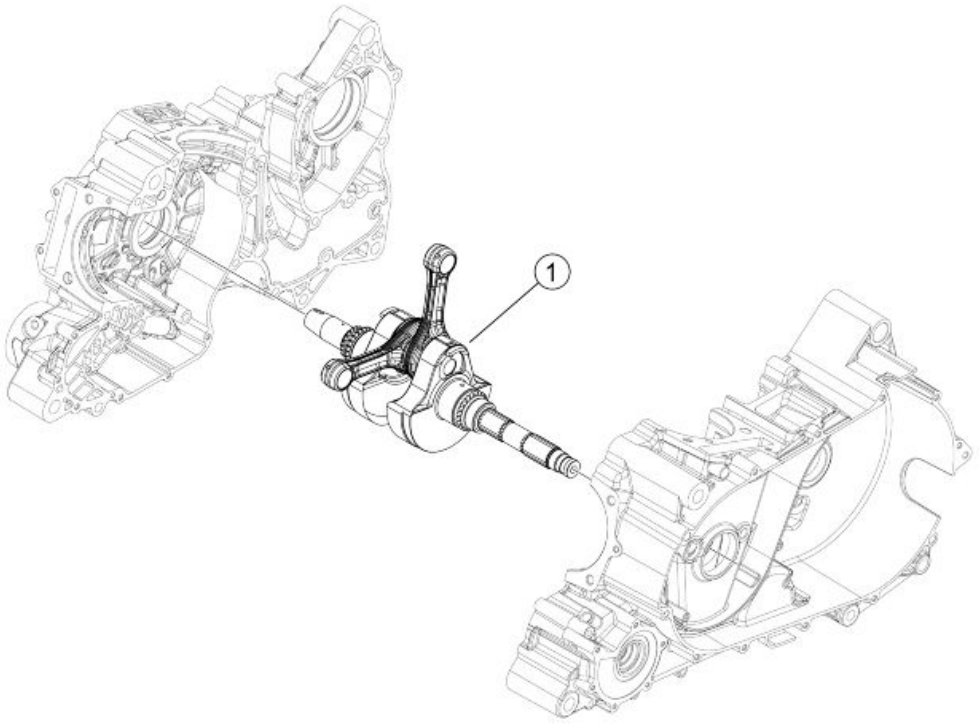
## Crankcase




**CRANKCASE**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001133 | Engine crankcase- Replacement | |
| 2 | 001153 | Crankcase half gasket - Replacement | |
| 3 | 001111 | Water pump gear - Replacement | |
| 4 | 007007 | Water pump rotor cover | |
| 5 | 001187 | Overall sealing - Replac. | |
| 6 | 005134 | Speed sensor - Replacement | |
| 7 | 001160 | Minimum oil pressure sensor - Replacement | |
| 8 | 110301 | Blow-by valve and/or blow-by pipe- Replac. | |
| 9 | 003064 | Engine oil - change | |
| 10 | 001100 | Oil seal, clutch side - Replacement | |
| 11 | 001188 | Water pump shaft sealing ring - Replac. | |

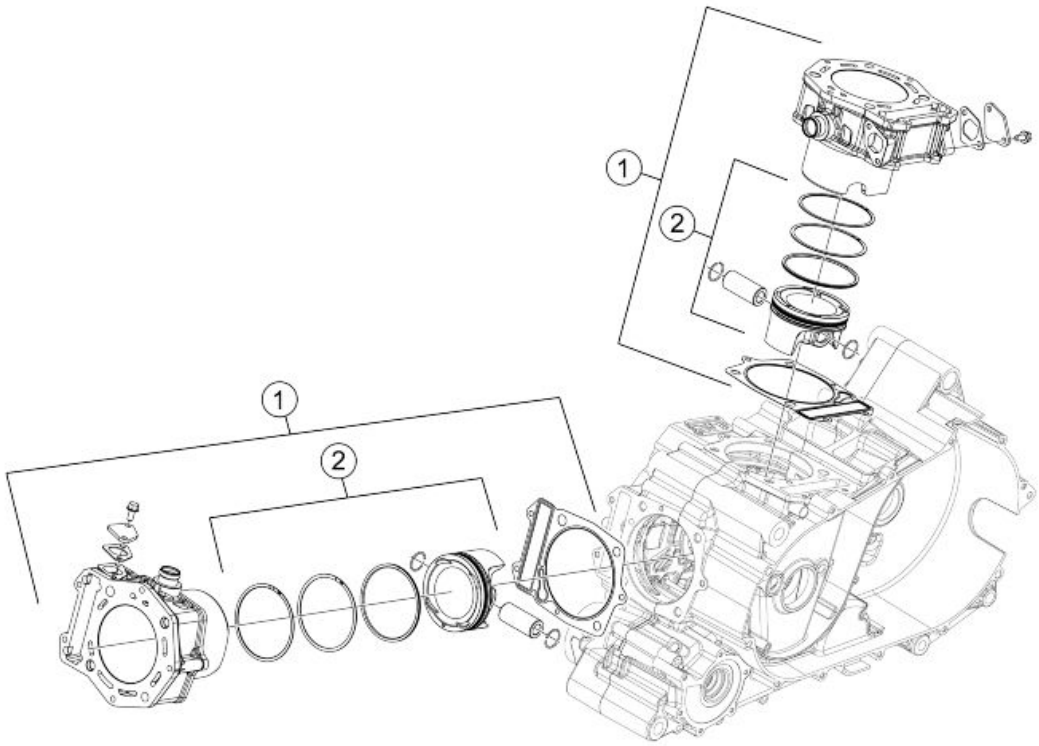
## Crankshaft




**CRANKSHAFT**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001117 | Crankshaft - Replacement | |

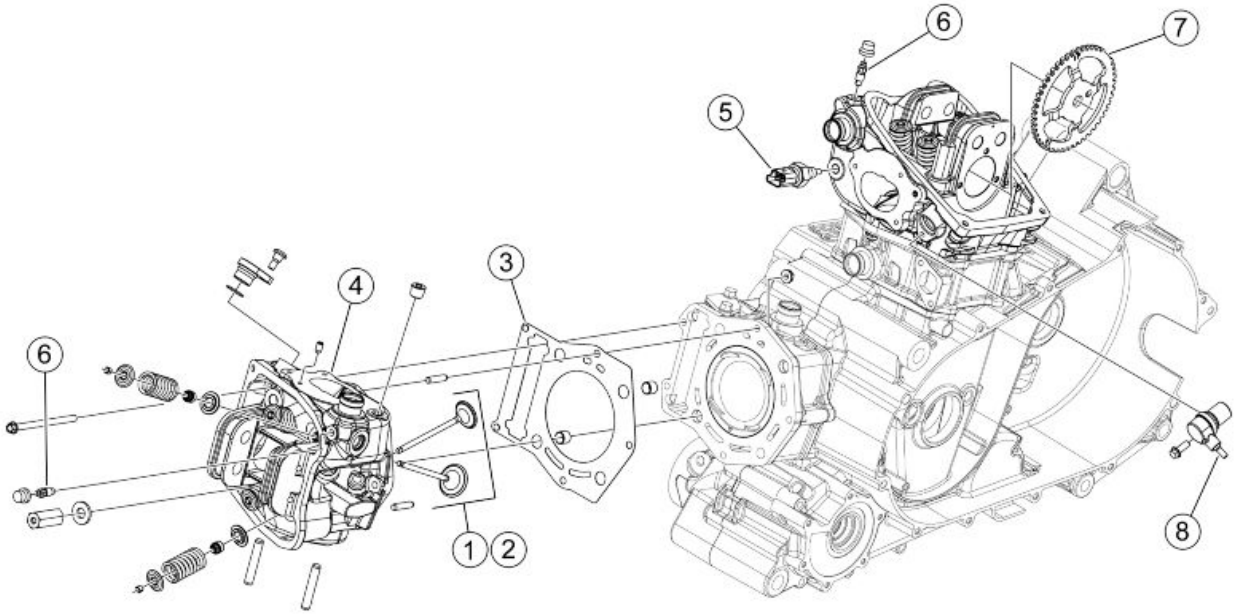
## Cylinder assy.




**CYLINDER GROUP**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001002 | Cylinder piston - Replacement | |
| 2 | 001154 | Pin ring piston unit - Service | |

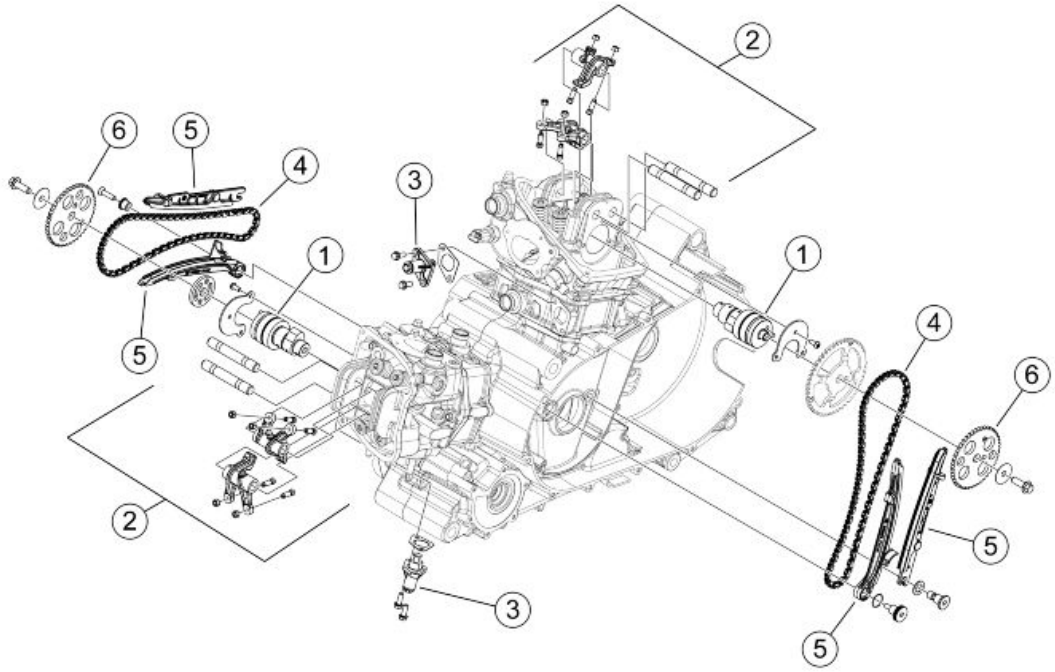
## Cylinder head assy.




**HEAD UNIT**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001045 | Valves - Replacement | |
| 2 | 001049 | Valves - Adjustments | |
| 3 | 001056 | Head gasket - Replacement | |
| 4 | 001126 | Head - Replacement | |
| 5 | 000235 | Coolant temperature sensor - Replac. | |
| 6 | 007012 | Coolant bleed valve - Replacement | |
| 7 | 005089 | Tone wheel - Replacement | |
| 8 | 005116 | revolution timing sensor - Replacement | |

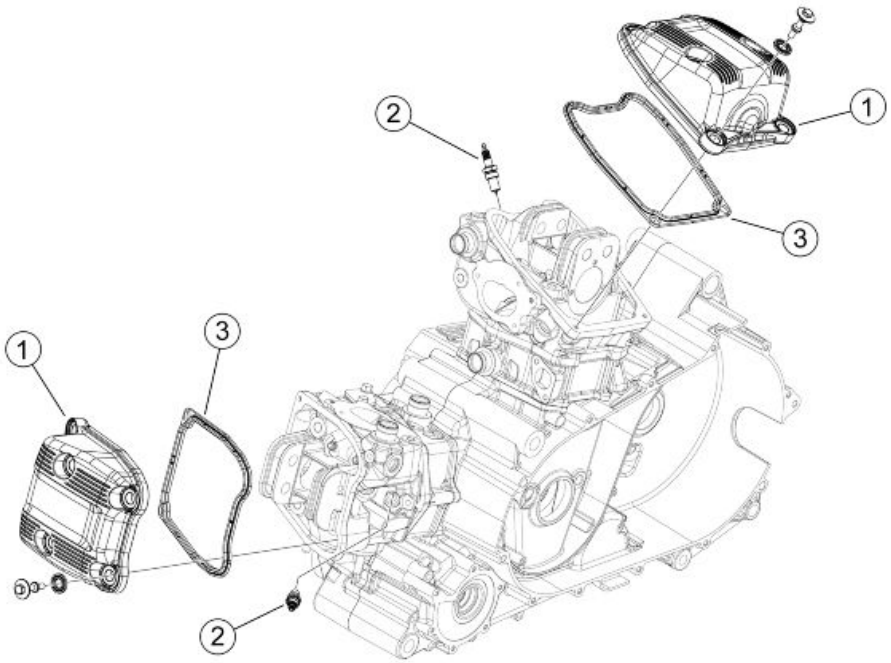
## Rocker arms support assy.




**ROCKING LEVER UNIT**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001044 | Camshaft - Replacement | |
| 2 | 001148 | Rocking lever valve - Replacement | |
| 3 | 001129 | Chain tightener - Replacement | |
| 4 | 001051 | Belt/ Timing chain - Replacement | |
| 5 | 001125 | Chain guide pads - Replacement | |
| 6 | 140021 | Camshaft timing system pulley - Replac | |

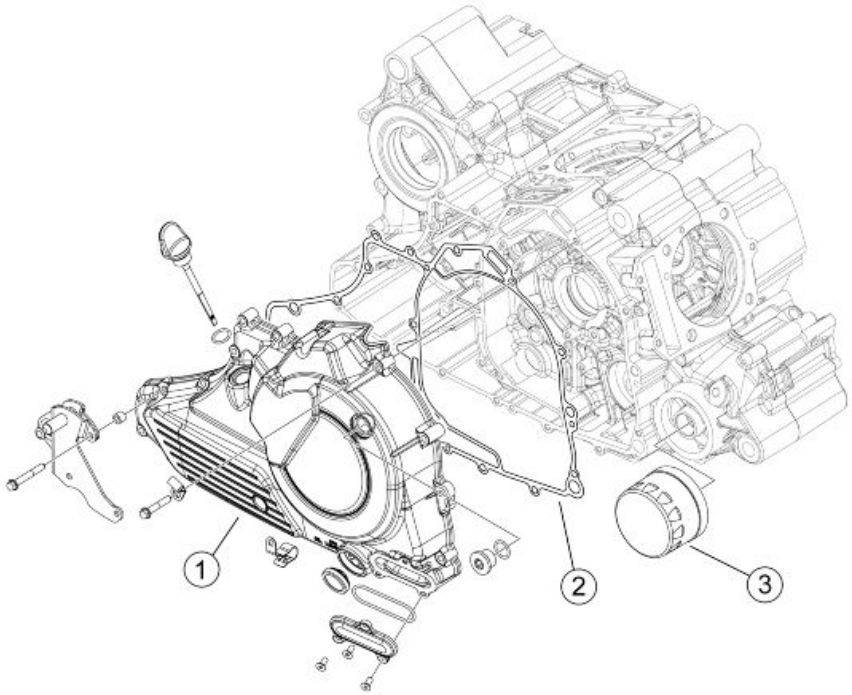
## Cylinder head cover




**HEAD COVER**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001089 | Head cover - Replacement | |
| 2 | 001093 | Spark plug - Replacement | |
| 3 | 001088 | Head cover gasket - Replacement | |

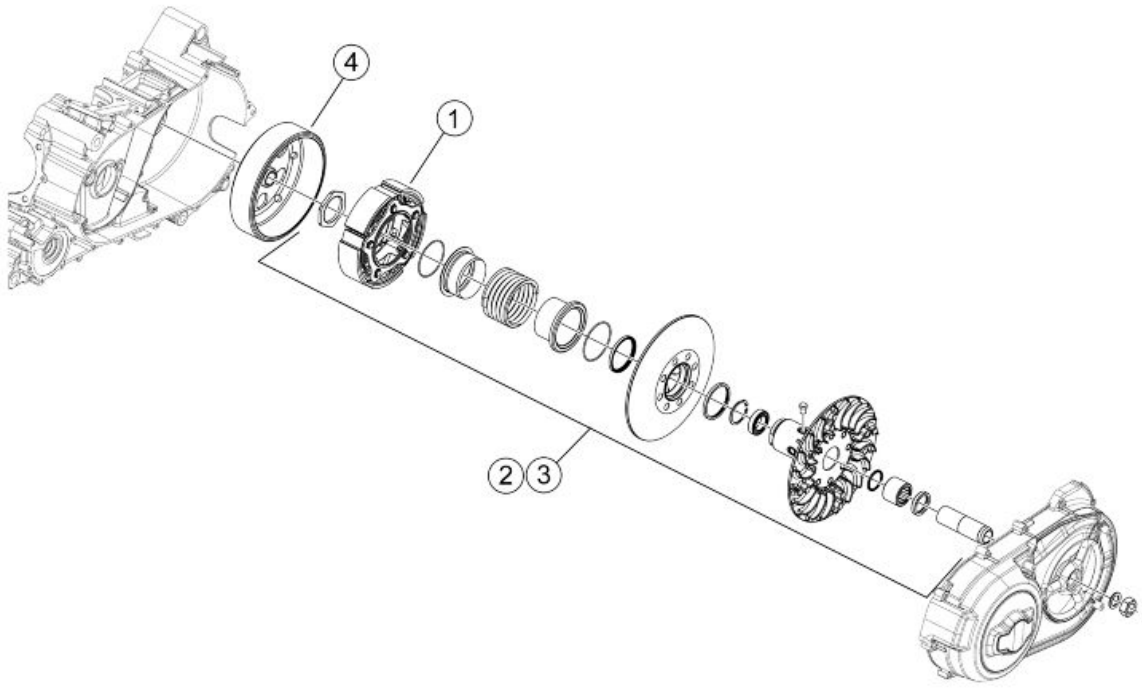
## Flywheel cover




**FLYWHEEL COVER**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001087 | Flywheel cover - replace | |
| 2 | 001150 | Flywheel cover gasket - Replacement | |
| 3 | 001123 | Oil filter -Replacement | |

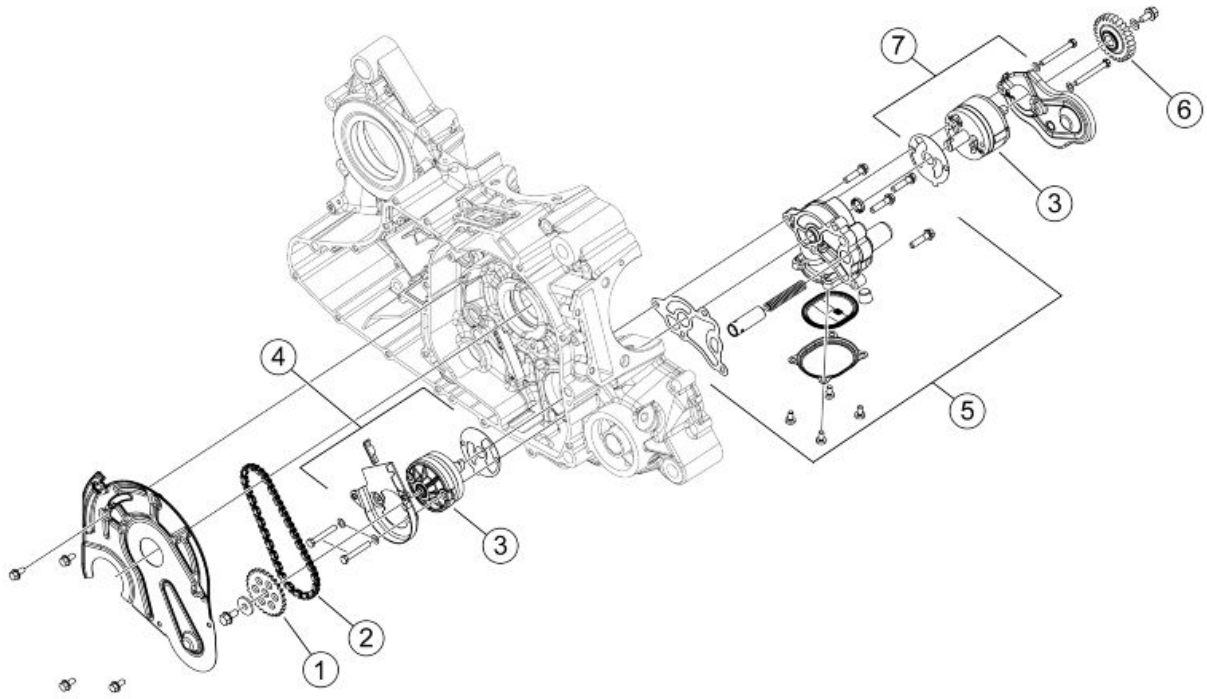
## Driven pulley




**DRIVEN PULLEY**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001022 | Clutch - Replacement | |
| 2 | 001012 | Driven pulley - Overhaul | |
| 3 | 001110 | Driven pulley - Replacement | |
| 4 | 001155 | Clutch bell housing - Replacement | |

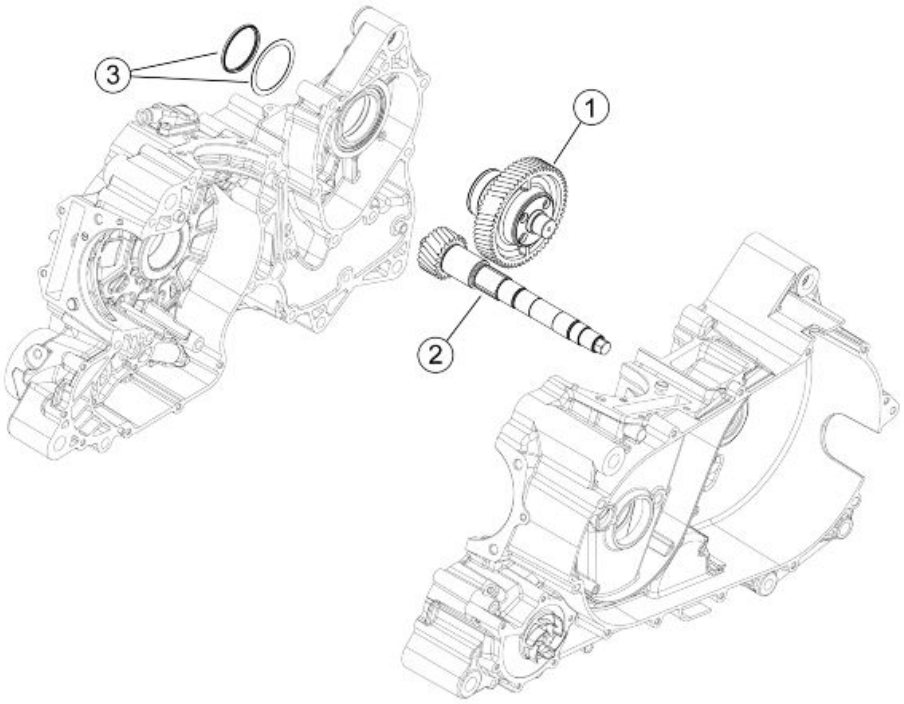
## Oil pump




**OIL PUMP**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001186 | Oil pump control gear - Replac. | |
| 2 | 001122 | Oil pump chain - Replacement | |
| 3 | 001042 | Oil pump - Service | |
| 4 | 001184 | Oil delivery pump - Replac. | |
| 5 | 001124 | Lubrication by-pass - Replacement | |
| 6 | 001189 | Water pump control gear - Replac. | |
| 7 | 001185 | Oil scavenge pump - Replac. | |

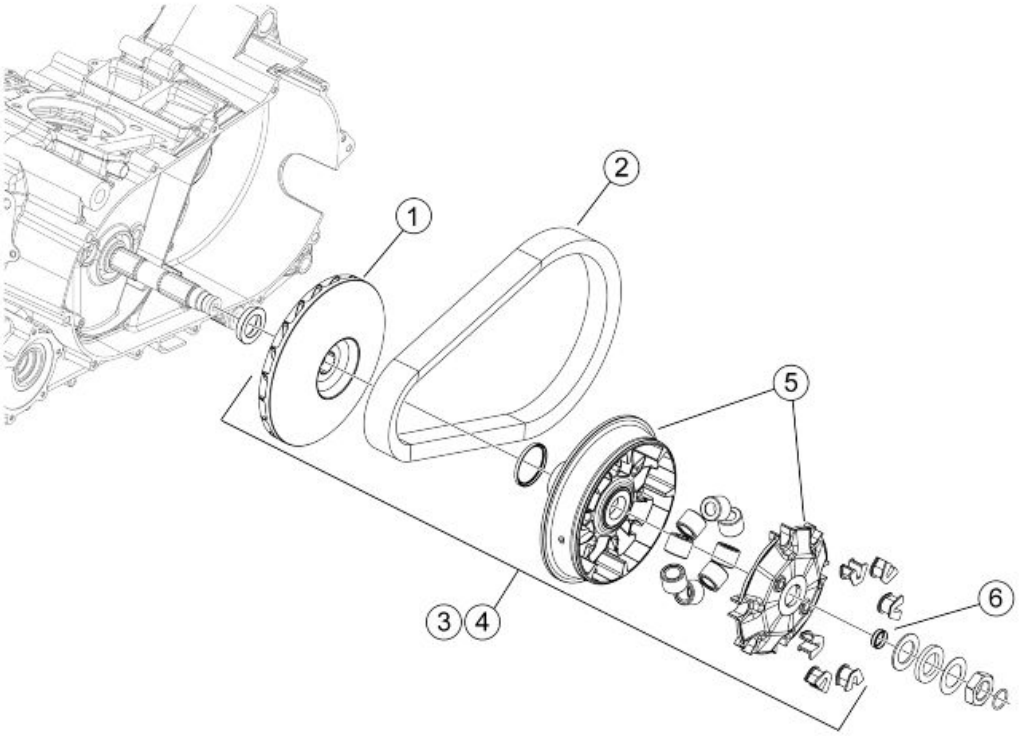
## Final gear assy.




**FINAL REDUCTION GEAR ASSEMBLY**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001195 | Toothed wheel - Replac. | |
| 2 | 001196 | Driven pulley shaft - Replac. | |
| 3 | 001190 | Oil sealing casing - Replac. | |

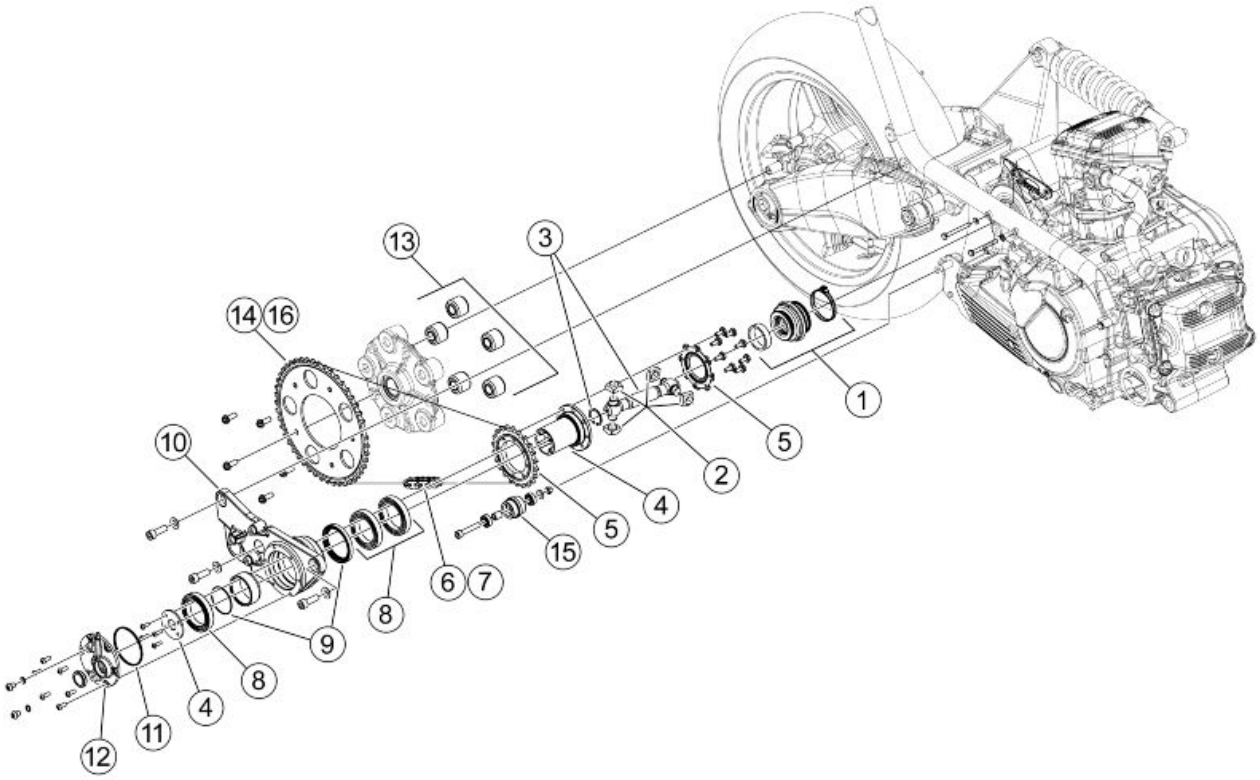
## Driving pulley




**DRIVING PULLEY**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001086 | Driving half-pulley - Replacement | |
| 2 | 001011 | Driving belt - Replacement | |
| 3 | 001006 | driving pulley - Service | |
| 4 | 001066 | driving pulley - Replacement | |
| 5 | 001177 | Variator rollers / shoes - Replacement | |
| 6 | 001181 | Adjusting ring - Replac. | |

## Final drive

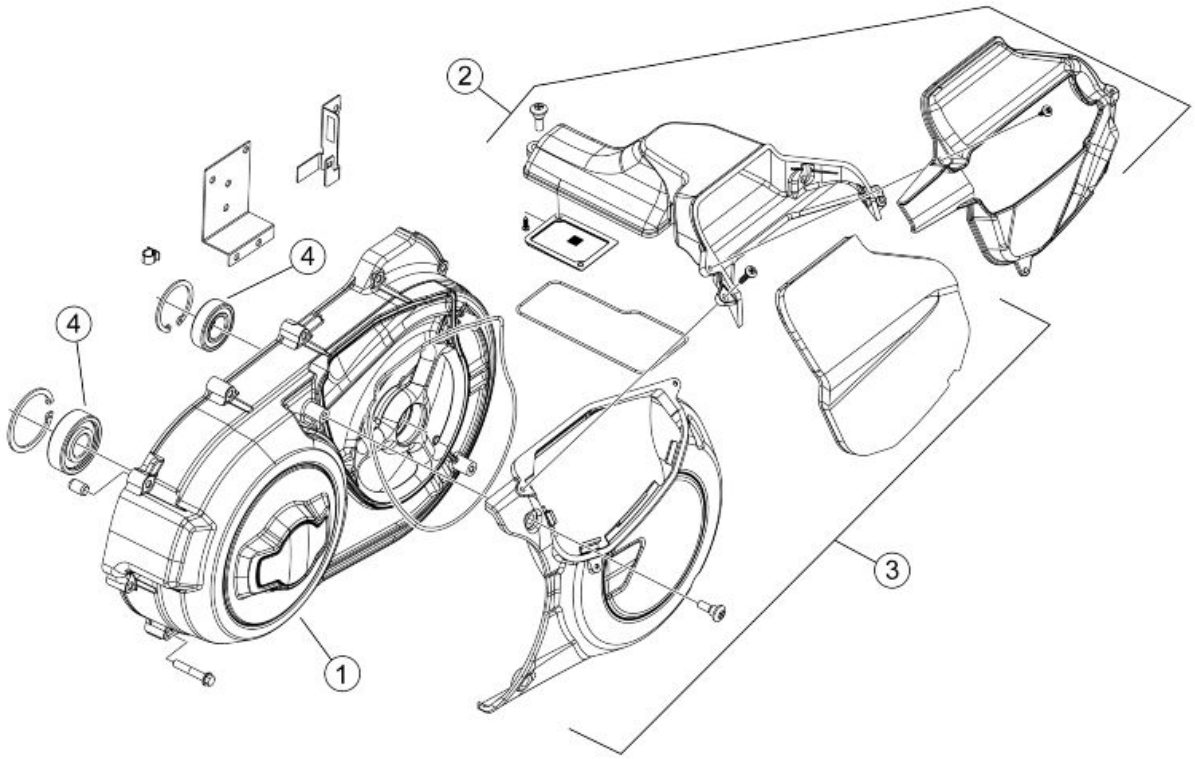



**FINAL DRIVE**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001190 | Oil sealing casing - Replac. | |
| 2 | 001191 | Driving sliders - Replac. | |
| 3 | 370011 | Propeller shaft - Replac. | |
| 4 | 410301 | Pinion flange - Replac. | |
| 5 | 001103 | Final drive pinion - Replac. | |
| 6 | 000605 | Final drive (pinion, chain, crown) - Replacement | |
| 7 | 002077 | Final drive chain - Replacement | |
| 8 | 410371 | Pinion bearings - Replac. | |
| 9 | 410271 | Flange oil seal - Replac. | |
| 10 | 001192 | Pinion unit support - Replac. | |
| 11 | 001193 | Pinion unit cover O-ring - Replac. | |
| 12 | 001194 | Pinion unit cover - Replac. | |
| 13 | 000604 | Rear hub anti-vibration buffer - Replac. | |
| 14 | 000122 | Final drive chain - Adjustment and lubrication | |

| | Code | Action | Duration |
|---|---|---|---|
| 15 | 001141 | Belt anti-flapping roller - Replacement | |
| 16 | 004128 | Corona ruota posteriore - Sost | |

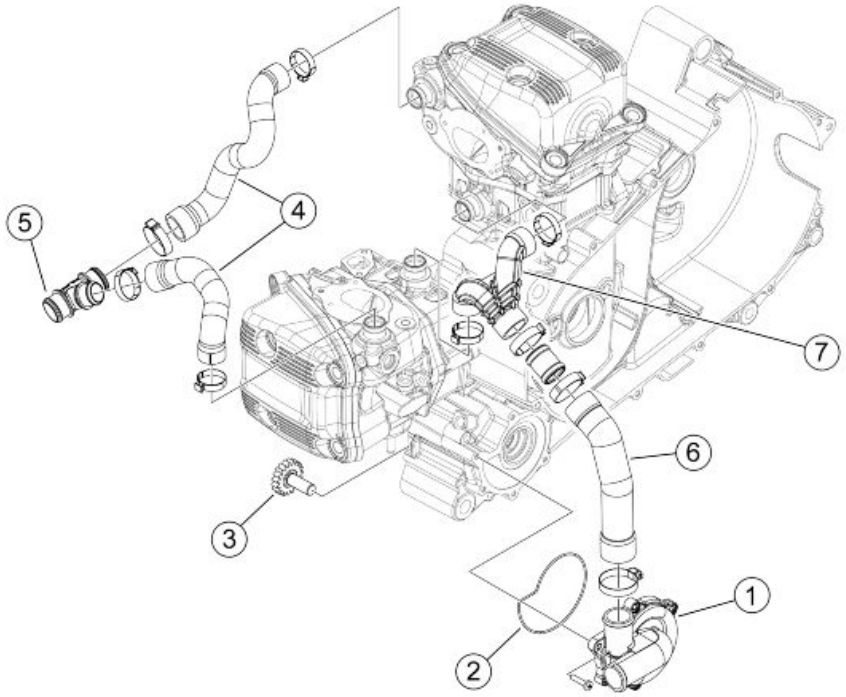
## Transmission cover




**TRANSMISSION COVER**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001096 | External transmission cover - Replacement | |
| 2 | 001131 | Transmission air intake - Replacement | |
| 3 | 001170 | Air manifold - replacement | |
| 4 | 001135 | Transmission cover bearing - Replacement | |

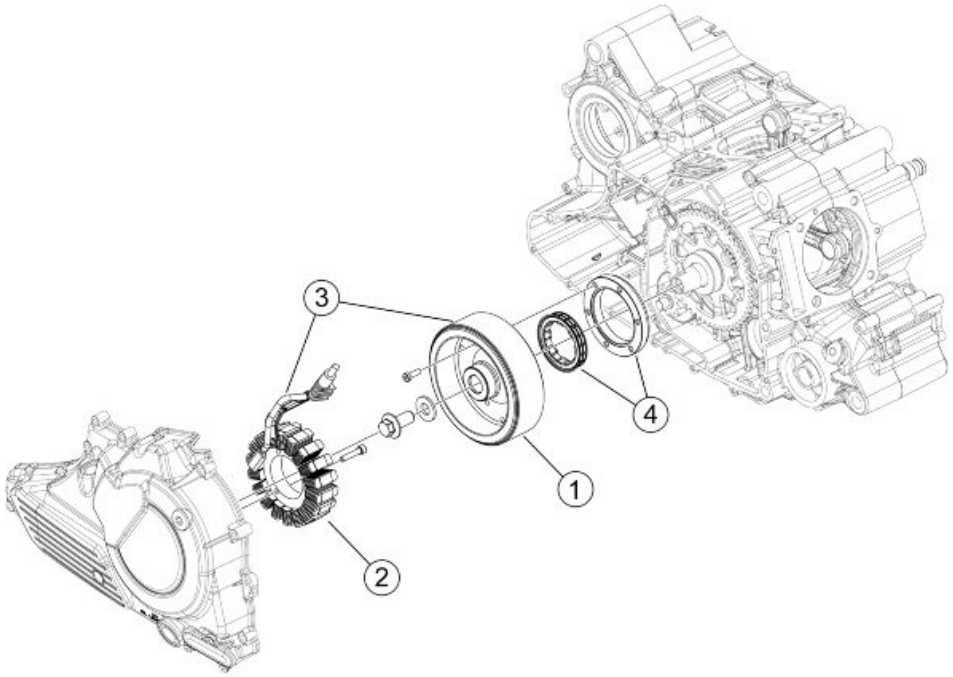
## Water pump




**WATER PUMP**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 007017 | Water pump cover - Replacement | |
| 2 | 161011 | Water pump and/or gasket - Replacement | |
| 3 | 001111 | Water pump gear - Replacement | |
| 4 | 007008 | Cylinder head outlet rubber coupling - Replacement | |
| 5 | 007022 | Head outlet T-joint - Replac. | |
| 6 | 001182 | Head intake rubber sleeve - Replac. | |
| 7 | 001183 | Head intake T-joint - Replac. | |

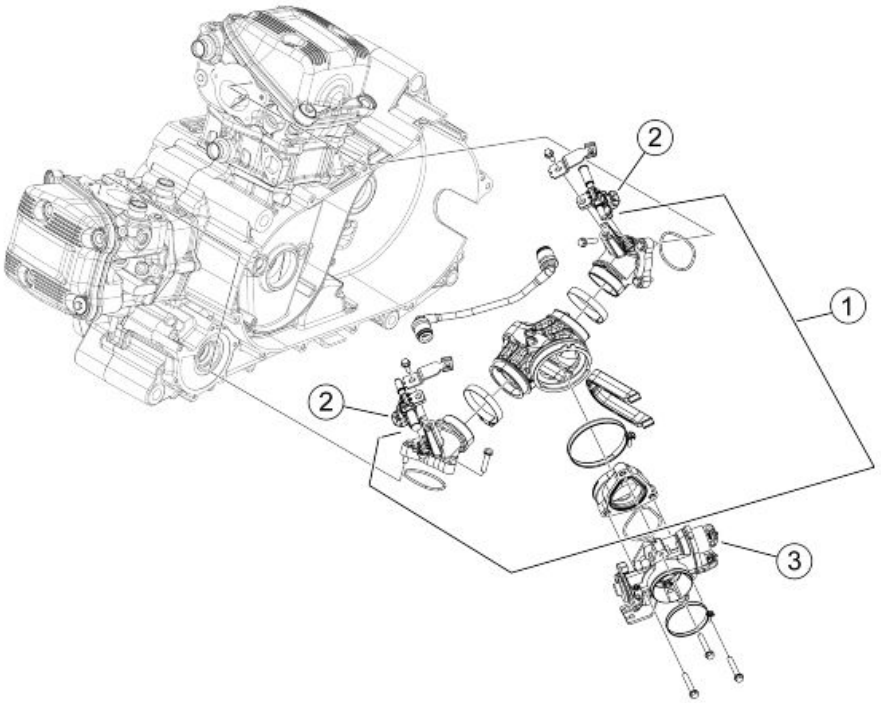
## Flywheel magneto




**MAGNETO FLYWHEEL**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001173 | Rotor - Replacement | |
| 2 | 001067 | Stator - Removal and Refitting | |
| 3 | 001058 | Complete flywheel - Replacement | |
| 4 | 001104 | Start-up freewheel - Replacement | |

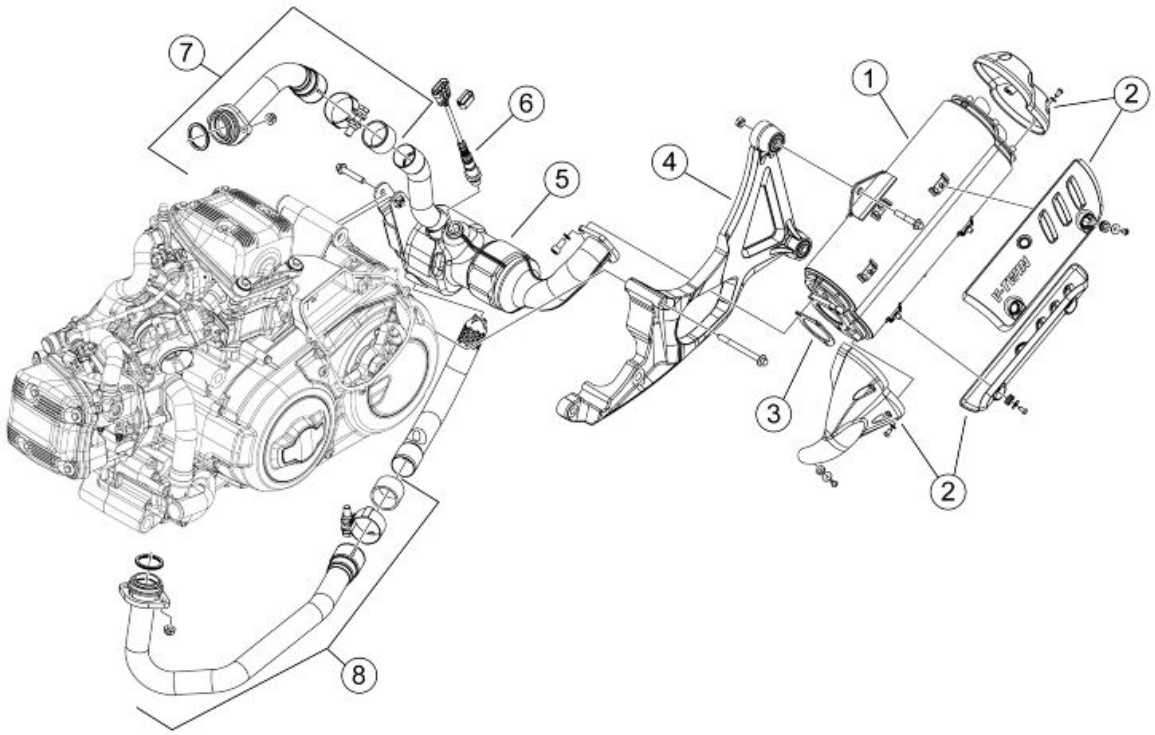
## Butterfly valve




**THROTTLE BODY**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001013 | Intake manifold - change | |
| 2 | 001047 | Injector - Replacement | |
| 3 | 001166 | Throttle body - Replacement | |

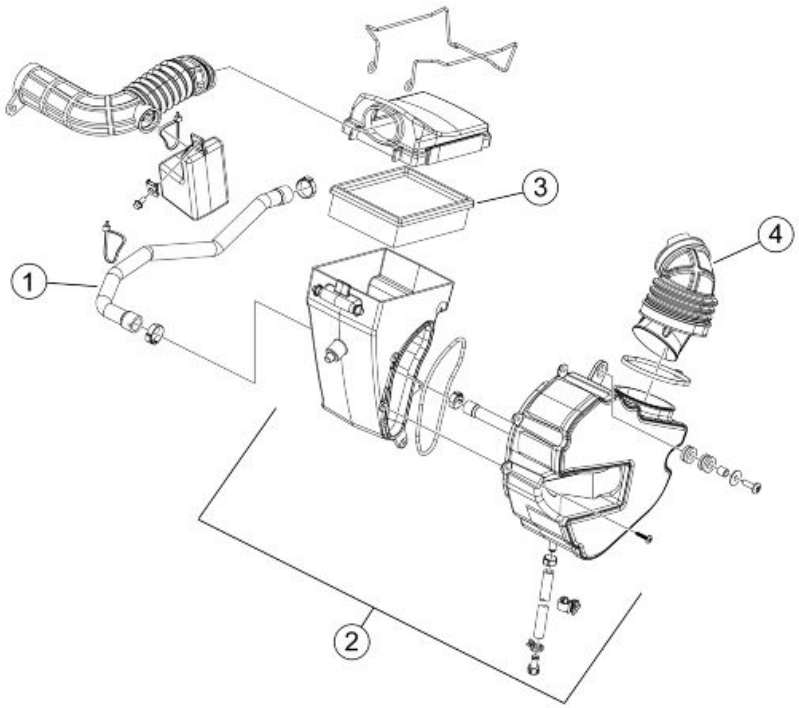
## Exhaust pipe




**MUFFLER**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001105 | Silencer - Replacement | |
| 2 | 001095 | Muffler guard - Replacement | |
| 3 | 170101 | Exhaust pipe gasket - Replacement | |
| 4 | 005138 | Lambda probe - Replacement | |
| 5 | 170071 | Catalytic converter and/ or gasket - Replacement | |
| 6 | 003077 | Muffler supporting arm/ rear shock absorber - Replacement | |
| 7 | 170171 | Muffler, duct No. 1 - Replacement | |
| 8 | 170211 | Muffler, duct No. 2 - Replacement | |

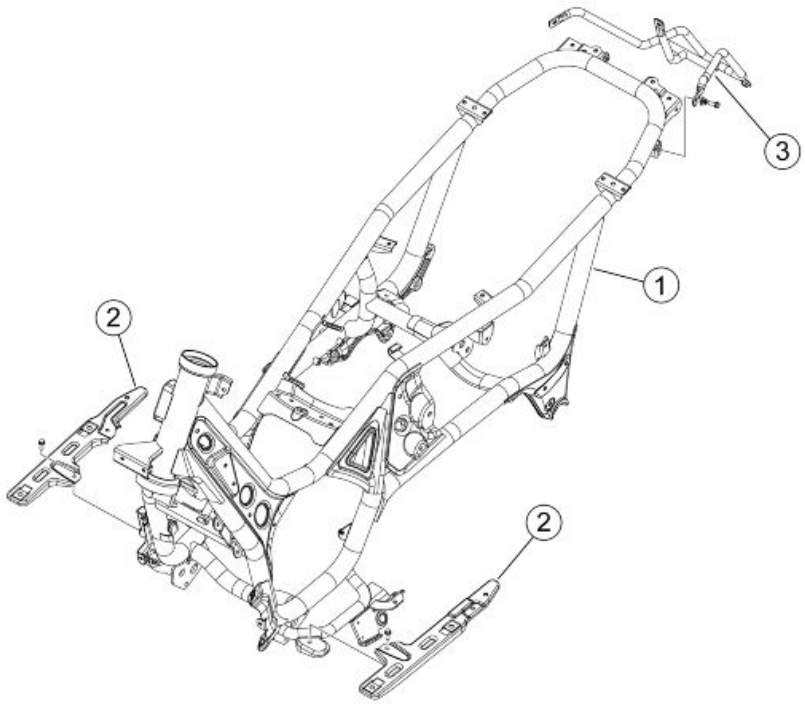
## Air cleaner




**AIR CLEANER**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 110301 | Blow-by valve and/or blow-by pipe- Replac. | |
| 2 | 001015 | Air filter box - Replacement | |
| 3 | 001014 | Air filter - Replacement / cleaning | |
| 4 | 004122 | Cleaner / Throttle body union - Replacement | |

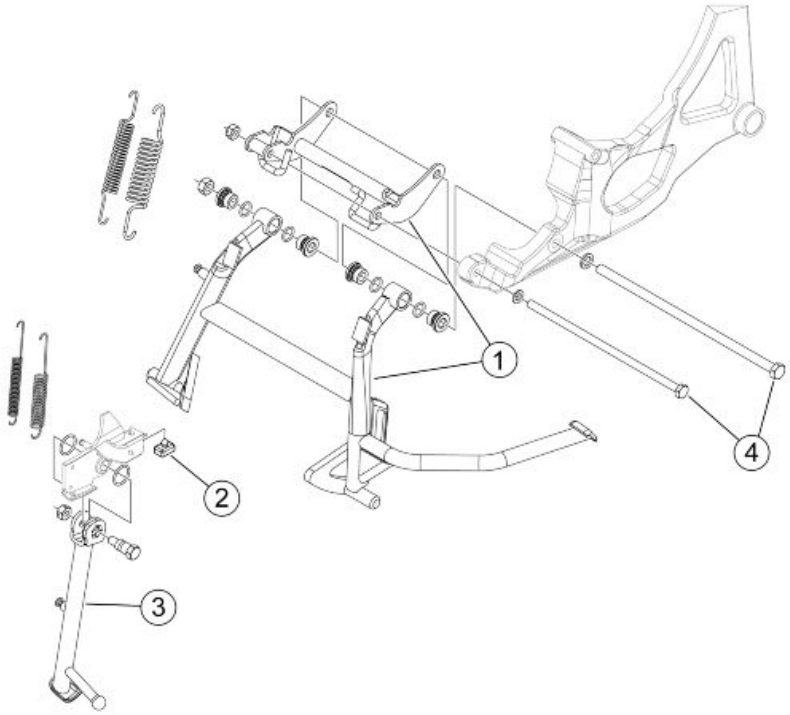
## Frame




**CHASSIS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 004001 | Chassis - Replacement | |
| 2 | 004147 | Footrest support bracket, one side - Replacement | |
| 3 | 004116 | Rear frame - Replacement | |

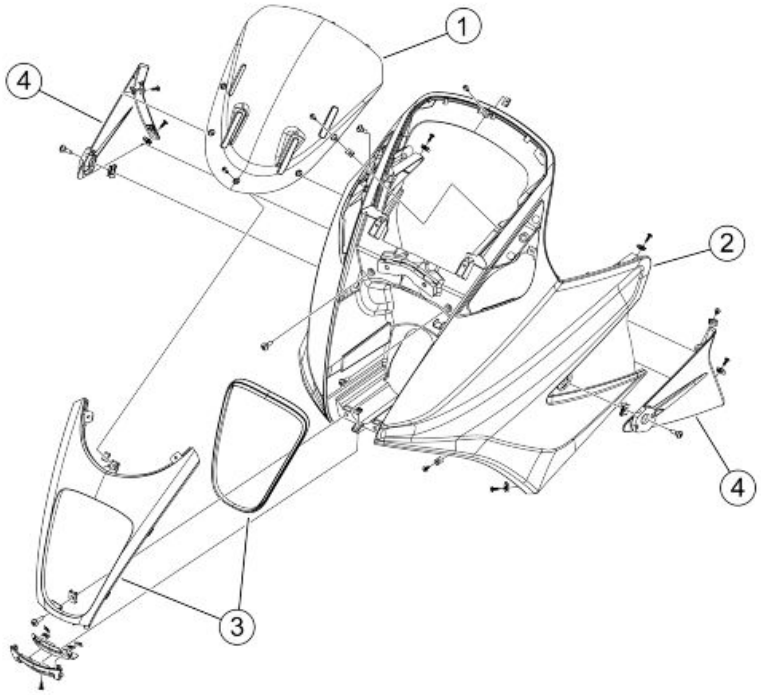
## Centre-stand




**STAND**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 004004 | Stand - Replacement | |
| 2 | 004179 | Stand buffer - Replacement | |
| 3 | 001053 | Stand bolt - Replacement | |
| 4 | 004102 | Side stand - Replacement | |

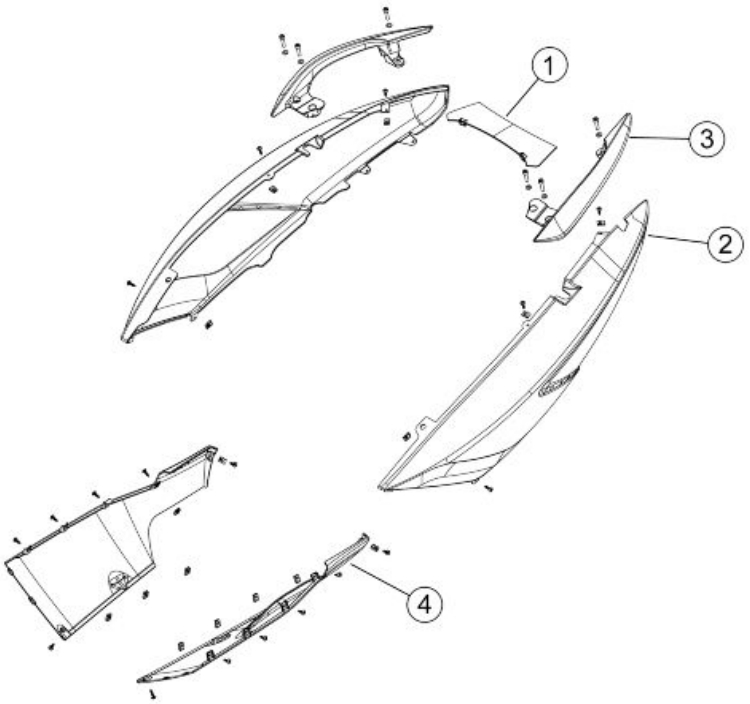
## Legshield spoiler




**FRONT SHIELD**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 004021 | Shield upper section - Replacement | |
| 2 | 004064 | Front shield - Replacement | |
| 3 | 004020 | Headlight frame - Replacement | |
| 4 | 004085 | Fairing (1) - Replacement | |

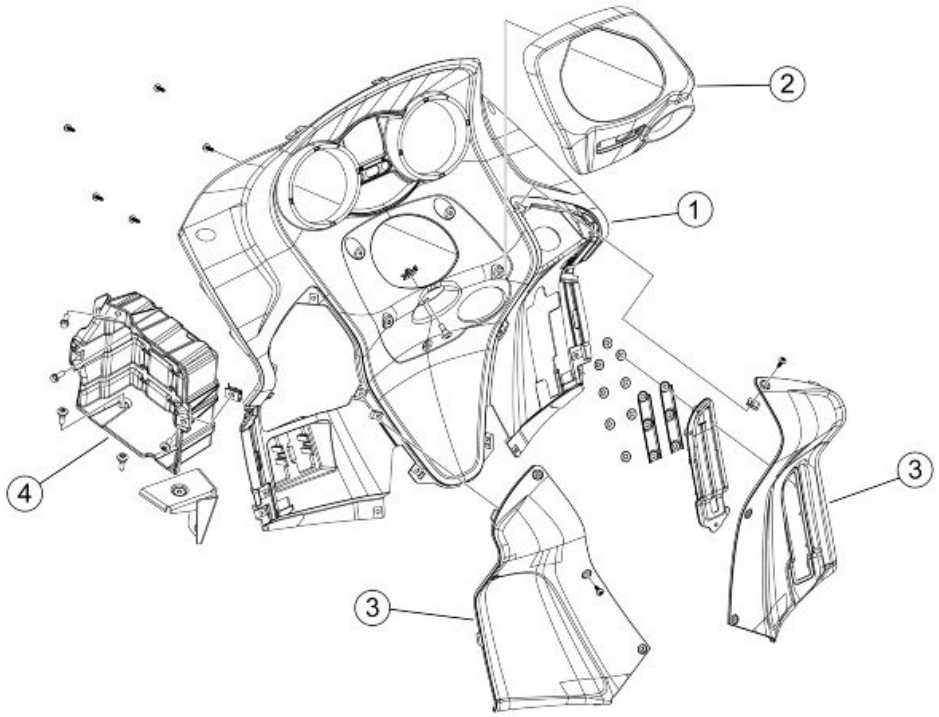
## Side fairings




**SIDE COVERS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 004036 | Frame cover - Replacement | |
| 2 | 004129 | Rear fairing - Replacement | |
| 3 | 004068 | Passenger handgrip - Replacement | |
| 4 | 004053 | Spoiler - Replacement | |

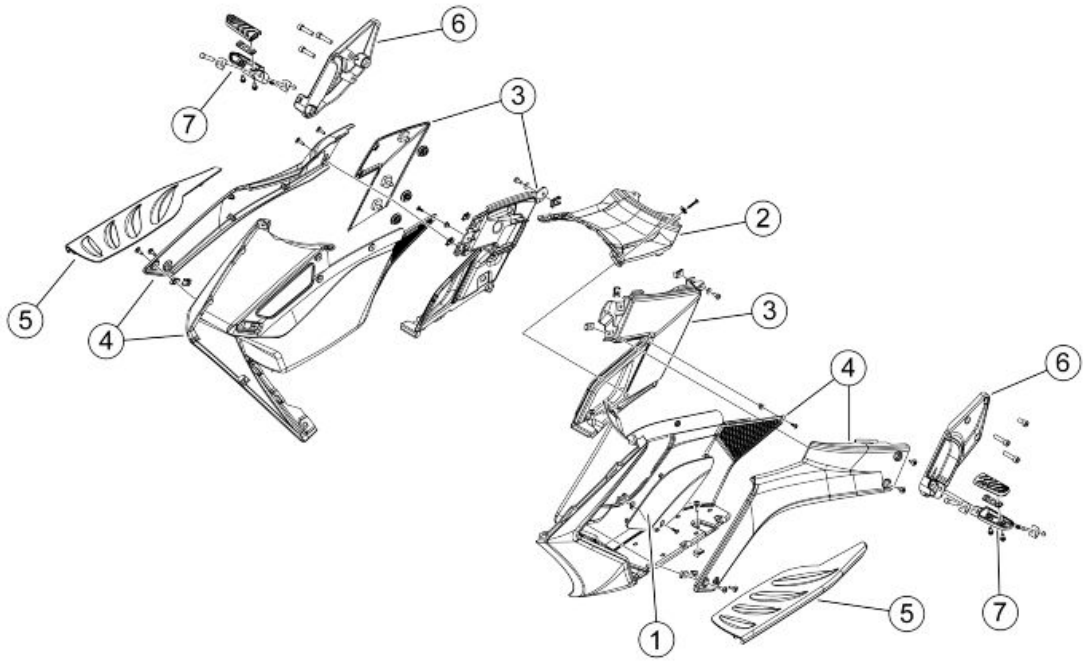
## Rear cover




**REAR SHIELD**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 004065 | Front shield, rear part - Removal and refitting | |
| 2 | 004023 | Shield rim - Replacement | |
| 3 | 004132 | Half-panel - replac. (1) | |
| 4 | 004071 | Battery compartment - Replacement | |

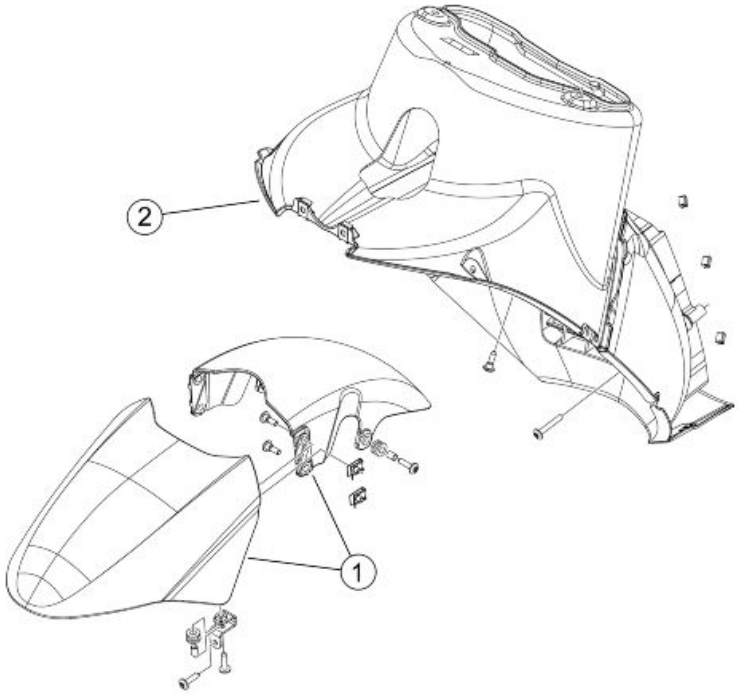
## Central cover




**CENTRAL COVER**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 004059 | Spark plug inspection flap - Replacement | |
| 2 | 004011 | Central chassis cover - Replacement | |
| 3 | 004012 | Rear fairings - Removal and refitting | |
| 4 | 004015 | Footrest - Removal and Refitting | |
| 5 | 004075 | Front mat - Replacement | |
| 6 | 004186 | Passenger footrest support - Replac. | |
| 7 | 004187 | Passenger footrests - Replac. | |

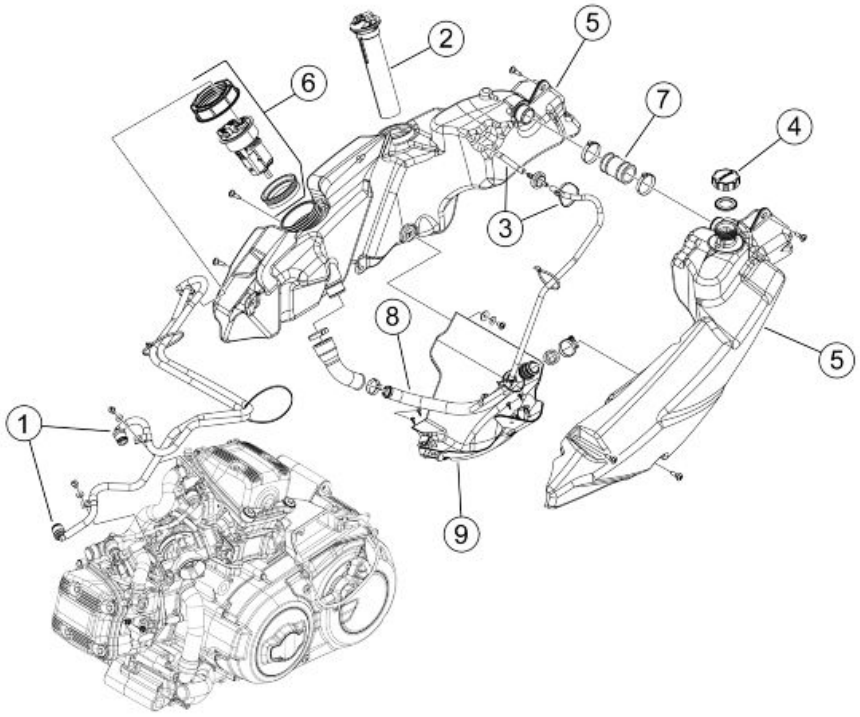
## Mudguard




**MUDGUARDS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 004002 | Front mudguard - Replacement | |
| 2 | 003087 | Wheel housing - Replacement | |

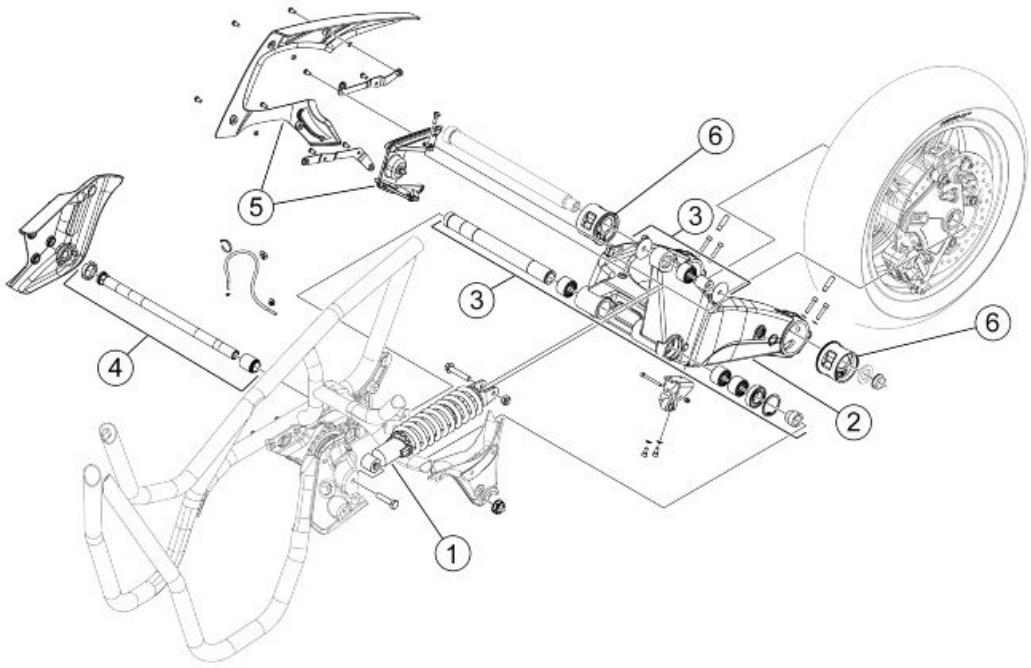
## Fuel tank




**FUEL TANK**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 004137 | Injector pump pipe - Replacement | |
| 2 | 005010 | Tank float - Replacement | |
| 3 | 004109 | Fuel tank breather - Replacement | |
| 4 | 004168 | Fuel tank cap - Replacement | |
| 5 | 004005 | Fuel tank - Replacement | |
| 6 | 004073 | Fuel pump - Replacement | |
| 7 | 004188 | Connecting sleeve - Replac | |
| 8 | 004189 | Whole compensation pipe - Replac. | |
| 9 | 004190 | Pipe guard - Replac. | |

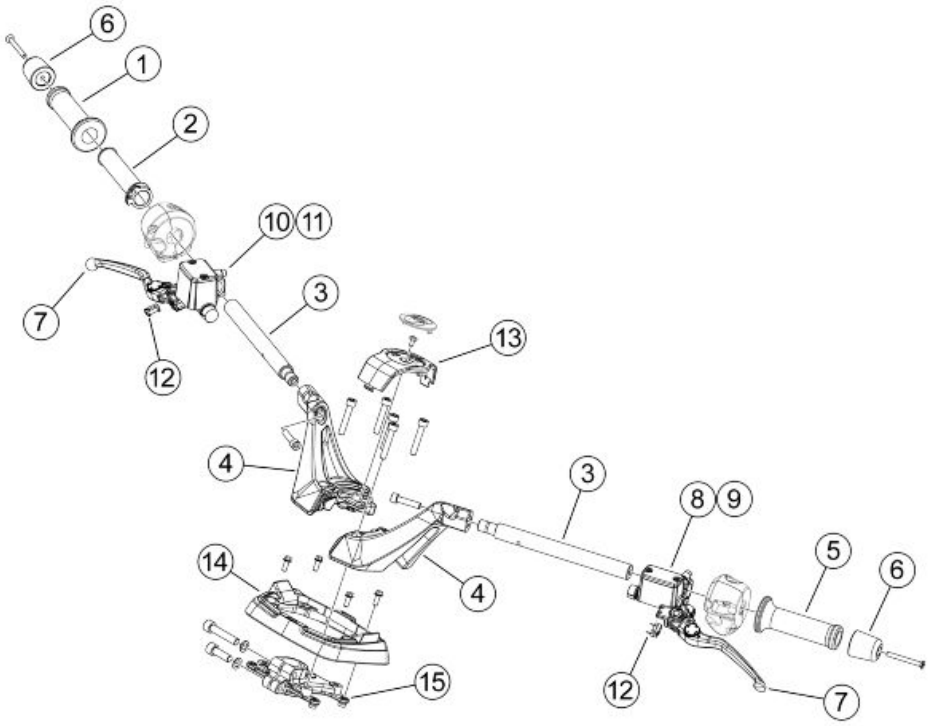
## Rear shock-absorber




**REAR SHOCK ABSORBERS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 003007 | Rear shock absorber - Removal and Refitting | |
| 2 | 003078 | Rear fork - Replac. | |
| 3 | 000601 | Fork removal and fitting / Bushings and spacer removal | |
| 4 | 003125 | Fork bolt - Replac. | |
| 5 | 003126 | Fork guards - Replac. | |
| 6 | 003127 | Eccentric - Replac. | |

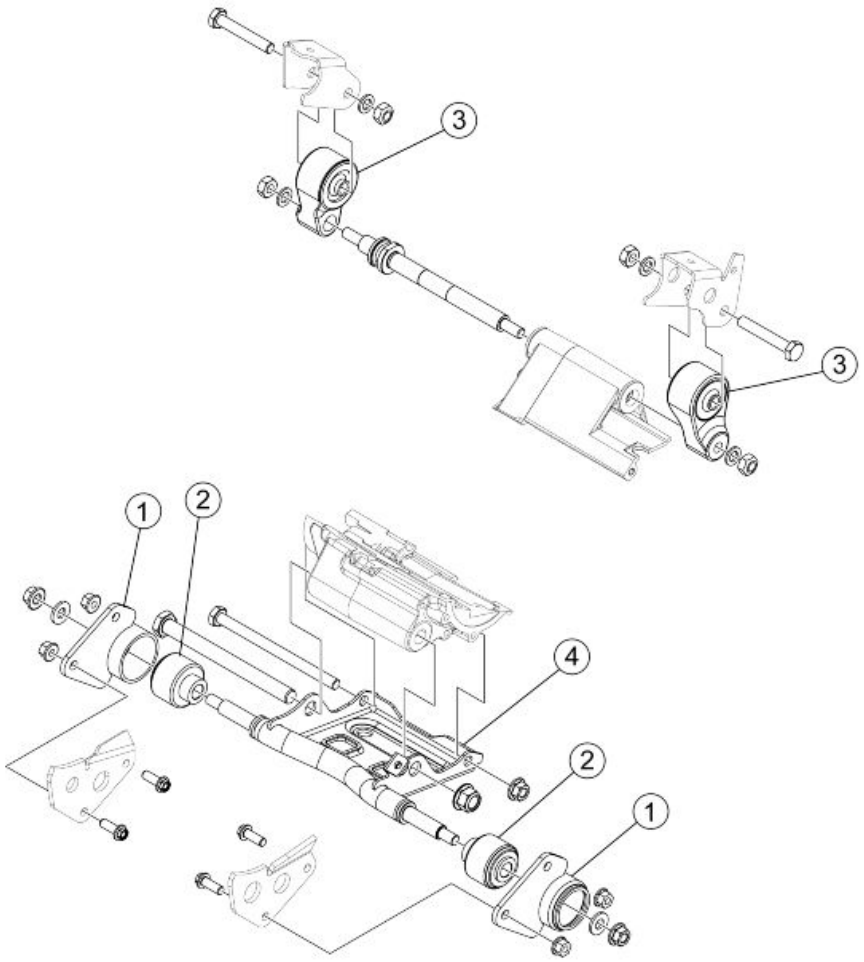
## Handlebar components




**HANDLEBAR COMPONENTS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 002059 | Right-hand knob - change | |
| 2 | 002060 | Complete throttle control - Replacement | |
| 3 | 004154 | Left/ right half-handlebar - Replac. | |
| 4 | 004155 | Left/ right half-handlebar support - Replac. | |
| 5 | 002071 | Left knob - Replacement | |
| 6 | 003059 | Counterweight - Replacement | |
| 7 | 002037 | Brake lever - Replacement | |
| 8 | 002067 | Rear brake pump - Replacement | |
| 9 | 002080 | Rear brake oil bleeding system - Replacement | |
| 10 | 002024 | Front brake pump - replace | |
| 11 | 002047 | Front brake fluid and air bleeding system - Replacement | |
| 12 | 005017 | Stop switch - Replacement | |
| 13 | 004026 | Handlebar cover - Replacement | |
| 14 | 003128 | Handlebar frame - Replac. | |
| 15 | 003129 | Supporting plate - Replac. | |

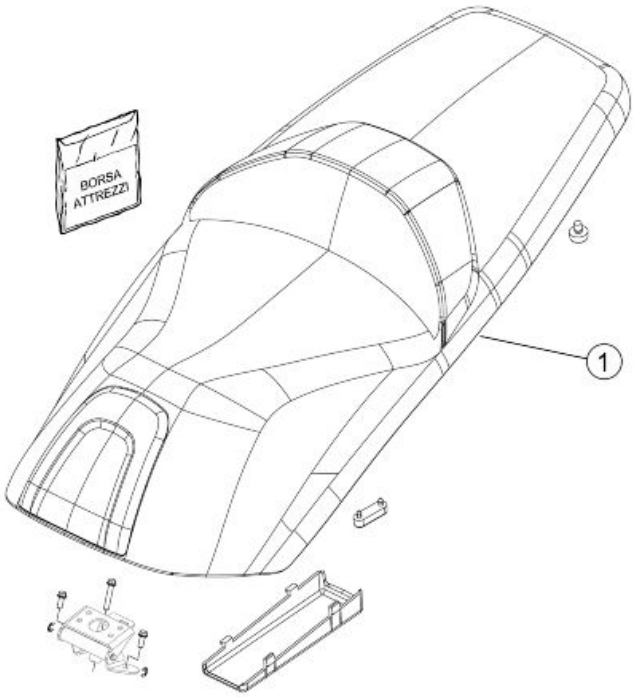
## Swing-arm




**BRACCIO OSCILLANTE**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 003015 | Traversa anteriore sostegno motore - Sost | |
| 2 | 003016 | Tamponi anteriori sostegno motore - Sost | |
| 3 | 003017 | Tampone posteriore suppor-to motore - Sost | |
| 4 | 001032 | Engine support pin - Replace-ment | |

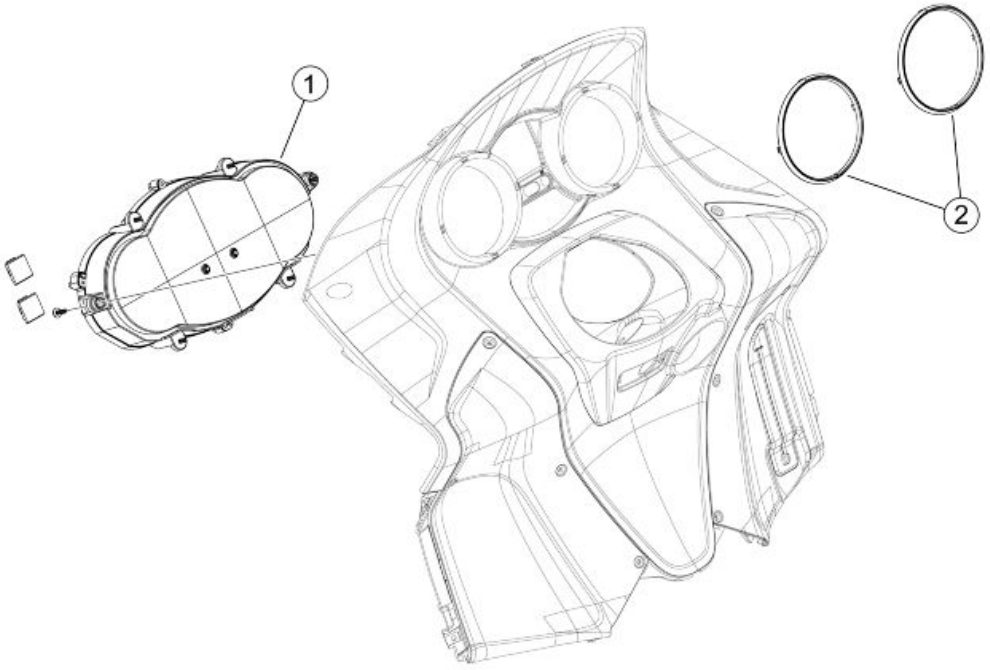
## Seat




**SADDLE**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 004003 | Saddle - Replacement | |

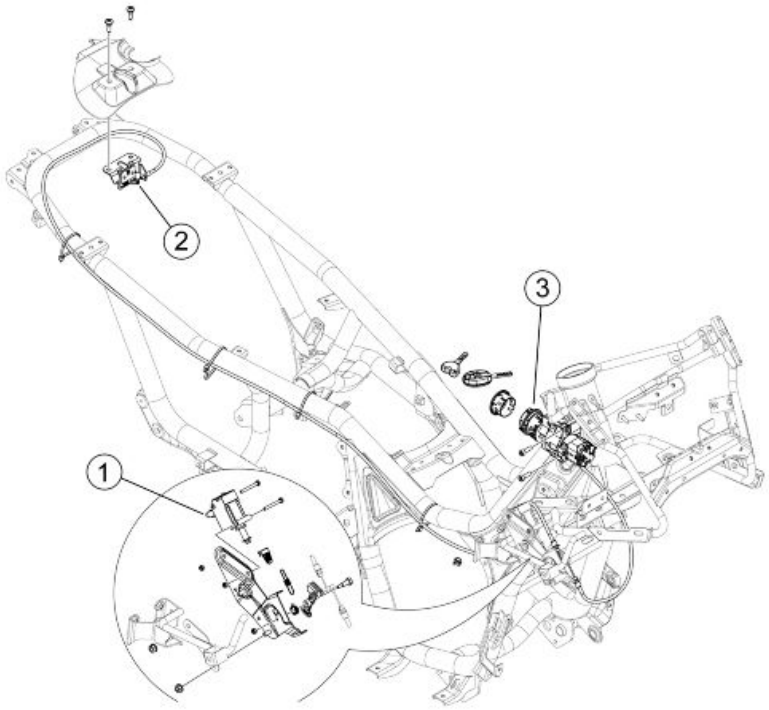
## Instrument panel




**INSTRUMENT PANEL**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 005014 | Odometer - Replacement | |
| 2 | 004099 | Odometer housing - Replacement | |

## Locks

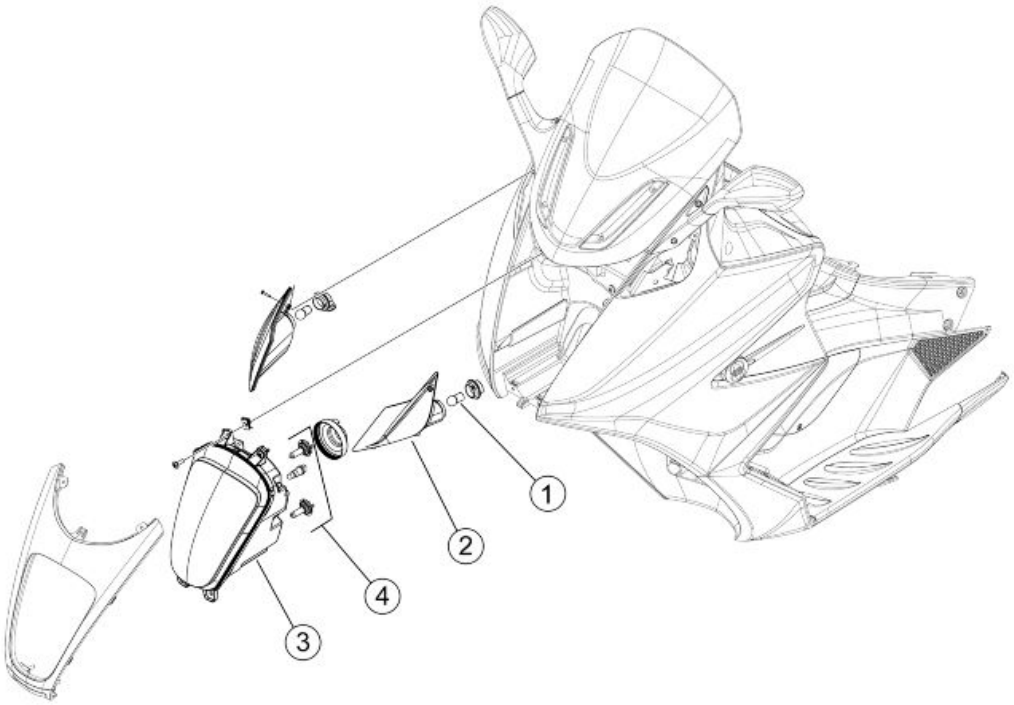



**LOCKS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 005146 | Electric saddle opening activator - Replacement | |
| 2 | 004054 | Saddle lock catch - Replacement | |
| 3 | 004010 | Anti-theft lock - Replacement | |

## Turn signal lights

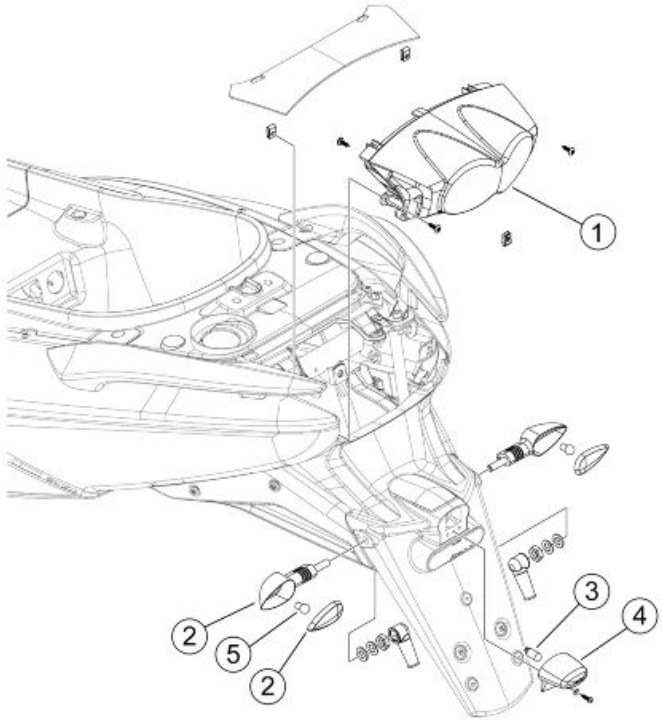
Front lights




**FRONT TURN INDICATORS INDICATOR LIGHTS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 005067 | Front direction indicator bulb - Replacement | |
| 2 | 005012 | Front direction indicators - Replacement | |
| 3 | 005002 | Front light - Replacement | |
| 4 | 005008 | Light bulbs - Replacement | |

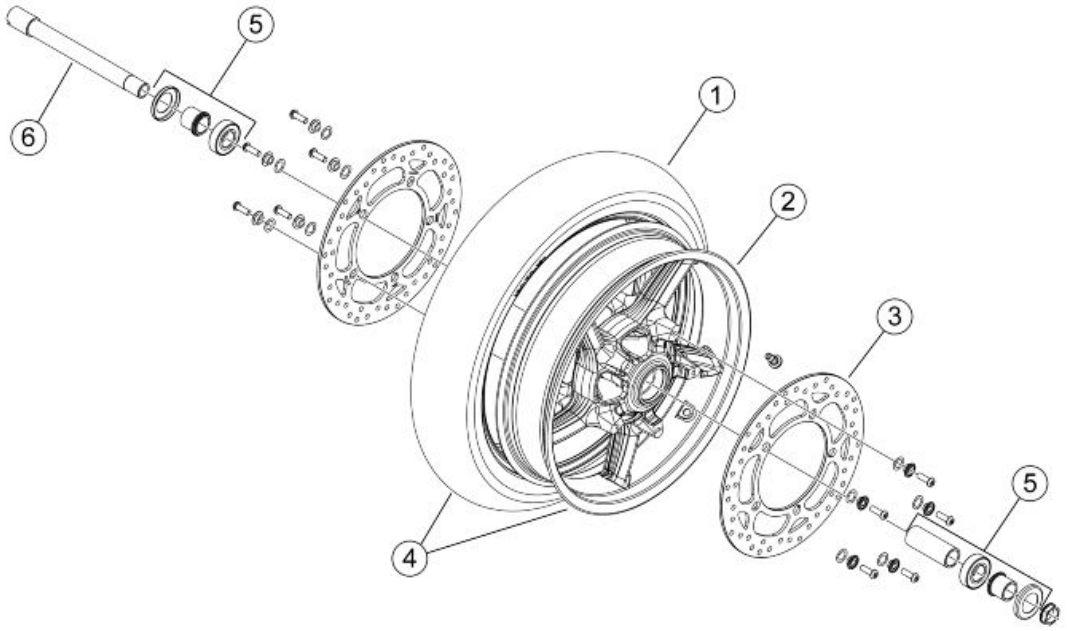
Rear lights




**REAR TURN INDICATORS INDICATOR LIGHTS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 005005 | Taillight - Replacement | |
| 2 | 005022 | Rear turn indicators - Replacement | |
| 3 | 005031 | Licence plate light bulb - Replacement | |
| 4 | 005131 | Licence plate light support - Replacement | |
| 5 | 005068 | Rear turn indicator bulb - Replacement | |

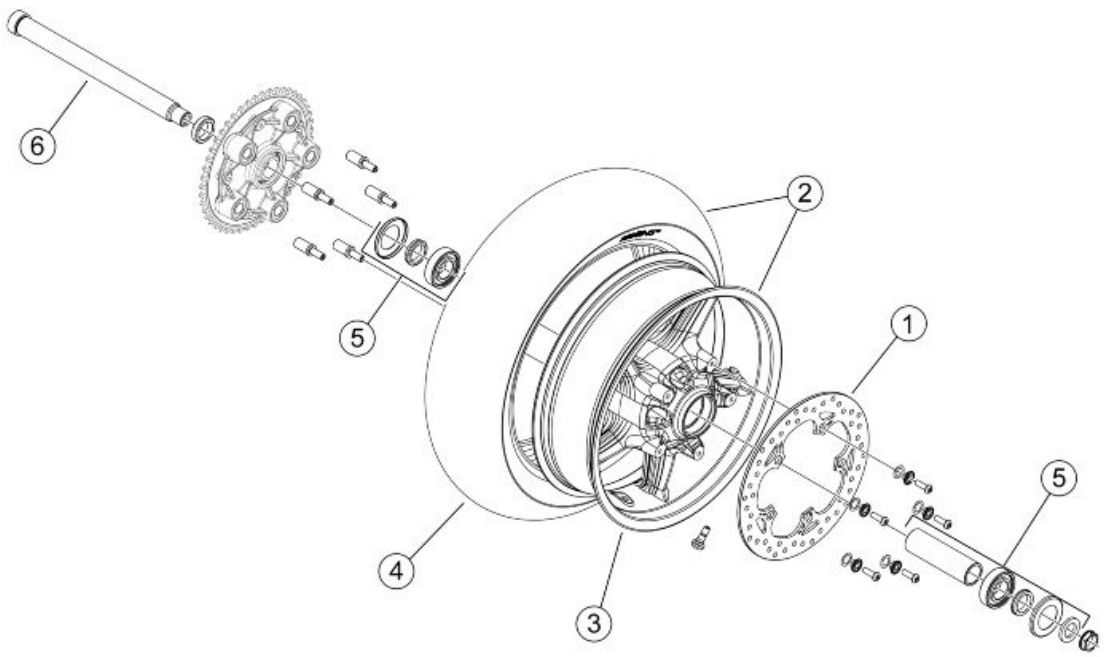
## Front wheel




**FRONT WHEELS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 003047 | Front tyre - Replacement | |
| 2 | 003037 | Front wheel rim- Replacement | |
| 3 | 002041 | Front brake disc - Replacement | |
| 4 | 004123 | Front wheel - Replacement | |
| 5 | 003040 | Front wheel bearings - Replacement | |
| 6 | 003038 | Front wheel axle - Removal and Refit. | |

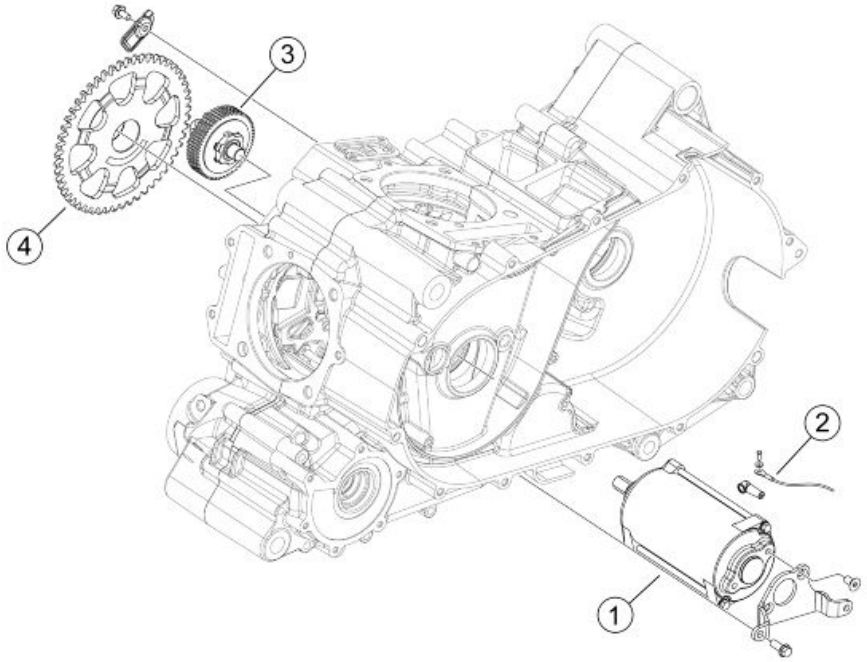
## Rear wheel




**REAR WHEEL**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 002070 | Rear brake disc - Replacement | |
| 2 | 001016 | Rear wheel - Replacement | |
| 3 | 001071 | Front wheel rim - Removal and refitting | |
| 4 | 004126 | Rear wheel tyre - Replacement | |
| 5 | 002031 | Rear wheel hub bearings - Replacement | |
| 6 | 004125 | Rear wheel axle - Replacement | |

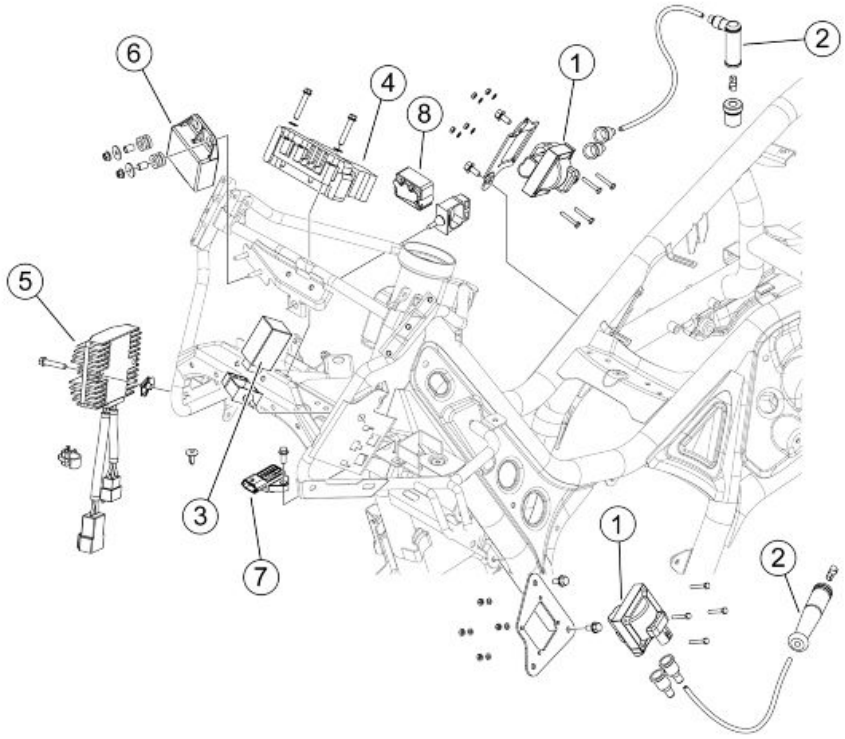
## Electric start




**ELECTRICAL START-UP**

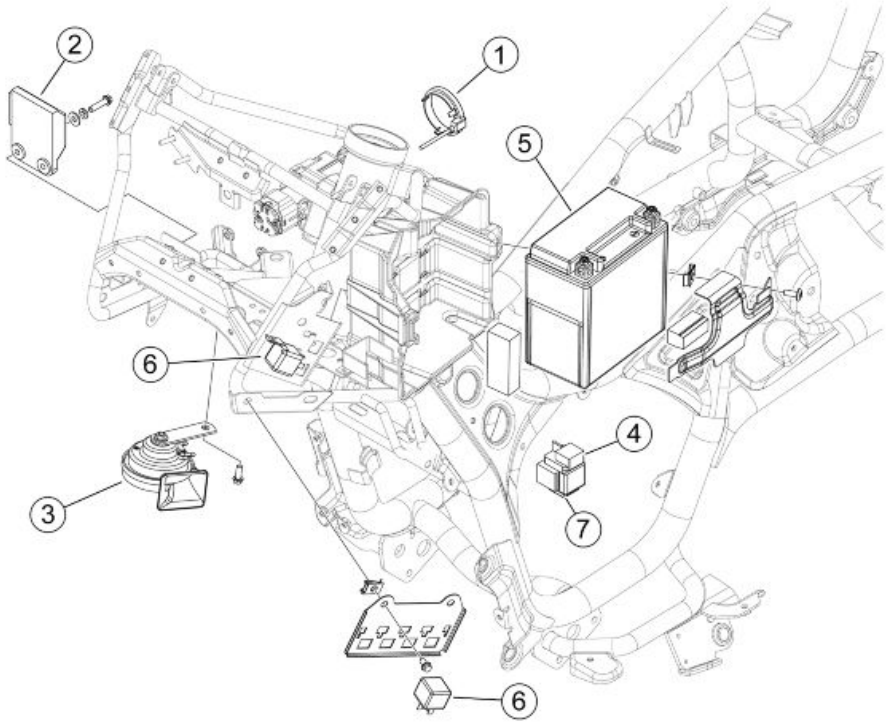
| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001020 | Starter motor - Replacement | |
| 2 | 005045 | Starter motor cable harness - Replacement | |
| 3 | 001017 | Start-up pinion - Replacement | |
| 4 | 001151 | Start-up driven gearing - Replacement | |

## Electric devices



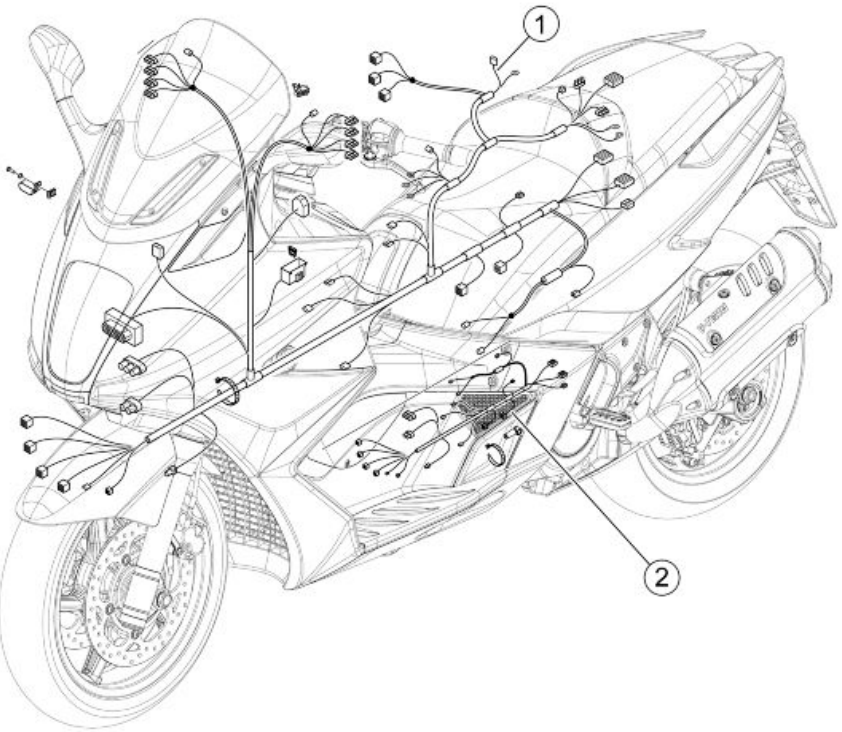

**ΗΛΕΚΤΡΙΚΑ ΕΞΑΡΤΗΜΑΤΑ**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 001069 | HV coil - Replacement | |
| 2 | 001094 | Spark plug cap - Replacement | |
| 3 | 832311 | Turn indicator flash - Replacement | |
| 4 | 001023 | Control unit - Replacement | |
| 5 | 005009 | Voltage regulator - Replacement | |
| 6 | 005099 | Electric saddle opening device - Replacement | |
| 7 | 005081 | Temperature sensor - Replacement | |
| 8 | 005127 | Roll-over sensor - Replacement | |




## REMOTE CONTROLS

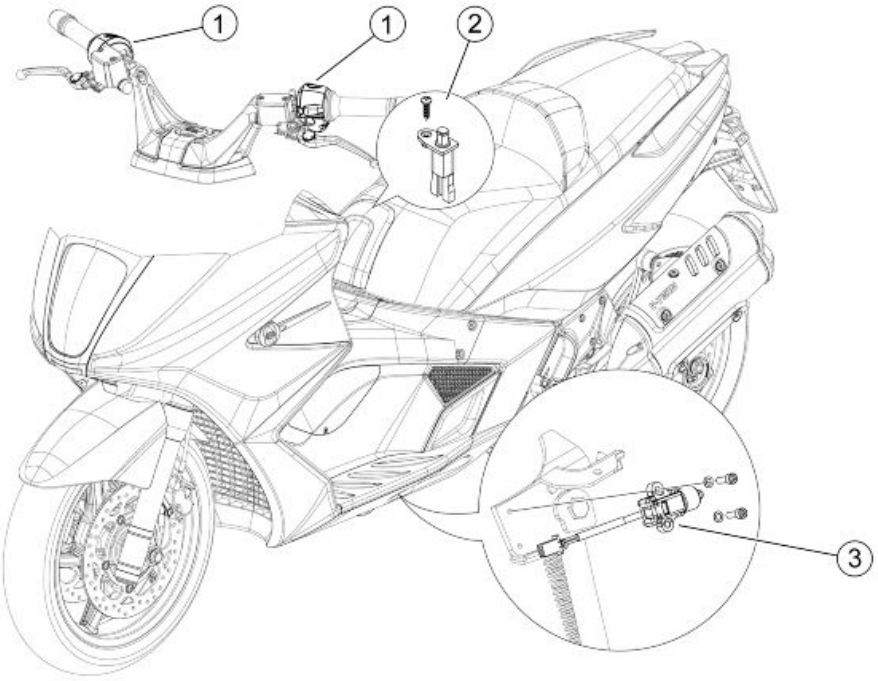
| | Code | Action | Duration |
|---|---|---|---|
| 1 | 005072 | Immobilizer aerial - Replacement | |
| 2 | 005073 | Immobilizer decoder - Replacement | |
| 3 | 005003 | Horn - Replacement | |
| 4 | 005011 | Start-up remote control switch - Replacement | |
| 5 | 005007 | Battery - Replacement | |
| 6 | 000319 | Remote control - Replac. | |
| 7 | 005052 | Fuse (1) - Replacement | |




**WIRE UNIT**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 005001 | Electrical system - Replacement | |
| 2 | 005114 | Electrical system - Service | |
| 3 | 820021 | Engine cable harness - Replac. | |

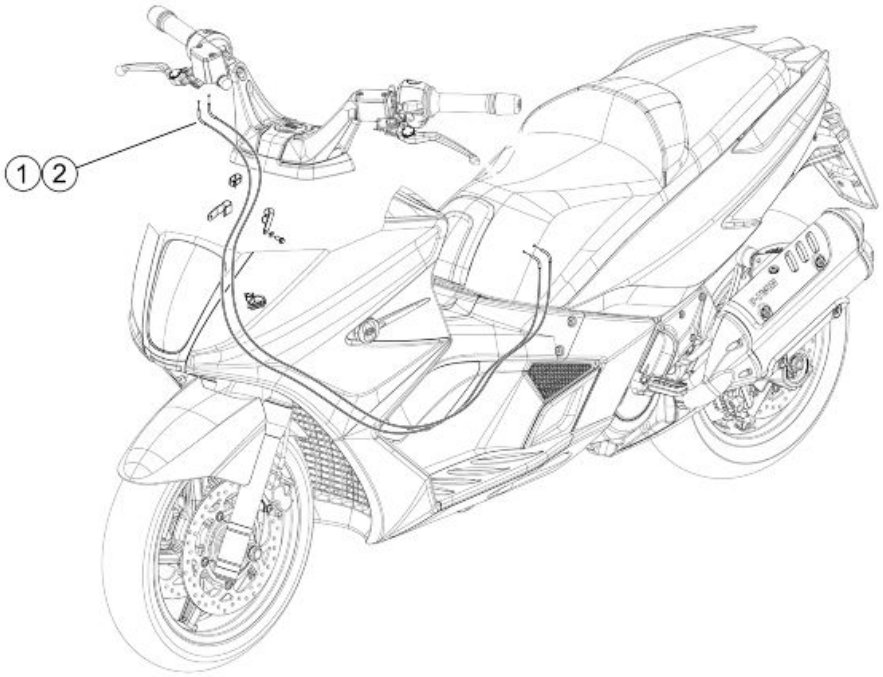
## Electronic controls




**HANDLEBAR CONTROLS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 000307 | RIGHT OR LEFT CONTROL ASSEMBLY REPLACE-MENT | |
| 2 | 888126 | Helmet compartment light switch - replacement | |
| 3 | 005079 | Stand switch - Replacement | |

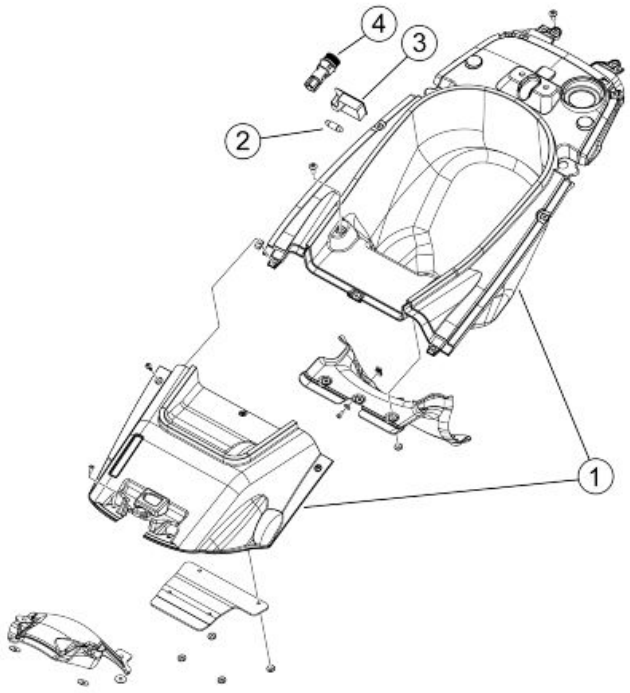
## Transmissions




**TRANSMISSIONS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 002063 | Complete throttle control - Replacement | |
| 2 | 003061 | Accelerator transmission - Adjustment | |

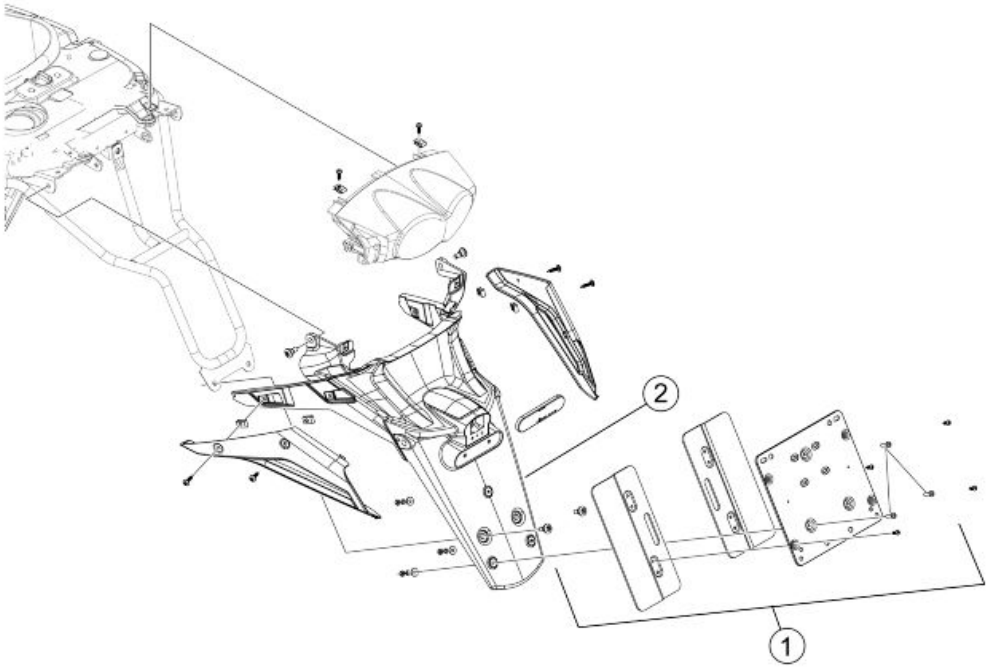
## Helmet bay




**HELMET COMPARTMENT**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 004016 | Helmet compartment - Replacement | |
| 2 | 005026 | Helmet compartment bulb - Replacement | |
| 3 | 005027 | Helmet compartment bulb support - Replacement | |
| 4 | 004142 | Plug socket - Replacement | |

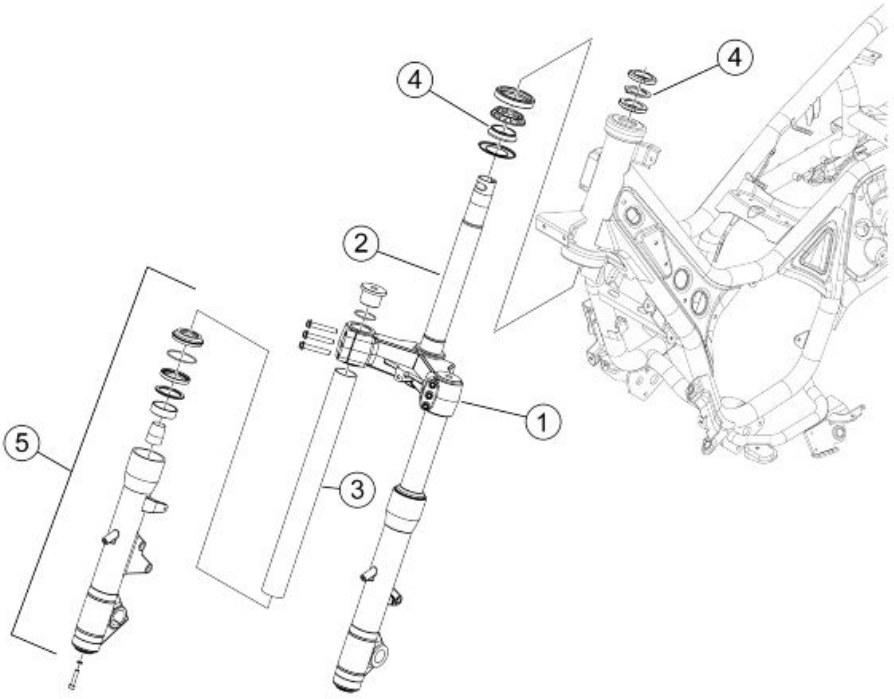
## Rear side fairings




**REAR COVERS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 005048 | Licence plate holder - Replacement | |
| 2 | 004136 | License plate support - Replacement | |

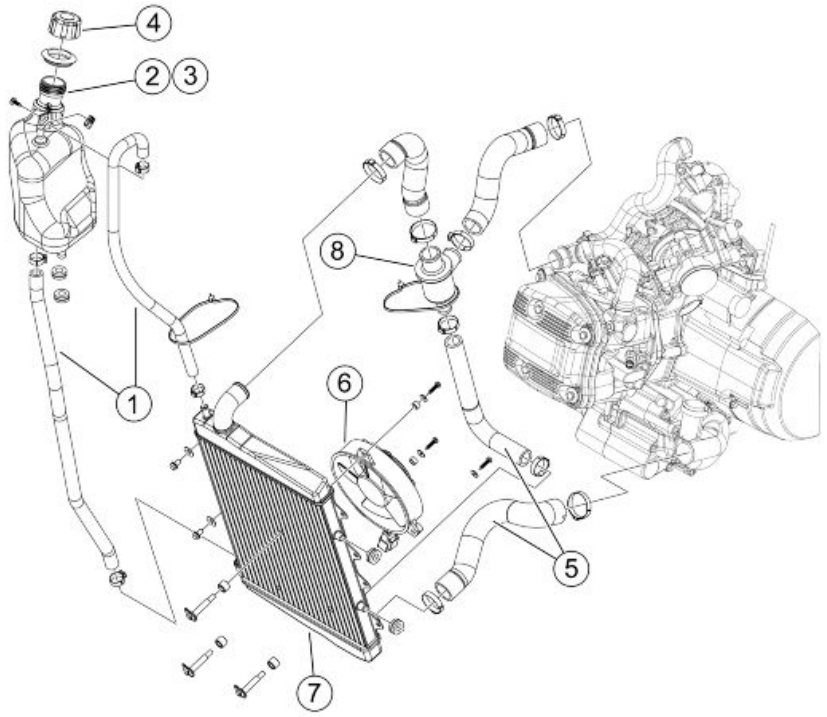
## Front suspension




**FRONT SUSPENSION**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 003010 | Front suspension - Service | |
| 2 | 003112 | Central steering tube - replacement | |
| 3 | 003107 | Sliding stems - replacement | |
| 4 | 003002 | Steering fifth wheel - Replacement | |
| 5 | 331352 | Fork service | |

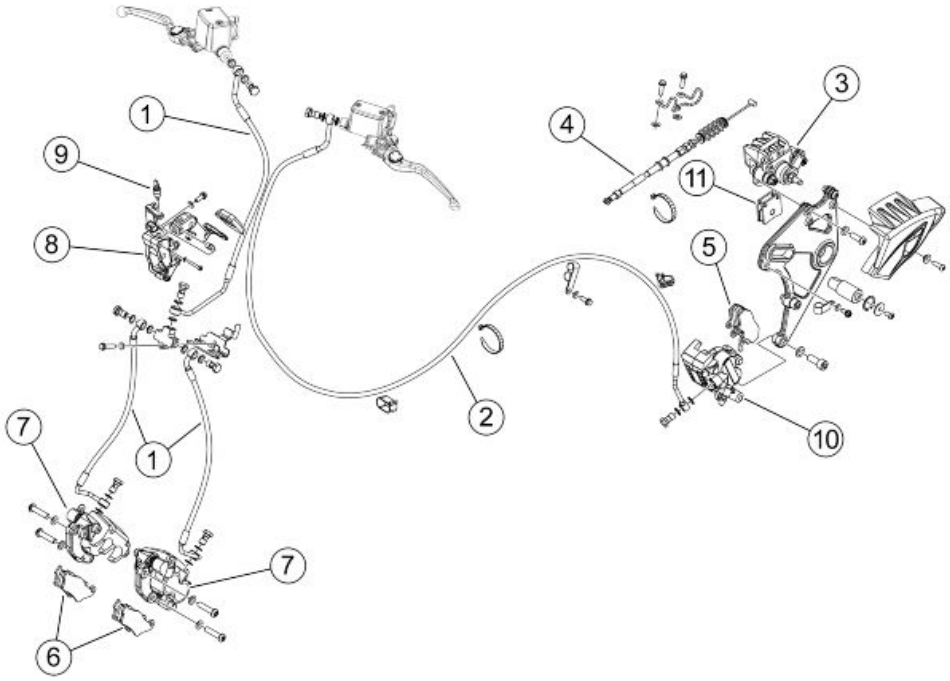
## Cooling system




**COOLING SYSTEM**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 007013 | Radiator expansion tank connection pipe - Replacement | |
| 2 | 001052 | Coolant and air bleed - Replacement | |
| 3 | 007001 | Expansion tank - Replacement | |
| 4 | 007024 | Expansion tank cap - Replacement | |
| 5 | 007003 | Coolant delivery and return pipe - Replacement | |
| 6 | 007016 | Fan with support - Replacement | |
| 7 | 007002 | Water radiator - replacement | |
| 8 | 001057 | Thermostat - Replacement | |

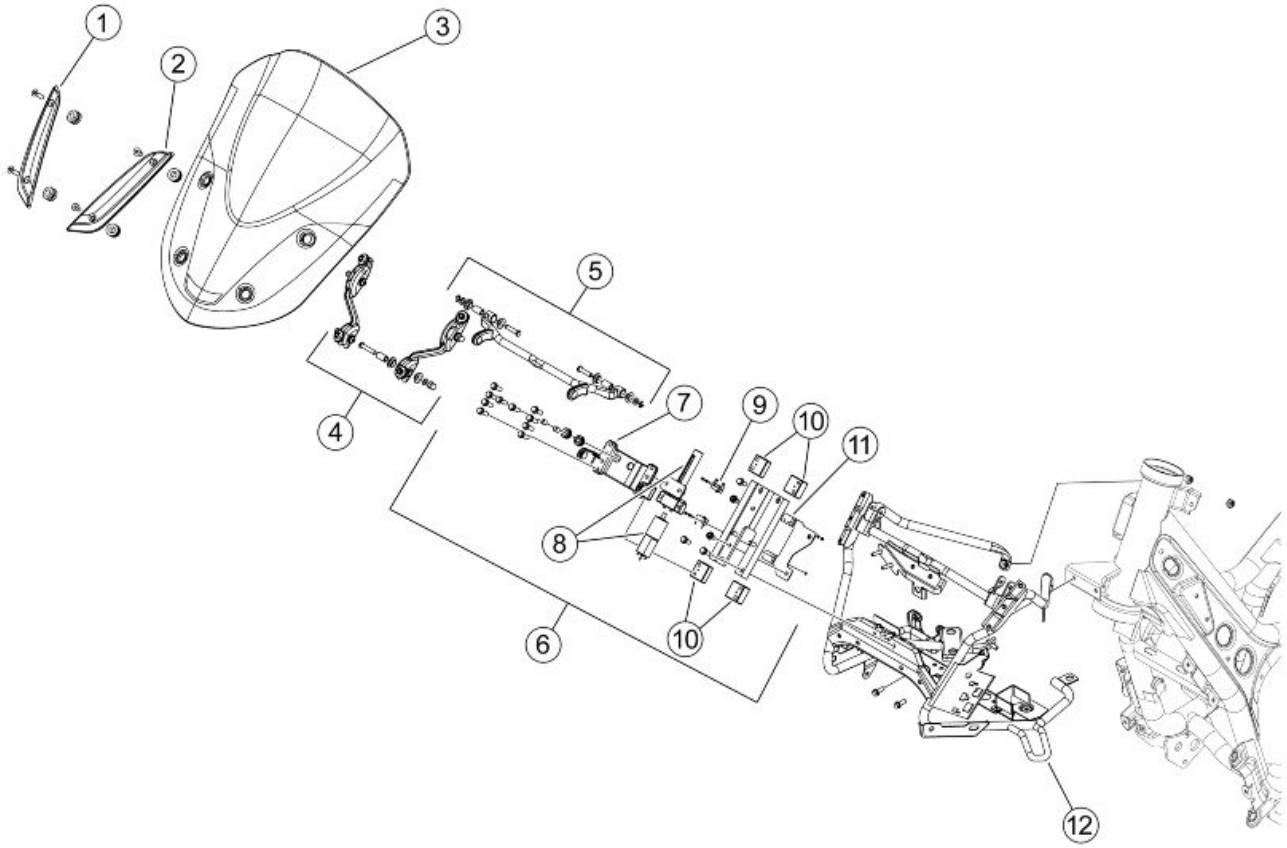
## Braking system




**BRAKE SYSTEM**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 002021 | Front brake piping - Replacement | |
| 2 | 002081 | Rear brake disc piping - Replacement | |
| 3 | 003109 | Parking brake mechanical calliper - replacement | |
| 4 | 003108 | Parking brake flexible transmission - replacement | |
| 5 | 002002 | Shoes - Rear brake pads - Replacement | |
| 6 | 002007 | Front brake pads - Replacement | |
| 7 | 002039 | Front brake calliper - Replacement | |
| 8 | 003121 | Parking brake control lever - replacement | |
| 9 | 003122 | Parking brake control lever micro-switch - replacement | |
| 10 | 002048 | Rear brake calliper - Replacement | |
| 11 | 002112 | Parking brake calliper pads - Replac. | |

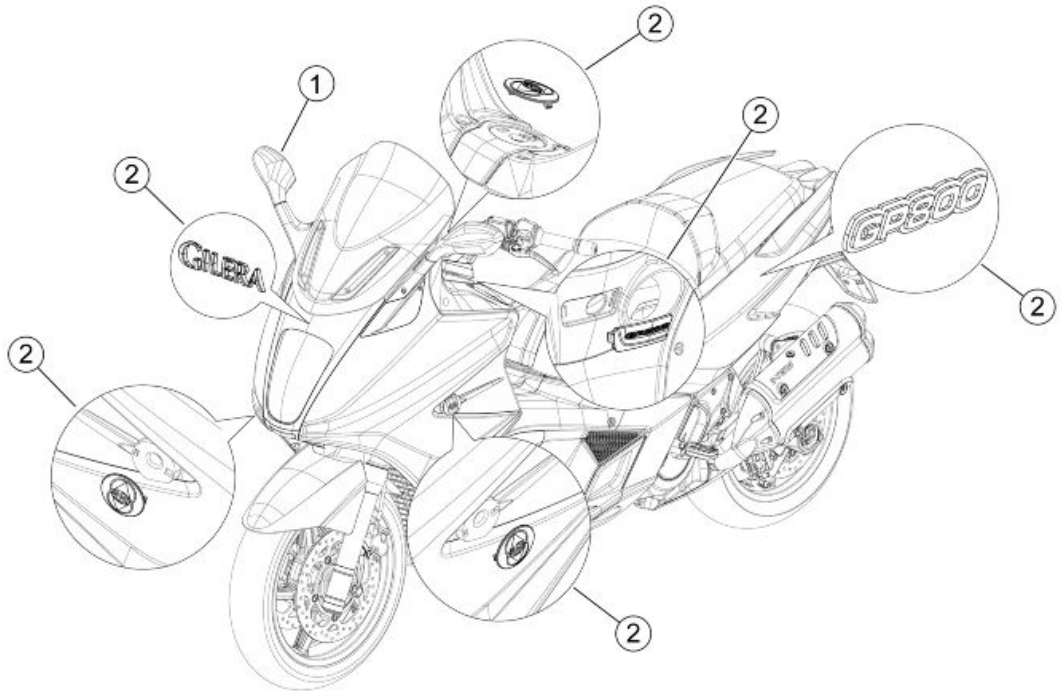
## Windscreen




**WINDSHIELD**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 442601 | Right side protection replac. | |
| 2 | 442611 | Left side protection replac. | |
| 3 | 004101 | Windshield - Replacement | |
| 4 | 004191 | Windshield support - Replac. | |
| 5 | 004192 | Windshield support tube - Replac. | |
| 6 | 004193 | Windshield motor unit - Replac. | |
| 7 | 004194 | Sliding plate - Replac. | |
| 8 | 004195 | Windshield electric motor - Replac. | |
| 9 | 005123 | End of stroke/enabling switches - Adjustment/replacement | |
| 10 | 004197 | Sliding carriage - Replac. | |
| 11 | 004196 | Guide profile - Replac. | |
| 12 | 004146 | Front frame - Replacement | |

## Stickers




**TRANSFERS**

| | Code | Action | Duration |
|---|---|---|---|
| 1 | 004066 | Driving mirror - Replacement | |
| 2 | 004159 | Plates / Stickers - Replacement | |