

**Vespa®**

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# MANUALE STAZIONE DI SERVIZIO

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**Vespa GTS Super 125 i.e. (2009)**

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# MANUALE STAZIONE DI SERVIZIO

## Vespa GTS Super 125 i.e. (2009)

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# MANUALE STAZIONE DI SERVIZIO

## Vespa GTS Super 125 i.e. (2009)

Questo manuale per stazioni di servizio è stato realizzato da Piaggio & C. Spa per essere utilizzato dalle officine dei concessionari e sub-agenzie Piaggio-Gilera. Si presuppone che chi utilizza questa pubblicazione per la manutenzione e la riparazione dei veicoli Piaggio, abbia una conoscenza base dei principi della meccanica e dei procedimenti inerenti la tecnica della riparazione dei veicoli. Le variazioni importanti nelle caratteristiche dei veicoli o nelle specifiche operazioni di riparazione verranno comunicate attraverso aggiornamenti di questo manuale. Non si può comunque realizzare un lavoro completamente soddisfacente se non si dispone degli impianti e delle attrezzature necessarie, ed è per questo che vi invitiamo a consultare le pagine di questo manuale riguardanti l'attrezzatura specifica e il catalogo degli attrezzi specifici.

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

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

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



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



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



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

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CHARACTERISTICS

CHAR

This section describes the general specifications of the vehicle.

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## **Rules**

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

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### **Safety rules**

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

### **Maintenance rules**

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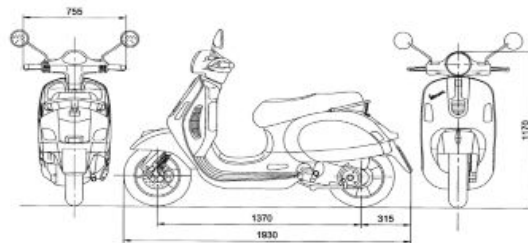
### Vehicle identification

Chassis prefix: ZAPM45100000 ÷ 1001

Engine prefix: M451M ÷ 1001



### Dimensions and mass



#### **WEIGHTS AND DIMENSIONS**

Specification	Desc./Quantity
Kerb weight	158 ± 5 kg
Maximum weight allowed	340 kg
Maximum height	1170 mm
Overall width	755 mm
Maximum length	1930 mm
Wheelbase	1370 mm



## Engine

### DATA

Specification	Desc./Quantity
Type	single-cylinder, four-stroke and four liquid-cooled valves
Engine capacity	124 cm <sup>3</sup>
Bore x stroke	57 x 48.6 mm
Max. power	11 kW at 9750 rpm
MAX. torque	12 Nm at 7500 rpm
Timing system	single overhead camshaft, chain-driven, on the left-hand side, three-arm rocking levers set up with threaded set screw
Compression ratio	12 ± 0.5: 1
Engine idle speed	1,750 ± 50 rpm
Air filter	sponge, impregnated with mixture (50% petrol and 50% oil)
Starting system	electric starter motor with freewheel
Lubrication	with lobe pump (inside the crankcase) chain-driven and double filter: mesh and paper
Fuel system	Electronic injection with electric fuel pump
valve clearance	intake: 0.10 mm - exhaust: 0.15 mm
Minimum lubrication pressure (100° C)	0.8 bar
Lubrication pressure	3.5 to 4 bar
Cooling	Forced liquid circulation cooling.

### OIL PUMP

Specification	Desc./Quantity
Type	Trochoidal
Distance between the rotors	Admissible limit clearance: 0.12 mm
Axial rotor clearance	Limit values admitted: 0.09 mm
Distance between the outer rotor and the pump body	Admissible limit clearance: 0.20 mm
Levelness	0.1 mm

### BY-PASS

Specification	Desc./Quantity
Type	With piston
Plunger diameter	Ø 13.9 - 0.039 - 0.057 mm
By-pass check up: Standard length	54.2 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

### COOLING SYSTEM

Specification	Desc./Quantity
Cooling system capacity	~ 2.100 ÷ 2.150 l
Recommended fluid	AGIP PERMANENT SPEZIAL
Sealing pressure	Cap calibrated at 0.9 bar

### THERMOSTAT

Specification	Desc./Quantity
Type	Wax-type, with deviator

Specification	Desc./Quantity
Starts opening at	85±2°C

### ELECTRIC VENTILATION

Specification	Desc./Quantity
Electric ventilation starts at	102°C
Electric ventilation stops at	96°C

### RADIATOR

Specification	Desc./Quantity
Type	Made of aluminium in two sections

### WATER PUMP

Specification	Desc./Quantity
Type	Centrifugal
Control	Electric

## Transmission

### TRANSMISSION

Specification	Desc./Quantity
Transmission	Automatic expandable pulley variator with torque server, V-belt, automatic clutch, gear reduction unit and transmission compartment with forced air circulation cooling

## Capacities

### CAPACITY

Specification	Desc./Quantity
Fuel tank (including a ~ 2 l reserve)	~ 9.2 l
Cooling system fluid	~ 2.100 ÷ 2.150 l
Engine oil	approx. 1300 cc
Rear hub	250 cc

## Electrical system

### ELECTRICAL COMPONENTS

Specification	Desc./Quantity
Ignition/advance	Electronic, with inductive discharge and variable advance with three-dimensional mapping
Spark plug	NGK CR8EKB
Battery	12V-12Ah
Fuses	1 30A - 2 15A - 4 7.5A
Generator	alternating current

**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.



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

**TURN INDICATOR SWITCH**

	Ro	Bl-Ne	Bi-BI
←	○—○		
↔ STOP ↔			
→		○—○	







**ENGINE STOP SWITCH**

	Ve-Ne	Gr-Ve	
⊞	○—○		
⊞		○—○	




**HORN BUTTON**

	Gi-Rs	Bi
📢	○—○	





**LIGHT SWITCH**

	Ma	Gr-Rs	Vi
			
			

**STARTER BUTTON**

	Bi-Ne	Ar-Bi
		

**KEY SWITCH**

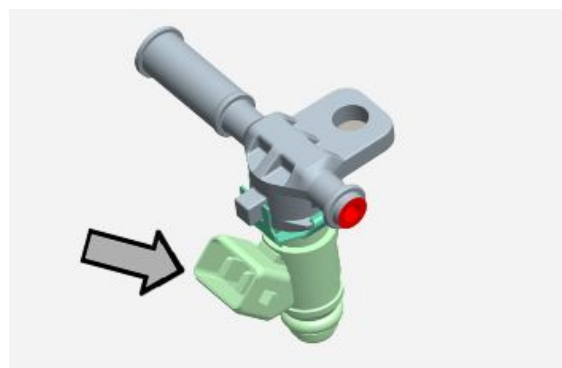
	Ar	Rs-Ne	Gr	Bi-Ne
0 LOCK				
1 OFF				
2 ON				

**FUEL INJECTOR**

Type: 3 holes

Conicity of the nozzle: 20°

Resistance at terminals: 13.7 to 15.2 Ohm



**FUEL PUMP UNIT**

Mechanical type pressure regulator operating at a pressure of 2.5 BAR

Pump winding resistance: ~ 1.5 Ohm

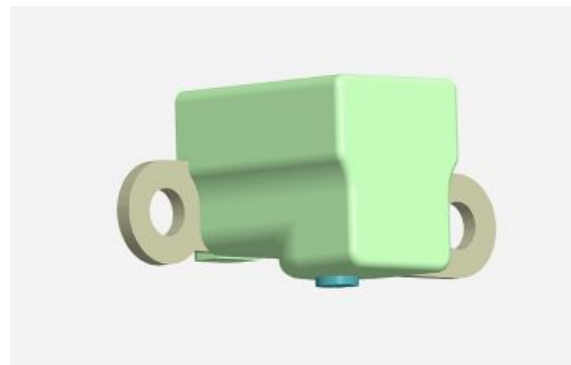
Input current during regular functioning: 1.4 - 1.8

A

**ENGINE SPEED SENSOR**

Resistance between pins 13 and 15: 100 to 150

Ohm at approx. 20°

**ENGINE TEMPERATURE SENSOR**

0° = 5900 Ohm

+10° = 3800 Ohm

+20° = 2500 Ohm

+30° = 1700 Ohm

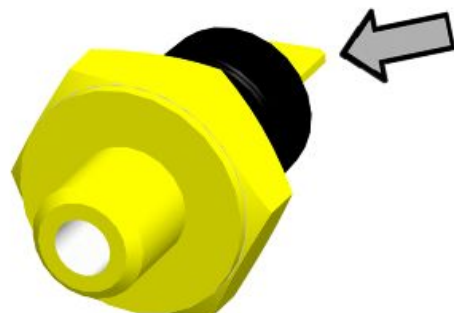
+80° = 300 Ohm

**MINIMUM OIL PRESSURE SENSOR**

Normally closed switch

Activation threshold: 0.3 - 0.6 bar

With the engine off: continuity between terminal and ground

**HV COIL**

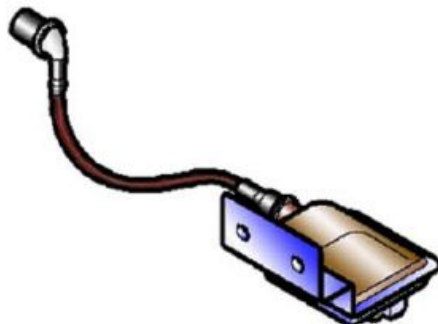
<DIV class=O v:shape="\_x0000\_s3074">

- Resistance of the primary = 0.5 Ohm ± 8%

- Resistance between primary and ground = infinite

- Resistance between primary and HV output = 3.1 KOhm ± 9%

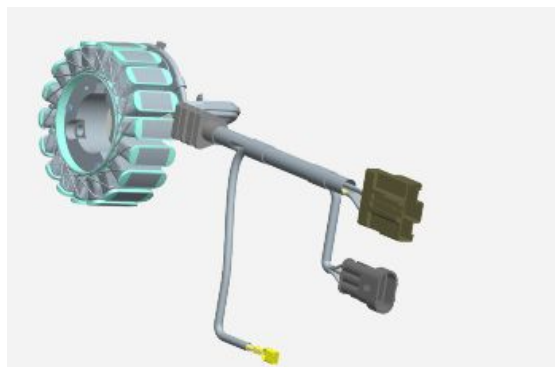
- Presence of battery voltage between pins 22 and 26 of the interface cable harness upon shifting to ON and for 2 sec.



**STATOR**

Power: 450 W

Resistance between terminals: 0.2 to 1 Ohm  
terminal insulation from ground



**Frame and suspensions**

**CHASSIS AND SUSPENSIONS**

Specification	Desc./Quantity
Type	Unitised body made of stamped plate
Front suspension	Single arm suspension (cantilever wheel) fitted with a double-acting hydraulic shock absorber with coaxial spring
Front shock absorber axial travel	86.5 mm
Rear suspension	Engine with swinging fork articulated to frame by means of an arm with 2 degrees of freedom Pair of double-acting hydraulic shock absorbers and coaxial springs with preloading adjustment in 4 positions.
Rear shock absorber axial travel	89.5 mm

**Brakes**

**BRAKES**

Specification	Desc./Quantity
Front	Ø 220 disc brake and floating calliper with Ø 25 mm twin plungers and hydraulic control (lever on the far right end of the handlebar)
Rear	Ø 220 disc brake and calliper with two Ø 30 mm counteracting plungers and hydraulic control (lever on the far left end of the handlebar)

## Wheels and tyres

### WHEELS AND TYRES

Specification	Desc./Quantity
Front wheels - light alloy rims	3.00x12
Rear wheels - light alloy rims	3.00x12
Front tyres	120/70-12" Tubeless
Rear tyres	130/70-12" Tubeless

### TYRE PRESSURE

Specification	Desc./Quantity
Front tyre pressure (when cold)	1.8 bar
Rear tyre pressure (when cold)	2 bar
Tyre pressure (when cold) with passenger	2.2 bar

**N.B.**

**CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE. REGULATE PRESSURE ACCORDING TO THE WEIGHT OF BOTH RIDER AND ACCESSORIES**

## Tightening Torques

### STEERING ASSEMBLY

Name	Torque in Nm
Upper steering ring nut	35 ÷ 40
Lower steering ring nut	12 ÷ 14
Handlebar fixing screw	45 ÷ 50 (The two screws must be tightened to the prescribed torque after having done so with the rear wheel axle nut. Safety locks: see «Pre-delivery Operations»)
Fixing screws for the handlebar control unit U-bolts	7 ÷ 10

### FRAME ASSEMBLY

Name	Torque in Nm
Engine-swinging arm pin	64 ÷ 72
swinging arm bolt - body shell	76 ÷ 83
Engine and vehicle side swinging arm junction bolt	33 to 41
Bolt of the Silent block support plate	42 ÷ 52
Centre stand bolt	32 ÷ 40
Side stand fixing bolt	35 ÷ 40

### FRONT SUSPENSION

Name	Torque in Nm
Screw fixing the shock absorber to the shock absorber - calliper attachment plate	20 ÷ 27
Wheel axle nut	74 ÷ 88
Wheel screw	20 ÷ 25
Screw fixing rear mudguard to steering shock absorber upper clamp	5 ÷ 6.5 20 to 30

### FRONT BRAKE

Name	Torque in Nm
Brake fluid pump-hose fitting	20 ÷ 25
Brake fluid pipe-calliper fitting	19 ÷ 24
Screw fixing calliper to the shock absorber - calliper plate attachment	24 ÷ 27
Disc tightening screw	6 (Apply LOCTITE 242 threadlock, medium strength)
Oil bleed screw	12 - 16
Pad fixing pin	19.6 ÷ 24.5
Brake pump reservoir screws	1.5 ÷ 2
Brake disc screws	8 to 10

**REAR SUSPENSION**

Name	Torque in Nm
Retainer for left shock absorber to crankcase support plate	20 ÷ 25
Shock absorber lower fitting	40 ÷ 45
Shock absorber upper fitting	20 ÷ 25
Rear wheel axle	104 ÷ 126
Screw fixing wheel to hub	20 ÷ 25
Screws for muffler - shock absorber support arm on engine	20 ÷ 25 (The two screws must be tightened to the prescribed torque after having done so with the rear wheel axle nut. Safety locks: see «Pre-delivery Operations»)
Engine- and vehicle-side swinging arm junction bolt	40 ÷ 45

**REAR BRAKE**

Name	Torque in Nm
Brake fluid pump-hose fitting	20 ÷ 25
Brake fluid pipe-calliper fitting	20 to 25
Rear disc tightening bolt	11 ÷ 13
Oil bleed screw	12÷16
Calliper to engine tightening screw	20 ÷ 25
Brake pump reservoir screws	1.5 ÷ 2
Calliper coupling screw	30 ÷ 33

**MUFFLER**

Name	Torque in Nm
Muffler heat guard fixing screw	4 ÷ 5
Screw for fixing muffler to mounting arm	20 ÷ 25
Lambda probe tightening on exhaust manifold	40 to 50
Exhaust manifold-muffler joint tightening	12÷13
Manifold - muffler diaphragm tightening clamp	16 to 18

**LUBRICATION**

Name	Torque in Nm
Hub oil drainage plug	15 to 17
Oil filter on crankcase fitting	27 ÷ 33
Engine oil drainage plug/ mesh filter	24 ÷ 30
Oil filter	4 ÷ 6
Oil pump cover screws	7 ÷ 9
Screws fixing oil pump to the crankcase	5 ÷ 6
Oil pump command crown screw	10 ÷ 14
Oil pump cover plate screws	4 ÷ 6
Oil sump screws	10 ÷ 14
Minimum oil pressure sensor	12 ÷ 14

**CYLINDER HEAD**

Name	Torque in Nm
Spark plug	12 to 14
Head cover screws	6 ÷ 7
Nuts fixing head to cylinder	7±1 + 10±1 + 270°
Head fixing side screws	11 ÷ 12
Starter ground screw	7 ÷ 8.5
Tappet adjustment check nut	6 ÷ 8
Intake manifold screws	11 to 13
Timing chain tensioner slider screw	10 ÷ 14
Start up counterweight support screw	11 to 15
Timing chain tensioner support screw	11 ÷ 13
Timing chain tensioner central screw	5 ÷ 6
Camshaft retention plate screw	4 ÷ 6

**TRANSMISSION**

Name	Torque in Nm
Belt support roller screw	11 ÷ 13
Clutch unit nut on driven pulley	45 to 50



Name	Torque in Nm
Drive pulley nut	75 ÷ 83
Transmission cover screws	11 ÷ 13
Driven pulley shaft nut	54 ÷ 60
Rear hub cap screws	24 ÷ 27

### **FLYWHEEL**

Name	Torque in Nm
Flywheel cover screw	11 ÷ 13
Stator assembly screws	3 ÷ 4 (Apply LOCTITE 242 medium-strength threadlock)
Flywheel nut	94 ÷ 102
Pick-up fixing screws	3 ÷ 4
Screw fixing freewheel to flywheel	13 ÷ 15

### **CRANKCASE AND CRANKSHAFT**

Name	Torque in Nm
Internal engine crankcase bulkhead (transmission-side half shaft) screws	4 ÷ 6
Engine-crankcase coupling screws	11 ÷ 13
Starter screws	11 ÷ 13
Crankcase timing cover screws	3.5 ÷ 4.5 (Apply LOCTITE 242 medium-strength threadlock)

### **COOLING**

Name	Torque in Nm
Water pump rotor cover	3 to 4
Thermostat cover screws	3 to 4
Bleed screw	3

## **Overhaul data**

## **Assembly clearances**

### **Cylinder - piston assy.**

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

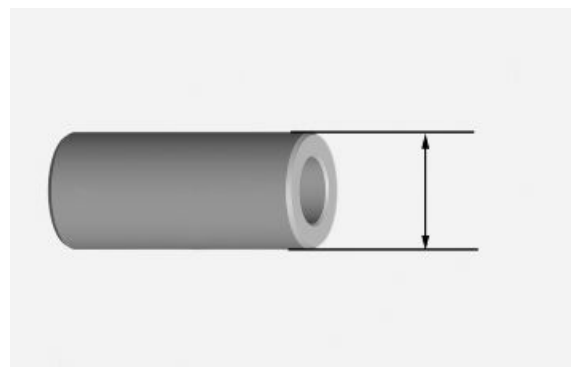
#### **Characteristic**

##### **Standard diameter:**

Ø 14.996 ÷ 15.0 mm

##### **Standard clearance:**

0.015 ÷ 0.029 mm

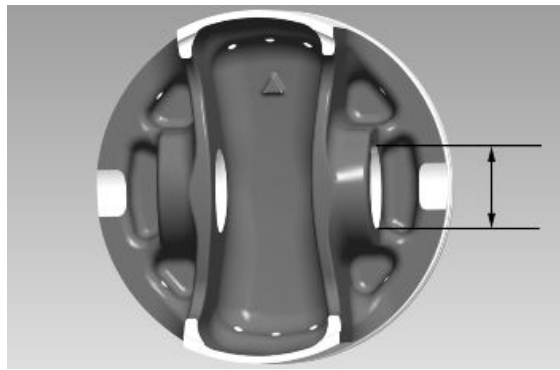


- Measure the diameter of the bearings on the piston.

**Characteristic**

**Standard diameter:**

15 +0.006 + 0.001mm



- Calculate the piston pin coupling clearance.

**N.B.**

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

**Characteristic**

**Standard clearance:**

0.001 ÷ 0.010 mm

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

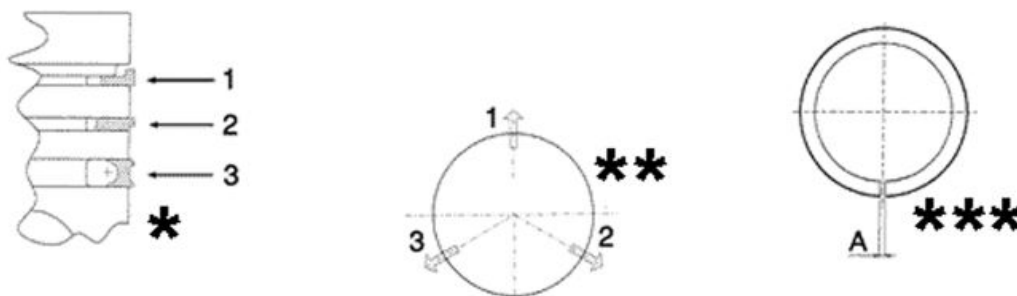
**Characteristic**

**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).



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

\*\* Position the port of the rings as shown here.

\*\*\* Value «A» of the sealing ring inside the cylinder (fitting clearance).

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

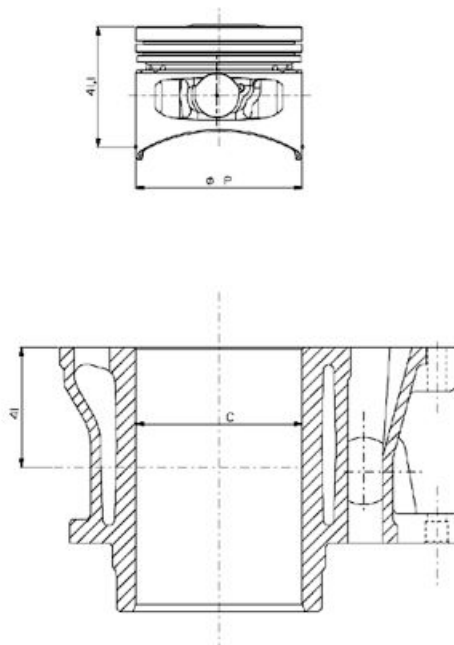
**Compression ring** 0.15 ÷ 0.30 mm. Max. value 0.5 mm

**Oil scraper ring** 0.10 ÷ 0.30 mm. Max. value 0.65 mm

**Oil scraper ring** 0.15 ÷ 0.35 mm. Max. value 0.65 mm

**N.B.**

**FITTING CLEARANCE VALUES ARE THE SAME FOR BOTH THE STANDARD SEALING RINGS AND THE OVERSIZES.**



**ENGINE COUPLING CATEGORIES**

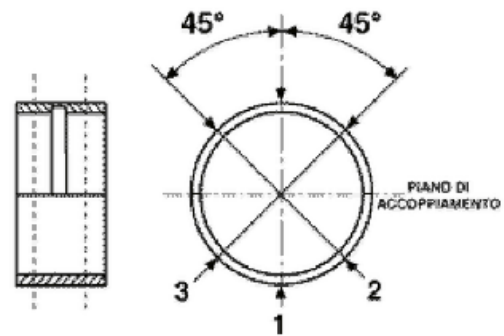
Name	Initials	Cylinder	Piston	Play on fitting
Cylinder	A	56.997 to 57.004	56.945 ÷ 56.952	0.045 - 0.059
Cylinder	B	57.004 to 57.011	56.952 ÷ 56.959	0.045 - 0.059
Piston	C	57.011 to 57.018	56.959 ÷ 56.966	0.045 - 0.059
Piston	D	57.018 to 57.025	56.966 ÷ 56.973	0.045 - 0.059
Cylinder 1st Oversize	A1	57.197 to 57.204	57.145 ÷ 57.152	0.045 - 0.059
Cylinder 1st Oversize	B 1	57.204 to 57.211	57.152 ÷ 57.159	0.045 - 0.059
Piston 1st Oversize	C 1	57.211 to 57.218	57.159 ÷ 57.166	0.045 - 0.059
Piston 1st Oversize	D 1	57.218 to 57.225	57.166 ÷ 57.173	0.045 - 0.059
Cylinder 2nd Oversize	A2	57.397 to 57.404	57.345 ÷ 57.352	0.045 - 0.059
Cylinder 2nd Oversize	B 2	57.404 to 57.411	57.352 ÷ 57.359	0.045 - 0.059
Piston 2nd Oversize	C 2	57.411 to 57.418	57.359 ÷ 57.366	0.045 - 0.059
Piston 2nd Oversize	D 2	57.418 to 57.425	57.366 ÷ 57.373	0.045 - 0.059
Cylinder 3rd Oversize	A 3	57.597 to 57.604	57.545 ÷ 57.552	0.045 - 0.059
Cylinder 3rd Oversize	B 3	57.604 to 57.611	57.552 ÷ 57.559	0.045 - 0.059
Piston 3rd Oversize	C 3	57.611 to 57.618	57.559 ÷ 57.566	0.045 - 0.059
Piston 3rd Oversize	D 3	57.618 to 57.625	57.566 ÷ 57.573	0.045 - 0.059

**N.B.**

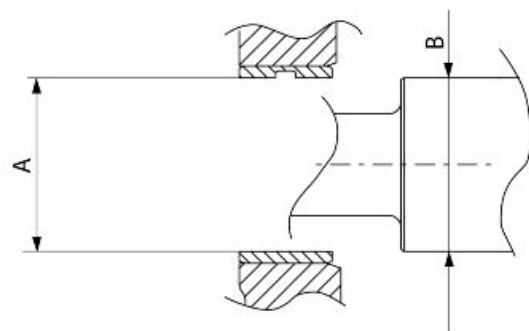
**THE PISTON MUST BE INSTALLED WITH THE ARROW FACING TOWARDS THE EXHAUST SIDE, THE PISTON RINGS MUST BE INSTALLED WITH THE WORD «TOP» OR THE STAMPED MARK FACING UPWARDS.**

**Crankcase - crankshaft - connecting rod**

- Measure the diameter of bushings «A» in the three directions shown in the figure.
- Measure the diameter of the crankshaft bearings «B».
- Check that the diametral clearance «A-B» is between the pre-set interval.



**Characteristic**  
**Diameter clearance**  
 0.023 ÷ 0.041 mm



If value «A-B» is above the limit, check that value «B» is within the admissible values of the categories.

**CRANKSHAFT**

Specification	Desc./Quantity
Category 1	28.998 to 29.004
Category 2	29.004 to 29.010

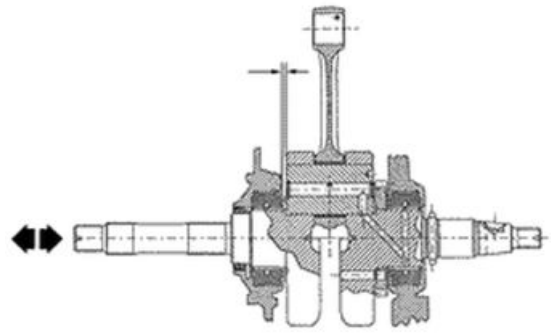
If the crankshaft is within the set limits, replace the crankshaft half-bearings mounting the crankcase so as to suit the specified couplings. The crankcase halves can be mounted with four types of crankshaft half-bearings identified by letters- B (blue), C (yellow), E (green).

**CRANKCASE**

Specification	Desc./Quantity
Category 1	32.959 ÷ 35.965
Category 2	32.953 to 32.959

**CRANKCASE - CRANKSHAFT COUPLING / CRANKSHAFT HALF-BEARINGS**

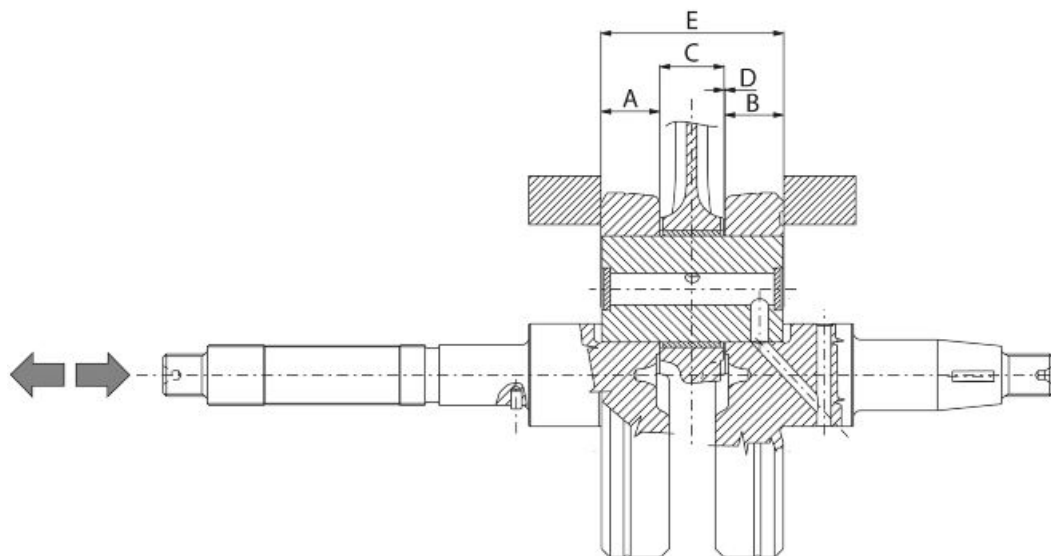
Specification	Desc./Quantity
Crankshaft category 1 - Crankcase category 1	E+E
Crankshaft category 2 - Crankcase category 1	C+C
Crankshaft category 1 - Crankcase category 2	C+C
Crankshaft category 2 - Crankcase category 2	B+B



**Characteristic**

**Axial crankshaft/crankcase clearance:**

0.5 ÷ 0.40 mm



**CRANKSHAFT/ CRANKCASE AXIAL CLEARANCE**

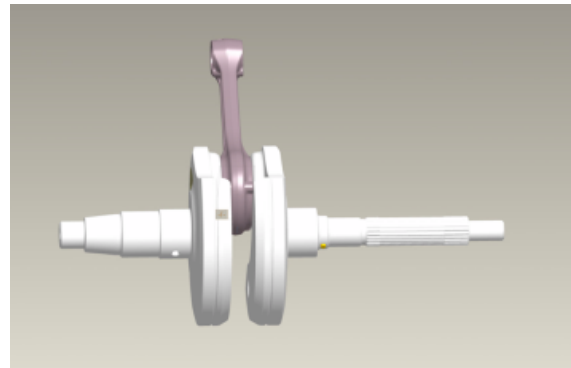
Name	Description	Dimensions	Initials	Quantity
Transmission side half-shaft		16.6 +0-0.05	A	D = 0.20 to 0.50
Flywheel side halfshaft		16.6 +0-0.05	B	D = 0.20 to 0.50
Connecting rod		18 -0.10 -0.15	C	D = 0.20 to 0.50
Spacer tool		51.4 +0.05	E	D = 0.20 to 0.50

**THE CRANKSHAFT** is available in two **CATEGORIES**:

**Characteristic**

**Crankshaft category:**

**CAT. 1 - CAT. 2**



#### **CRANKSHAFT CATEGORY IDENTIFICATION:**

The identification is indicated on the counterweight shoulder «\*1 - \*2», if carried out with micropinholing. Otherwise, «1 - 2» if done manually with an electric pen. The spare part identification is located on the package with a **drawing number** plus **FC1/FC2** or **(001/002)**.

If a crankshaft comprising two half-shafts of different categories needs to be replaced, also replace both crankcase halves, combining the two components (Shaft and Crankcase) featuring the same category.

## **Cylinder Head**

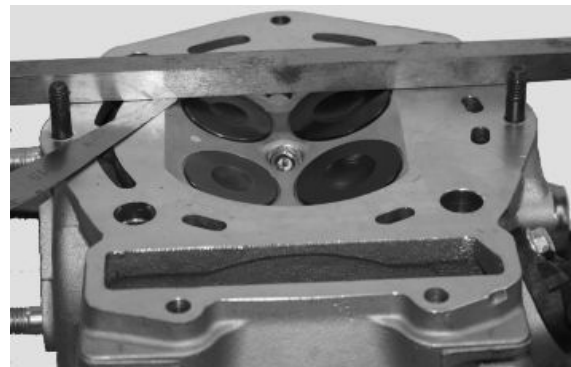
Before performing head service operations, thoroughly clean all coupling surfaces. Note the position of the springs and the valves so as not to change the original position during refitting

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

**Characteristic**

**Maximum allowable run-out**

0.09 mm

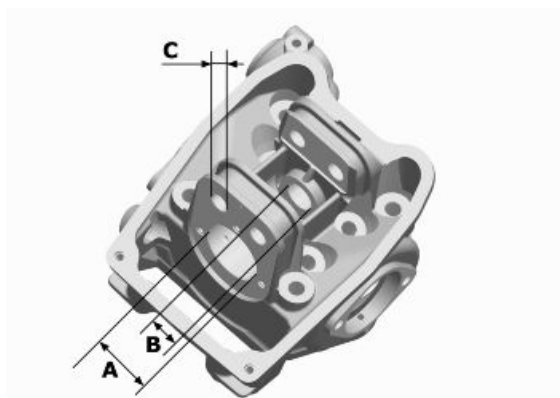


- In case of irregularities, replace the head.
- Check the sealing surfaces for the intake and exhaust manifold.
- Check that the camshaft and the rocking lever pin capacities exhibit no wear.
- Check that the head cover surface is not worn.
- Check that the coolant sealing pad exhibits no oxidation.

- 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"	37 +0.025
Bearing "B"	20 +0.021
Bearing "C"	12 +0.018

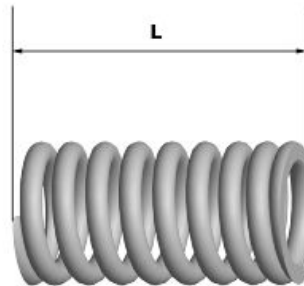
- Measure the unloaded spring length.

**Characteristic**  
**Standard length**

40.5 mm

**Allowable limit after use:**

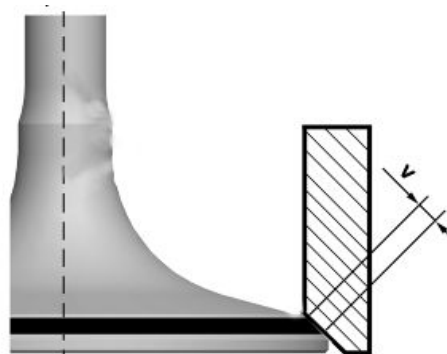
39.7 mm



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

**Characteristic**  
**Admissible limit:**

1.6 mm



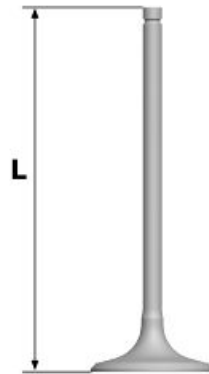
- If the width of the impression on the valve seat exceeds the specified limits, replace the cylinder head.



- In case of excessive wear or damage, replace the head.

**STANDARD VALVE LENGTH**

Specification	Desc./Quantity
Intake	84.5 mm
Exhaust	94.5 mm



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

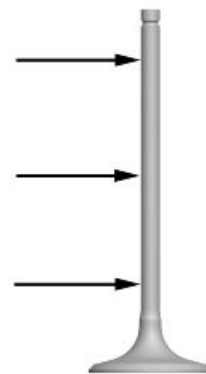
**STANDARD DIAMETER**

Specification	Desc./Quantity
Intake:	4.987 - 4.972 mm
Exhaust:	4.975 - 4.960 mm

**MINIMUM ADMISSIBLE DIAMETER**

Specification	Desc./Quantity
Intake:	4.96 mm
Exhaust:	4.945 mm

- Calculate the clearance between valve and valve guide.

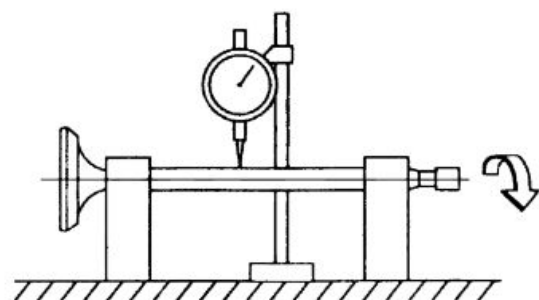


- Check the deviation of the valve stem by resting it on a «V» shaped abutment and measuring the extent of the deformation with a dial gauge.

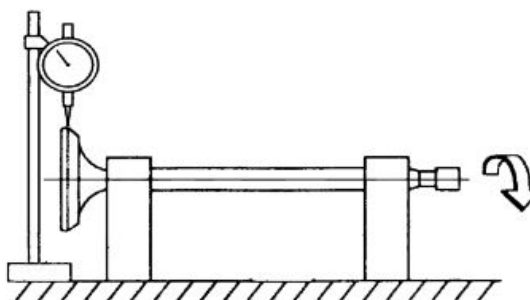
**Characteristic**

**Limit values admitted:**

0.1 mm



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



**Characteristic**

**Admissible limit:**

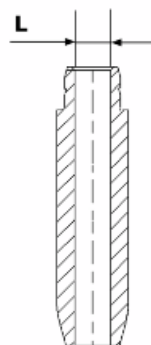
0.03 mm

Measure the valve guide.

**Characteristic**

**Valve guide:**

5 +0.012 mm



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



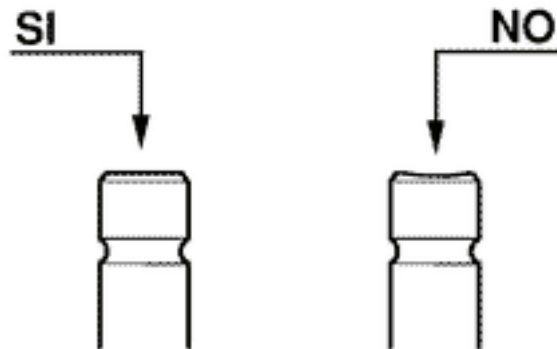
**EXHAUST**

Specification	Desc./Quantity
Standard clearance:	0.025 to 0.052 mm
Admissible limit:	0.09 mm

**INTAKE**

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 no anomalies are found during the above checks, 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 FAYING SURFACE, DO NOT KEEP ROTATING THE VALVE WHEN NO LAPPING COMPOUND IS LEFT. CAREFULLY WASH THE CYLINDER HEAD AND THE VALVES WITH A SUITABLE PRODUCT FOR THE TYPE OF LAPPING COMPOUND BEING USED.**

**CAUTION**

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

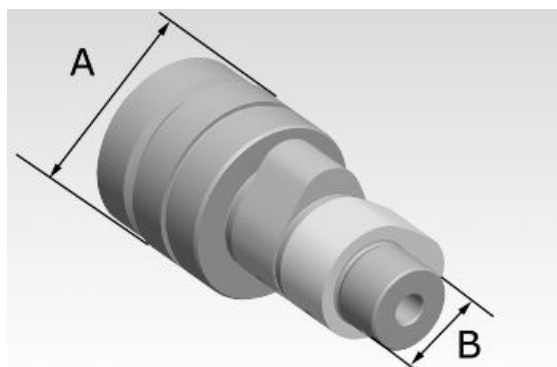
- Check that the camshaft bearings exhibit no scores or abnormal wear.
- Using a micrometer, measure the camshaft bearings.

**STANDARD DIAMETER**

Specification	Desc./Quantity
Bearing A Ø:	37 - 0.025 -0.050 mm
Bearing B diameter:	19 - 0.020 -0.041 mm

**MINIMUM ADMISSIBLE DIAMETER**

Specification	Desc./Quantity
Bearing A Ø:	36.940 mm
Bearing B diameter:	19.950 mm



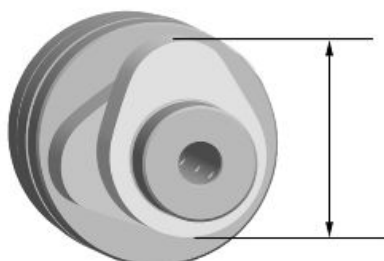
-Using a gauge, measure the cam height.

**STANDARD HEIGHT**

Specification	Desc./Quantity
intake	17.382 mm
Exhaust	16.563 mm

**ADMISSIBLE LIMITS**

Specification	Desc./Quantity
intake	17.130 mm
Exhaust	16.310 mm
standard axial clearance	0.11 - 0.41 mm
maximum admissible axial clearance	0.42 mm



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

**Characteristic**

**Standard diameter**

Diameter 11.977 - 11.985 mm

- Measure the inside diameter of each rocking lever.

**Characteristic**

**Standard diameter**

Ø 12 +0.011 mm

- Check that the cam contact sliding block and the articulated register plate is free from wear.
- In case of wear, replace the component.

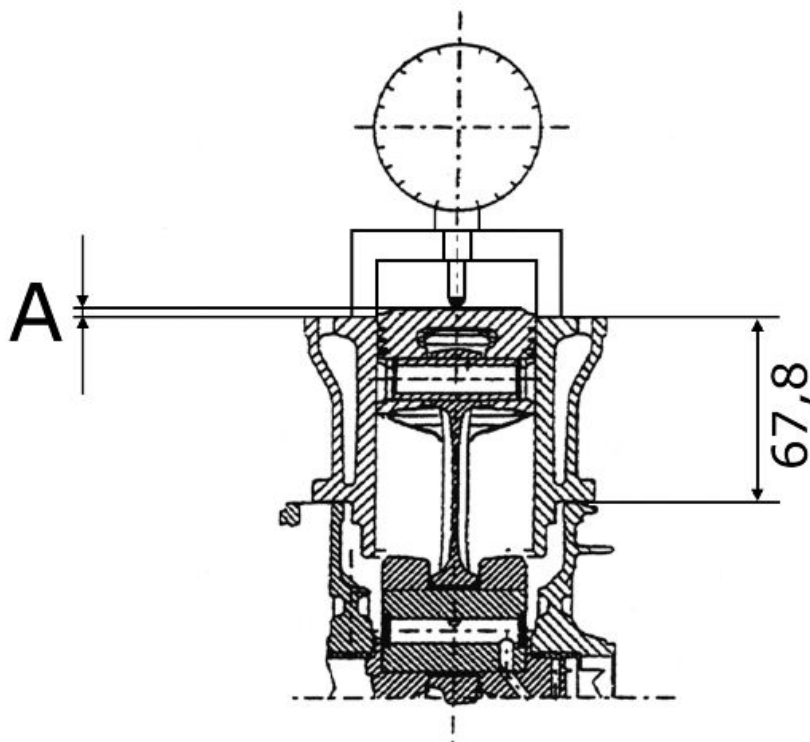


## Slot packing system

### Characteristic

#### Compression ratio

Cr: 11.50 ÷ 13:1



Measurement «A» to be taken, is a value of piston protrusion. It indicates by how much the plane formed by the piston crown protrudes from the plane formed by the upper part of the cylinder. The further the piston protrudes from the cylinder, the thicker the base gasket to be used (to restore the compression ratio) and vice versa.

#### N.B.

**NO GASKETS AND SEALS SHOULD BE ASSEMBLED BETWEEN THE CRANKCASE AND CYLINDER AND THE DIAL GAUGE EQUIPPED WITH SUPPORT SHOULD BE SET TO ZERO FOR MEASUREMENT «A» TO BE TAKEN WITH THE PISTON AT TOP DEAD CENTRE POSITION AND ON A RECTIFIED PLANE.**

**MODELS WITH METAL HEAD GASKET (0.3)**

Name	Measure A	Thickness
Shimming 125 - Cylinder 67.8 - Head gasket 0.3 - Base gasket 0.6	1.40 ÷ 1.60	0.60 ± 0.05
Shimming 125 - Cylinder 67.8 - Head gasket 0.3 - Base gasket 0.8	1.60 ÷ 1.80	0.80 ± 0.05

**Products****RECOMMENDED PRODUCTS TABLE**

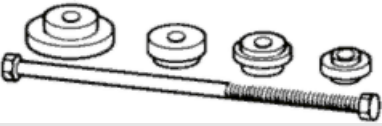


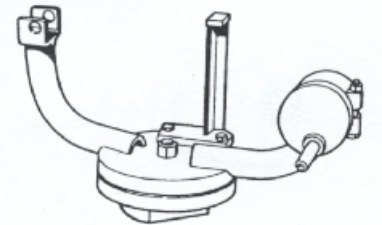

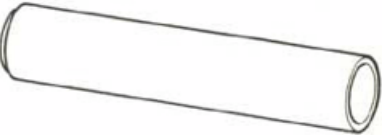

Product	Description	Specifications
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications
AGIP CITY HI TEC 4T	Oil to lubricate flexible transmissions (throttle control)	Oil for 4-stroke engines
AGIP FILTER OIL	Oil for air filter sponge	Mineral oil with specific additives for increased adhesiveness
AGIP GP 330	Grease for brake levers, throttle	White calcium complex soap-based spray grease with NLGI 2; ISO-L-XBCIB2
AGIP CITY HI TEC 4T	Engine oil	SAE 5W-40, API SL, ACEA A3, JASO MA Synthetic oil
AGIP BRAKE 4	Brake fluid	FMVSS DOT 4 Synthetic fluid
AGIP PERMANENT SPEZIAL	coolant	Monoethylene glycol-based antifreeze fluid, CUNA NC 956-16
AGIP GREASE PV2	Grease for steering bearings, pin seats and swinging arm	Soap-based lithium and zinc oxide grease containing NLGI 2; ISO-L-XBCIB2 of the swinging arm

## INDEX OF TOPICS

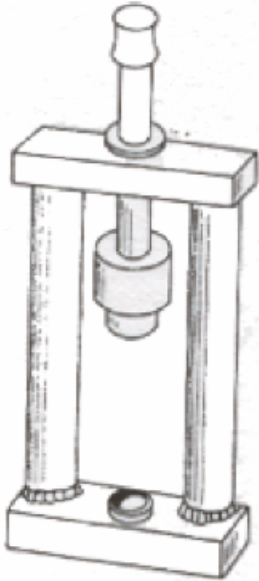
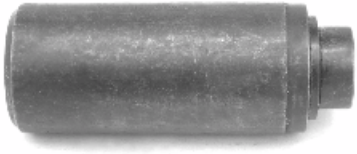
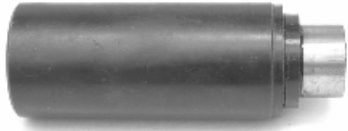


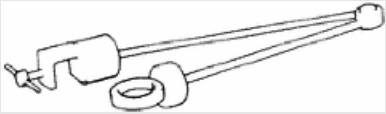
TOOLING

TOOL

**SPECIFIC TOOLS**

Stores code	Description	
001330Y	Tool for fitting steering seats	
001467Y017	Bell for bearings, OD 39 mm	
001467Y014	Pliers to extract ø 15-mm bearings	
005095Y	Engine support	
002465Y	Pliers for circlips	
006029Y	Punch for fitting fifth wheel seat on steering tube	
020004Y	Punch for removing fifth wheels from headstock	



Stores code	Description	
020021Y	Front suspension service tool	
020036Y	Punch	
020038Y	Punch	
020055Y	Wrench for steering tube ring nut	
020074Y	Support base for checking crankshaft alignment	
020150Y	Air heater mounting	

**Stores code**

**Description**

020151Y

Air heater



020193Y

Oil pressure check gauge



020262Y

Crankcase splitting plate



020263Y

Driven pulley assembly sheath



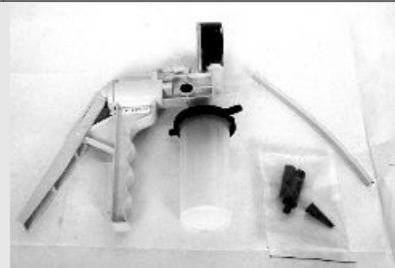
020306Y





Punch for assembling valve seal rings



020329Y

Mity-Vac vacuum-operated pump



Stores code	Description	
020330Y	Stroboscopic light to check timing	 A handheld stroboscopic light tool with a grey body and a black handle. It has a lens at the front and a power switch on the side. A black power cord is attached to the back and is coiled.
020331Y	Digital multimeter	 A digital multimeter with a white face and a black casing. It has a large LCD display at the top showing '0'. Below the display is a rotary selector dial and several buttons. Two black test leads with red and black probes are connected to the front panel.
020332Y	Digital rpm indicator	 A black rectangular digital rpm indicator. It has a small LCD display at the top showing '0'. Below the display is a small red LED indicator. A black cable with a connector is attached to the top of the device.
020648Y	Single battery charger	 A black rectangular single battery charger. The top of the device has a series of ventilation slots. The front panel features a digital display, several buttons, and two large circular ports for battery connection. The text 'BatteryMate 150-9' is visible on the top.

Stores code	Description
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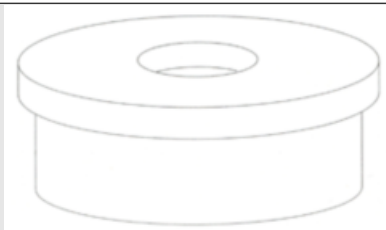
020335Y	Magnetic mounting for dial gauge
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020357Y	32x35-mm Adaptor
020359Y	42x47-mm Adaptor



020360Y	52x55-mm Adaptor
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020363Y	20-mm guide
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020364Y	25-mm guide
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Stores code	Description	
020365Y	22 mm guide	
020375Y	28 x 30 mm adaptor	
020376Y	Adaptor handle	
020382Y	Valve cotters equipped with part 012 removal tool	
020382Y011	adapter for valve removal tool	
020393Y	Piston assembly band	

Stores code	Description
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020412Y

15-mm guide



020423Y

Driven pulley lock wrench



020424Y

Driven pulley roller casing fitting punch



020426Y

Piston fitting fork



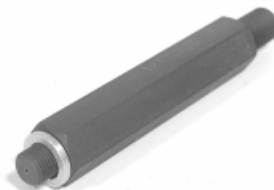
020431Y



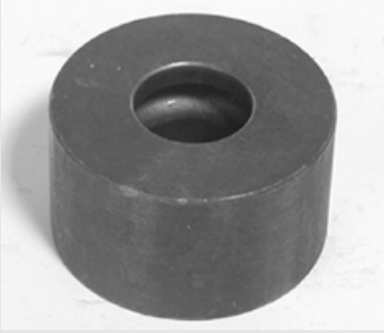


Valve oil seal extractor



020434Y

Oil pressure check fitting

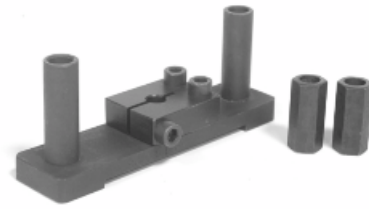


Stores code	Description	
020441Y	26 x 28 mm adaptor	
020444Y	Tool for fitting/ removing the driven pulley clutch	
020456Y	Ø 24 mm adaptor	
020477Y	37 mm adaptor	
020483Y	30-mm guide	
020489Y	Hub cover support stud bolt set	

Stores code	Description
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020428Y

Piston position check mounting



020680Y

Diagnosis Tool



020621Y

HV cable extraction adaptor



020481Y

Control unit interface wiring



001467Y035

Bearing housing, outside  $\varnothing$  47 mm









020626Y

Driving pulley lock wrench





Stores code	Description	
001467Y013	Pliers to extract $\varnothing$ 15-mm bearings	
020627Y	Flywheel lock wrench	
020467Y	Flywheel extractor	
020454Y	Tool for fitting piston pin stops (200 - 250)	
020622Y	Transmission-side oil guard punch	
020480Y	Petrol pressure check set	

**Stores code**

**Description**

020244Y

15-mm diameter punch



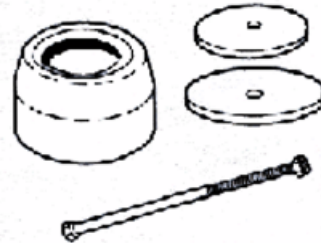
020115Y

Ø 18 punch



020271Y

Tool for removing-fitting silent bloc



020469Y

Reprogramming kit for vehicle diagnostic tester



## INDEX OF TOPICS

**MAINTENANCE**

**MAIN**

## Maintenance chart

### SCHEDULED MAINTENANCE TABLE

*I: CHECK AND CLEAN, ADJUST, LUBRICATE OR REPLACE IF NECESSARY.*

*C: CLEAN, R: REPLACE, A: ADJUST, L: LUBRICATE*

*\* Replace every 2 years*

Km x 1,000	1	5	10	15	20	25	30	35	40	45	50	55	60
Roller bearing - Driven pulley			L		L		L		L		L		L
Safety locks	I		I				I				I		I
Spark plug			R		R		R		R		R		R
Driving belt			I	R	I		R		I	R	I		R
Throttle control	A		A		A		A		A		A		A
Air filter			C		C		C		C		C		C
Oil filter	R		R		R		R		R		R		R
CVT Filter			C		C		C		C		C		C
Valve clearance			A				A				A		
Electrical system and battery	I		I		I		I		I		I		I
Brake control levers	L		L		L		L		L		L		L
Brake fluid *	I		I		I		I		I		I		I
Coolant *	I		I		I		I		I		I		I
Engine oil	R	I	R	I	R	I	R	I	R	I	R	I	R
Hub oil	R		I		R		I		R		I		R
Headlight direction adjustment				A			A			A			A
Brake pads	I	I	I	I	I	I	I	I	I	I	I	I	I
Sliding blocks / variable speed rollers			R		R		R		R		R		R
Tyre pressure and wear	I		I		I		I		I		I		I
Vehicle test ride	I		I		I		I		I		I		I
Radiator (external cleaning)				I			I			I			I
Suspension	I		I		I		I		I		I		I
Steering	A		A		A		A		A		A		A
Transmissions				L			L			L			L

### MAINTENANCE TABLE - TIME

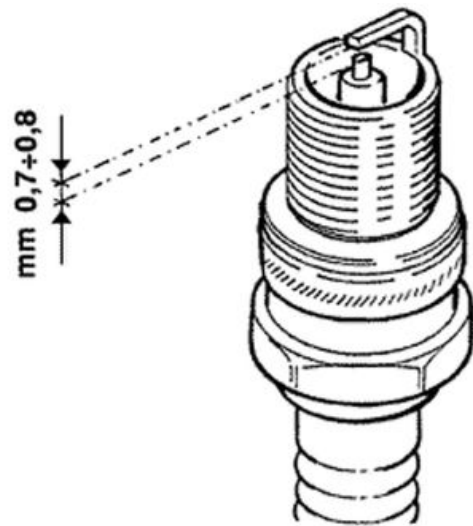
Km x 1000	1	5	10	15	20	25	30	35	40	45	50	55	60
Operation Time	60'	10'	100'	45'	150'	10'	140'	10'	150'	45'	100'	10'	190'

## Spark plug

- Rest the scooter on its stand
- Open the saddle and take out the helmet compartment
- Disconnect the spark plug HV wire cap;
- Unscrew the spark plug using the wrench supplied;
- Check the conditions of the spark plug, make sure the insulation is intact, that the electrodes are not excessively worn or sooty, the conditions of the washer, and measure the distance between the electrodes using the appropriate feeler thickness gauge.



- Adjust the distance, if necessary, by bending the side electrode very carefully. In case of anomaly (as described before), replace the spark plug with another of the recommended type;
- Fit the spark plug with the correct inclination and manually screw it all the way down, then use the special spanner to tighten it.
- Insert the cap onto the spark plug and proceed with the reassembly operations.



**CAUTION**

THE SPARK PLUG MUST BE REMOVED WHEN THE MOTOR IS COLD. THE SPARK PLUG MUST BE REPLACED EVERY 20,000 KM. THE USE OF NON CONFORMING ELECTRONIC IGNITION CONTROL UNITS OR SPARK PLUGS OTHER THAN THOSE PRESCRIBED CAN SERIOUSLY DAMAGE THE ENGINE.

**Characteristic**

**Electrode gap**

0.7 to 0.8 mm

**Electric characteristic**

**Spark plug**

NGK CR8EKB

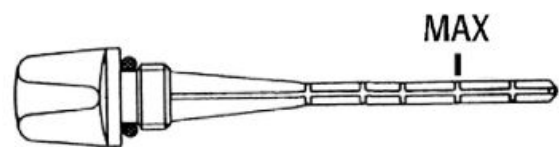
**Locking torques (N\*m)**

Spark plug 12 to 14

**Hub oil**

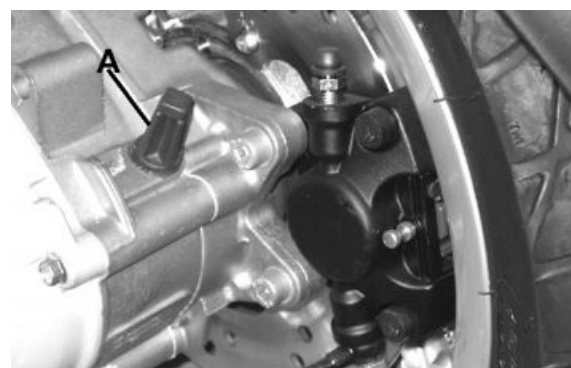
**Check**

- Park the vehicle on its centre stand on flat ground;
- Remove the oil dipstick «A», dry it with a clean cloth and put it back into its hole **tightening it completely**;



Remove the dipstick and check that the oil level is slightly over the second notch starting from the lower end; if the level is under the MAX. mark, it needs to be filled with the right amount of hub oil.

- Screw up the oil dipstick again and make sure it is locked properly into place.



## Replacement

- Remove the oil filler cap «A».
- Unscrew the oil drainage cap «B» and drain out all the oil.
- Screw in the drainage cap again and fill the hub with the prescribed oil.

### Recommended products

#### AGIP ROTRA 80W-90 Rear hub oil

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

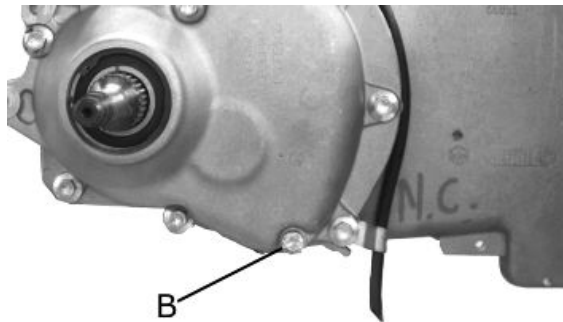
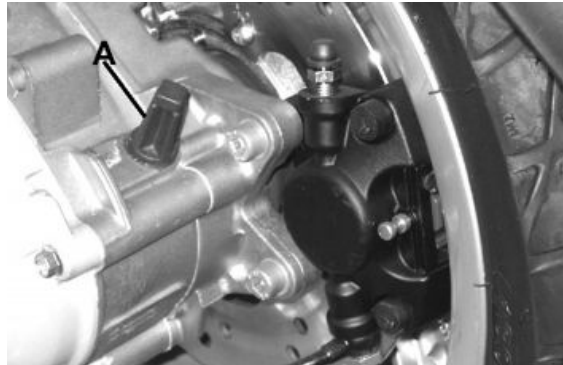
### Characteristic

#### Rear hub oil

Capacity approximately 250 cc

### Locking torques (N\*m)

Hub oil drainage screw 15 to 17 Nm

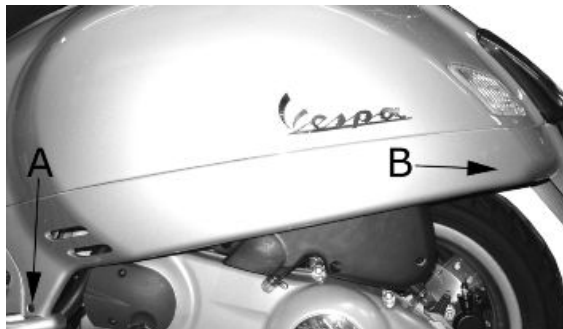


## Air filter

Proceed as follows:

1. unscrew the fixing screw «A».
2. unscrew the nut «B» under the body.
3. remove the left side fairing.
4. remove the helmet compartment;
5. unscrew the fixing screws «C» that can be reached once the helmet compartment has been removed;
6. Unscrew the screws «D» and remove the air filter cover.

Remove the filtering element and clean it with water and shampoo; then dry it with a clean cloth and short blasts of compressed air. Finally, immerse it in a mixture of 50% oil of the recommended type and 50% petrol. Then gently squeeze the filter element between your hands, allow it to drip and then refit it. Oil or water deposits in the filter hous-



ing can be cleaned off by removing the two rubber caps «E».

#### CAUTION

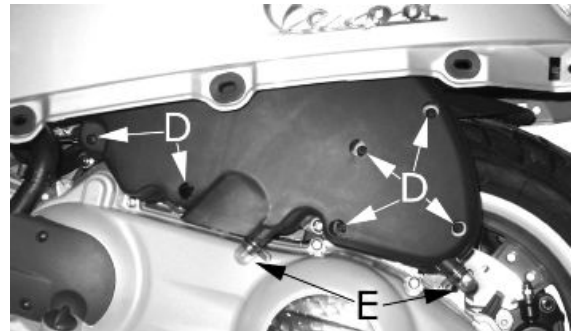
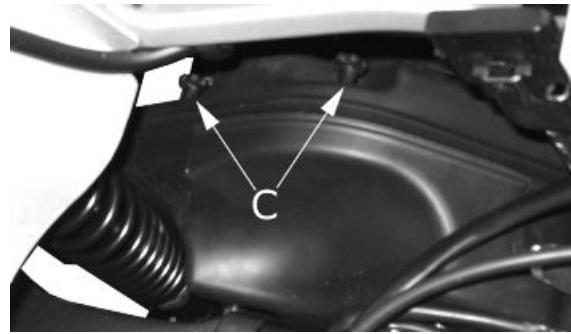


IF THE VEHICLE IS USED ON DUSTY ROADS, IT IS NECESSARY TO SERVICE THE AIR FILTER MORE OFTEN TO AVOID DAMAGING THE ENGINE.

#### Recommended products

##### AGIP FILTER OIL Oil for air filter sponge

Mineral oil with specific additives for increased adhesiveness



## 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.**

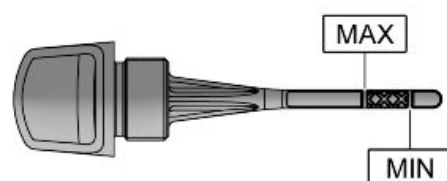
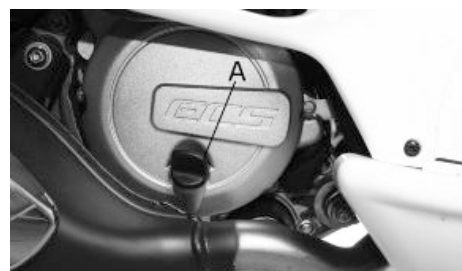
In all 4T engines, the deterioration of the oil characteristics, or a certain consumption should be considered normal, especially if during the run-in period. Consumption levels in particular can be influenced by the conditions of use (e.g.: oil consumption increases when driving at "full throttle").

## Replacement

At 1,000 km and after every 10,000 km, the oil and the filter must be changed. The engine must be drained by running off the oil from drainage cap "B" of the flywheel side gauze pre-filter; furthermore to facilitate oil drainage, loosen the cap/dipstick "A". Once all the oil has drained through the drainage hole, unscrew the oil cartridge filter "C" and remove it.

Make sure the pre-filter and drainage plug O-rings are in good conditions.

Lubricate them and refit the mesh filter and the oil drainage plug, screwing them up to the prescribed torque.



Refit the new cartridge filter being careful to lubricate the O-ring before fitting it.

Change the engine oil.

Since a certain quantity of oil still remains in the circuit, oil must be filled from cap "A". Then start up the scooter, leave it running for a few minutes and switch it off: after five minutes check the level and if necessary top up without exceeding the **MAX** level. The cartridge filter must be replaced every time the oil is changed. Use new oil of the recommended type for topping up and changing purposes.

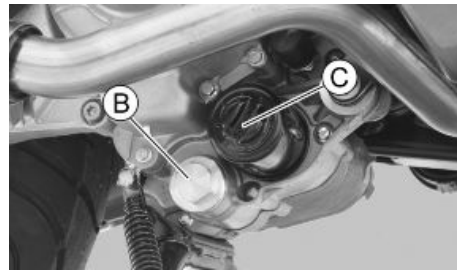
**N.B.**

**THE ENGINE MUST BE HOT WHEN THE OIL IS CHANGED.**

**Recommended products**

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

SAE 5W-40 Synthetic oil that exceed the requirements of API SL, ACEA A3, JASO MA specifications



## Check

This operation must be carried out with the engine cold and following the procedure below:

1. Place the vehicle on its centre stand and on flat ground.
2. Undo cap/dipstick "A", dry it off with a clean cloth and replace it, **screwing down completely**.
3. Remove the cap/dipstick again and check that the level is between the min and max. marks; top-up, if required.

The MAX level mark indicates a quantity of around 1300 cc of engine oil. If the check is carried out after the vehicle has been used, and therefore with a hot engine, the level line will be lower; in order to carry out a correct check, wait at least 10 minutes after the engine has been stopped so as to get the correct level.

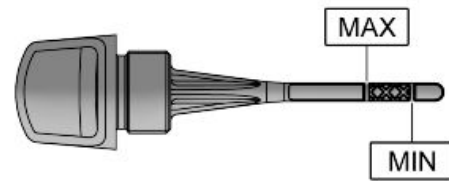
**Oil top-up**

The oil should be topped up after having checked the level and in any case by adding oil **without ever exceeding the MAX. level**.

Restoration of the level from **MIN** to **MAX** requires approximately **200 cc**.








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## Engine oil filter

The cartridge filter must be replaced every time the oil is changed. Use new oil of the recommended type for topping up and changing purposes.

Make sure the pre-filter and drainage plug O-rings are in good conditions. Lubricate them and refit the mesh filter and the oil drainage plug, screwing them up to the prescribed torque. Refit the new cartridge filter being careful to lubricate the O-ring before fitting it. Change the engine oil.

### Recommended products

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

SAE 5W-40 Synthetic oil that exceed the requirements of API SL, ACEA A3, JASO MA specifications

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## 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.**

---

## Cooling system

### Adding engine coolant.

The fluid level must be checked every 10,000 kilometres with a cold engine, in the way shown below: Place the scooter on its centre stand and on flat ground.

- Undo the screw shown in the figure and remove the expansion tank cap on RHS.
- Top up if the fluid level is near or below the MIN level edge. The liquid level must always be between the MIN and MAX level.



-The coolant consists of an ethylene glycol and corrosion inhibitor based 50% de-ionised water-antifreeze solution mix.

**CAUTION**

**DO NOT EXCEED THE MAX LEVEL WHEN FILLING SO THAT COOLANT DOES NOT SPILL OVER THE EXPANSION TANK WHEN THE VEHICLE IS BEING USED.**



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## Braking system

---

### Level check

The brake fluid tanks for the front and rear brakes are located on the pumps under the handlebar cover. Proceed as follows:

- Remove the brake pump cover
- Rest the vehicle on its centre stand with the handlebars perfectly horizontal;
- Check the fluid level through the sight glass as shown in the figure. A certain lowering of the level is caused by wear on the pads.



---

### Top-up

- Position the vehicle on a flat surface and on the centre stand
- Remove the brake pump cover as indicated in the photo



Check the brake fluid level through the sight glass on the pump as shown in the photograph

- If the level is below the minimum, fill using the two screws shown in the figure



- Remove the gasket and fill with DOT 4 until the spyglass is completely covered

For refitting purposes carry out the operations in the reverse order from the removal operation and respect the tightening torque of the tank cover screws.

**CAUTION**



AVOID CONTACT OF THE BRAKE FLUID WITH YOUR EYES, SKIN, AND CLOTHING. IN CASE OF ACCIDENTAL CONTACT, WASH WITH WATER.

**CAUTION**



THE BRAKING CIRCUIT FLUID IS HIGHLY CORROSIVE. THEREFORE, WHEN TOPPING IT UP, AVOID LETTING IT COME INTO CONTACT WITH THE PAINTED PARTS OF THE VEHICLE. THE BRAKING CIRCUIT FLUID IS HYGROSCOPIC, THAT IS, IT ABSORBS HUMIDITY FROM THE SURROUNDING AIR. IF MOISTURE CONTAINED IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, THIS WILL RESULT IN INEFFICIENT BRAKING.

**CAUTION**

NEVER USE BRAKE FLUID COMING FROM OPEN OR PARTIALLY USED CONTAINERS. UNDER NORMAL CLIMATIC CONDITIONS, BRAKE FLUID MUST BE CHANGED EVERY 20,000 KM OR ANYWAY EVERY 2 YEARS.

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

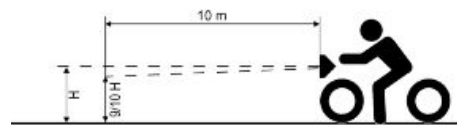
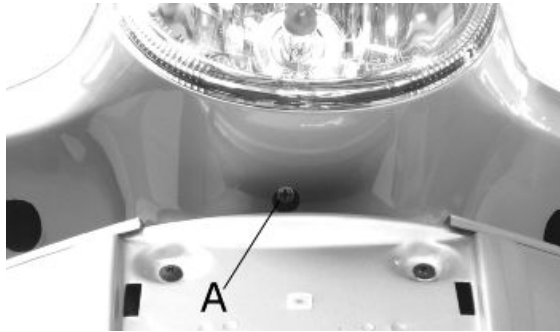
Brake pump reservoir screws 15 ÷ 20



## Headlight adjustment

Proceed as follows:

1. 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 scooter is perpendicular to the screen;
2. Turn on the headlight and check that the borderline of the projected light beam on the screen is not higher than  $9/10$  or lower than  $7/10$  of the distance from the ground to the centre of vehicle headlamp;
3. If otherwise, adjust the right headlight with screw «A».



**N.B.**

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

## INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

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

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

## Engine

### 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 unit
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 seal	Replace the valve oil seal
Worn valve guides	Check and replace the head unit if required

### Insufficient lubrication pressure

#### LOW 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 faying surface with the bell 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 change 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

Possible Cause	Operation
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 plunger sliding	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 deviation of the disc.
Clogged compensation holes on the pump Swollen or stuck rubber gaskets	Clean carefully and blast with compressed air 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: replace them if they are recessed or if the balls are flattened.

### 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: replace them if they are recessed or if the balls are flattened.

### 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 absorber; 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 disc in the attachment to the hub and the steering tube.

## Suspension oil leakage

### OIL LEAKAGE FROM SUSPENSION

Possible Cause	Operation
Faulty or broken seals	Replace the shock absorber Check the condition of wear of the steering covers and the adjustments.

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## INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS

- 
1. Magneto flywheel
  2. Voltage regulator
  3. 12V-12Ah Battery
  4. Start-up remote control switch
  5. Starter motor
  6. Starter button
  7. 30A Fuse
  8. 15A fuse
  9. Stop light bulb
  10. Key switch contacts
  11. Engine stop switch
  12. Stop buttons
  13. Light switch
  14. Key switch contacts
  15. Saddle opening switch
  16. Saddle opening actuator
  17. Front and rear daylight bulbs and license plate light
  18. Headlight with twin-filament bulb
  19. Pre-installation for anti-theft device
  20. Turn indicator bulbs
  21. Turn indicator switch
  22. Turn indicator control device
  23. Instrument panel
  24. Fuel level transmitter
  25. Oil pressure sensor
  26. Headlight remote control
  27. Fuse 7.5A
  28. Fuse 7.5A
  29. Fuse 15A
  30. Fuse 7.5A
  31. Fuse 7.5A
  32. Horn button
  33. Horn
  34. Injection load remote control
  35. Electric fan remote control
  36. Radiator electric fan
  37. Lambda sensor

- 38. Water pump
- 39. Engine rpm sensor
- 40. HV coil
- 41. Fuel injector
- 42. Coolant temperature sensor:
- 43. Diagnostics socket
- 44. Fuel supply pump
- 45. Injector ECU
- 46. Immobilizer aerial

**Key**

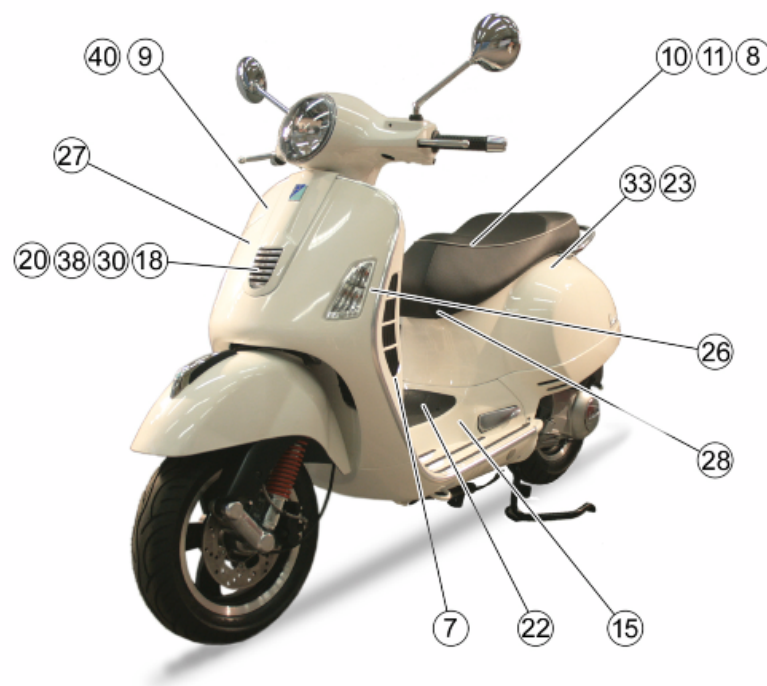
**Ar:** Orange **Az:** Sky Blue **Bi:** White **Bl:** Blue **Gi:**

Yellow **Gr:**Grey

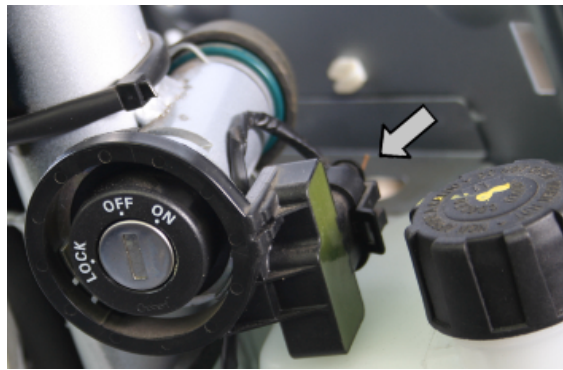
**Ma:**Brown **Ne:** Black **Ro:** Pink **Rs:** Red **Ve:** Green

**Vi:** Purple

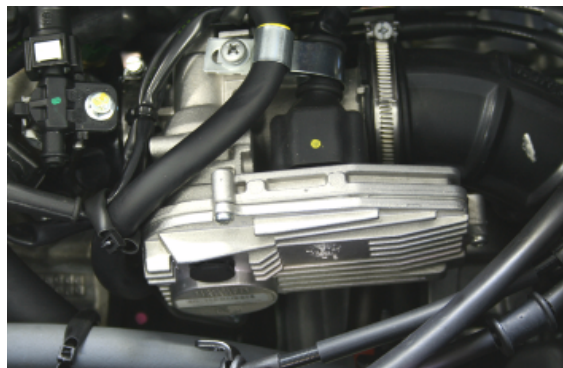
**Components arrangement**



**9. Immobilizer aerial-** Remove the shield back plate to reach it.



**10. Injection ECU -** Remove the helmet compartment to reach it.

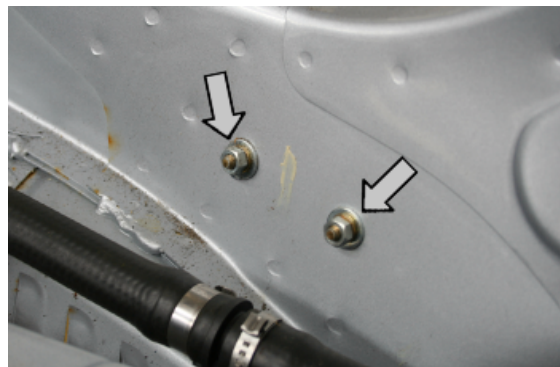


**11. Diagnosis connector -** Remove the helmet compartment to reach it.

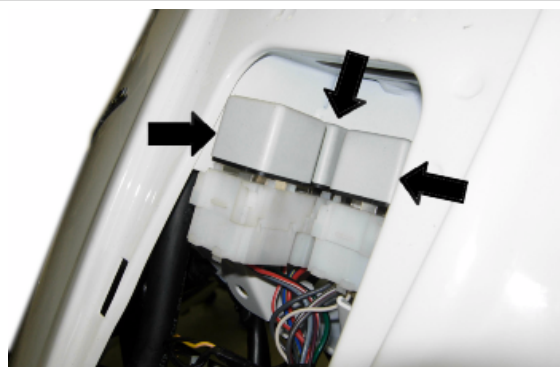


**15. HV coil-** Remove the battery to reach it; to remove the coil, first remove the footrest and undo the two screws indicated.





**20-18-30-38 Horn - Solenoids** Remove front central cover to reach them.



**23. Remote control switches** - Remove the front central cover and the helmet compartment to reach them.



**22-26. Main fuses** - Open the front top box and the battery cover to reach them.

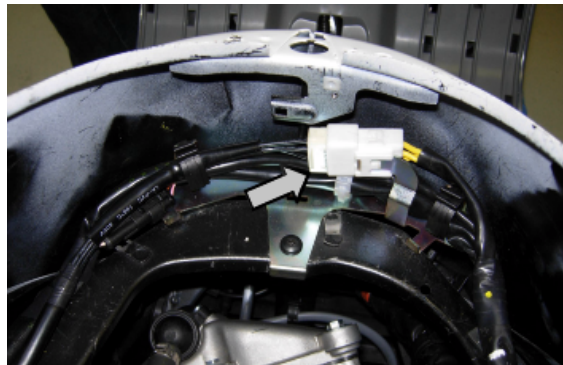




**27. Voltage regulator** - Remove the shield back plate to reach it.



**28. Magneto flywheel** - Remove the flywheel cover, as described in the «Engine» chapter, to reach it. To get access to the connectors, remove the helmet compartment.



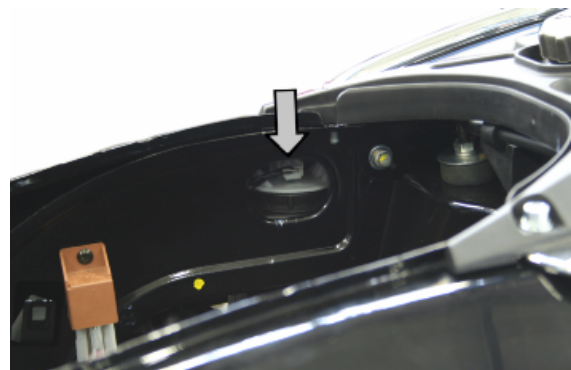
**40. Key switch contacts** - Remove the shield back plate to reach them.



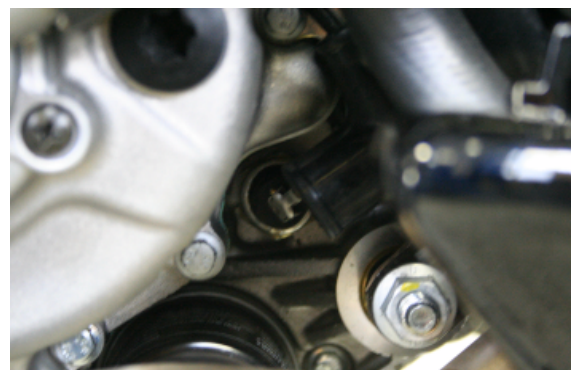
**33. Saddle-opening actuator** - Remove the helmet compartment to reach it, undo the two screws indicated and remove the fixing bracket together with the actuator.



**8. Fuel level transmitter** - Remove the fuel tank to reach it.



**7. Oil pressure sensor** - Remove the right side fairing to reach it.



**22. Battery** - Remove the rear central cover to reach it.



## Conceptual diagrams

## Ignition

- 3. 12V-12Ah Battery
- 7. 30A Fuse
- 8. 15A Fuse
- 10. Key switch contacts
- 11. Engine stop switch
- 23. Instrument panel
- 28. Fuse 7.5A
- 31. Fuse 7.5A
- 34. Injection load remote control
- 40. HV coil
- 43. Diagnostics socket
- 45. Injector ECU
- 46. Immobilizer aerial

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## Battery recharge and starting

- 1. Magneto flywheel
- 2. Voltage regulator
- 3. 12V-12Ah Battery
- 4. Start-up remote control switch
- 5. Starter motor
- 6. Starter button
- 7. 30A Fuse
- 8. 15A Fuse
- 9. Stop light bulb
- 10. Key switch contacts
- 12. Stop buttons
- 30. Fuse 7.5A
- 31. Fuse 7.5A
- 45. Injector ECU

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## Level indicators and enable signals section

- 3. 12V-12Ah Battery
- 7. 30A Fuse
- 8. 15A Fuse
- 10. Key switch contacts
- 11. Engine stop switch



- 23. Instrument panel
  - 24. Fuel level transmitter
  - 25. Oil pressure sensor
  - 30. Fuse 7.5A
  - 31. Fuse 7.5A
  - 34. Injection load remote control
  - 37. Lambda sensor
  - 39. Engine rpm sensor
  - 41. Fuel injector
  - 42. Coolant temperature sensor:
  - 45. Injector ECU
  - 46. Immobilizer aerial
- 

**Devices and accessories**

- 3. 12V-12Ah Battery
- 7. 30A Fuse
- 8. 15A Fuse
- 10. Key switch contacts
- 14. Key switch contacts
- 15. Saddle opening switch
- 16. Saddle opening actuator
- 19. Pre-installation for anti-theft device
- 20. Turn indicator bulbs
- 21. Turn indicator switch
- 22. Turn indicator control device
- 23. Instrument panel
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- 29. Fuse 15A
- 30. Fuse 7.5A
- 31. Fuse 7.5A
- 32. Horn button
- 33. Horn
- 34. Injection load remote control
- 35. Electric fan remote control
- 36. Radiator electric fan
- 38. Water pump
- 44. Fuel supply pump

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45. Injector ECU

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## Lights and turn indicators

- 3. 12V-12Ah Battery
- 7. 30A Fuse
- 8. 15A Fuse
- 10. Key switch contacts
- 13. Light switch
- 17. Front and rear daylight bulbs and license plate light
- 18. Headlight with twin-filament bulb
- 20. Turn indicator bulbs
- 21. Turn indicator switch
- 22. Turn indicator control device
- 23. Instrument panel
- 26. Headlight remote control
- 27. Fuse 7.5A
- 28. Fuse 7.5A
- 29. Fuse 15A
- 30. Fuse 7.5A
- 31. Fuse 7.5A
- 45. Injector ECU

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## Checks and inspections

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

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## Immobiliser

The electronic ignition system is controlled by the control unit with the integrated Immobilizer system. The immobilizer is an anti-theft system that allows the vehicle to be operated only when it is started with coded keys recognised by the control unit. The code is integrated in a transponder in the key block. This allows the driver clear operation without having to do anything other than just turning the key. The Immobilizer system consists of the following components:



- Control unit
- Immobilizer aerial
- master and service keys with built-in transponder
- HV coil
- diagnosis LED

The diagnosis LED also works as a theft-deterrent blinker. This function is activated every time the ignition switch is turned to the "OFF" position, or the emergency stop switch is turned to the "OFF" position. It remains activated for 48 hours in order not to affect the battery charge.

When the key switch is turned to "ON", it interrupts the function of the immobiliser lamp and a start enable lamp comes "ON".

The duration of the flash depends on the programming of the electronic control unit

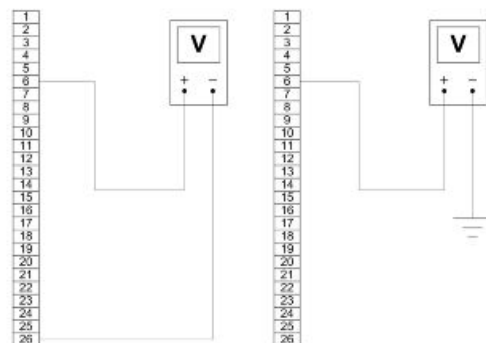
If the LED is off regardless of the position of the ignition-key switch and/or the instrument panel is not initiated, check if:

- there is battery voltage
- that fuse 1 and fuse 8 are in good condition.
- there is power to the control unit as specified below:

Remove the connector support bracket shown in the photograph and disconnect the connector from the control unit. Check the following conditions:

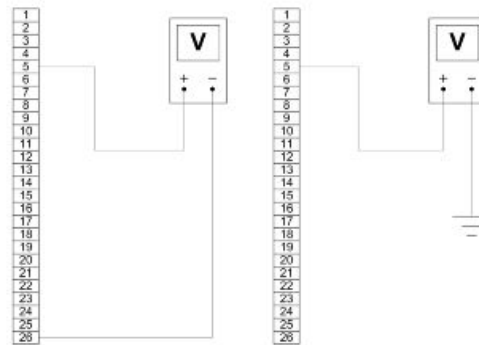
**With the key switch set to OFF:**

- there is battery voltage between terminals 6-26 and terminal 6-frame earth (fixed power supply). If there is no voltage check that fuse 4 and its cable are in working order.



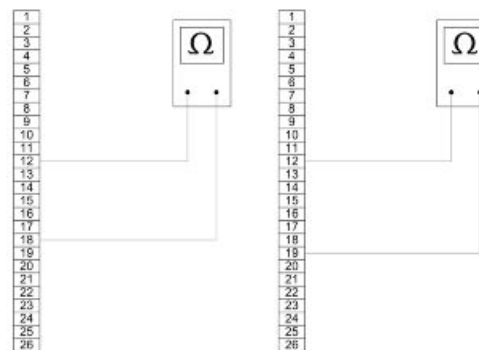
**With the key switch set to ON:**

- there is battery voltage between terminals 5-26 and terminal 5-chassis ground (fixed power supply). If there is no voltage, check the key switch contacts, that fuse 2 and its cable are in working order.



- There is continuity between terminals 12-18 and 12-19 with the emergency cut-out switch in the RUN position. If there is no continuity, check the contacts of the latter.

If no faults are found, replace the control unit.



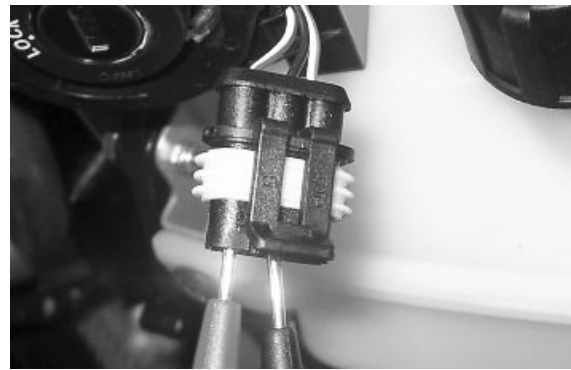
After removing the shield back plate, remove the electrical connection from the aerial as shown in the picture.



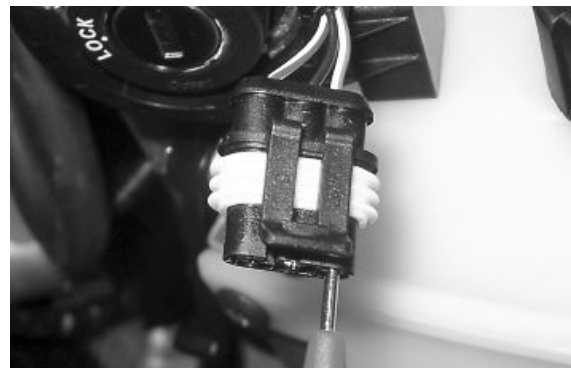
Remove the protective base from the connector.



With the ignition key switch at ON check there is battery voltage between the Red-White and Black cables



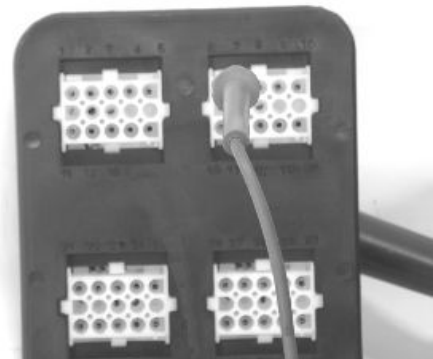
With MIU connector disconnected, check the continuity between the Orange-White cable and pin 7 of the interface wiring.



### Specific tooling

**020481Y Control unit interface wiring**

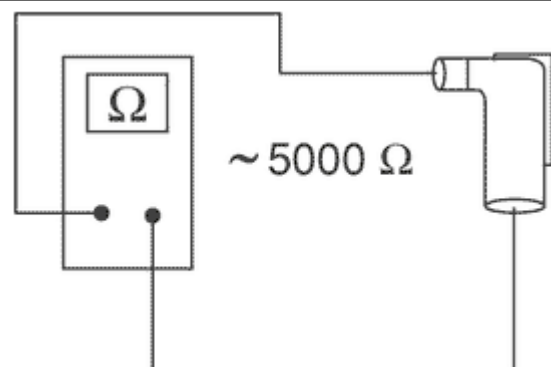
**020331Y Digital multimeter**



## Virgin circuit

When the ignition system is not encrypted, any key will start the engine but limited to 2000 rpm. The keys can only be recognised if the control unit has been programmed properly.

The data storage procedure for a previously unprogrammed control unit provides for the recognition of the red key (master key) as the first key to be stored to memory: this becomes particularly important because it is the only key that enables the control unit to be wiped clean and reprogrammed for the memorisation of the service keys.



The master and service keys must be used to code the system as follows:

- Insert the Master key, turn it to «ON» and keep this position for two seconds (limit values 1 to 3 seconds).
- Insert the blue key and set to «ON» for 2 seconds.
- If you have copies of the key, repeat the operation with each key.
- Insert the MASTER key again and turn it to «ON» for 2 seconds.

The maximum time to change keys is 10 seconds.

A maximum of 7 service keys (blue) can be programmed at one time.

It is essential to adhere to the times and the procedure. If you do not, start again from the beginning.

Once the system has been programmed, master key transponder, decoder and control unit are strictly matched.

With this link established, it is now possible to encode new service keys, in the event of losses, replacements, etc.

Each new programming deletes the previous one so, in order to add or eliminate keys, you must repeat the procedure using all the keys you intend to keep using.

If a service key becomes uncoded, the efficiency of the high voltage circuit shielding must be thoroughly inspected: In any case it is advisable to use resistive spark plugs.

### **Characteristic**

#### **Shielded cap resistance**

~ 5000  $\Omega$ .

---

## Diagnostic codes

The Immobilizer system is tested each time the key switch is turned from «OFF» to «ON». During this diagnosis phase a number of control unit statuses can be identified and various light codes displayed. Regardless of the code transmitted, if at the end of the diagnosis the LED remains off permanently, the ignition is enabled. If, however, the LED remains on permanently, it means the ignition is inhibited:

### 1. Previously unused control unit - key inserted:

a single 2 second flash is displayed, after which the LED remains off permanently. The keys can be stored to memory, the vehicle can be started but with a limitation imposed on the number of revs.

### 2. Previously unused control unit - transponder absent or cannot be used:

The LED is permanently ON; in this condition, no operations are possible, including starting of the vehicle.

### 3. Programmed control unit - the service key in (normal condition of use):

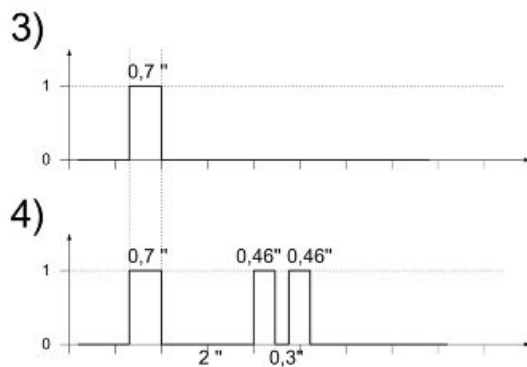
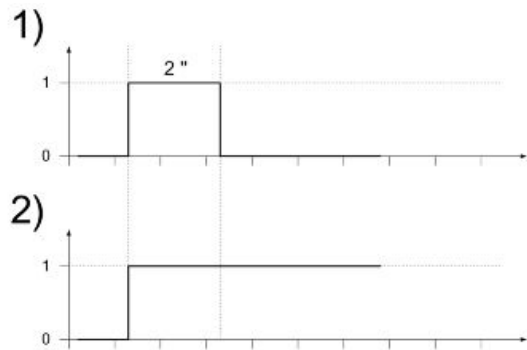
a single 0.7-second flash is displayed, after which the LED remains off steadily. The engine can be started.

### 4. Programmed control unit - Master key in:

a 0.7 sec. flash is displayed followed by the LED remaining off for 2 sec. and then by short 0.46 sec. flashes the same number of times as there are keys stored in the memory including the Master key. When the diagnosis has been completed, the LED remains permanently OFF. The engine can be started.

**5. Programmed control unit - fault detected:** a light code is displayed according to the fault detected, after which the LED remains on steadily. The engine cannot be started. The codes that can be transmitted are:

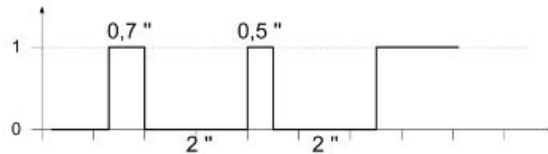
- 1-flash code
- 2-flash code



- 3 flash code

### Diagnostic code - 1 flash

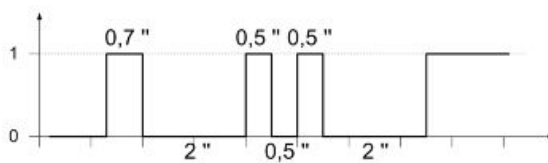
A one-flash code indicates a system where the serial line is not present or is not detected. Check the Immobilizer aerial wiring and change it if necessary.



### Diagnostic code - 2 flashes

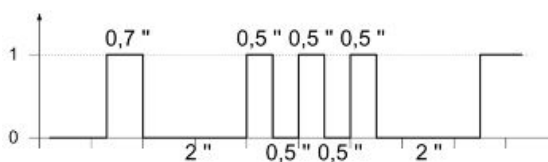
A two-flash code shows a system where the control unit does not show the transponder signal. This might depend on the inefficiency of the immobiliser aerial or the transponder.

Turn the switch to ON using several keys: if the code is repeated even with the Master key, check the aerial wiring and change it if necessary. If this is not the case, replace the defective key and/or reprogram the control unit. Replace the control unit if the problem continues.



### Diagnostic code - 3 flashes

A three-flash code indicates a system where the control unit does not recognise the key. Turn the switch to ON using several keys: if the error code is repeated even with the Master key, replace the control unit. If this is not the case, reprogram the decoder.



### Battery recharge circuit

The recharge circuit is provided with a three-phase generator with permanent magneto flywheel. The generator is directly connected to the voltage regulator.



This, in its turn, is connected directly to the ground and the battery positive terminal passing through the 30A 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

### Checking the stator windings

**WARNING**

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

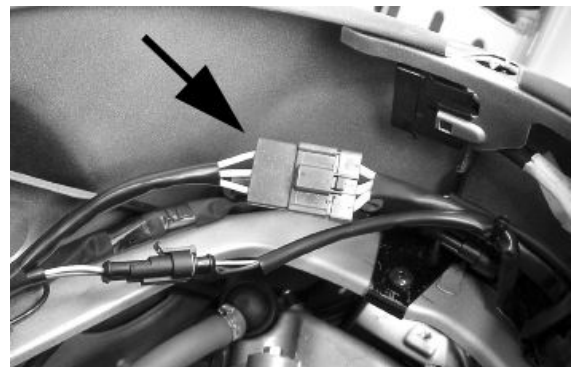
- 1) Lift the saddle and remove the helmet compartment.
- 2) Disconnect the connector between stator and regulator with the three yellow cables as shown in the picture.
- 3) Measure the resistance between each of the yellow terminals and the other two.

### Electric characteristic

#### Resistance:

0.2 - 1  $\Omega$

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



---

## Recharge system voltage check

### Look for any leakage

- 1) Access the battery by removing the cover in the footrest.
- 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 the ignition key always at OFF, the reading indicated by the ammeter must be  $\leq 0.5$  mA.

### Charging current check

**WARNING**

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

- 1) Park the vehicle on its centre stand

- 2) With the battery correctly connected to the circuit, place the multimeter leads between the battery terminals..
- 3) Start the engine, ensure that the lights are all out, increase the engine speed and at the same time measure the voltage.

**Electric characteristic**

**Voltage ranging between 14.0 and 15.0V at 5000 rpm.**

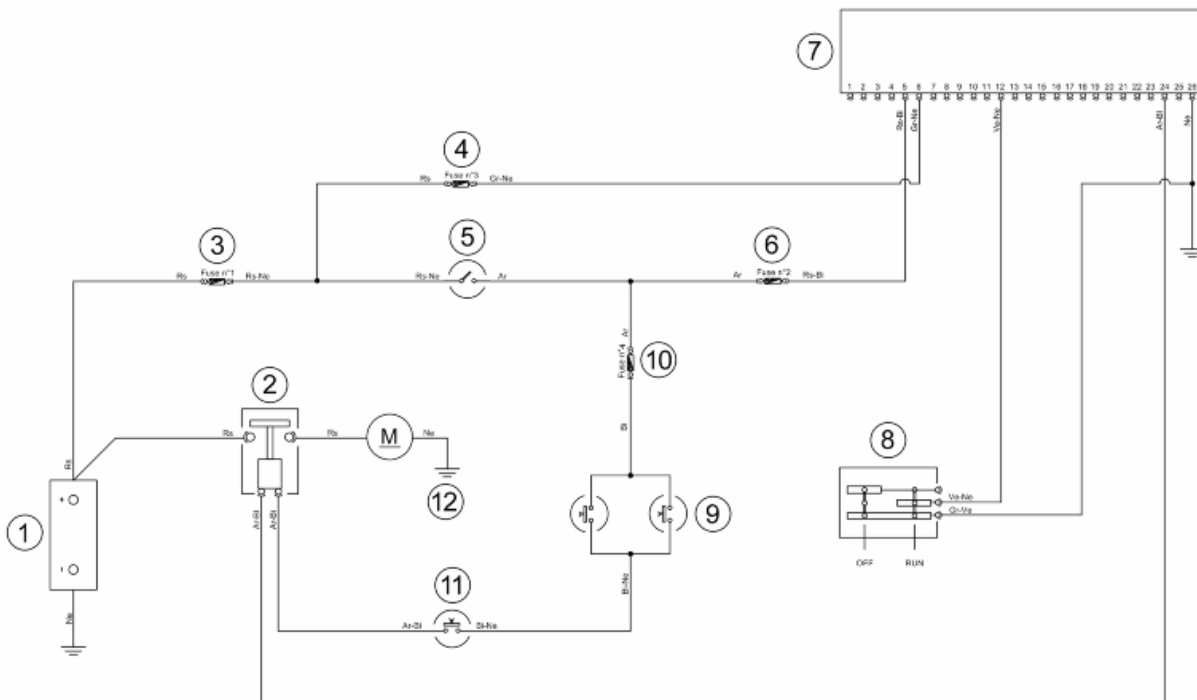
**Maximum current output check.**

- With engine off and panel set to "ON" turn on the lights and let the battery voltage set to 12V.
  - Connect ammeter pliers to the 2 recharge positive poles in output from the regulator.
  - Keep the lights on and start the engine, bring it to normal speed and read the values on the ammeter.
- With an efficient battery a value must be detected: > 20A

**VOLTAGE REGULATOR/RECTIFIER**

Specification	Desc./Quantity
Type	Non-adjustable three-phase transistor
Voltage	14 to 15V at 5000 rpm with lights off

**Starter motor**



**KEY**

- 1. Battery
- 2. Start-up remote control switch
- 3. Fuse No. 1
- 4. Fuse No. 3

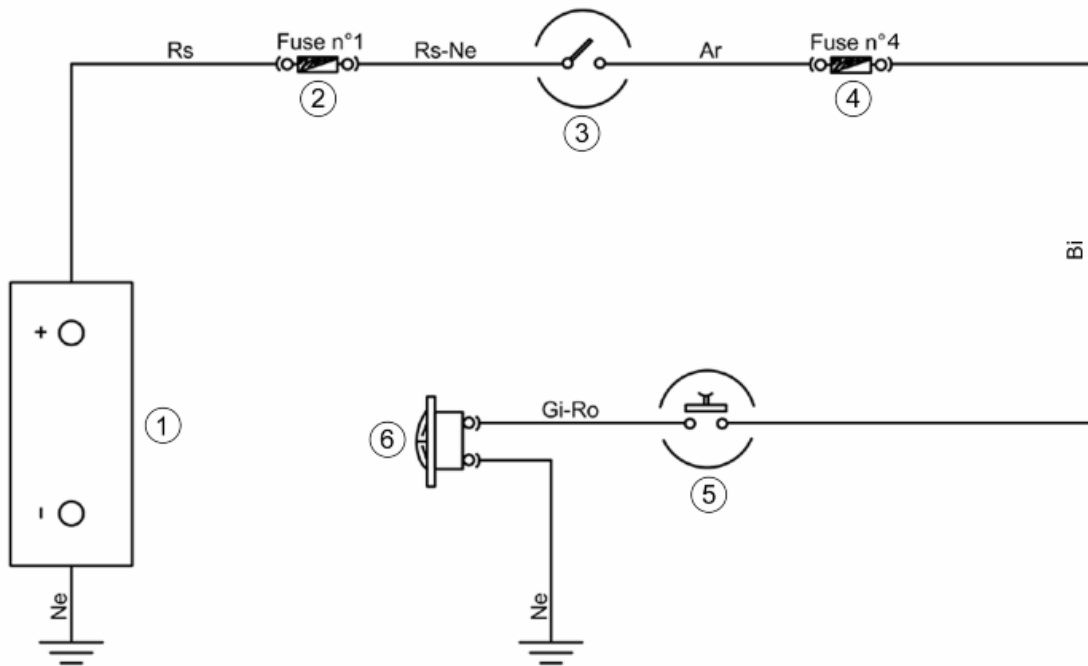
- 5. Key switch contacts
- 6. Fuse No. 2
- 7. Electronic control unit
- 8. Engine stop switch
- 9. Stop buttons
- 10. Fuse No. 4
- 11. Starter button
- 12. Starter motor

**WARNING**

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

- 1) Check fuses No. 1,2,3 and 4.
  - 2) Check key switch contacts.
  - 3) Check the contacts of the stop buttons and the starter button.
  - 4) With the key switch set to «**ON**», the brake pulled and the starter button pressed, check if there is voltage between the Orange-White cable of the start-up remote control switch and the ground connection. If there is not, check the cable harnesses.
  - 5) Check the start-up remote control switch.
  - 6) Check that the Red cable between the battery and the start-up remote control switch is not interrupted. Also check continuity between the latter and the starter motor.
  - 7) Check the starter motor ground connection.
  - 8) Check that the Orange-Blue cable between the start-up remote control switch and the control unit (pin 24) is not interrupted.
  - 9) Check the contacts of the engine stop switch and that the Green-Black cable connecting this switch to the control unit (pin 12) is not interrupted.
  - 10) Check the engine stop switch ground connection.
-

## Horn control



### KEY

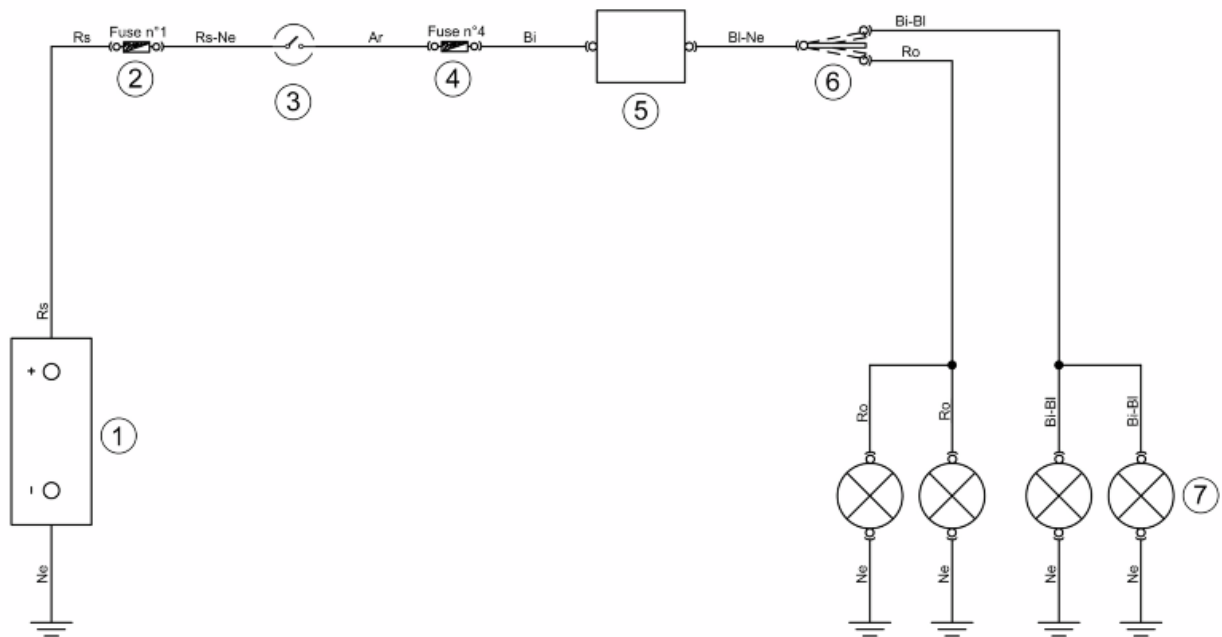
1. Battery
2. Fuse No. 1
3. Key switch contacts
4. Fuse No. 4
5. Horn button
6. Horn

### WARNING

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

- 1) Check fuses No. 1 and 4.
- 2) Check the key switch and horn button contacts.
- 3) With the key switch set to «ON» and the horn button pressed, check if there is voltage between the Yellow-Pink cable of the horn device and the ground connection. If there is not, check the cable harnesses.
- 4) Check the horn device ground connection.

## Turn signals system check

**KEY**

1. Battery
2. Fuse No. 1
3. Key switch contacts
4. Fuse No. 4
5. Turn indicator control device
6. Turn indicator switch
7. Turn indicator bulbs

**WARNING**

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

- 1) Check that bulbs operate properly.
- 2) Check fuses No. 1 and 4.
- 3) Check key switch contacts.
- 4) With the key switch set to «ON», check if there is voltage between the Blue-Black cable of the turn indicators switch and the ground connection. If there is not, check the cable harnesses and the connections of the turn indicator control device.
- 5) Check the turn indicator switch contacts.
- 6) With the turn indicator switch pressed to the right, check if there is voltage between the White-Blue cable of the switch and the ground connection. If there is not, check the cable harnesses.

7) With the turn indicator switch pressed to the left, check if there is voltage between the Pink cable of the switch and the ground connection. If there is not, check the cable harnesses.

8) Check that the cable harnesses of the bulbs and their ground connection are not interrupted.

---

## level indicators

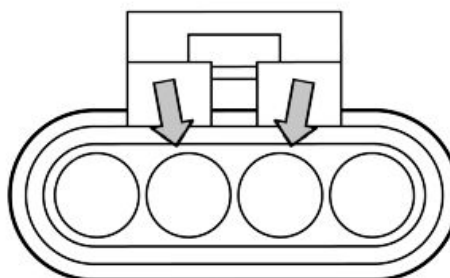
### WARNING

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

If faults are detected:

1) With a multimeter, check resistance values between the White-Green cable and the Black cable of the fuel level transmitter under different conditions.

2) If the transmitter operates correctly but the indication on the instrument panel is not exact, check that the cable harnesses between them are not interrupted.



### Electric characteristic

**Resistance value when the tank is full**

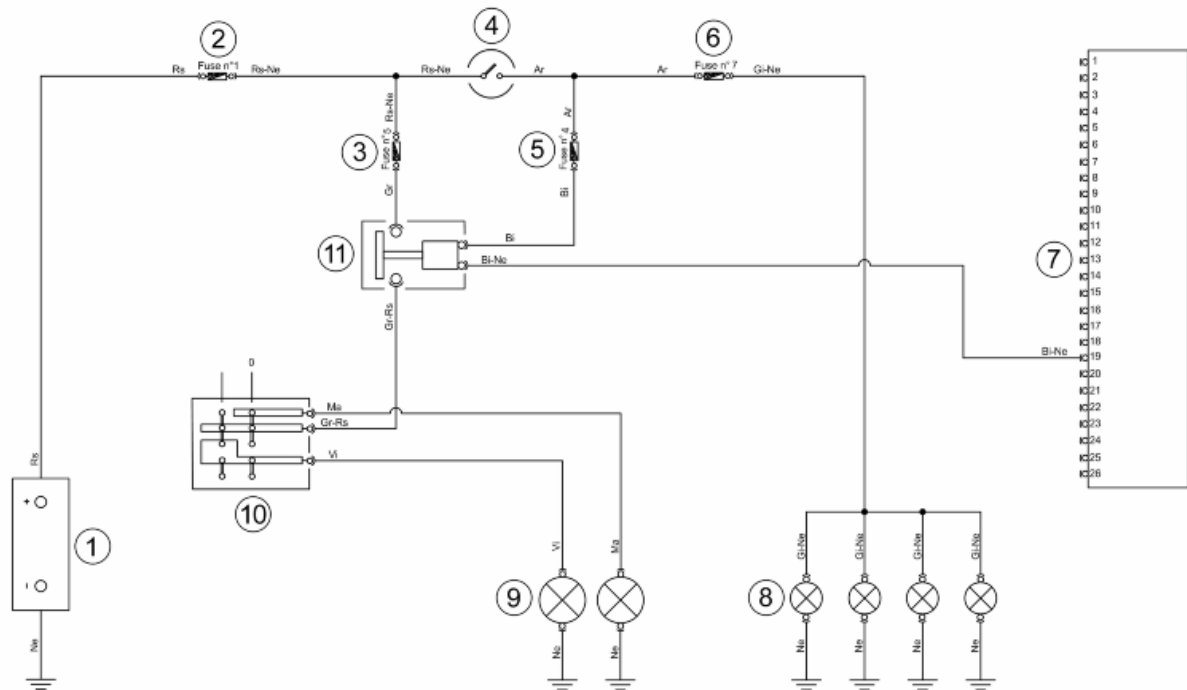
$\leq 7 \Omega$

**Resistance value when the tank is empty**

$90 + 13/-3 \Omega$

---

## Lights list

**KEY**

1. Battery
2. Fuse No. 1
3. Fuse No. 5
4. Key switch contacts
5. Fuse No. 4
6. Fuse No. 7
7. Electronic control unit
8. Tail lights and license plate light bulbs
9. High-/low-beam two-light bulb
10. Light switch
11. Headlight remote control

**WARNING**

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

**TAIL LIGHTS AND LICENSE PLATE LIGHT LINE**

- 1) Check that bulbs operate properly.
- 2) Check fuses No. 1 and 7.
- 3) Check key switch contacts.
- 4) Check if there is voltage between the Yellow-Black cable of fuse No. 7 and the ground. If not, check cable harnesses.

5) Check that the cable harnesses of the bulbs and their ground connection are not interrupted.

#### HIGH-BEAM /LOW-BEAM LIGHTS LINE

- 1) Check that bulbs operate properly.
- 2) Check fuses No. 1, 4 and 5.
- 3) Check key switch contacts.
- 4) Check if there is voltage between the Grey cable of the headlight remote control and the ground connection. If there is not, check the cable harnesses.
- 5) With the key switch set to «ON» and the engine running, check if there is voltage between the Yellow-Red cable of the headlight remote control and the ground connection. If there is not, check the cable harnesses.
- 6) Check that the White-Black cable connecting the headlight remote control switch and the control unit (pin 19) is not interrupted.
- 7) Check the headlight remote control switch.
- 8) Check that the Grey-Red cable of the light switch and the headlight remote control switch is not interrupted.
- 9) Check the light switch contacts.
- 10) Check that the cable harnesses of the bulbs and their ground connection are not interrupted.

## Fuses

The electrical system is equipped with:

1. six protection fuses «A» located in the glove compartment to the left
2. of a fuse «B», located in the battery compartment.

The chart shows the position and specifications of the fuses in the vehicle.

#### CAUTION

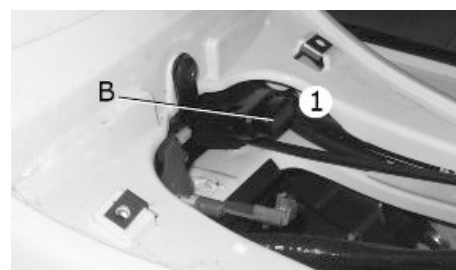
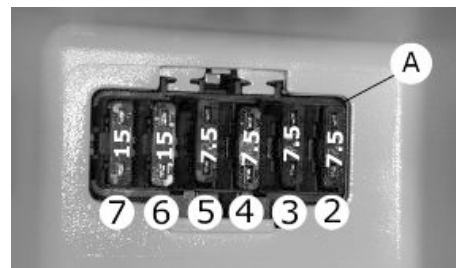


**BEFORE REPLACING A BLOWN FUSE, FIND AND SOLVE THE FAILURE THAT CAUSED IT TO BLOW. NEVER TRY TO REPLACE THE FUSE WITH ANY OTHER MATERIAL (E.G., A PIECE OF ELECTRIC WIRE).**

#### CAUTION



**MODIFICATIONS OR REPAIRS TO THE ELECTRICAL SYSTEM, PERFORMED INCORRECTLY OR WITHOUT STRICT ATTENTION TO THE TECHNICAL SPECIFICATIONS OF THE SYSTEM CAN CAUSE MALFUNCTIONING AND RISK OF FIRE.**





## FUSES

	Specification	Desc./Quantity
1	Fuse 1	<b>Current rating:</b> 30 A <b>Protected circuits:</b> Vehicle main fuse
2	Fuse 2	<b>Current rating:</b> 7.5A <b>Protected circuits:</b> Running lights and instrument panel illumination power
3	Fuse 3	<b>Current rating:</b> 7.5A <b>Protected circuits:</b> Live services circuit
4	Fuse 4	<b>Current rating:</b> 7.5A <b>Protected circuits:</b> Live injection ECU
5	Fuse 5	<b>Current rating:</b> 7.5A <b>Protected circuits:</b> Battery power for accessories and instrument panel
6	Fuse 6	<b>Current rating:</b> 15A <b>Protected circuits:</b> Battery power for headlight and saddle release system.
7	Fuse 7	<b>Current rating:</b> 15A <b>Protected circuits:</b> Injection load power supply.

## Dashboard

- A = Digital clock
- B = Odometer
- C = Speedometer
- D = Injection telltale light
- E = Engine oil pressure warning light
- F = Turn indicators
- G = High-beam warning light
- H = Headlight warning light
- I = Fuel gauge
- L = Low fuel warning light
- M = Coolant temperature gauge
- N = Immobilizer LED



## Sealed battery

If the vehicle is provided with a sealed battery, the only maintenance required is checking its charge and recharging, when 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 standard 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 to 14.70V
- Initial charge voltage equal to 0.3 to 0.5 for Nominal capacity
- Charge time:
  - 10 to 12 h recommended
  - Minimum 6 h
  - Maximum 24 h

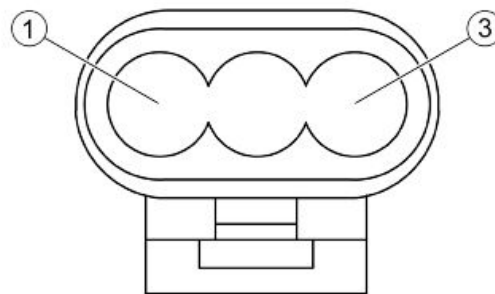
### 3) Constant current battery charge mode

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

## Connectors

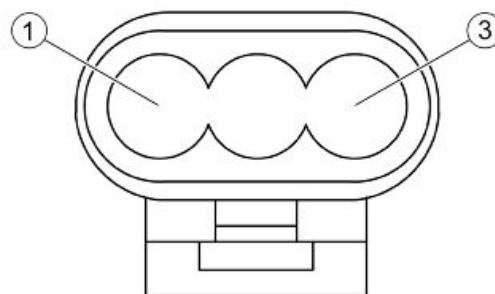
### DIAGNOSIS CONNECTOR

1. Not connected
2. Ground (Black)
3. Electronic control unit (Purple-White)



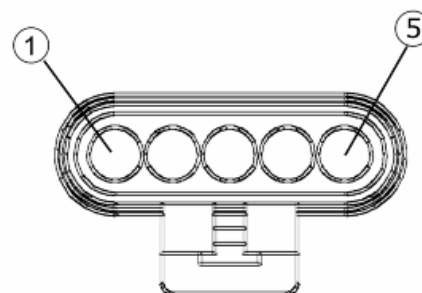
### PICK-UP CONNECTOR

1. Positive from control unit (Red)
2. Negative from control unit (Brown)
3. Not connected



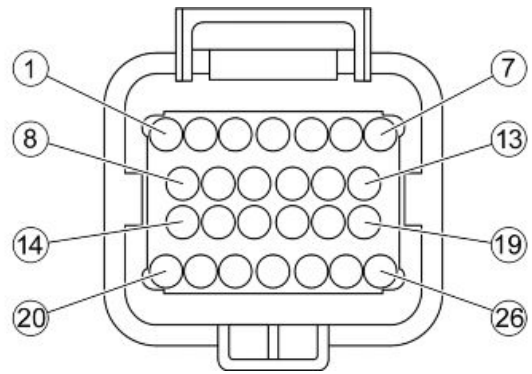
### FUEL PUMP CONNECTOR

1. Not connected
2. Ground (Black)
3. Not connected
4. Not connected
5. Power supply via solenoid (Black-Green)



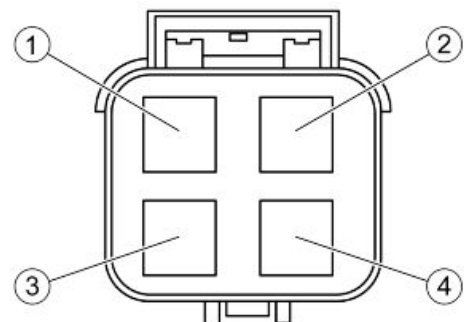
**ELECTRONIC CONTROL UNIT CONNECTOR**

1. Injection telltale light (Brown-Black)
2. Not connected
3. Not connected
4. Lambda probe negative terminal (White-Green)
5. Live supply (Red-White)
6. Battery powered (Grey-Black)
7. Immobilizer Aerial (Orange-White)
8. Electric fan remote control (Blue-Yellow)
9. Water temperature sensor (Sky blue-Green)
10. Not connected
11. Lambda probe positive (Sky blue-Black)
12. Engine stop switch (Green-Black)
13. Engine rpm sensor positive (Red)
14. Injector (Red-Yellow)
15. Engine rpm sensor negative (Brown)
16. Diagnosis (Purple-White)
17. Immobilizer warning light (Red-Green)
18. To ground (Grey-Green)
19. Low-beam lights automatic ignition (White-Black)
20. Injection load remote control (Black-Purple)
21. Not connected
22. HV coil (Pink-Black)
23. Not connected
24. Start-up enabling (Orange-Blue)
25. Not connected
26. Ground lead (Black)



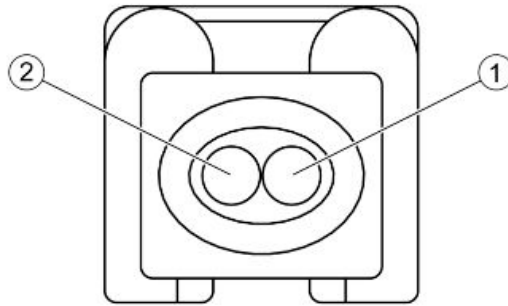
**ENGINE TEMPERATURE SENSOR CONNECTOR**

1. Ground (Grey-Green)
2. Instrument panel (Grey-Black)
3. Electronic control unit (Sky Blue-Green)
4. Ground (Black)

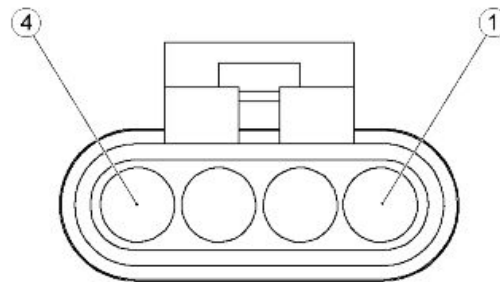


**INJECTOR CONNECTOR**

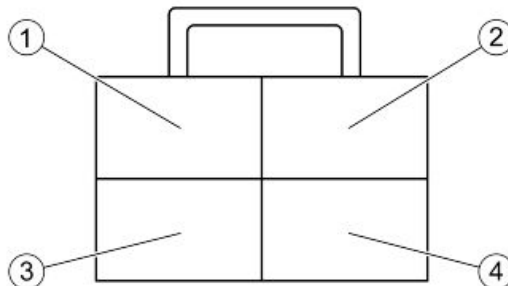
1. Power via remote control (Black-Green)
2. Electronic control unit (Red-Yellow)

**LAMBDA PROBE CONNECTOR**

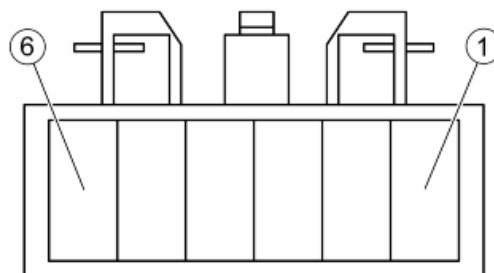
1. Positive from control unit (Sky blue-Black)
2. Negative from control unit (White-Green)

**VOLTAGE REGULATOR CONNECTOR**

1. +Battery (Red-Black)
2. Ground (Black)
3. Battery positive (Red-Black)
4. Ground (Black)

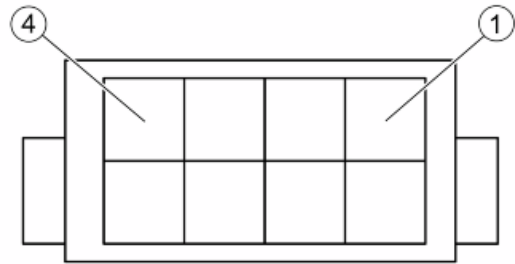
**INSTRUMENT PANEL CONNECTOR «A»**

1. Fuel level indicator (White-Green)
2. High-beam warning light (Purple)
3. Left indicators warning light (White-Blue)
4. Right indicators warning light (Pink)
5. Power permanent supply (White)
6. Oil pressure sensor (Pink-White)



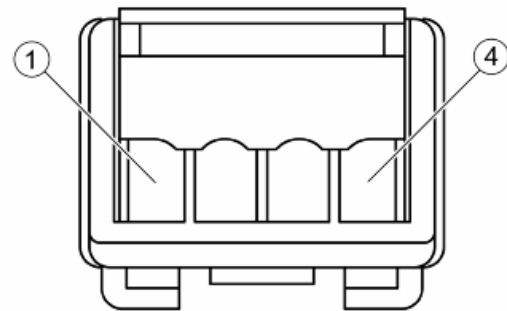
**INSTRUMENT PANEL CONNECTOR «B»**

1. Ground (Black)
2. Injection telltale light (Brown-Black)
3. Low fuel warning light (Yellow-Green)
4. Water temperature (Grey-Black)



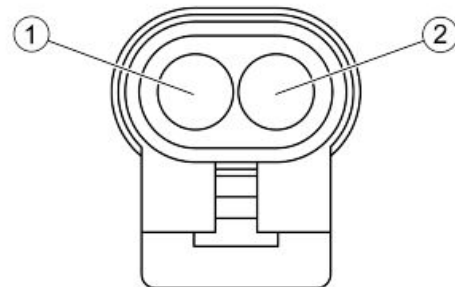
**INSTRUMENT PANEL CONNECTOR «C»**

1. Immobilizer warning light (Red-Green)
2. Battery powered (Red-Blue)
3. Lighting (Yellow-Black)
4. Power permanent supply (White)



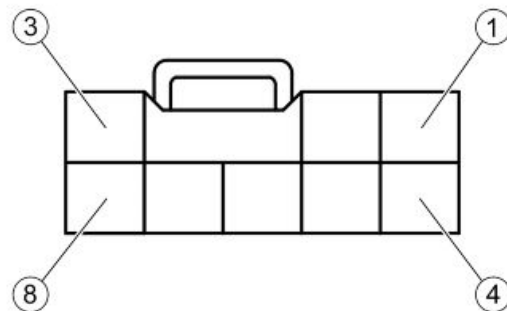
**HV COIL CONNECTOR**

1. Power via remote control (Black-Green)
2. Electronic control unit (Pink-Black)



**ANTI-THEFT DEVICE PRE-INSTALLATION CONNECTOR**

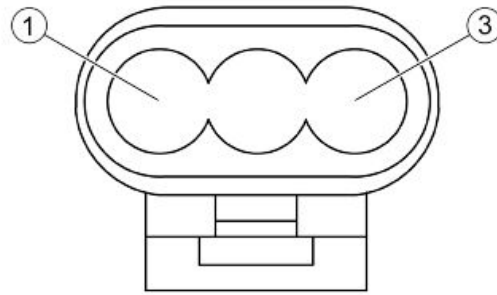
1. Ground (Black)
2. Left indicators (White-Blue)
3. Right indicators (Pink)
4. Battery powered (Red-Blue)
5. Power permanent supply (White)
6. Not connected
7. Not connected
8. Not connected



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**IMMOBILIZER AERIAL CONNECTOR**

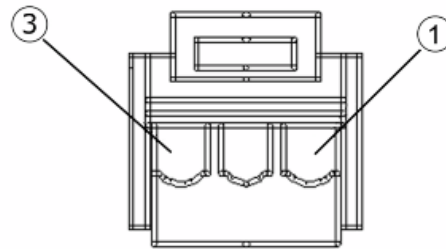
1. Live supply (Red-White)
2. Ground (Black)
3. Electronic control unit (Orange-White)



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**FUEL LEVEL TRANSMITTER CONNECTOR**

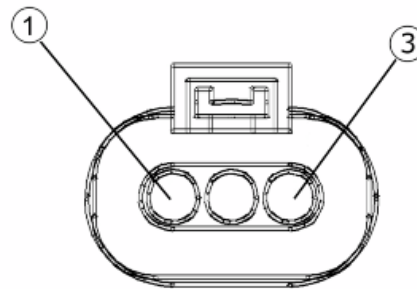
1. Fuel level indicator (White-Green)
2. Ground (Black)
3. Low fuel warning light (Yellow-Green)



---

**COOLANT PUMP CONNECTOR**

1. Ground (Black)
2. Injection load remote control (Black-Green)
3. Injection load remote control (Black-Green)



## INDEX OF TOPICS

ENGINE FROM VEHICLE

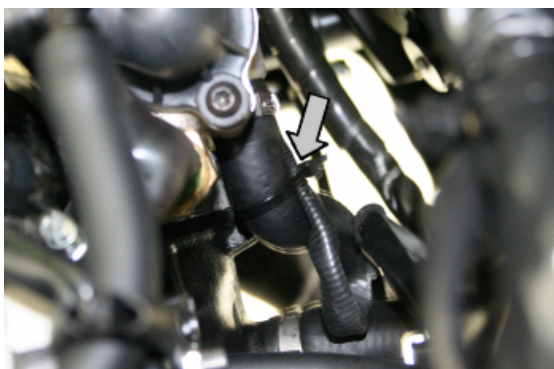
ENG VE

Questa sezione descrive le operazioni da effettuare per lo smontaggio del motore dal veicolo.

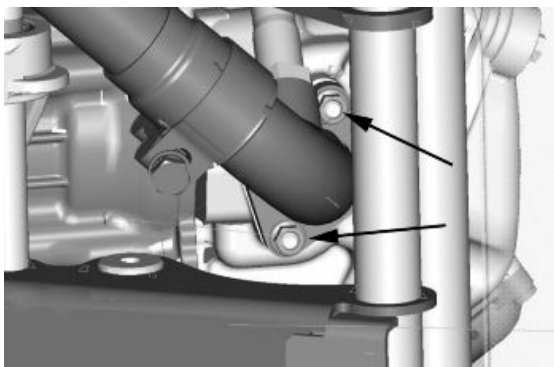
## Exhaust assy. Removal

- Remove the right and left fairings and the spoiler terminals.
- Remove the Lambda probe from its support and disconnect it.

Remove the clamp holding the lambda probe cable to the coolant pipe indicated in the photograph



- Undo the two exhaust manifold fixings on the head. To unscrew the nuts that fix the muffler flange to the head properly, use a jointed wrench that allows, according to the travel direction, to get also at the right nut. That is difficult to do with a traditional straight wrench.



- Undo the three screws that fix the muffler to the supporting arm.
- Remove the full muffler unit.





Remove the lambda probe from the manifold.



**CAUTION: SHOULD IT BE NECESSARY TO REMOVE ONLY THE MUFFLER TIP, ALWAYS REPLACE THE GRAPHITE GASKET BETWEEN STUB AND TIP.**

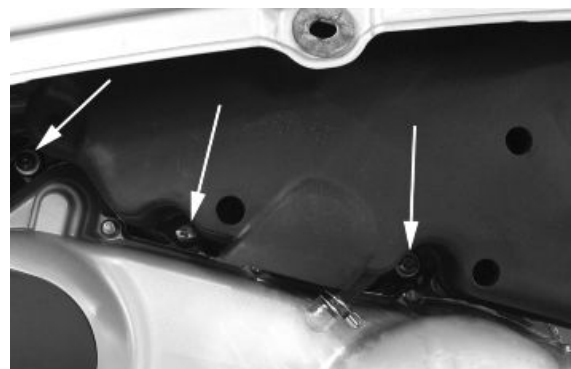
## Removal of the engine from the vehicle

CAUTION



**SUPPORT THE VEHICLE ADEQUATELY.**

- Disconnect the battery.
- Remove the helmet compartment.
- Remove the side fairings and the spoiler terminals.
- Remove the rear brake calliper
- Remove the air cleaner from the housing by unscrewing the three screws indicated in the photograph.

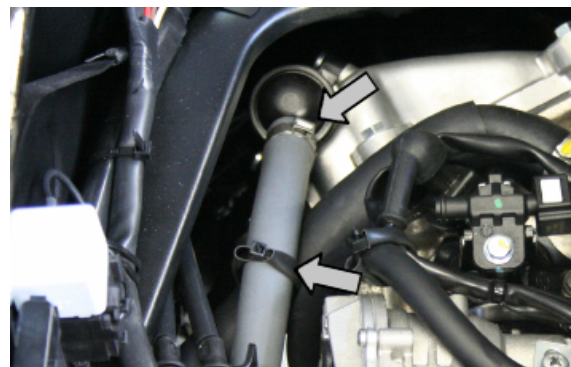


CAUTION



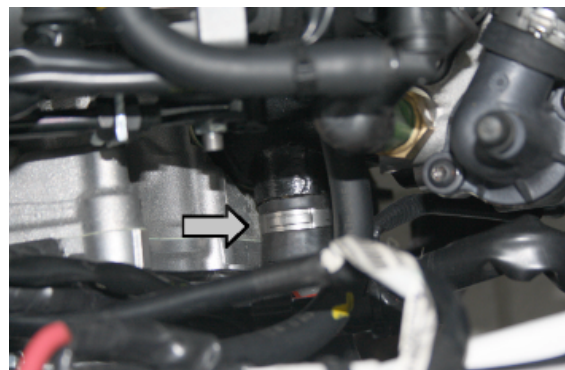
**THIS OPERATION MUST BE CARRIED OUT WHEN THE ENGINE IS COLD.**

- Remove the clamp from the blow-by pipe and take the pipe out; remove the retainer clamp.
- Remove the clamp indicated in the photograph and disconnect the sleeve connecting it to the throttle body.

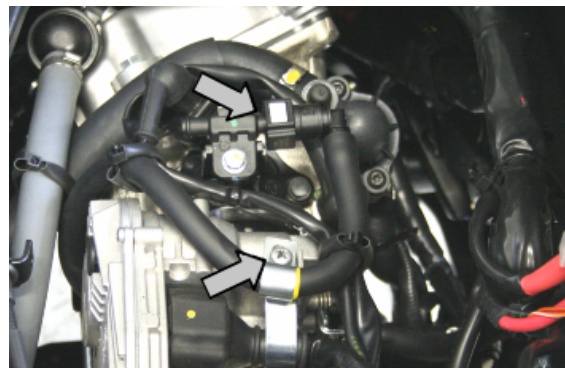




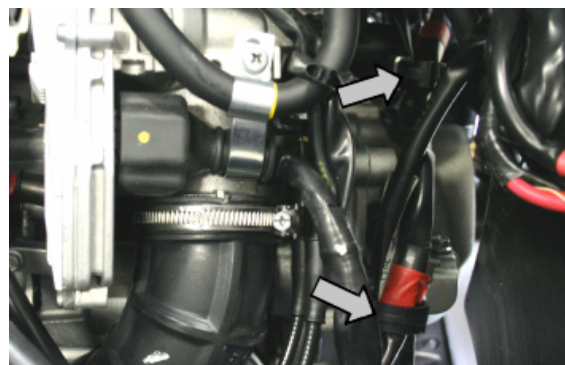
- Get a + 2.5 l container to collect the coolant.
- Remove the coolant inlet pipe to the motor as indicated in the photograph.



- Disconnect the fuel pipe from the injector and remove the screw locking the retainer clamp.
- Disconnect the injector wiring and the throttle body control unit wiring.



- Disconnect the cable harnesses from the two clamps indicated.



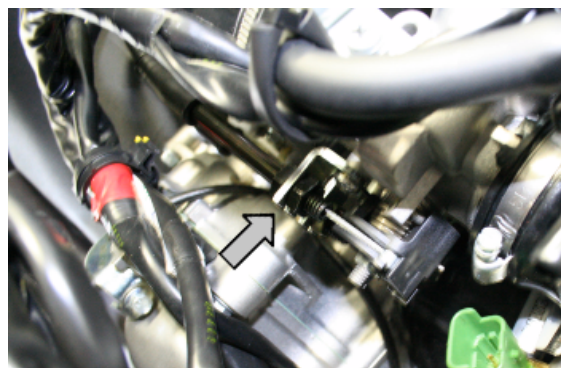
- Remove the coolant outlet pipe from the engine as indicated.



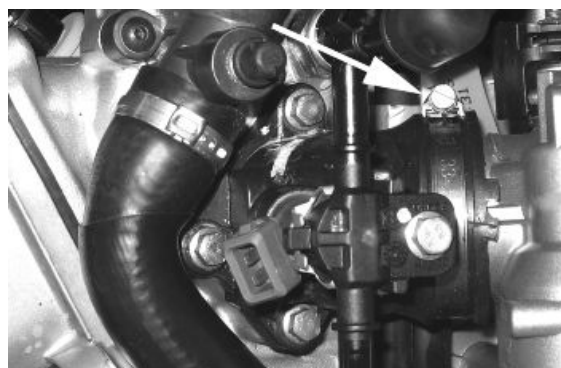
- Remove the spark plug cap.
- Remove the coolant temperature sensor connector indicated in the photo.



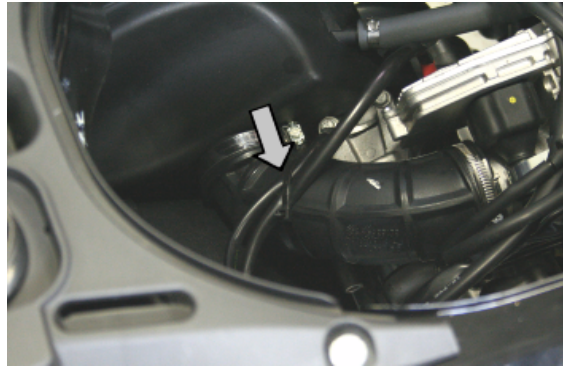
- Remove the throttle control cables from the throttle body by undoing the nuts indicated in the photograph.



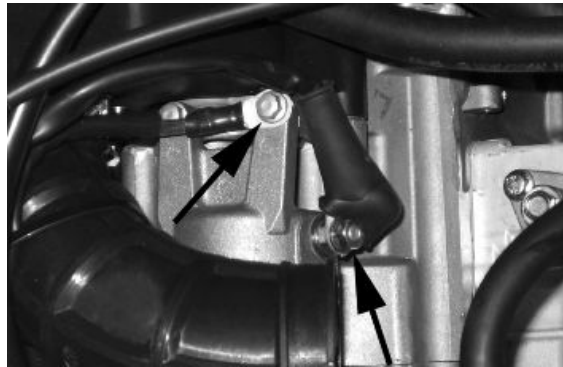
- Loosen the clamp indicated in the photograph and remove the throttle body.



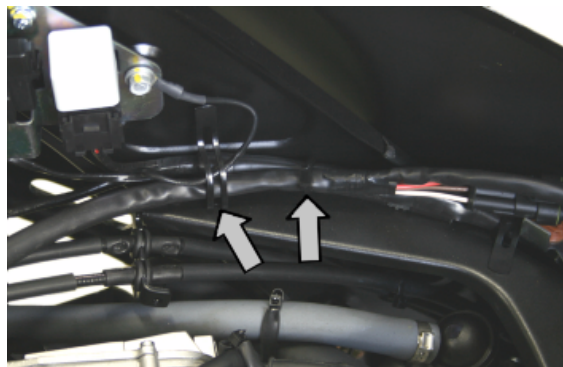
- Remove the clamp retaining the starter motor from the sleeve.



- Remove the positive and negative wiring from the starter motor as shown in the picture.



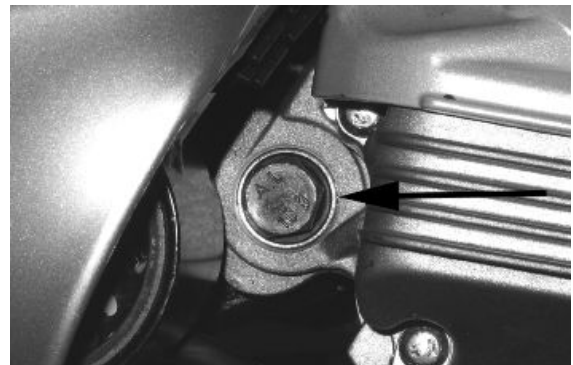
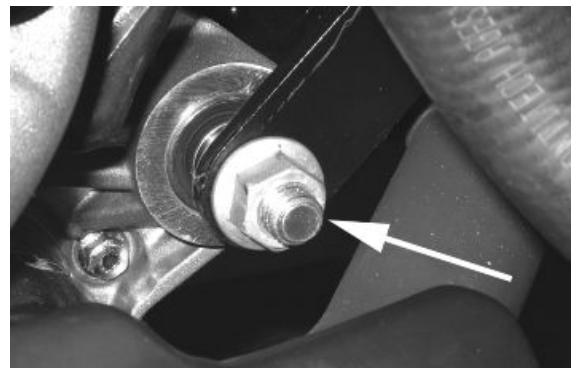
- Disconnect the connectors from the flywheel wiring as shown in the photo.
- Release the cables from the retainer clamps.



- Remove the four retainers of the rear brake pipes from the crankcase.
- Remove the rear shock absorbers.

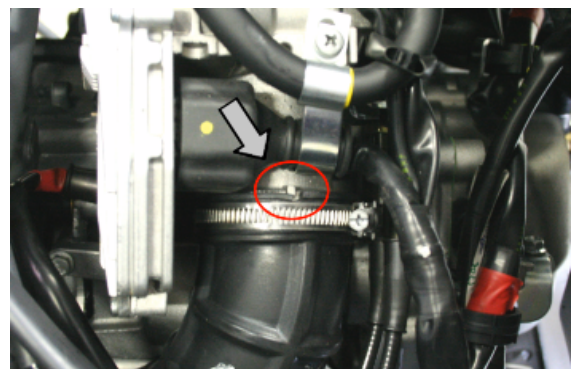


- Remove the engine-swinging arm fixing pin by undoing the nut and operating on the head of the pin as shown in the photograph.
- The engine is now free.



Upon refitting the engine onto the scooter, carry out the removal operations but in reverse order and respect the tightening torques shown in the «Specifications» Chapter.

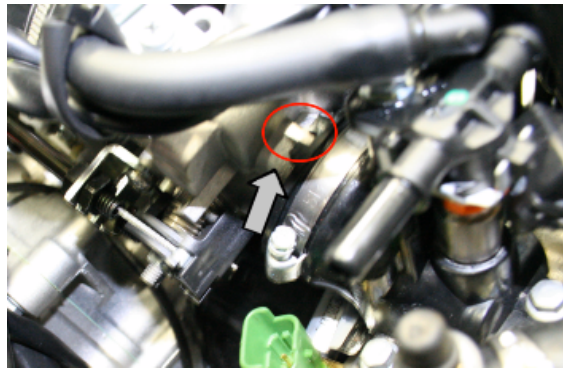
- Check that there is a small clearance when the valve is in abutment against the set screw.
- Check the engine oil level and if necessary, top it up with the recommended type.
- Fill and bleed the cooling circuit.
- Check accelerator and electric devices for correct functioning.



- Pay particular attention to the sleeve, be careful to position the throttle body reference marks as indicated in the picture.

**CAUTION**

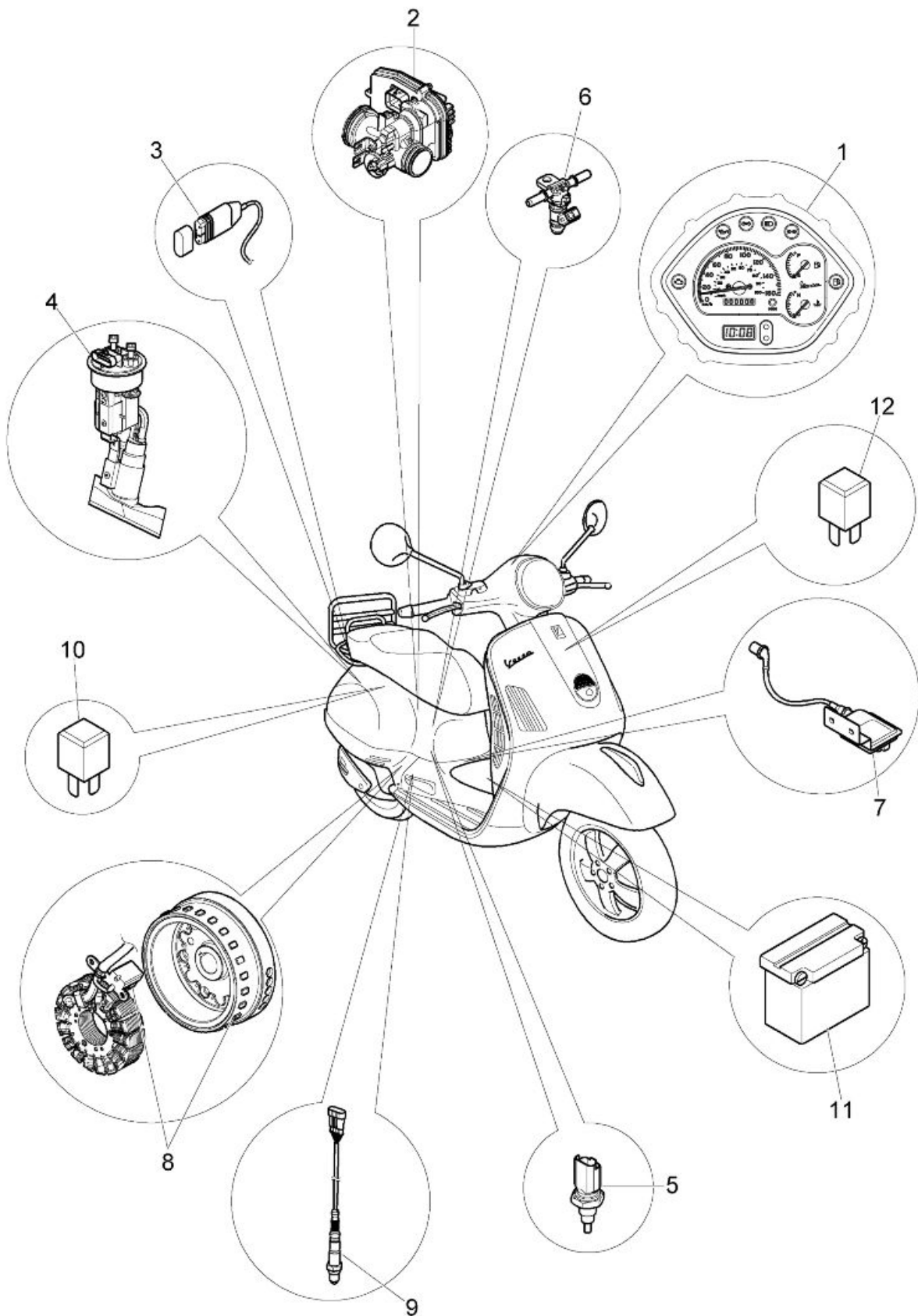
**PAY PARTICULAR ATTENTION TO POSITIONING THE THROTTLE CONTROL TRANSMISSION PROPERLY.**



# INDEX OF TOPICS

INJECTION

INJEC





**COMPONENT TRANSPOSITION**

	Specification	Desc./Quantity
1	Instrument panel	
2	Throttle body and electronic injection control unit (MIU)	
3	Diagnostics socket connector	
4	Fuel pump	
5	Water temperature sensor	
6	Fuel injector	
7	HV coil	
8	Engine speed sensor	
9	Lambda probe	
10	Injection load remote control	
11	Battery	12V - 12 Ah
12	Electric fan remote control	

**MIU injection system**

This vehicle is fitted with an integrated injection and ignition system.

Injection is indirect in the manifold through an electro-injector.

The injection and ignition are timed on the four-stroke cycle by means of a tone wheel keyed on to the crankshaft (24-2 teeth) and pick-up sensor.

Combustion and ignition are managed on the basis of engine revs and throttle valve opening. Further corrections are made according to the following parameters:

- Coolant temperature.
- Intake air temperature
- Lambda probe

The system implements an idle feeding correction with cold engine through a Stepper motor on a by-pass circuit of the throttle valve. The control unit manages the Stepper motor and the injector opening time, thereby ensuring the idle steadiness and the proper combustion.

In all conditions of use, mixture preparation is managed by modifying the injector opening time.

The fuel system pressure is kept constant based on the ambient pressure.

The **fuel system circuit** consists of:

- Fuel pump
- Fuel filter
- Injector
- Pressure regulator

The pump, the filter and the regulator are placed inside the fuel tank on a single support.

The injector is connected by a pipe with fast-release fittings. The pressure regulator is located at the beginning of the circuit.

The fuel pump is controlled by the MIU control unit; this ensures the scooter safety

The **ignition circuit** consists of:

- HV coil
- HV cable
- Shielded cap
- MIU control unit

- Spark plug

The MIU control unit manages ignition with the best advance ensuring four-stroke timing (ignition only in the compression phase) at the same time.

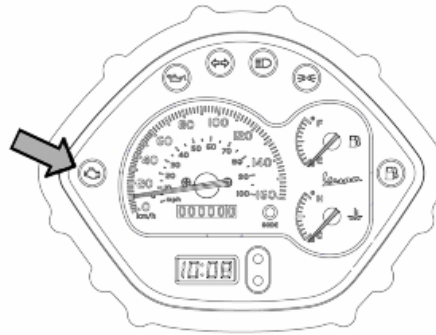
The MIU injection-ignition system controls engine functions by means of a pre-set program.

Should any input signals fail, an acceptable working order of the engine is ensured to allow the user to reach a service station.

Of course, this cannot happen when the rpm-timing signal is missing, or when the failure involves the control circuits:

- Fuel pump
- HV coil
- Injector

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.



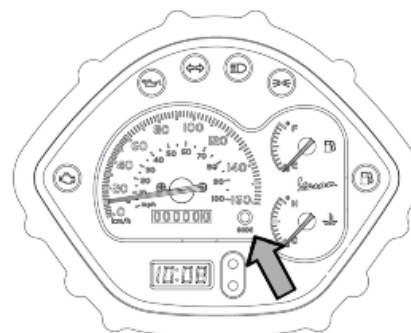
### Specific tooling

#### 020680Y Diagnosis Tool

The MIU injection-ignition system carries out checks on the rpm indicator and the electric fan for radiator cooling.

The MIU control unit has a decoder for the anti-theft immobilizer system.

The MIU control unit is connected to a diagnostic LED on the instrument panel, that also carries out the deterrent flashing functions.



The MIU control unit power supply is furthermore controlled by the emergency switch; to allow further safety of the scooter.

---

## Precautions

### Troubleshooting hints

1 A MIU failure is more likely to be due to the connections than to the components.

Before troubleshooting the MIU system, carry out the following checks:

**A:** Electrical power supply

- a. Battery voltage
- b. Blown fuse
- c. Remote controls
- d. Connectors

**B:** Chassis ground

**C:** Fuel system

- 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 timing
- b. Wrong idle mixture
- c. Incorrect reset of the throttle valve position sensor

2 MIU system 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 MIU. If the fault is fixed by replacing the MIU control unit, install the original control unit again and check if the fault occurs again.

4 When troubleshooting use a multimeter with an internal resistance over 10 Ohm /V. Instruments that are not suitable might damage the MIU control unit. Instruments must be used with definitions over 0.1V and 0.5 W , the precision must be greater than 2%.

---

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 feed system is pressurised at 250 kPa (2.5 BAR). Before disconnecting the fast-release fitting of the power supply pipe, check that there are no naked flames. Do not smoke. Act with caution to prevent spraying in the eyes.

3. When fixing electric components, operate with the 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 vehicle 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 MIU ECU connector, perform the following steps 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 poles when fitting the battery.

11. To avoid causing any damage, disconnect and reconnect the MIU system connectors only if required. Before reconnecting, check that the connectors are dry.

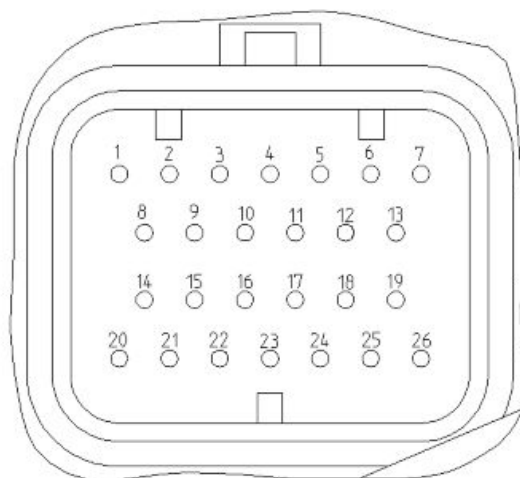
12. When carrying out electric inspections, do not force the tester probes into the connectors. Do not take measurements not specifically foreseen by the manual.

13. At the end of every check performed with the diagnostic tester, remember to protect the system connector with its cap. Failure to observe this precaution may damage the MIU control unit.

14. Before reconnecting the quick couplers of the power supply system, check that the terminals are perfectly clean.

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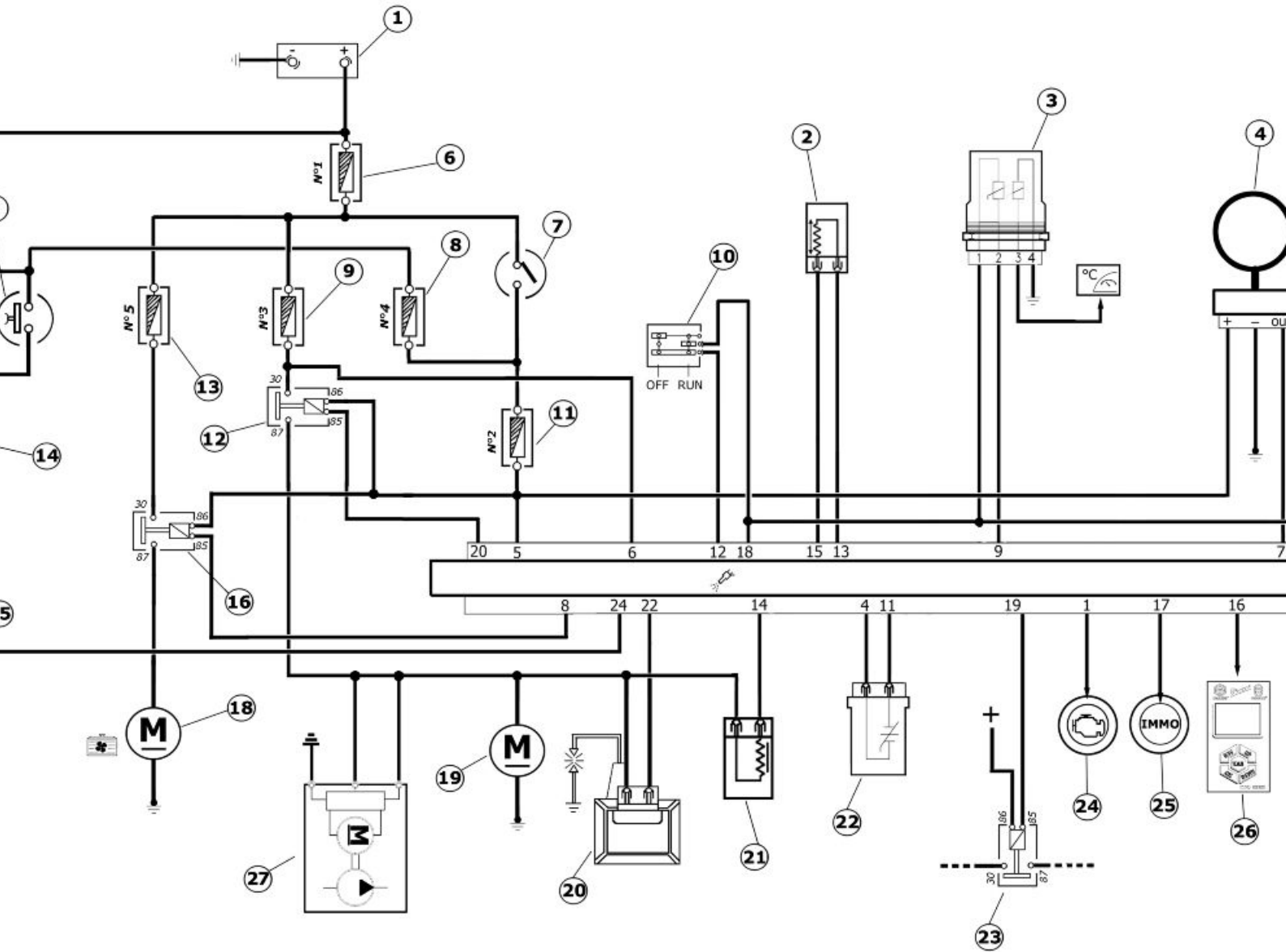
## Terminals setup



1. Injection warning light
2. incomplete
3. incomplete
4. (-) lambda probe
5. (+) live battery
6. (+) battery
7. Immobilizer aerial
8. Electric fan remote control
9. Water temperature sensor
- 10.incomplete
- 11.(+) lambda probe
- 12.Engine stop switch
- 13.(+) engine rpm sensor
- 14.(-) fuel injector
- 15.(-) engine rpm sensor
- 16.Diagnostics socket output
- 17.Immobilizer LED
- 18.Pin short-circuited with pin 26
- 19.(-) low-beam automatic ignition
- 20.(-) injection load remote control
- 21.incomplete
- 22.(-) HV coil
- 23.incomplete
- 24.Start up enabling
- 25.incomplete

26. Ground lead

**EMS circuit diagram**



- 1. Battery 12V - 12 Ah
- 2. Rpm sensor
- 3. coolant temperature sensor
- 4. Immobilizer aerial
- 5. Stop switches
- 6. Fuse No. 1; 30A
- 7. Key switch contacts
- 8. Fuse No. 4; 7.5A

- 9. Fuse No. 3; 15A
- 10.Engine stop switch
- 11.Fuse No. 2; 7.5A
- 12.Injection load remote controls
- 13.Fuse No. 5; 15A
- 14.Starter button
- 15.Start-up remote control switch
- 16.Electric fan remote control
- 17.Starter motor
- 18.Electric fan motor
- 19.Fuel pump
- 20.HV coil
- 21.Injector
- 22.Lambda sensor
- 23.Headlight remote control
- 24."WARNING" light
- 25."IMMOBILIZER" led
- 26.Diagnostics socket output
- 27.Coolant electric pump

## Troubleshooting procedure

### Engine does not start

#### ENGINE DOES NOT START IF ONLY PULLED

Possible Cause	Operation
Immobiliser enabling signal	System not encoded System not efficient, repair according to the indications of the self-diagnosis
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor
Fuel system	Fuel in the tank Fuel pump activation Fuel pressure (low) Injector capacity (low)
Power to the spark plug	Shielded spark plug cap HV coil (secondary insulation)
Parameter reliability	Coolant temperature Distribution timing - injection ignition 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 HV coil Injector Revolution timing sensor Air temperature Coolant temperature
Start-up speed	Starter motor and remote control Battery Ground connections
End of compression pressure Power to the spark plug	End of compression pressure Spark plug Shielded cap HV coil Speed-timing sensor Ignition advance
Fuel system	Fuel pressure (low) Injector capacity (low) Injector sealing (poor)
Correctness of the parameters	Coolant temperature Stepper throttle valve position intake air temperature (steps and actual opening) Cleaning of the auxiliary air pipe and throttle valve; air filter efficiency

## Engine stops at idle

### ENGINE DOES NOT IDLE/ IDLING IS UNSTABLE/ IDLING TOO LOW

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature
Ignition efficiency	Spark plug Ignition timing
Correctness of the parameters	Throttle valve position sensor Stepper Coolant temperature sensor Intake air temperature sensor
Intake system cleaning	Air filter Diffuser and throttle valve Additional air pipe and Stepper
Intake system sealing (infiltrations)	Intake manifold - head Throttle body - manifold Intake sleeve Filter box
Fuel system (low pressure)	Fuel pump Pressure regulator Fuel filter Injector capacity

## Engine does not rev down

### ENGINE DOES NOT RETURN TO IDLING SPEED/IDLING SPEED TOO HIGH

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay



Possible Cause	Operation
	HV coil Injector Revolution timing sensor Air temperature Coolant temperature
Ignition efficiency	Ignition timing
Correctness of the parameters	Throttle valve position sensor Stepper Coolant temperature sensor Intake air temperature sensor
Intake system sealing (infiltrations)	Intake manifold - head Throttle body - manifold Intake sleeve Filter box
Fuel system (low pressure)	Fuel pump Pressure regulator Fuel filter Injector capacity

### Exhaust backfires in deceleration

#### **EXHAUST BACKFIRES WHEN DECELERATING**

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature Lambda probe
Correctness of the parameters	Throttle valve position sensor Stepper Coolant temperature sensor Intake air temperature sensor
Intake system sealing (infiltrations)	Intake manifold - head Throttle body - manifold Intake sleeve Filter box
Fuel system (low pressure)	Fuel pump Pressure regulator Fuel filter Injector capacity
Exhaust system sealing (infiltrations)	Manifold - head Manifold - muffler Muffler welding

### Engine revs irregularly

#### **ENGINE IRREGULAR PERFORMANCE WITH VALVE SLIGHTLY OPEN**

Possible Cause	Operation
Intake system cleaning	Air filter Diffuser and throttle valve Additional air pipe and Stepper
Intake system sealing	Intake sleeve Filter box
Ignition system	Spark plug wear check
Parameter reliability	Throttle valve position signal Coolant temperature indicator Intake air temperature indicator Ignition advance
TPS reset successful	TPS reset successful
Presence of faults detected by the self diagnosis	Pump relay HV coil

**Possible Cause****Operation**

Injector  
 Revolution timing sensor  
 Air temperature  
 Coolant temperature  
 Lambda probe

**Poor performance at full throttle****POOR ENGINE PERFORMANCE AT FULL POWER/ ENGINE IRREGULAR PERFORMANCE ON PICKUP****Possible Cause****Operation**

Presence of faults detected by the self diagnosis

Pump relay  
 HV coil  
 Injector  
 Revolution timing sensor  
 Air temperature  
 Coolant temperature  
 Lambda probe

Spark plug power supply

Spark plug  
 Shielded cap  
 HV cable  
 HV coil

Intake system

Air filter  
 Filter box (sealing)  
 Intake sleeve (sealing)

Parameter reliability

Throttle valve position signal  
 Coolant temperature indicator  
 Intake air temperature indicator  
 Ignition advance

Fuel system

Fuel level in the tank  
 Fuel pressure  
 Fuel filter  
 Injector capacity

**Engine knocking****PRESENCE OF KNOCKING (COMBUSTION SHOCKS)****Possible Cause****Operation**

Presence of faults detected by the self diagnosis

Pump relay  
 HV coil  
 Injector  
 Revolution timing sensor  
 Air temperature  
 Coolant temperature  
 Lambda probe

Ignition efficiency

Spark plug

Parameter reliability

Throttle valve position signal  
 Coolant temperature indicator  
 Intake air temperature indicator  
 Ignition advance

Intake system sealing

Intake sleeve  
 Filter box

TPS reset successful

TPS reset successful

Fuel system

Fuel pressure  
 Fuel filter  
 Injector capacity  
 Fuel quality

Selection of the cylinder base gasket thickness

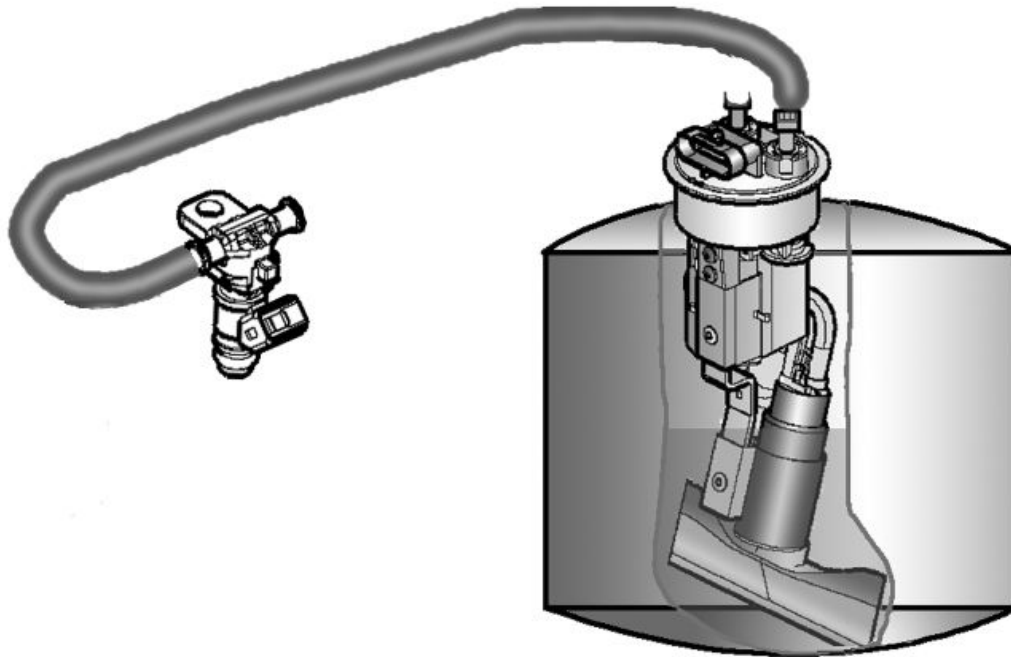
Selection of the cylinder base gasket thickness

## Fuel supply system

The fuel system circuit includes the electric pump, the filter, the pressure regulator, the electro-injector and the fuel delivery pipes.

The electrical pump is located in the tank from which the fuel is pumped and sent to the injector through the filter.

The pressure is controlled by the pressure regulator situated in the pump assembly in the tank.



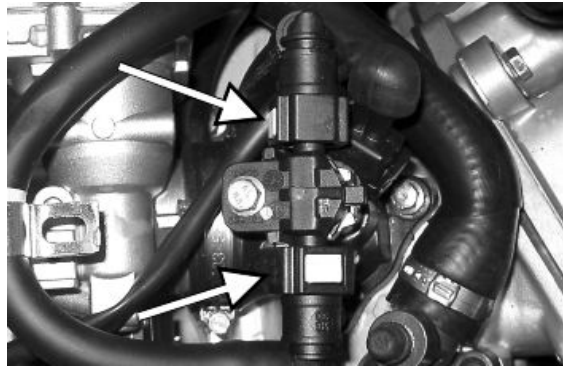
## Removing the butterfly valve

Remove the helmet compartment.

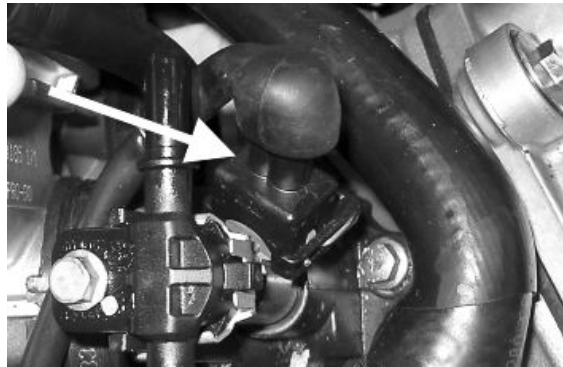
Remove the fuel piping clamping screw indicated in the figure.



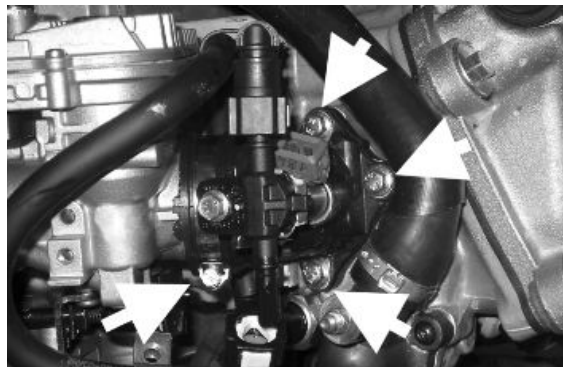
Remove the fast-release fittings from the injector support.



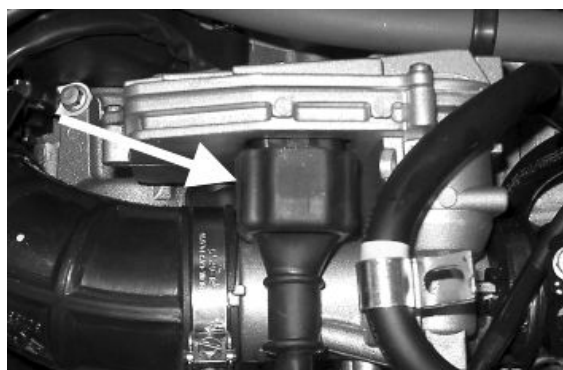
Remove the injector connector.



Remove the three screws fixing the manifold to the cylinder head and the clip fixing the throttle body to the manifold.



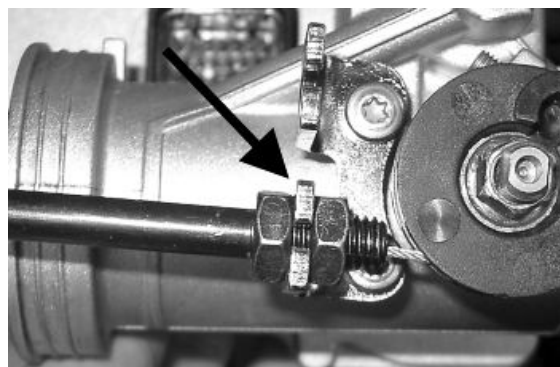
Remove the MIU ECU connector.



Remove the clip fixing the throttle body to the air cleaner bellows.

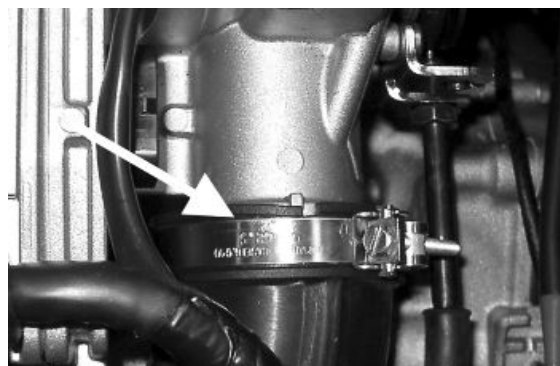


Remove the gas command fitting as indicated in the picture

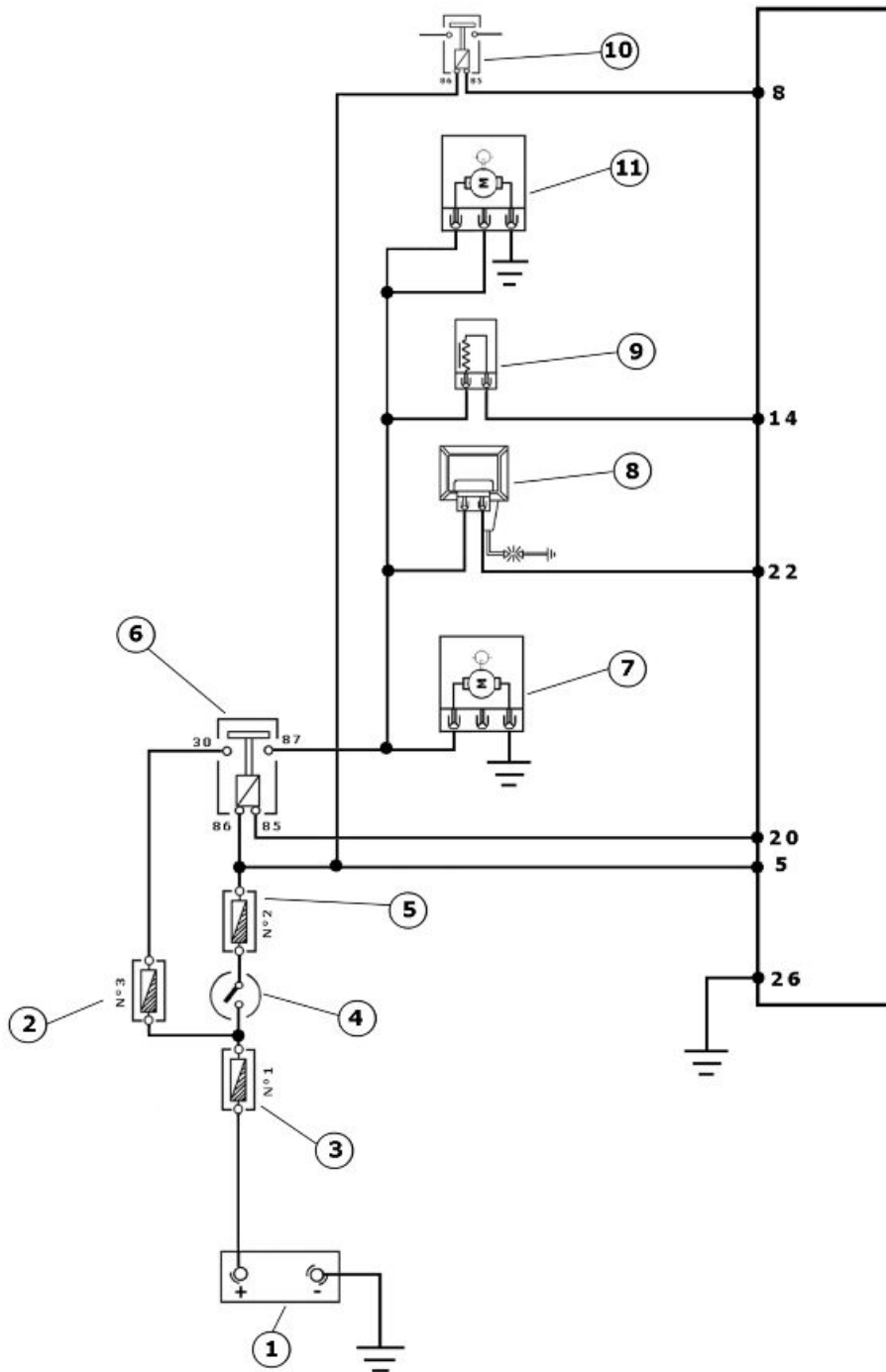


### Refitting the butterfly valve

To refit, perform the operations in the reverse order from the removal operations being careful to position the clip fixing the throttle body to the air filter bellows at 45° as shown in the picture.



**Pump supply circuit**



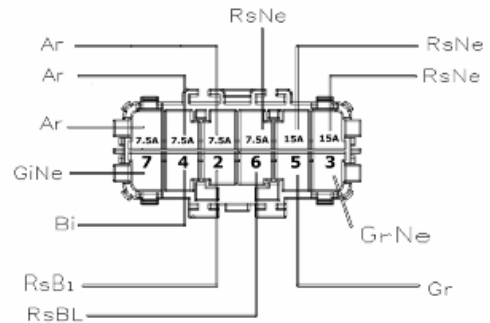
- 1. Battery 12V
- 2. Fuse No. 3; 15A
- 3. Fuse No. 1; 30A
- 4. Key switch contacts

5. Fuse No. 2; 7.5A
6. Injection load remote control
7. Fuel pump
8. HV coil
9. Fuel injector
10. Electric fan remote control
11. Coolant electric pump

When switched to "ON", the fuel pump starts to rotate for two seconds and then stops. When the engine starts up, in the presence of rpm timing signal the pump is continuously supplied.

### ELECTRICAL DATA

- Pump winding resistance ~ 1.5 Ohm
- Input current during normal functioning 1.4 ÷ 1.8 A
- Input current to the closed hydraulic circuit ~ 2 A (to be checked with specific tool for fuel pressure control, choking the circuit on the return pipe)



Check that the injection load 15A fuse No. 3 works properly.

Check that the 7.5A fuse No. 2 for live control unit power works properly.

Check the efficiency of the injection load remote control. Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm  
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.



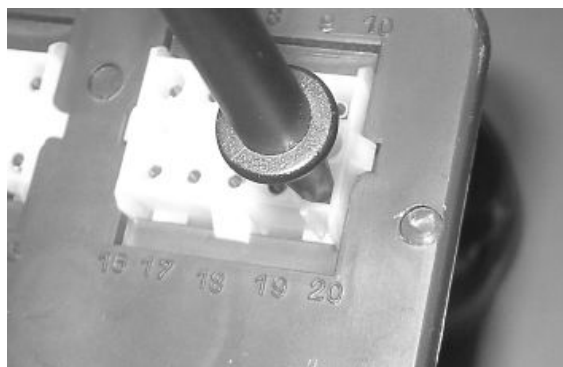
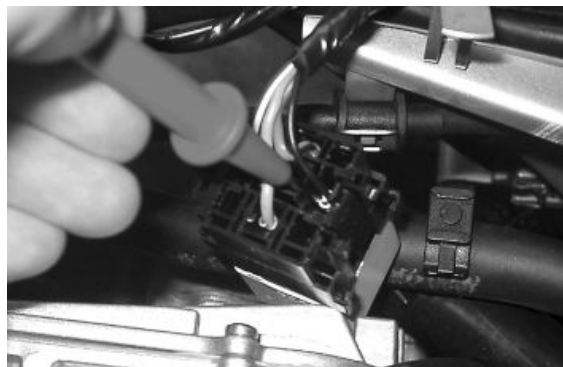
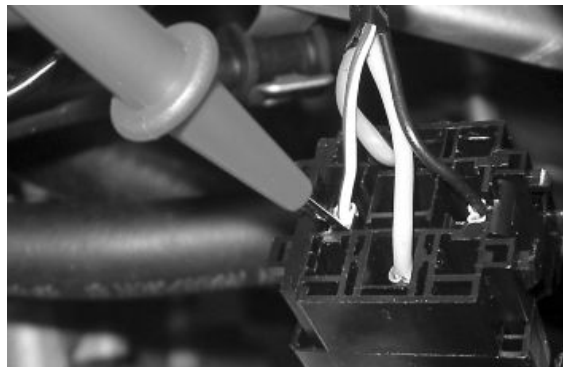
Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for 2 seconds, between the Red-White cable and Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable between the fuse box and the remote control base



and of the Black-Purple cable between the pin 20 of the control unit and the remote control base.

**N.B.**

**CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).**

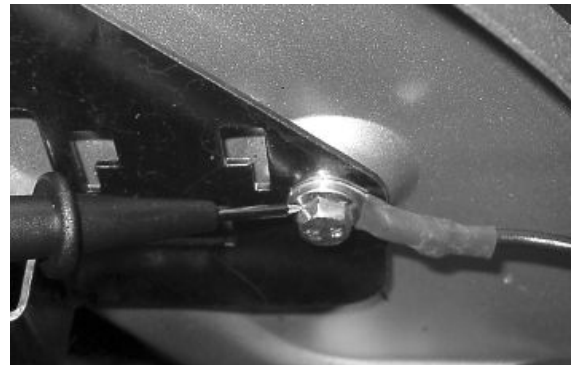
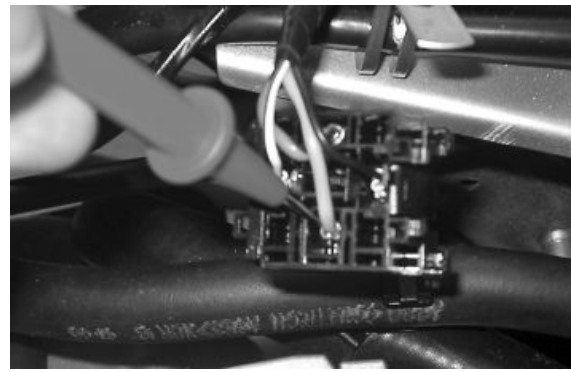




Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none, check the continuity of the grey/black cable between the fuse box (No. 3 15 A) and the remote control base.

**N.B.**

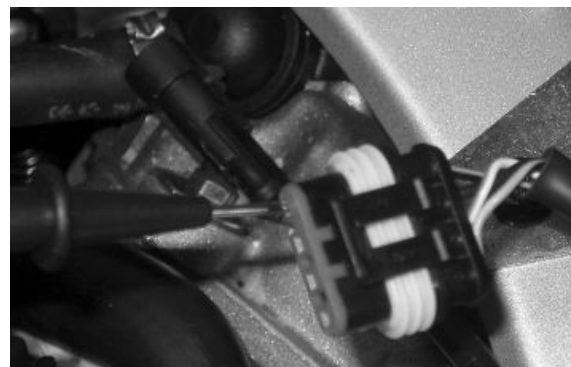
**CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).**



## pump circuit 6

Check, on switching to "ON", that there is battery voltage, for about two seconds, to the Black-Green cable of the pump connector and ground with pump connector disconnected. Otherwise, check the continuity of the Black-Green cable between the pump connector and the remote control base. Check the efficiency of the ground line of the fuel pump by measuring the continuity between the pump connector black cable, system side, and the ground.

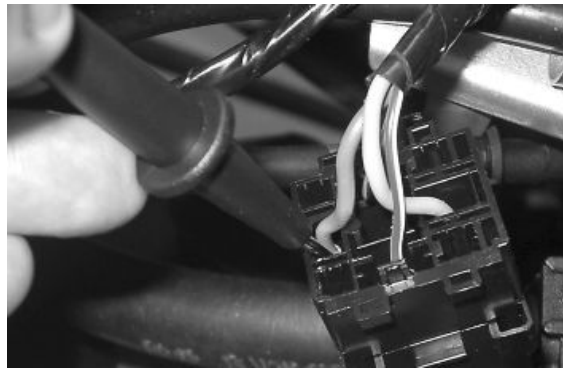
If, when switching to "ON", the pump continues to turn after two seconds of activation, check, with the control unit disconnected and the injection load re-



mote control disconnected, that the Black-Purple cable (pin 20 on the interface wiring) is insulated from the ground.

### Specific tooling

020331Y Digital multimeter



## 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 the battery voltage > 12 V check that the fuel pressure is 2.5 BAR and that the input current is 1.4 to 1.8 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. 2.5 BAR. Check that within 15 seconds the pump has a flow rate of approx. 110 cm<sup>3</sup>.

### Specific tooling

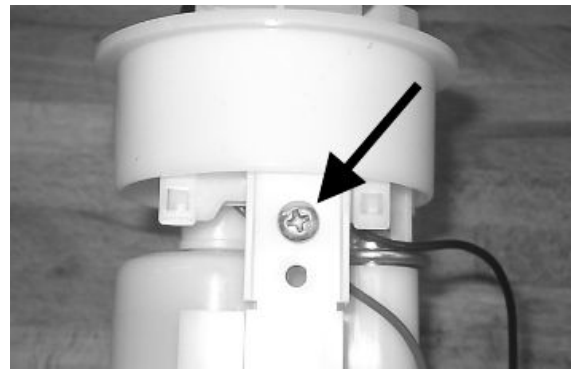
020480Y Petrol pressure check set

## Fuel filter check

Disconnect the terminals from the electric pump



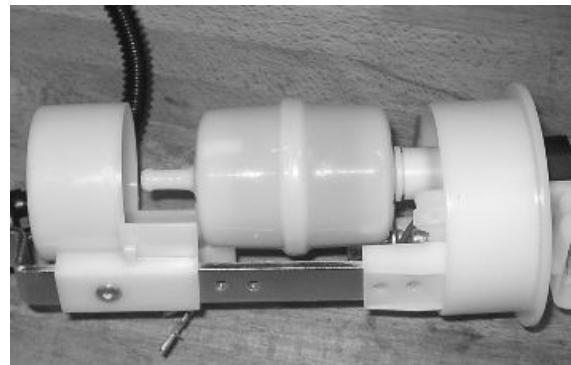
Remove the screw shown in the picture



Remove the clip fixing the piping to the filter shown in the picture



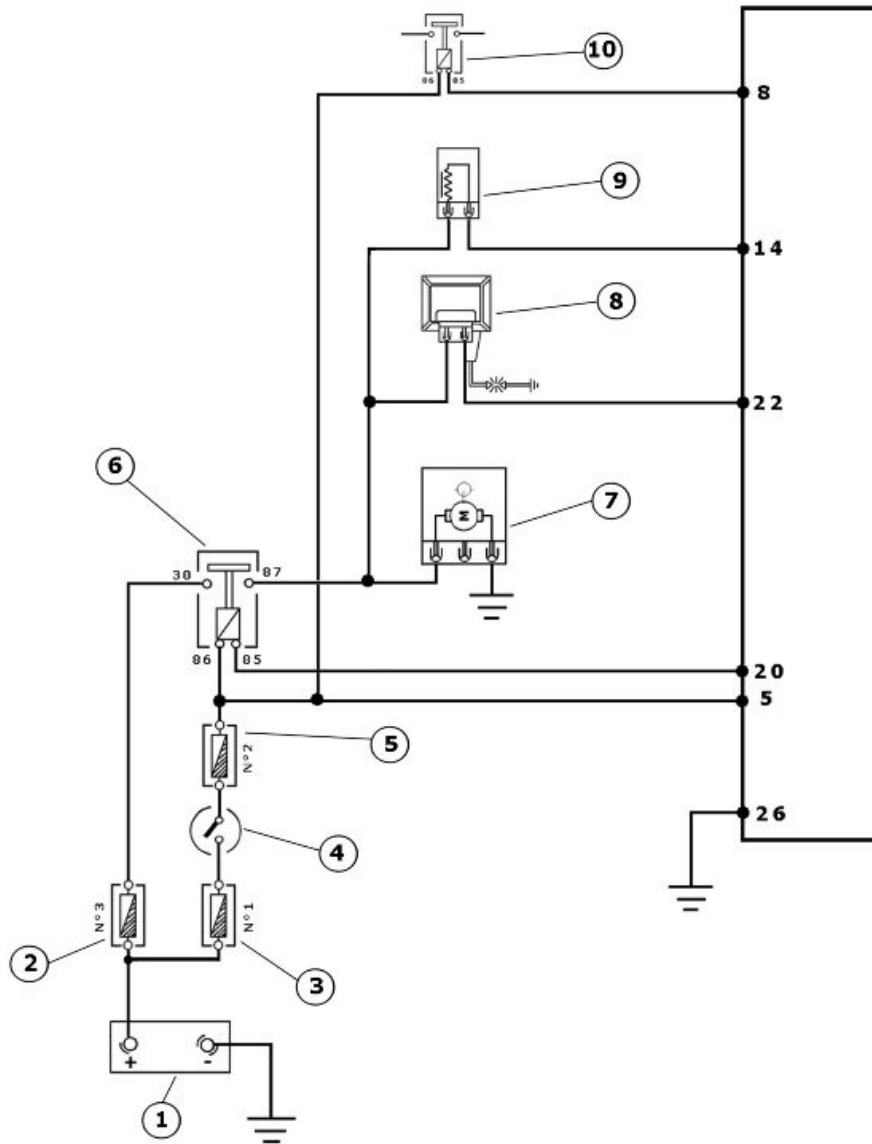
Separate the lower part of the pump mounting as shown in the picture.



Remove the filter from the pump mounting



Inspecting the injector circuit



1. Battery 12V
2. Fuse No. 3; 15A
3. Fuse No. 1; 30A
4. Key switch contacts
5. Fuse No. 2; 7.5A
6. Injection load remote control
7. Fuel pump
8. HV coil

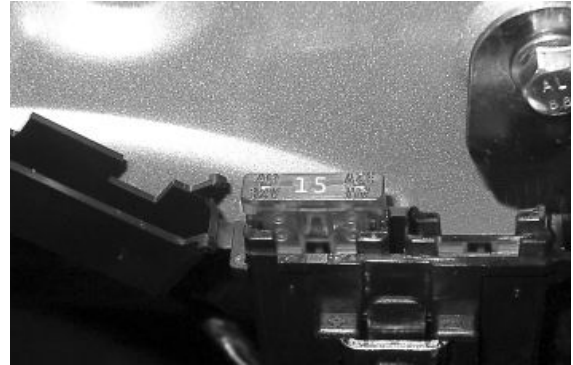
9. Fuel injector

10. Electric fan remote control

Check the resistance at the injector ends:  $14.5 \pm 5\%$  Ohm

Check that the injection load 15A fuse No. 3 works properly.

Check that the 7.5A fuse No. 2 for live control unit power works properly.



Check the efficiency of the injection load remote control. Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm

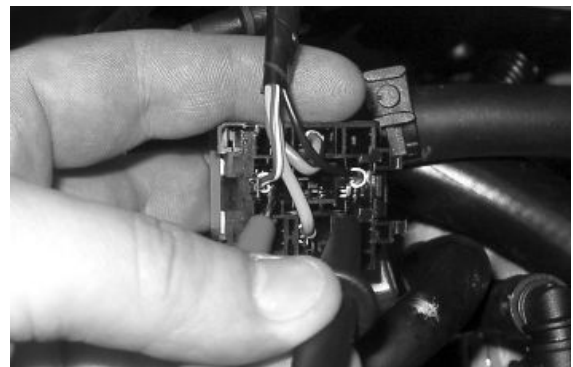
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.

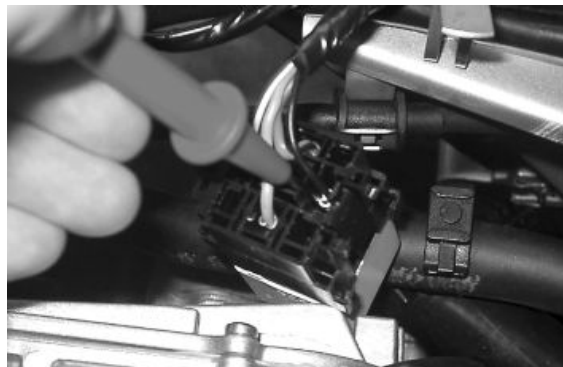
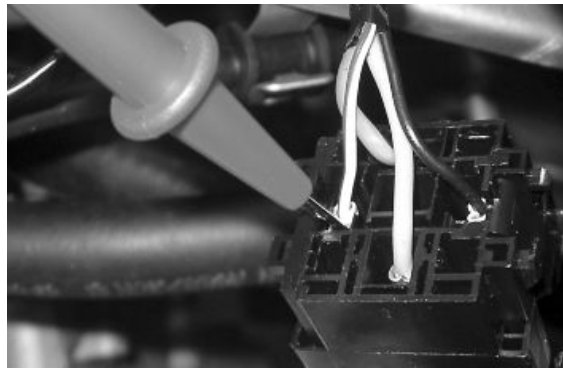


Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for two seconds, between the Red-White cable and Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable between the fuse box under the saddle hinge and the remote control base and of the Black-Purple cable between pin 20 of the control unit and the remote control base.

**N.B.**

**CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).**

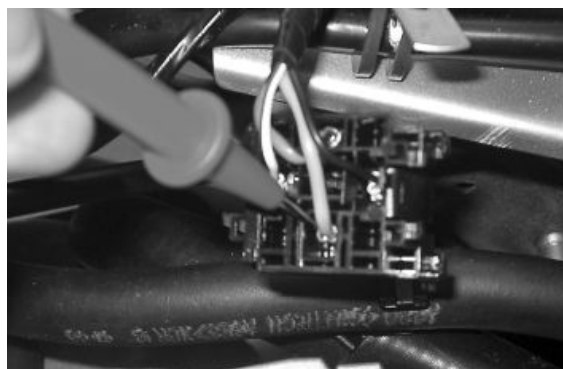


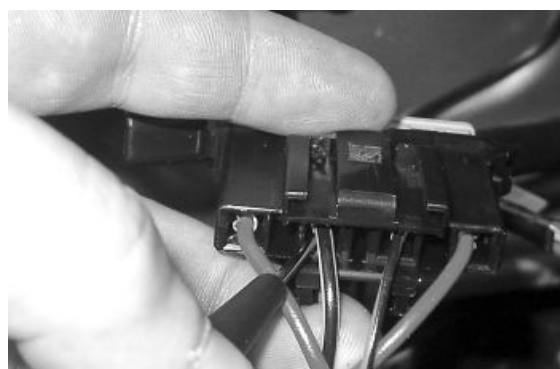
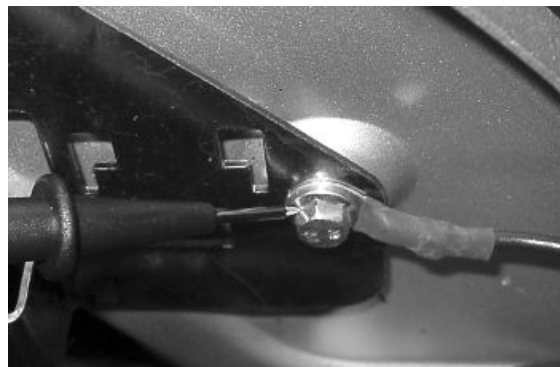


Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none, check the continuity of the grey/black cable between the fuse box (No. 3 15 A) and the remote control base.

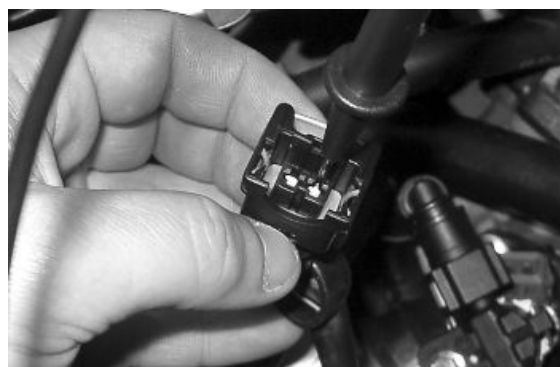
**N.B.**

**CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).**





With the control unit and the injector disconnected, check the continuity of the Red-Yellow cable between pin 14 of the interface wiring and the injector connector



Switch to «ON» and check if there is voltage, with injector disconnected and control unit connected, between the Black-Green cable of the injector connector and the ground lead

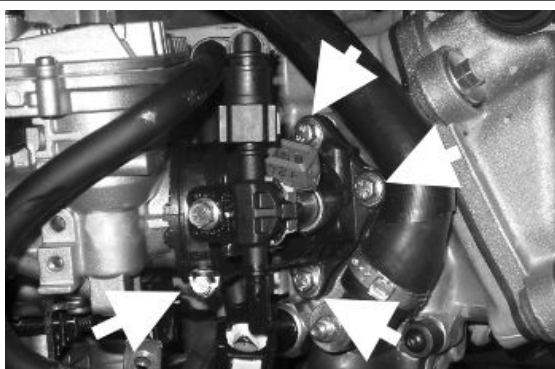


With injector disconnected and the injector load remote control disconnected, check the continuity of the Black-Green cable between the injector connector and remote control base.



## Inspecting the injector hydraulics

To carry out the injector check, remove the intake manifold by removing the three clamping screws at the head and the clip connecting the control unit to the manifold.



Install the appropriate tool for checking fuel pressure and position the manifold over a container graduated by at least 100 cm<sup>3</sup>. Connect the injector with the cable making up part of the supply for the injection tester. Connect the clamps of the cable to an auxiliary battery. Activate the fuel pump with the active diagnosis. Check that, within fifteen seconds, approximately 40 cm<sup>3</sup> of fuel is dispensed with an adjustment pressure of approximately 2.5 BAR.

### Specific tooling

**020480Y Petrol pressure check set**





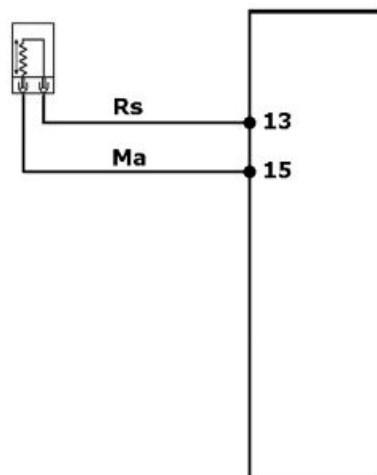
Proceed with the injector seal test.

Dry the injector outlet with a blast of compressed air. Activate the fuel pump. Wait for one minute, making sure there are no leaks coming from the injector. Slight oozing is normal.

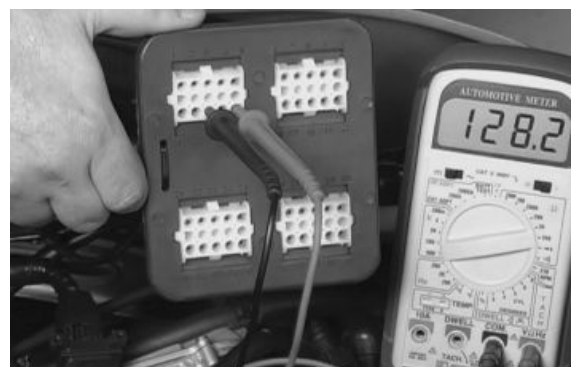
Value limit = 1 drop per minute



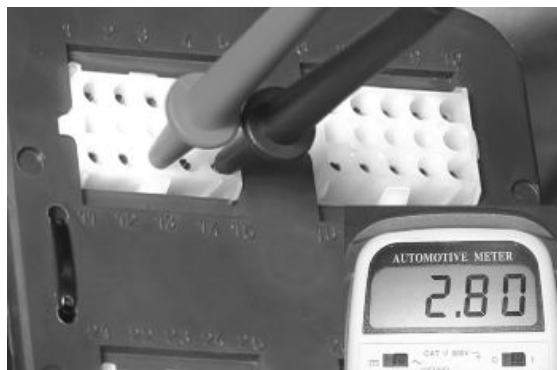
## Tachometer



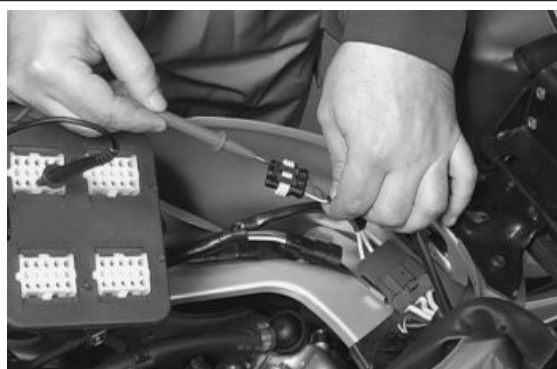
With wiring disconnected from the control unit and connected to the system, check that the sensor resistance between pins 13 - 15 is between 100 and 150 Ohm at an engine temperature of approximately 20°



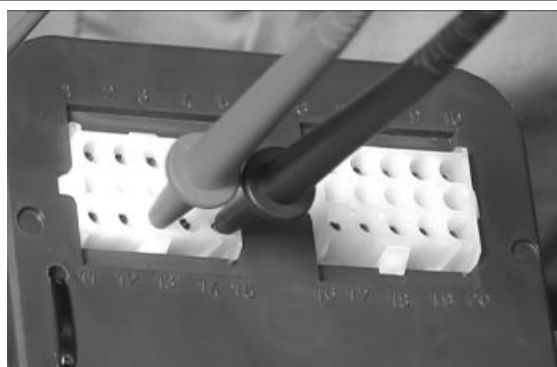
Disconnect the fuel pipe connector. Start up the engine and wait for it to stop. With the wiring connected to the control unit and system try to start up the engine and check that the voltage between pins 13 and 15 is around 2.8 V



With the interface cable harness disconnected from the control unit, check continuity between pin 13 and the red cable of the engine speed sensor connector and between pin 15 and the brown cable of the engine speed sensor connector



With the interface wiring and rpm sensor connector disconnected from the control unit, check that the Red and Brown cables (pin 13 - 15) are isolated from each other and insulated from the ground.

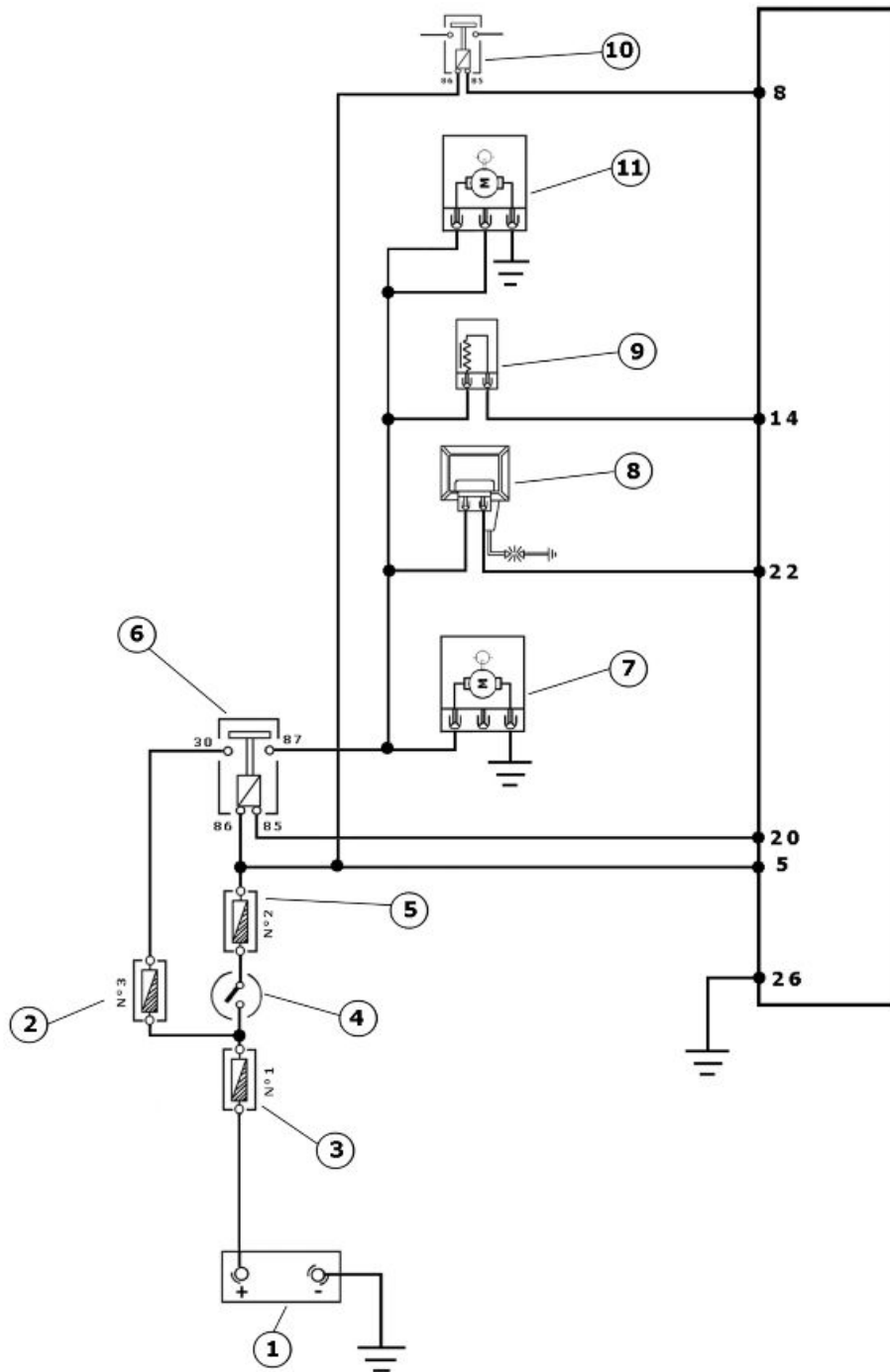


### Specific tooling

**020481Y Control unit interface wiring**

**020331Y Digital multimeter**

HT coil



1. Battery 12V
2. Fuse No. 3; 15A
3. Fuse No. 1; 30A
4. Key switch contacts

5. Fuse No. 2; 7.5A
6. Injection load remote control
7. Fuel pump
8. HV coil
9. Fuel injector
10. Electric fan remote control
11. Coolant electric pump

The ignition system is integrated with the injection and it is a high-efficiency inductive type ignition.

The control unit manages two important parameters:

- Ignition advance

This is optimised according to the engine rpm, to the engine load, temperature and ambient pressure

With idle engine, it is optimised to obtain the stabilisation of the speed at  $1450 \pm 50$  R/1'.

- Magnetisation time

The coil magnetisation time is controlled by the control unit. The ignition power is increased during the engine start-up phase.

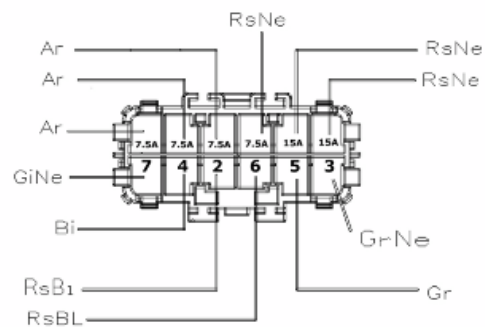
The injection system recognises the 4-stroke cycle and therefore, ignition is only controlled during compression.

### Specific tooling

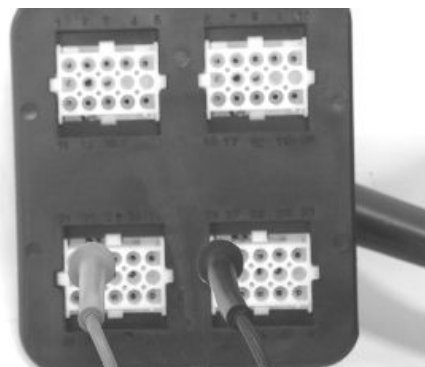
#### 020331Y Digital multimeter

Check that the injection load 15A fuse No. 3 works properly.

Check that the 7.5A fuse No. 2 for live control unit power works properly.

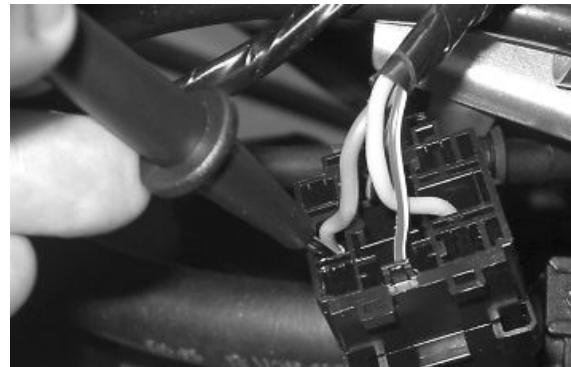
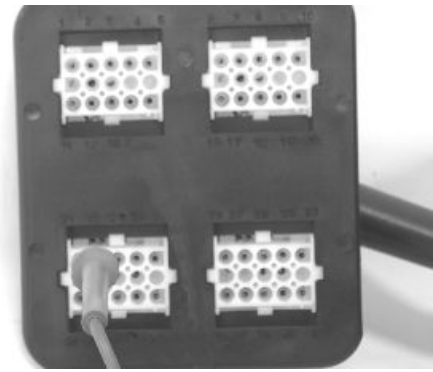


Check there is voltage between pins 22 and 26 of the interface wiring for around two seconds when switching to «ON».



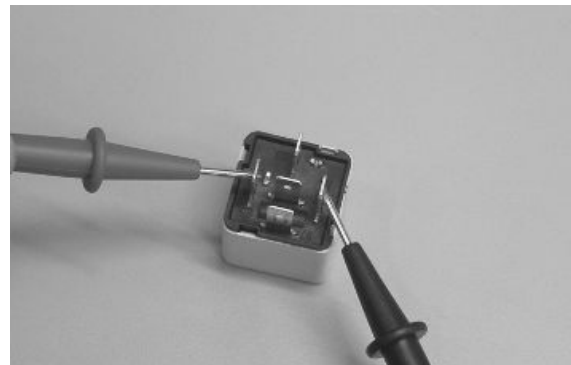
Check the resistance of the primary coil between pin 22 of the interface wiring and the green black cable of the injection load remote control base with the control unit disconnected and the remote control disconnected.

Resistance of the primary =  $0.5 \pm 8\%$  Ohm



Check the efficiency of the injection load remote control. Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm

Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.

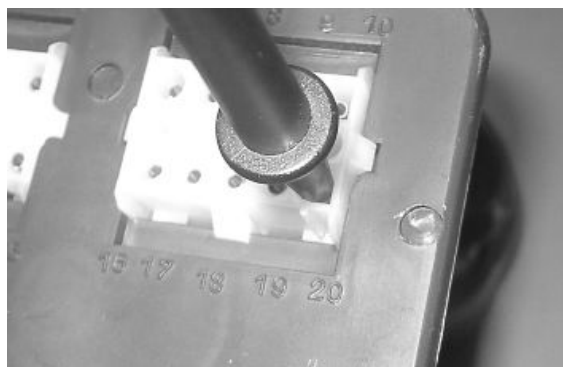
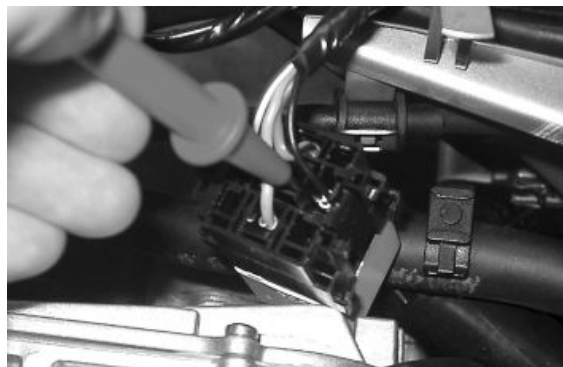
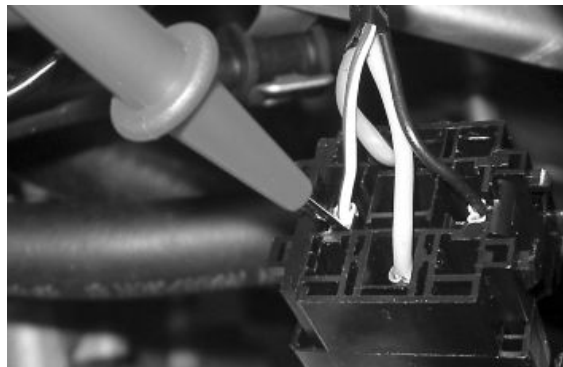


Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for 2 seconds, between the Red-White cable and Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable between the fuse box and the remote control base and of the Black-Purple cable between the pin 20 of the control unit and the remote control base.

**N.B.**

**CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).**

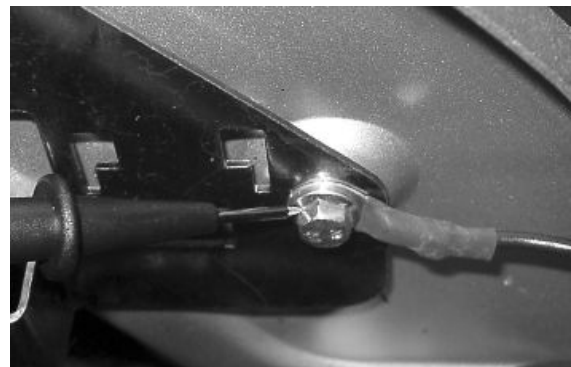
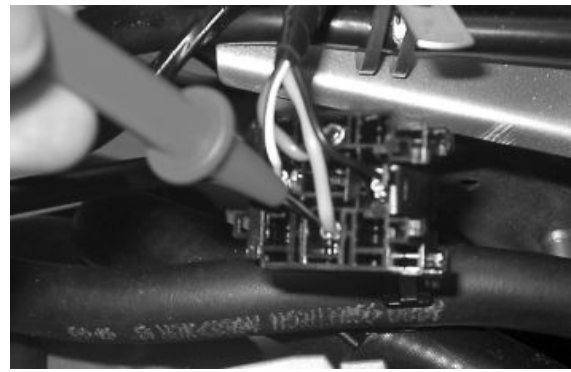




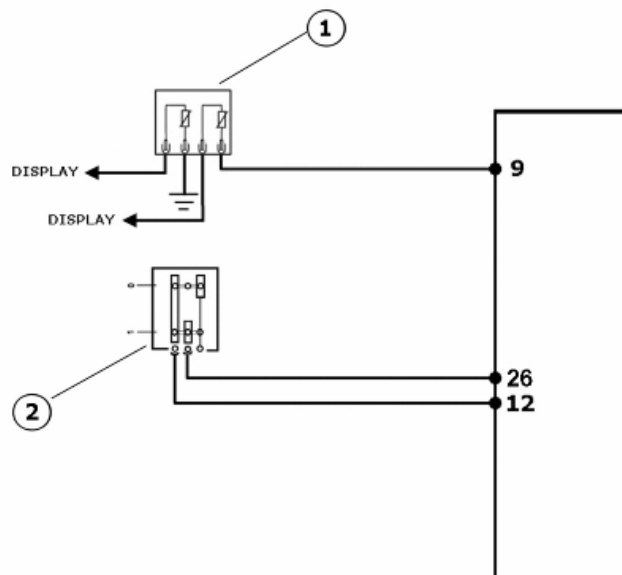
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none, check the continuity of the grey/black cable between the fuse box (No. 3 15 A) and the remote control base.

**N.B.**

**CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).**



**Coolant temperature sensor**



**TEMPERATURE SENSOR 1**

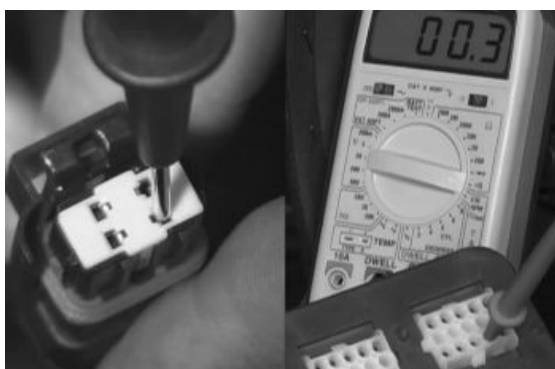
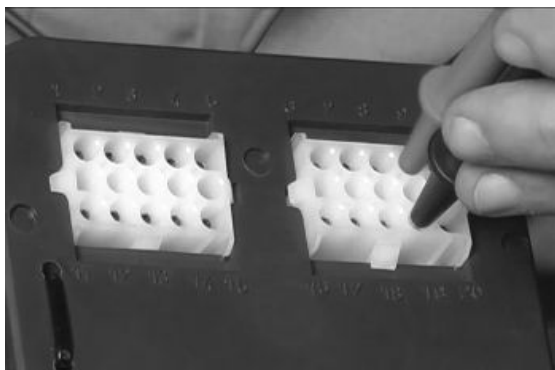
	Specification	Desc./Quantity
1	Water temperature sensor	
2	Engine stop switch	

With the control unit side connector disconnected and the coolant temperature sensor connector connected, check the resistance between pins 9 and 26 in relation to the engine temperature.

$20^{\circ} = 2500 \pm 100 \Omega$

$80^{\circ} = 308 \pm 6 \Omega$

With the control unit side connector disconnected and the coolant temperature connector disconnected, check the insulation between the two light blue/green and pink/yellow cables



## 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».

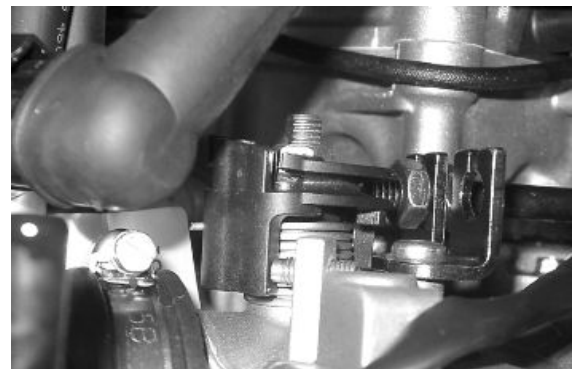
Select the functions of the diagnostic tester on «TPS RESET».

### Specific tooling

020680Y Diagnosis Tool



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.**

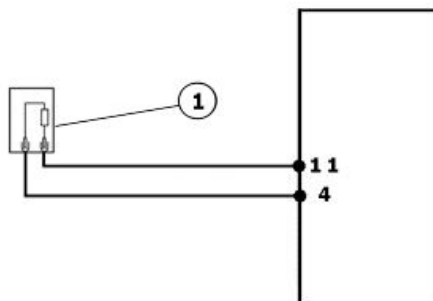
**THE TPS RESET PROCEDURE MUST NOT BE CARRIED OUT WITH A USED THROTTLE BODY BECAUSE POSSIBLE VALVE WEAR AND STOP WEAR FOR THE MINIMUM OPENING MAKE THE AIR FLOW DIFFERENTLY FROM THAT OF PRE-CALIBRATION.**

Given that the TPS resetting is also done when the control unit is replaced, place the control unit - filter box bellows at 45° during the refitting operation as shown in the picture.



## Lambda probe

### SIGNAL CONTROL

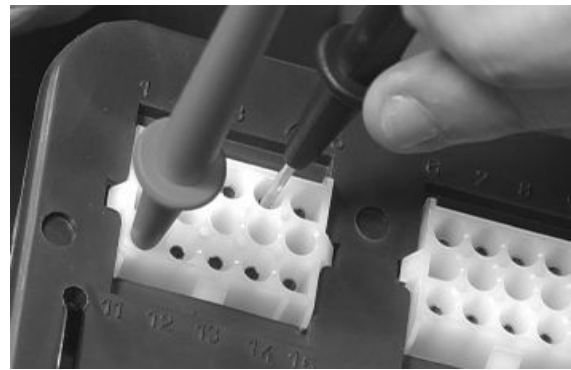


1. Lambda probe

Install the electronic control unit interface wiring.  
Start the engine and warm up until the electric fan switches on.

Use an analogue multimeter with a direct voltage scale measuring down to 2 V.

Place the tips of the multimeter between pins 4 (-) and 11 (+)

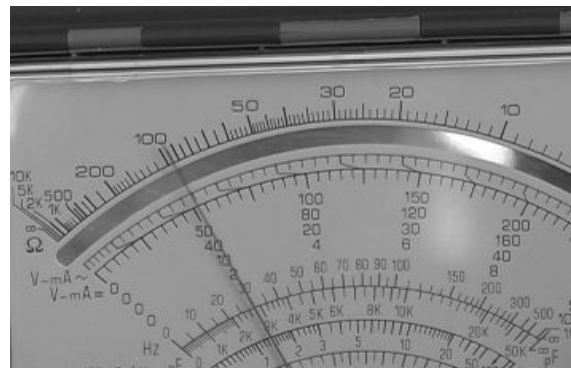


With the engine running at idle speed, check that the voltage oscillates between 0V and 1V

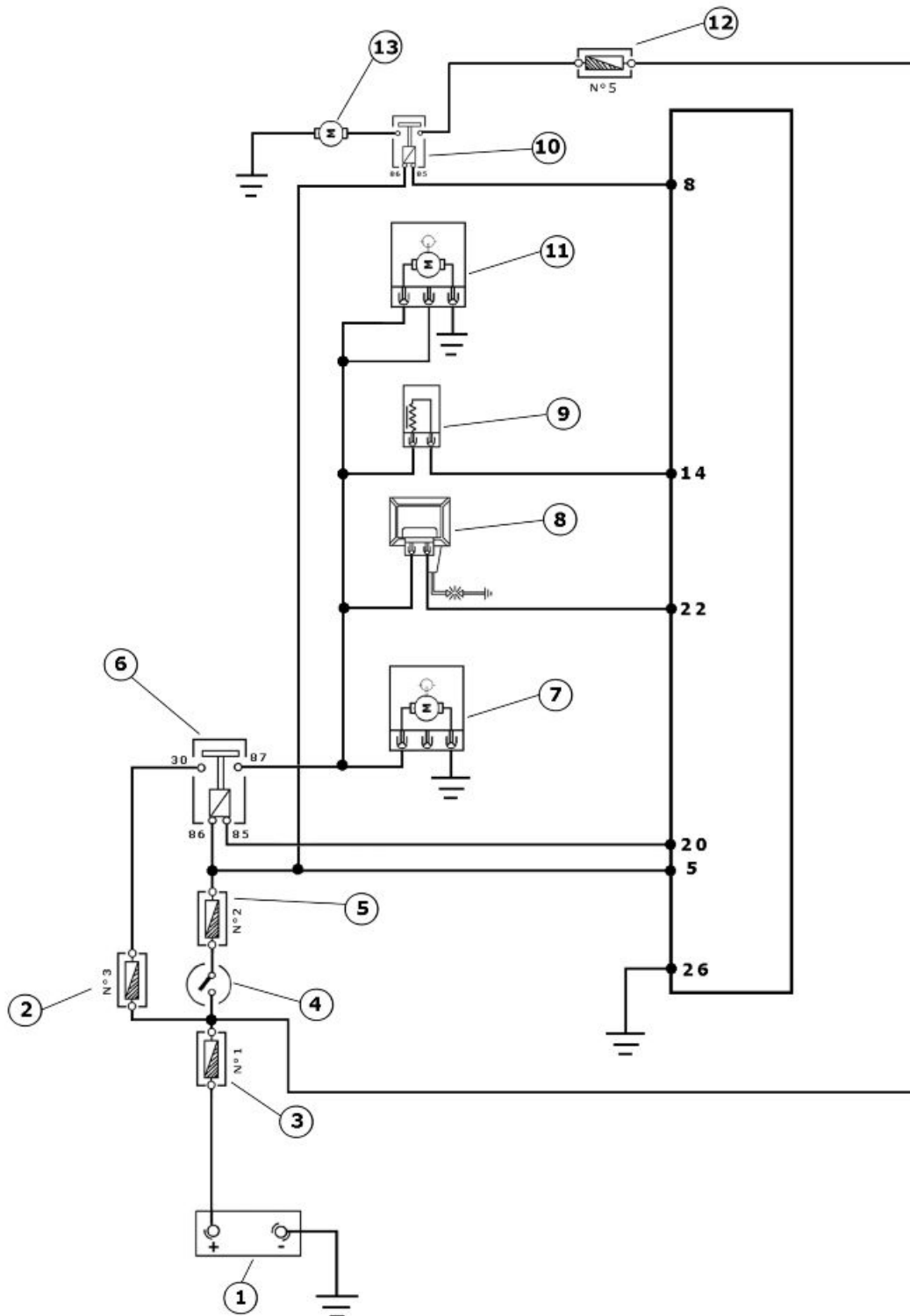
With the throttle valve completely open, the voltage is approx. 1V.

During the closing phase, the voltage is approx. 0V.

If the voltage remains constant, the sensor may be damaged. Remove the sensor and check that there are no oil or carbon deposits inside it..



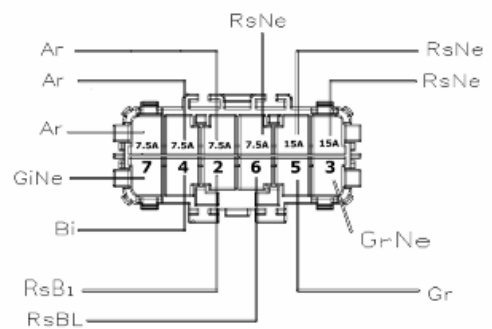
Impianto elettroventilatore



1. Battery 12V
2. 15A fuse No. 3
3. 30A fuse No. 1

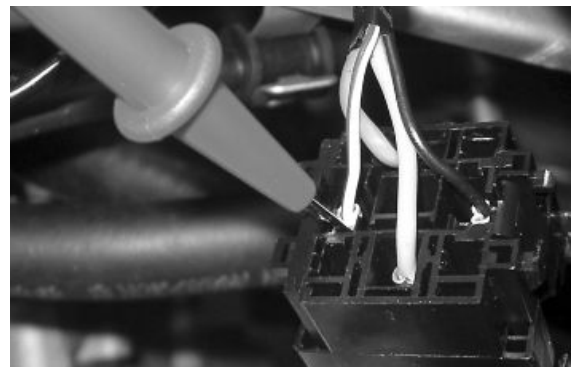
4. Key switch contacts
5. 7.5A fuse No. 2
6. Injection load remote control
7. Fuel pump
8. HV coil
9. Fuel injector
10. Electric fan remote control
11. Coolant electric pump
12. Fuse No. 5; 15A
13. Electric fan motor

Check that the 7.5A fuse No. 2 works properly



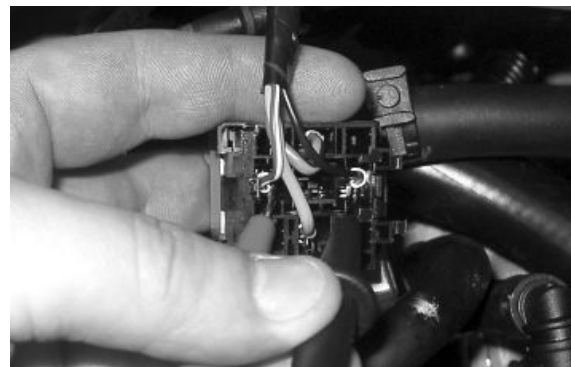
With the key switch set to ON, check if there is +12 V battery voltage between the RED - WHITE cable of the electric fan remote control and the ground connection.

Check if the RED - WHITE cable between the fuse box and the electrical fan remote control base is not interrupted



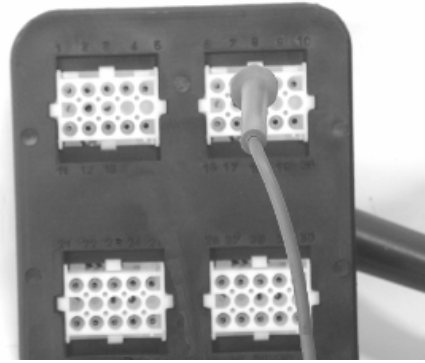
Using a diagnosis hand-held computer, carry out an active diagnosis for the "ELECTRIC FAN".

Check if there is battery voltage at pins 85 - 86 of the electric fan remote control



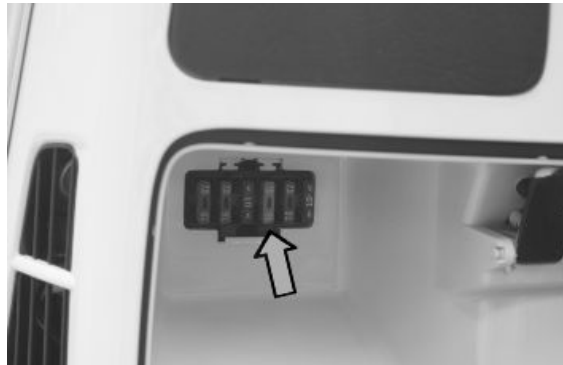
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Check if the BLUE - YELLOW cable between the control unit pin 8 and the electric fan remote control base is not interrupted



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Check the 15A Fuse No. 5



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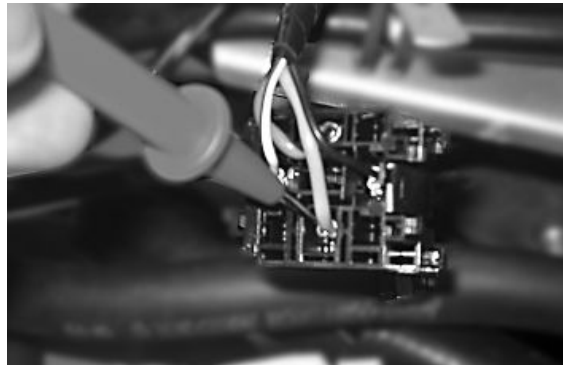
Check if there is +12 V voltage between the GREY cable of the electric fan remote control base and the ground connection.

Check if the GREY cable between the fuse box in the glove-box compartment and the electric fan remote control base is not interrupted.

Check if the RED cable between the electric fan remote control base and the electric fan motor is not interrupted.

Check that the electric fan motor is earthed.

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## INDEX OF TOPICS

**S**SUSPENSIONS

**SUSP**

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

## Front

### Removing the front wheel

- Remove the 5 fixing screws indicated in the picture.

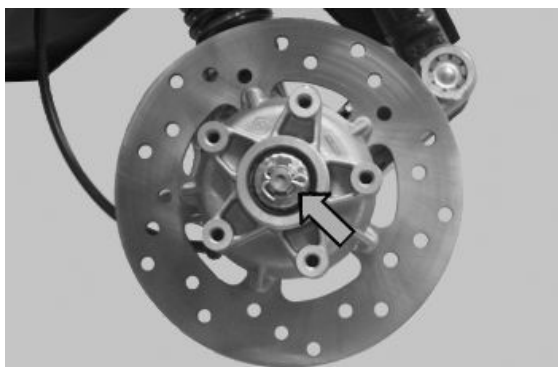
#### Locking torques (N\*m)

Wheel fixing screw 20 ÷ 25



### Front wheel hub overhaul

- Support the vehicle adequately.
- Remove the front wheel.
- Remove the front brake calliper.
- Remove the cotter pin and remove the cap.

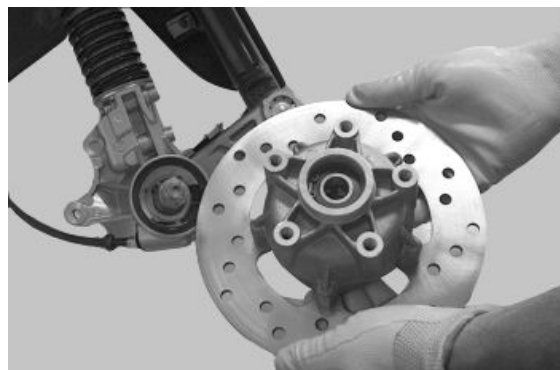


- Unscrew the nut fixing the front wheel hub.





- Remove the wheel hub.



- Remove the ball bearing check Seeger ring indicated in the picture



Extract the ball bearing using the specific tool

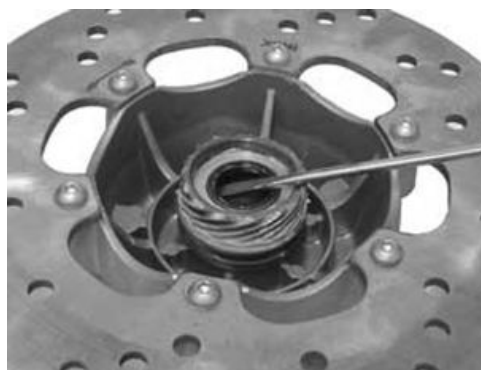
**Specific tooling**

**001467Y014 Pliers to extract  $\varnothing$  15-mm bearings**

**001467Y017 Bell for bearings, OD 39 mm**



- Remove the oil seal on the roller bearing side using a screwdriver.



- Remove the roller bearing using the specific tool

### Specific tooling

**020376Y Adaptor handle**

**020456Y Ø 24 mm adaptor**

**020363Y 20-mm guide**



- Heat the roller bearing seat with a heat gun
- Use the specific tool to introduce and push the bearing until it stops, with the shielded side facing out
- Refit the ball bearing check Seeger ring

### Specific tooling

**020151Y Air heater**

**020376Y Adaptor handle**

**020359Y 42x47-mm Adaptor**

**020412Y 15-mm guide**



- Use the specific tool to fit and push the roller casing until it stops
- Refit the oil seal on the roller bearing side
- Lubricate the area between the roller bearing and the ball bearing

### Specific tooling

**020038Y Punch**

### Recommended products

**AGIP GREASE MU3 Grease for odometer transmission gear case**

Soap-based lithium grease with NLGI 3; ISO-L-XBCHA3, DIN K3K-20



## Refitting the front wheel

- To refit, carry out the removal operations but in reverse order and comply with the specified locking torque.

### Locking torques (N\*m)

**Wheel fixing screw 20 ÷ 25 Wheel axle nut 74 ÷ 88**

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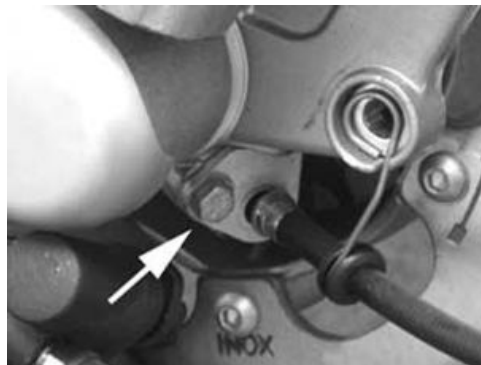
## Steering column

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### Removal

---

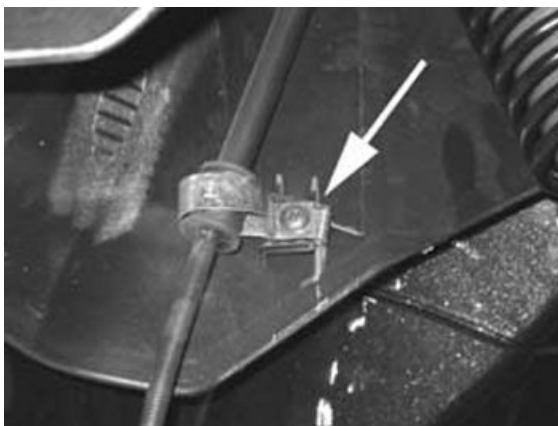
- Remove the front wheel
- Remove the brake calliper
- Loosen the screw fixing the odometer cable plate and take out the cable.



- Remove the suspension arm housing by unscrewing the three screws indicated in the photograph.



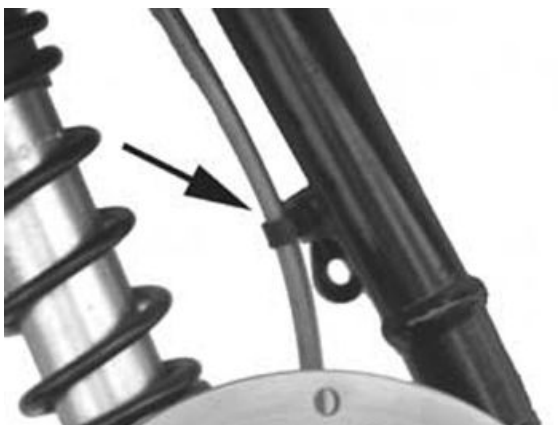
- Remove the retainer fixing the odometer cable to the mudguard indicated in the photograph



- Remove the retainer fixing the brake piping to the front shock absorber upper plate



- Remove the retainer fixing the brake piping to the suspension arm



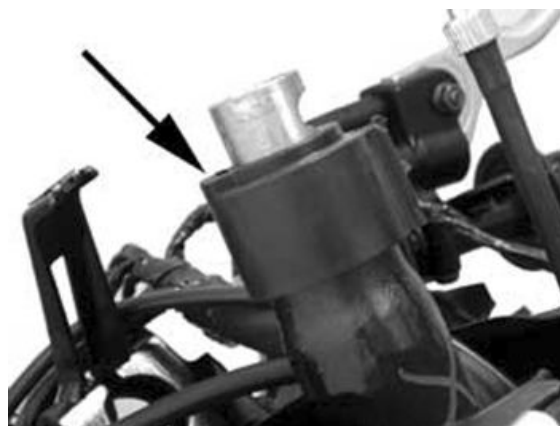
- Pre-loosen the 3 nuts fixing the mudguard to the suspension



- Remove the rear handlebar cover.
- Remove the screw fixing the handlebar to the steering tube
- Tilt the handlebar towards the shield back plate being careful not to scratch the plastic parts



- Remove the steering tube ring nut cover



- Use a specific tool to remove the counter-ring nut, the spacer washer and the ring nut of the upper disk of the fifth wheel fitting
- Slide off the steering tube and remove permanently the mudguard from the suspension

### **Specific tooling**

**020055Y Wrench for steering tube ring nut**



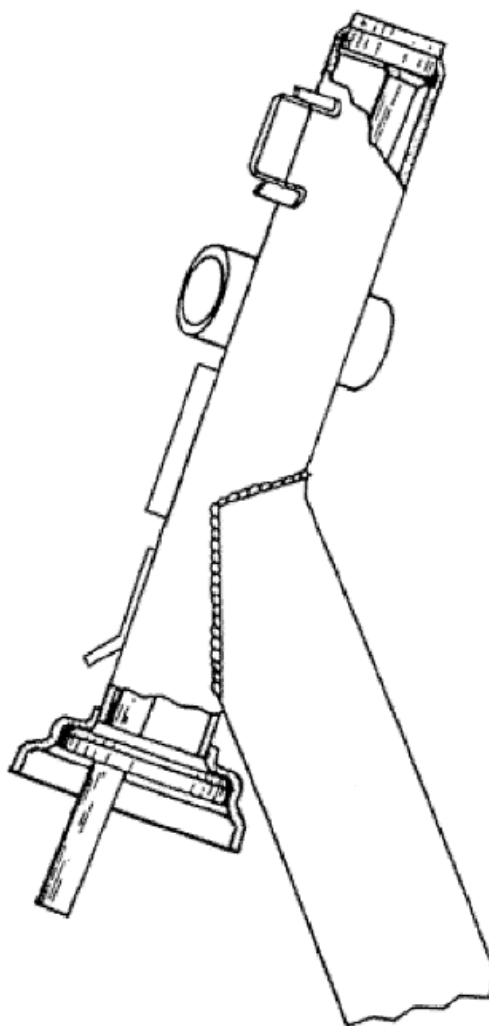
## **Overhaul**

Carry out this operation only if strictly necessary and in any case remove and replace the old part with a new one.

- 
- Remove the steering tube
  - Use a special tool remove the upper disk of the fifth wheel fitting seat on the headstock by operating from the lower part of the headstock as indicated in the photograph. Afterwards remove the lower disk of the fifth wheel operating from the upper part

**Specific tooling**

**020004Y Punch for removing fifth wheels from headstock**



- 
- Remove the fifth wheel fitting and the dust guard on the steering tube as shown in figure, using the specific tool. Proceed giving a few taps with the mallet.

**Specific tooling**

**020004Y Punch for removing fifth wheels from headstock**



- Refit the fifth wheel fitting and the dust guard on the steering tube until they stop, using the specific tool.

**Specific tooling**

**006029Y Punch for fitting fifth wheel seat on steering tube**



- Use the specific tool to fit the fifth wheel fitting on the headstock as indicated in the figure

**Specific tooling**

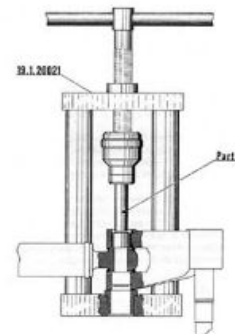
**001330Y Tool for fitting steering seats**



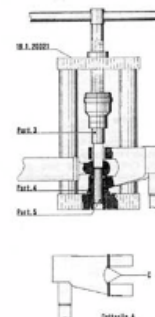
- Remove the steering tube
- Remove the attachment bracket
- Use the specific tool with the part 1 and operate the handgrip until removing temporarily the pin and the Nadella opposite the tool thrusting direction.
- To extract the second Nadella, use the tool with the part 2, instead of part 1, on opposite side to the one indicated in the figure.

**Specific tooling**

**020021Y Front suspension service tool**



- Fit both dust guard rings «C» on the swinging hub as shown in the detail drawing «A».
- Connect the swinging hub to the steering tube with the guiding pin, part 5.
- Use the specific tool fitted with part 3 on the stem and part 4 on the tool base.
- Lubricate the pin with recommended grease and insert it temporarily on the swinging hub, move the tool handgrip until part 3 is fully inserted on the steering tube.



- Once the pin has been fitted, insert the two spacers part 17 slightly hitting with a mallet (see next figure).

**CAUTION**

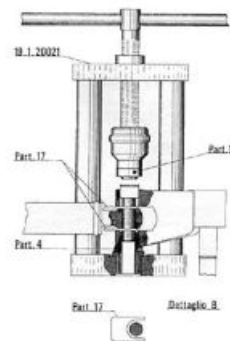
USE NEW ROLLER CASINGS, PIN, SEALING RINGS AND DUST GUARDS FOR REFITTING.

**Specific tooling****020021Y Front suspension service tool****Recommended products****AGIP GREASE PV2 Grease for steering bearings, pin seats and swinging arm**

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

To fit sealing rings, roller casings and wedging washers proceed as follows

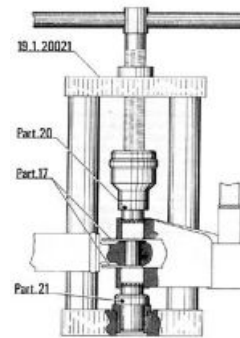
- Lubricate the sealing rings with mineral oil and half-fill the roller casings with recommended grease.
- Insert the sealing ring on the pin and the roller bushing with wedging washers at the same time.
- Remove the specific tool and then the part 5 (guide) partially ejected in the previous assembly stage; part 4 must be always fitted.
- Replace part 3 with part 16 on the stem.
- Push, from the handgrip, the wedging washer - roller casing - sealing ring unit, placing part 16 until it stops on the swinging hub
- Repeat the operation described above using the tool fitted with part 16 and part 22\* instead of part 4 on the stem, on the side opposite the one shown in the figure to refit the second wedging washer - roller casing - sealing ring unit.





To position roller casings on the pin (pin end in contact with the internal bottom of the roller casings) proceed as follows:

- Use the tool with part 20 and 21 fitted to the stem as indicated in the figure.
- Push the two roller casings with the handgrip until their bottoms make contact with the pin end.
- Use the specific tool fitted with parts 3 and 4 as indicated for fitting the spin and push with the handgrip until the washer is wedged in the swinging hub.
- Remove the spacers, part 17; fill with recommended grease the area between the steering tube and the swinging hub, and place the dust guard rings in that place.



### Recommended products

#### AGIP GREASE PV2 Grease for steering bearings, pin seats and swinging arm

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

## Refitting

To refit, carry out the removal operations but in reverse order; grease the fifth wheel fittings and tighten at the specified locking torques

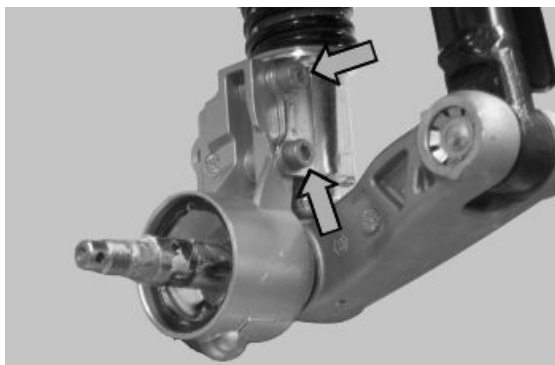
### Locking torques (N\*m)

Handlebar to steering tube 45 ÷ 50 Upper steering ring nut 35 ÷ 40 Lower steering ring nut 12 ÷ 14

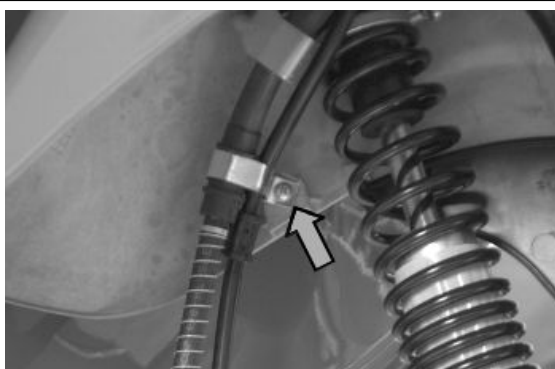
## Front shock absorber

## Removal

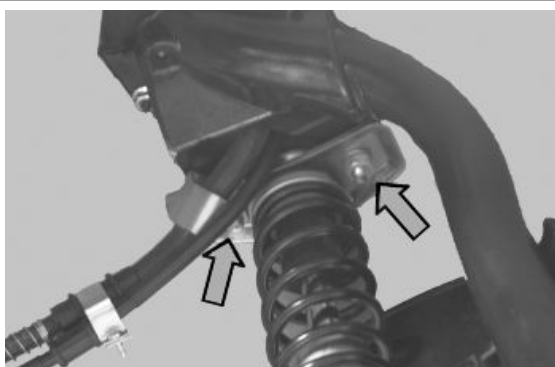
- Support the vehicle adequately.
- Remove the wheel hub.
- Loosen the shock absorber lower clamps and remove the brake calliper shock absorber mounting.



- Loosen the screws fixing the front brake pipe retainer clamp and the odometer cable in order to reach the upper clamps.



- Unscrew the upper fixing nuts.



- Remove the front shock absorber.



---

**Refitting**

To refit, carry out the removal operations in reverse order, observing the prescribed tightening torques.

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

**shock absorber lower clamping 20 - 27 shock absorber upper clamp 20 to 30**

---

**Shock-absorber - calliper bracket**

- Remove the front wheel hub with the brake disc
- Remove the front shock absorber lower clamps



- Remove the bracket locking Seeger ring
- Unscrew the bracket



- Before refitting the bracket in the wheel axle, place the O-ring as shown in the photograph so that it is correctly placed after fitting the bracket.
- Refit the washer and the Seeger ring.
- Refit the lower screws fixing the shock absorber to the bracket and tighten at the prescribed torque

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

**Shock absorber lower clamping 20 to 27**

---

## Overhaul

- The bracket for the shock absorber -calliper attachment has two roller bearings separated one from the other as shown in the photograph



- Remove the two roller bearings from the bracket with the specific tool operating on the shock absorber attachment side as shown in the photograph



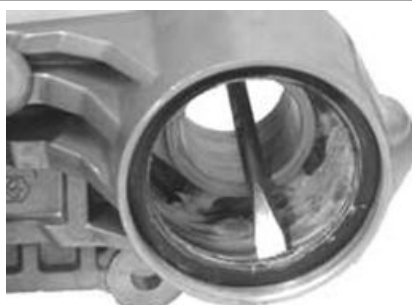
### Specific tooling

**020376Y Adaptor handle**

**020441Y 26 x 28 mm adaptor**

**020365Y 22 mm guide**

- Remove the oil seal on the wheel hub side with the screwdriver as shown in the photograph



- Suitably hold the brake calliper - shock absorber attachment bracket

- Fit a new oil seal and move it until it stops using the specific tool

### Specific tooling

**020376Y Adaptor handle**

**020360Y 52x55-mm Adaptor**



- Assemble a new roller bearing on the shock absorber side and move it until it stops using the specific tool

### Specific tooling

**020036Y Punch**



- Suitably hold the brake calliper - shock absorber attachment bracket

- Assemble a new roller bearing on the wheel hub side and move it until it stops using the specific tool

### Specific tooling

**020037Y Punch**



## Refitting

- Refit the parts in reverse order of the removal operation.

### CAUTION

BEFORE CARRYING OUT REFITTING OPERATIONS IN THE AREAS MARKED WITH AN ASTERISK, LUBRICATE THEM WITH THE RECOMMENDED PRODUCT

### Specific tooling

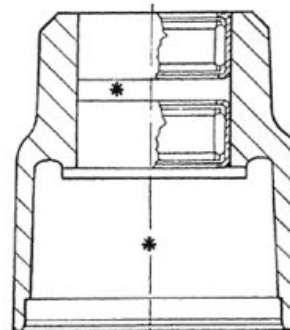
**020036Y Punch**

**020037Y Punch**

### Recommended products

**AGIP GREASE PV2 Grease for steering bearings, pin seats and swinging arm**

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



## Rear

---

## Removing the rear wheel

- Remove the bracket supporting the rear shock absorber and the muffler;
- Remove the rear wheel by unscrewing the 5 screws indicated in the photograph



---

## Refitting the rear wheel

To refit, carry out the removal operations but in reverse order, observing the prescribed torques.

### Locking torques (N\*m)

Wheel fixing screws: 20 - 25

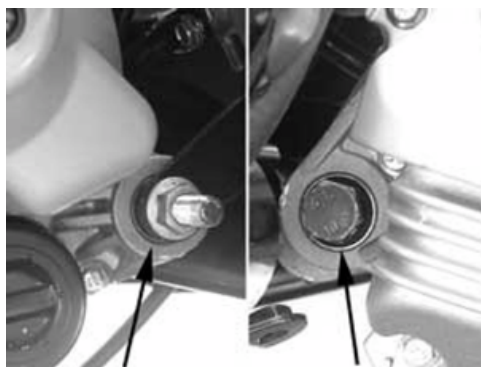
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## Swing-arm

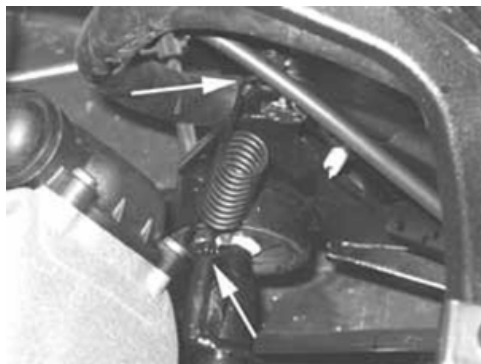
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### Removal

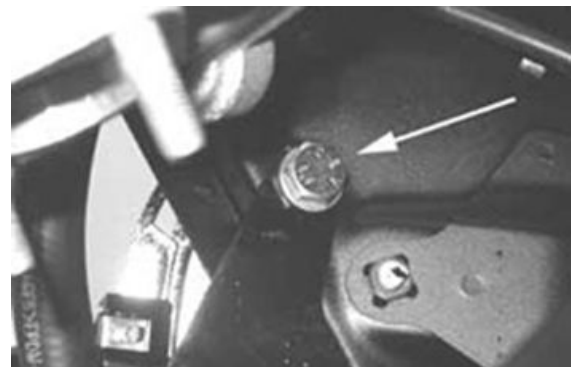
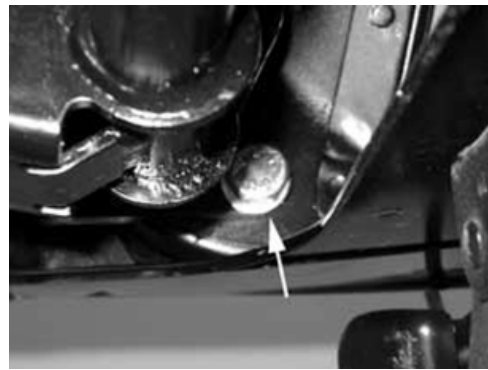
- Place the vehicle on its centre stand;
- Remove the engine housing
- Remove the swinging arm/engine fitting shown in the picture
- Move the engine back



- remove the spring anchoring the swinging arm to the chassis as shown in the picture



- Remove the two screws fixing the buffer support bracket to the chassis



- Remove the left and right caps located under the footrest to reach the pin fixing the swinging arm to the body.
- Remove the pin. Then remove the swinging arm.



- Check the entire swinging arm assembly.
- Check all the centring bushing components and silent block rubber buffers.
- Replace the work components that cause excessive clearance on the rear suspension.



## Overhaul

- Check there is no sticking in the movement of the connection of the swinging arm on the engine side to the swinging arm on the chassis side.
- Check the axial clearance between the two swinging arms using a feeler gauge



### Characteristic

#### Standard clearance

0.40 ÷ 0.60 mm

#### Allowable limit after use:

1.5 mm

- To check the clearance on the chassis-side arm, mount the retainer using the pin fixing the swinging arm to the chassis and two adaptor rings of the appropriate tool 020229Y. Alternatively use two washers with inner diameter for 12-mm pins, min. outer diameter: 30 mm: min. thickness: 4 mm.



- Check there is no sticking in the rotation.
- Check the axial clearance of the swinging arm on the chassis side

### Characteristic

#### Standard clearance

0.40 ÷ 0.60 mm

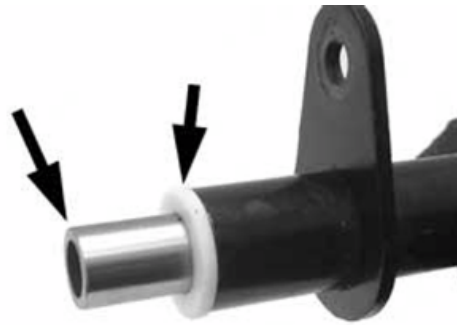
#### Allowable limit after use:

1.5 mm





- Separate the swinging arm on the engine side from the vehicle side arm.
- Remove the plastic bushings and the internal spacer shown in the picture.



- Using a suitable pin remove the roller casings as shown in the pictures



- Using an appropriate tool plant new roller casings, being careful to position the bearings with the O-rings facing outwards

### Specific tooling

020244Y 15-mm diameter punch

020115Y Ø 18 punch

### Characteristic

**Length of the swinging arm tube on the engine side:**

L 175.3 + 0.3 0

**Length of the internal swinging arm spacer on the engine side:**

L 183 + 0.3 0

**Engine side swinging arm plastic bushing shim:**

3.5 ± 0.05 mm

**Chassis side swinging arm plastic bushing shim:**

3.5 ± 0.05 mm

**Length of the internal swinging arm spacer on the frame side:**

290 ± 0.1 mm



**Length of the swinging arm tube on the frame side:**

283 ± 0.1 mm

- Lubricate roller casings and the plastic bushings with grease
- Insert the spacers
- Assemble the two arms with the relative bolt in the position shown in the picture
- Adjust the bolt as shown in the picture
- Position the chassis side swinging arm with the most protruding part pointing towards the silent block side as shown in the picture

**Recommended products****AGIP GREASE PV2 Grease for steering bearings, pin seats and swinging arm**

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

- Make sure the silent bloc is not broken. If it is, replace the coupling.
- Remove the Seeger ring shown in the picture



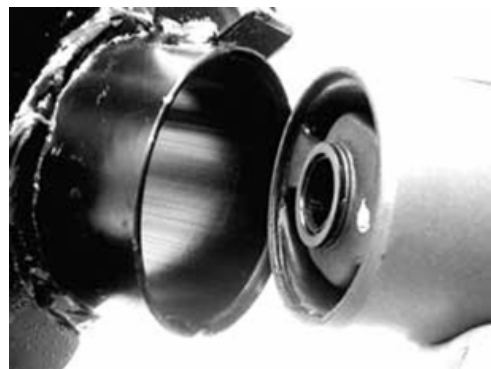
- Remove the full silent bloc bracket
- Undo the silent bloc ring shown in the picture



- Hold the full silent bloc bracket in the clamp
- Using the appropriate tool, remove the silent bloc from the bracket from the side corresponding to the inside of the vehicle. This is to guarantee the tool is centred properly on the support



- Install a new silent bloc, making sure it aligns properly with the reference tooth.
- Fit the silent blocs, making sure the chamfered part of the silent bloc matches the chamfered part of the bracket



- Using the appropriate tool, fit the silent bloc as shown in the picture



## Refitting

- To refit, perform the removal operations in reverse.
- Grease the bearings and the rolling parts with the recommended grease.

-Complete the fitting by tightening the nuts on the relative bolts to the proper tightening torque.

### Locking torques (N\*m)

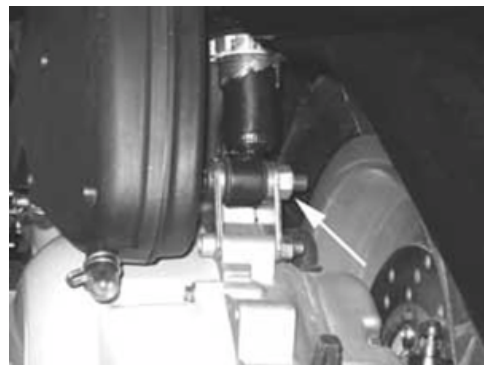
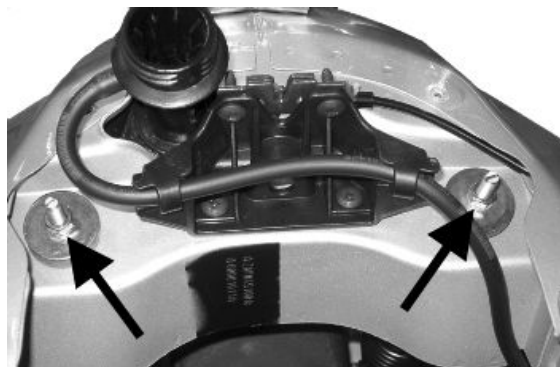
Engine- and vehicle-side swinging arm junction bolt 40 ÷ 45 Swinging arm pin - Engine 64 ÷ 72  
Body shell - Swinging arm pin 76 ÷ 83 Screw fixing the silent-block support plate to the body 42 ÷ 52

## Shock absorbers

### Removal

Proceed as follows:

- place the vehicle on its centre stand;
- remove the luggage rack
- lift the engine a little with a jack so as to free the two shock absorbers;
- remove the muffler assembly;
- undo the shock absorber spring assembly clamping screw from the support fixed to the engine on the one side and from that fixed to the muffler on the other;
- unscrew the two upper nuts (one on each side) fixing the shock absorber spring assembly to the frame and remove the shock absorbers.



### Refitting

To refit, carry out the above removal operations in reverse order, observing the prescribed torques.

### Locking torques (N\*m)

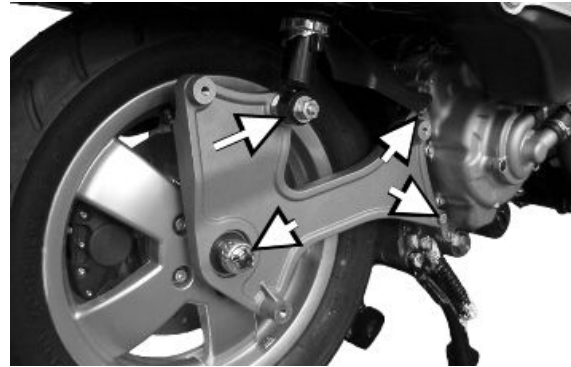
Shock absorber lower fitting 40 ÷ 45 Upper shock absorber fixing screws 20 ÷ 25 Nm

## Exhaust bracket

### Removal

Remove the full muffler unit.

- Remove the two fixing screws of the bracket to the engine crankcase
- Remove the split pin, the cover and the fixing nut of the rear wheel axle and its spacer
- Remove the shock absorber lower clamp



### Refitting

- The refitting procedure is in the reverse order of the removal operation being careful to respect the torques indicated and the spacer assembly layout as shown in the photo.

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

Bracket fixing screws to the engine crankcase: 20 ÷ 25 Shock absorber lower fitting 40 ÷ 45  
Wheel axle clamping 104 ÷ 126

## Centre-stand

### REMOVAL

- Use a jack to support the vehicle properly.
- Remove the two return springs from the centre stand.
- Undo the nut shown in the figure.
- Remove the pin from the right side.
- Remove the centre stand.



### FITTING

- On refitting tighten the nut to the specified torque.

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

Centre stand bolt 32 ÷ 40

## Side stand

### REMOVAL

- Uncouple the centre stand return spring;
- Remove the screw shown in the photograph

### FITTING

To refit, carry out the removal operations in reverse order and comply with the specified torque.

### Locking torques (N\*m)

**Side stand fixing bolt 35 ÷ 40**

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## INDEX OF TOPICS

**B**RAKING SYSTEM

**BRAK SYS**

This section è is devoted to the description of the braking system components.

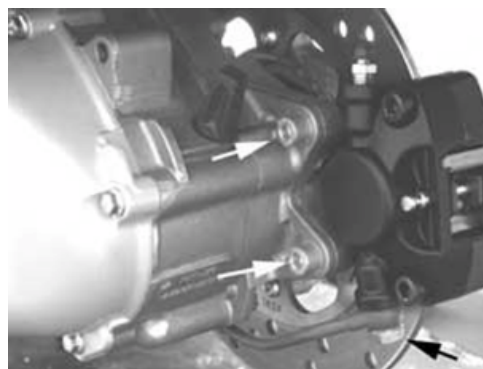
## Rear brake calliper

### Removal

- Remove the rear wheel.
- Remove the pad retention pin snap ring.
- Using a pin partially remove the brake pad retention pin.
- Remove the screws fixing the brake calliper to the crankcase then remove the brake calliper complete with pipe.
- Complete the extraction of the pad retention pin, the spring and the pads.

#### N.B.

**IF IT IS NECESSARY TO REPLACE OR SERVICE THE BRAKE CALLIPER, BEFORE REMOVING THE FITTINGS FIXING THE CALLIPER TO THE SUPPORT BRACKET, FIRST LOOSEN THE OIL HOSE FITTING AFTER HAVING EMPTIED THE SYSTEM OF THE CIRCUIT BEING EXAMINED.**



### Overhaul

- Remove the rear brake calliper.
- Suitably hold the brake calliper in a clamp
- Remove the two calliper coupling screws as shown in the photo
- Remove the two pistons from the calliper body with the aid of short blasts of compressed air through the brake fluid holes
- Remove the dust ring and the O-ring of each half calliper.
- Remove the O-rings in the half calliper.

#### N.B.

**WHEN REMOVING THE O-RINGS, BE CAREFUL NOT TO SCRATCH THE HALF CALLIPER SEATS**







- Check that the pistons and their seats show no scratches.
- Wash and blow all the components carefully
- Fit the O-rings and new dust guards
- Refit the pistons in their seats being careful to lubricate with brake fluid
- Re-couple the half callipers and lock the two screws at the specified torque



### Locking torques (N\*m)

Calliper coupling screw 30 ÷ 33 Nm



## Refitting

- Follow the removal steps but in reverse order and tighten to the prescribed torque.

### Locking torques (N\*m)

Calliper fixing screw 24 ÷ 27

If the calliper is replaced:

**CAUTION**

**ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.**

**CAUTION**

**ALWAYS USE NEW COPPER WASHERS.**

### Locking torques (N\*m)

Screw fixing the oil connection to the calliper 19 ÷ 24

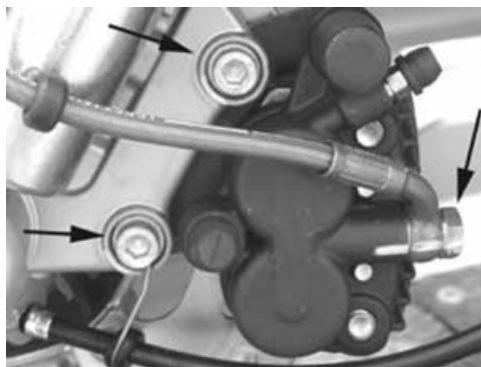
## Front brake calliper

### Removal

- Remove the front wheel
- Pre-loosen the two fixing pins of the brake pads
- Remove the two front brake calliper devices fastening them to the support as shown in the photograph.

#### N.B.

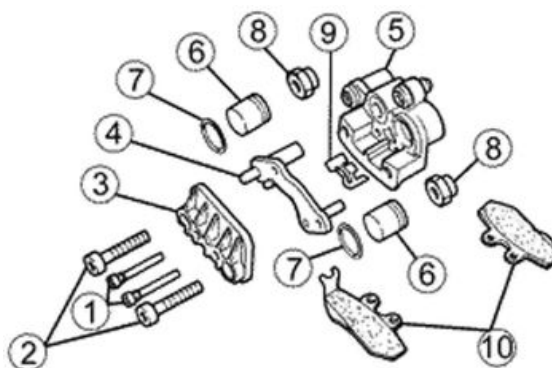
**WHEN A PROCEDURE IS PLANNED INCLUDING THE SERVICE OR REPLACEMENT OF THE CALLIPER, FIRST LOOSEN THE FITTING CONNECTING THE PIPE TO THE BRAKE CALLIPER**



### Overhaul

Proceed as follows:

- 1) remove the two male hexagonal screws (1) and take out the two pads (10);
- 2) remove the two male hexagonal screws (2) and remove the reaction plate (3);
- 3) take out the fixed plate (4) from the guide;
- 4) remove the internal elements from the floating body (5) with the help of short blows of compressed air through the brake fluid pipe in order to facilitate the expulsion of pistons (6).
- 5) Check:
  - that the plates and the body are whole and in good condition;



- that the cylinder and the floating body of the calliper do not show signs of scratches or erosion, otherwise replace the entire calliper;
- that the guides of the fixed plate are not scratched or eroded, otherwise replace the entire plate;
- that the brake pad check spring works properly.

**CAUTION**

**ALL THE INTERNAL COMPONENTS MUST BE REPLACED EVERY TIME THE CALLIPER IS SERVICED.**

**The brake pad check spring**

1. pad fixing screws
2. reaction plate fixing screws
3. reaction plate
4. fixed plate
5. floating body
6. piston
7. piston sealing rings
8. guide protection rubbers
9. brake pad check spring
10. pads

**Refitting**

Insert the following on the front brake body:

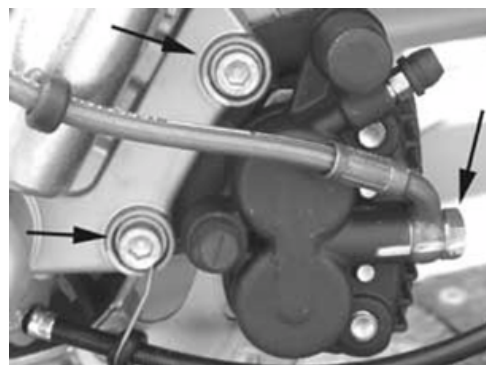
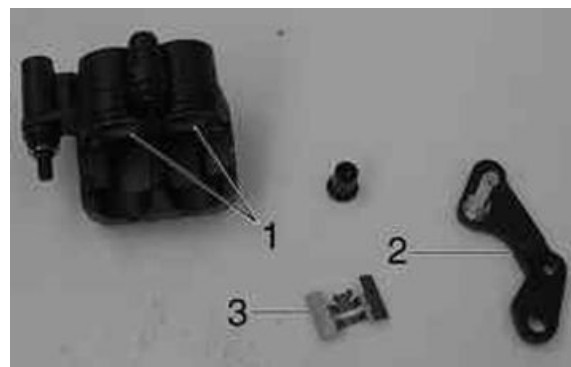
- The sealing rings and the pistons (1).
- Refit the plate (2).
- Arrange the pad holding clamp (3).
- Refit the pads and bleed air.
- Place the calliper on the disk and lock it to the support by tightening the bolts at the prescribed torque.
- Lock the pipe joint to the calliper at the prescribed torque.

**CAUTION**

**ALWAYS USE NEW COPPER WASHERS.**

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

**Screws fixing the front calliper to the support: 24 ÷ 27 Screw fixing the oil connection to the calliper 19 ÷ 24**



## Rear brake disc

### Removal

- Remove the rear brake calliper.
- Remove the brake disc and the hub from the wheel axle
- To remove the brake disc from the hub, hold the unit firmly with a vice and operate on the 5 fixing screws indicated in the photograph



### Refitting

- To reassemble the brake disc on the hub, carry out the removal operations in the reverse order arranging the brake disc on the hub on the side opposite the wheel keying
- Follow the direction of rotation shown by the arrow and tighten to the prescribed torque.
- Fit the hub unit
- disc in the wheel axle

### Locking torques (N\*m)

**Disk to the hub 11 ÷ 13**

### Disc Inspection

- Remove the rear brake calliper.
- Check the disc thickness with a micrometer

#### Characteristic

#### Standard thickness:

3.5 mm



- Repeat the measurement at no fewer than six points on the disc.
- Check the regular nature of the rotation of the brake disc assembly using the appropriate tool fixed onto the brake calliper as shown in the photo.
- In order to be able to anchor the appropriate tool properly use a metal plate with M8 threaded hole and fix it to one of the two rear brake calliper attachment points.
- Suitably fix the flange to the wheel axle with the original nut and spacer and a  $\text{Æ} 17$  mm bearing.

**N.B.**

**SO AS NOT TO GET A DISTORTED READING, CAUSE THE DRIVEN PULLEY SHAFT TO TURN IN ORDER TO ROTATE THE DISC.**

### Specific tooling

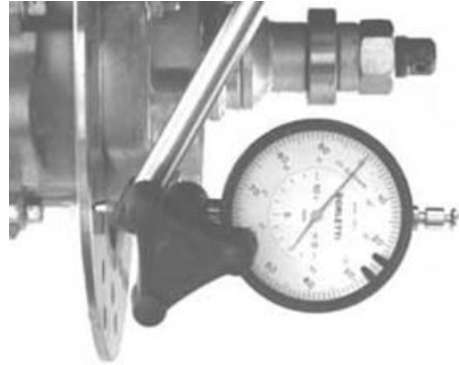
**020335Y Magnetic mounting for dial gauge**

### Characteristic

**Max. deviation allowed:**

0.1 mm

- If you detect incorrect values, replace the disc. If the anomaly persists, replace the hub.



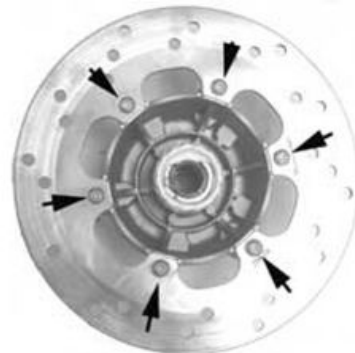
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## Front brake disc

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### Removal

- Remove the front wheel
- Remove the front brake calliper
- Remove the hub and the disc operating on the wheel axle nut
- Hold the hub and the disc firmly and remove the brake disc undoing the six screws indicated in the photograph



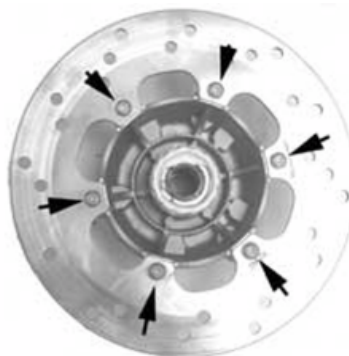
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## Refitting

- Carry out the operations in the reverse order from the removal being careful to respect the direction of disc rotation shown by the arrow printed on it
- Tighten the six screws to the specified torque.

### Locking torques (N\*m)

**Brake disc screws 8 to 10**



---

## Disc Inspection

- Remove the front wheel
- Use a micrometer to check the disc thickness as shown in the photograph
- Repeat the measurement in at least 6 points on the disk
- Remove the front brake calliper
- In order to secure the appropriate tool adequately use a metal plate with M8 threaded hole and fix it to one of the two front brake calliper attachment points
- Place the dial gauge on the disk outer edge
- Make the wheel hub turn and check the disk deviation



### Specific tooling

**020335Y Magnetic mounting for dial gauge**

### Characteristic

**Standard thickness:**

3.5 mm

**Max. deviation allowed:**

0.1 mm

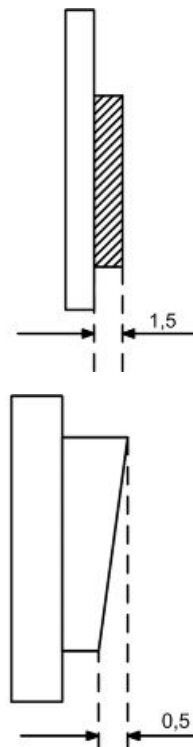
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## Front brake pads

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## Removal

- Remove the front wheel
- Pre-loosen the two fixing pins of the brake pads
- Remove the brake calliper
- Remove permanently the two pad fixing screws
- Check that there are no flaws or warping. If there is, replace it.
- Check the thickness of the friction material is more than 1.5 mm. If it is not, replace it
- 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



## 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**

Medium Loctite 243 threadlock

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

**Screw tightening calliper to support 24 to 27 Pad fixing pin 19.6 ÷ 24.5**

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## Rear brake pads

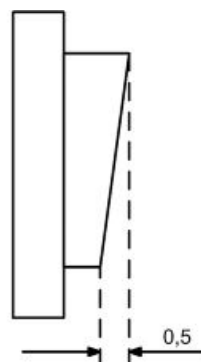
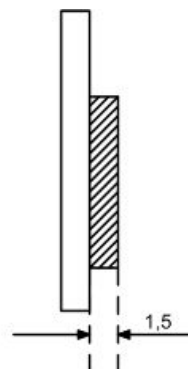
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### Removal

- Remove the rear brake calliper.
- Remove the snap ring, slide off the pad retention pin and the clip.



- Remove the brake pads and check there are no faults or warping. Otherwise, replace them.
- Check the thickness of the friction material is more than 1.5 mm. If it is not, replace it
- 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





---

## Refitting

- Insert the brake pads
- Insert the fixing pin being careful to position the clip with the ends towards the bleed screw as in the photo.



- Insert the lock on the bolt and then the protection cover



**N.B.**

**FAILURE TO RESPECT THE PAD POSITIONING REQUIREMENTS WITH RESPECT TO THE DIRECTION OF ROTATION COULD COMPROMISE PROPER BRAKE FUNCTIONING AND NOISE-LESSNESS.**

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## Fill

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### Rear - combined

- Remove the rubber cap from the bleed screw.
  - Insert a rubber pipe in the bleed screw to permit the brake fluid to be recovered.
  - 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. Then tighten the bleed screw
  - Repeat the operation until only brake fluid comes out of the rubber pipe.
  - 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 OBSERVE THIS PRECAUTION WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM**

### Specific tooling

020329Y Mity-Vac vacuum-operated pump

Locking torques (N\*m)

System bleed calliper fitting: 12 ÷ 16 Nm

## Brake fluid level check

- Position the vehicle on a flat surface and on the centre stand
- Remove the brake pump cover as indicated in the photo



- Use the appropriate spyglass on the pump to check the level of the brake fluid, as shown in the photograph



- If the level is below the minimum, fill up by acting on the two screws shown in the figure.
- Remove the gasket and fill with recommended brake fluid until the spyglass is completely covered.



**CAUTION**



AVOID CONTACT OF THE BRAKE FLUID WITH YOUR EYES, SKIN, AND CLOTHING. IN CASE OF ACCIDENTAL CONTACT, WASH WITH WATER.

**CAUTION**



THE BRAKING CIRCUIT FLUID IS HIGHLY CORROSIVE. THEREFORE, WHEN TOPPING IT UP, AVOID LETTING IT COME INTO CONTACT WITH THE PAINTED PARTS OF THE VEHICLE. THE BRAKING CIRCUIT FLUID IS HYGROSCOPIC, THAT IS, IT ABSORBS HUMIDITY FROM THE SURROUNDING AIR. IF MOISTURE CONTAINED IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, THIS WILL RESULT IN INEFFICIENT BRAKING.

**CAUTION**

BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR. IF THE LEVEL OF HUMIDITY IN THE BRAKE FLUID EXCEEDS A GIVEN VALUE, BRAKING EFFICIENCY WILL BE REDUCED.

Never use brake liquid in open or partially used containers.

Under standard climatic conditions, replace coolant as indicated in the scheduled maintenance table.

For refitting purposes carry out the removal operations but in reverse order and respect the tightening torques of the tank cover screws.

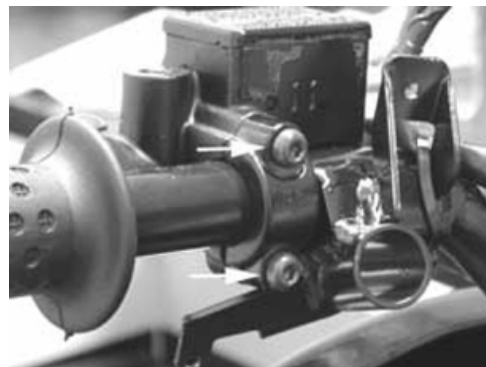
### Locking torques (N\*m)

**Brake pump reservoir screws 1.5 ÷ 2**

## Front brake pump

### Removal

- Remove the rear handlebar cover.
- Remove the two screws fixing the brake pump to the handlebar indicated in the photograph
- Remove the oil pipe joint from the pump
- Remove the connector to the stop light switch



---

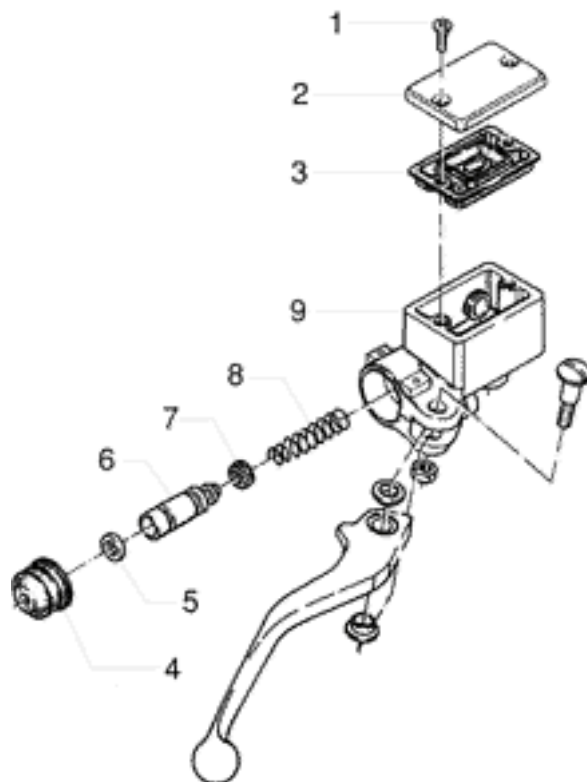
## Overhaul

Proceed as follows:

- 1) Remove the brake lever by loosening the retaining screw; open the cover (2) and take out the diaphragm (3);
- 2) remove the cap (4) and take out the internal parts in order;
- 3) Check that:
  - The pump body shows no signs of internal damage or corrosion;
  - The plunger shows no sign of damage or abnormal wear;
  - The plunger return spring is in good condition.

### CAUTION

**ALL THE SEALS AND GASKETS MUST BE REPLACED EVERY TIME THE PUMP IS SERVICED.**



1. Reservoir cap screw
2. Reservoir cap.
3. Diaphragm.
4. Bellows.
5. Sealing ring
6. Piston.
7. Gasket.
8. Spring.
9. Tank

---

## Refitting

To refit, carry out the removal operations but in reverse order, observing the specified torques.

### Locking torques (N\*m)

**Oil pipe joint to the pump: 20 - 25 Brake pump fixing screws to the handle bar: 7 to 10 Nm**

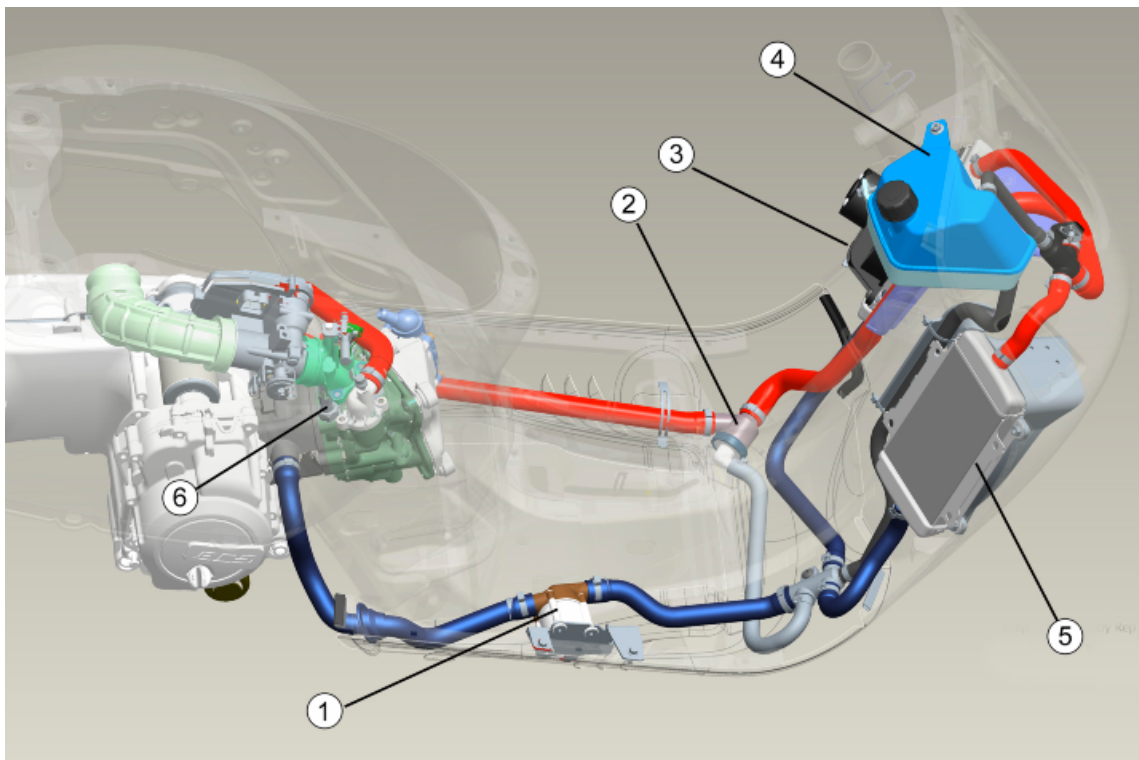
---

## INDEX OF TOPICS

COOLING SYSTEM

COOL SYS

Circuit diagram



1. Coolant electric pump
2. Three-way thermostat
3. Electric fan

4. Expansion tank
  5. Radiator
  6. coolant temperature sensor
-



# INDEX OF TOPICS

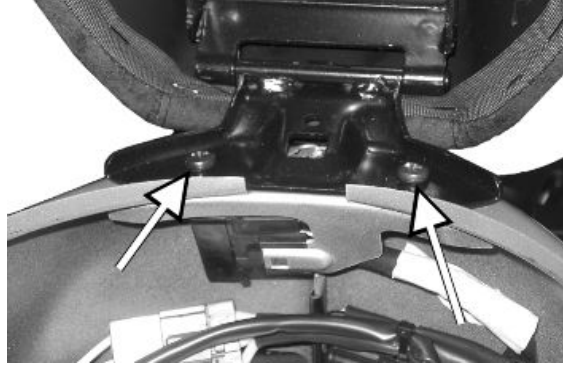
**CHASSIS**

**CHAS**

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

## Seat

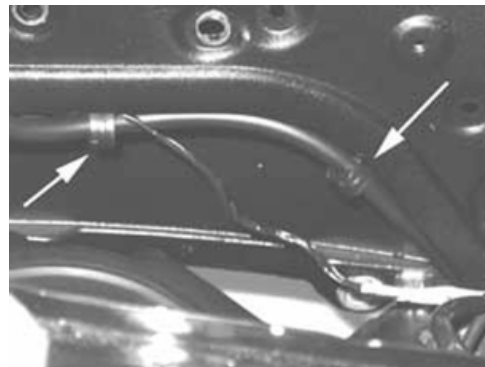
- Remove the helmet compartment
- Remove the two screws shown in the photograph
- Remove the saddle



- Remove the helmet compartment
- Remove the 2 nuts indicated in the photograph



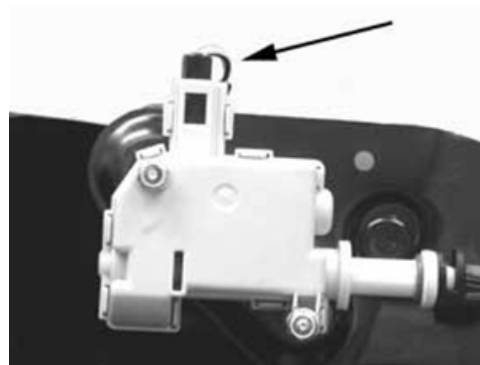
- Free the electric cables from the retaining clamps indicated in the photograph



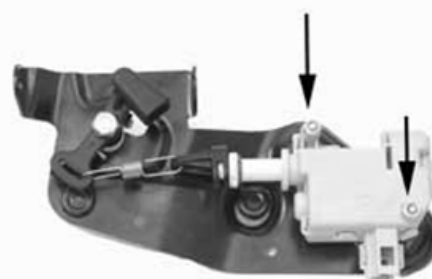
- Remove the saddle opening transmission cable
- Remove the saddle manual opening transmission cable.



- Remove the electric connector from the saddle opening actuator



- Remove the two screws shown in the photograph
- Remove the clip from the transmission
- Remove the actuator from the supporting bracket

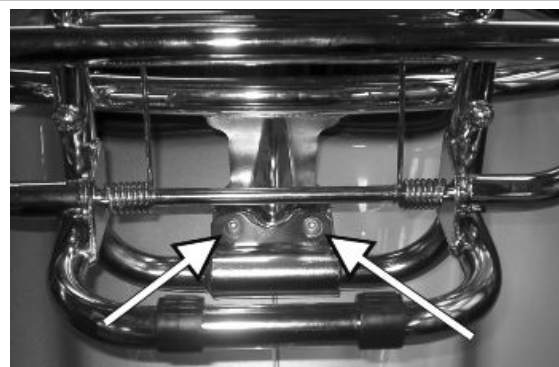


## Rear rack

- Remove the helmet compartment
- Remove the 4 screws indicated in the figure



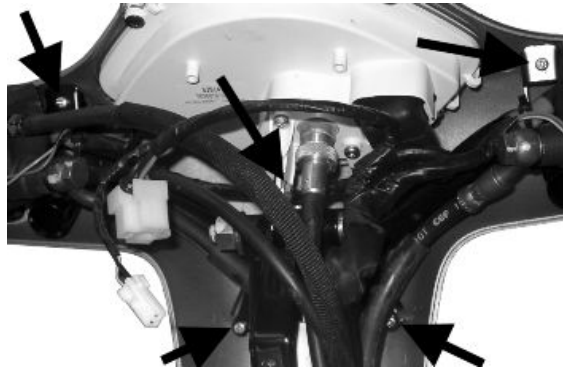
- Remove the two screws, indicated in the figure, that fix the luggage rack to the body



---

## Rear handlebar cover

- Remove the front handlebar cover
- Undo the 5 screws indicated in the photograph
- Disconnect the odometer cable
- After disconnecting the wiring remove the rear handlebar.



---

## Instrument panel

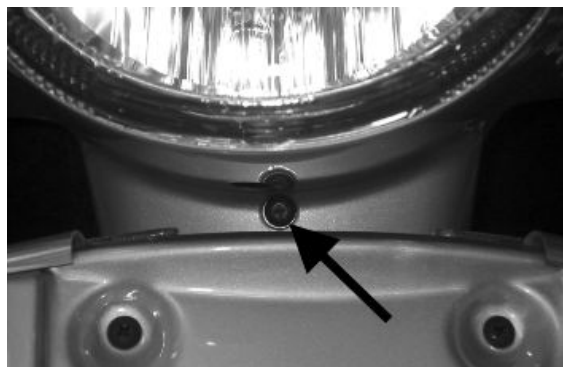
- Remove the rear handlebar cover;
- Remove the four screws indicated in the figure
- Remove the instrument panel.



---

## Front handlebar cover

- Remove the rear-view mirrors.
- Remove the front central cover.
- Remove the front screw indicated in the figure.



- Undo the 2 screws indicated in the figure;
- Remove the front handlebar cover
- Disconnect the front headlamp connectors



## Headlight assy.

- Remove the front handlebar cover.
- Undo the four screws indicated.

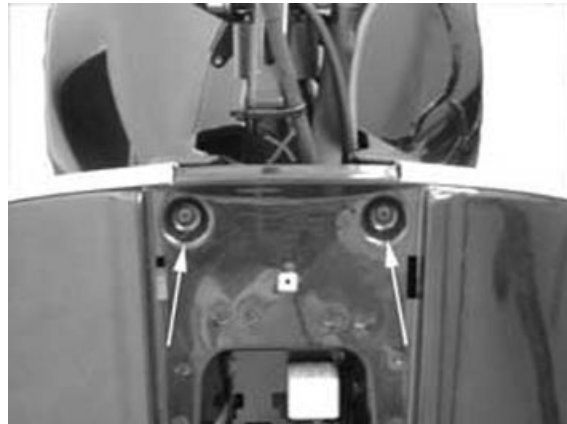


- Operate the screw indicated in the figure to remove the front turn indicator



## Knee-guard

- Remove the rear handlebar cover.
- Remove the two screws indicated in the photograph and located on the shield under the grille



- Remove the expansion tank cover and then its cap
- Remove the central screw inside the glove-box, indicated in the photograph



- Remove the two screws indicated in the photograph and located below the expansion tank cover and the left cover respectively



- Remove the shield back plate lower screws, to the right and left side of the shield back plate, as indicated in the photograph





- Remove the electric saddle opening switch, the fuse box and the manual saddle opening cable as shown in the photograph



### Taillight assy.

- Operate the screw indicated in the figure to remove the rear turn indicator



Remove screw «A» to remove the rear headlight assembly.

Access to taillight bulbs, stop light bulb and license plate bulb.

To reassemble, repeat the operation but in reverse order.



#### **N.B.**

**IF MISTING IS NOTICED ON THE INSIDE OF THE HEAD-LAMP GLASS, THIS DOES NOT INDICATE A FAULT AND IS ATTRIBUTABLE TO HUMIDITY AND/OR TO LOW TEMPERATURES.**

**THE PHENOMENON SHOULD QUICKLY DISAPPEAR WHEN THE LIGHT IS SWITCHED ON.**

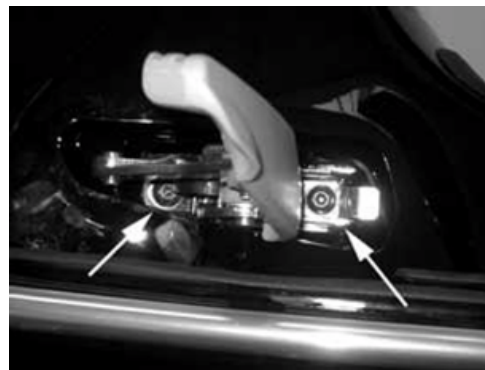
**THE PRESENCE OF DROPS OF WATER, ON THE OTHER HAND, COULD INDICATE THAT WATER IS INFILTRATING. CONTACT THE AFTER-SALES SERVICE NETWORK.**

## Footrest

- Remove the shield back plate
- Remove the battery compartment cover
- Remove the side fairings
- Remove the central screw located under the battery compartment cover as indicated in the figure



- Remove the passenger footrests undoing the two screws indicated in the figure



- Remove the right and left screws fixing the footrest indicated in the figure



- Remove the right and left lower covers as shown in the figure



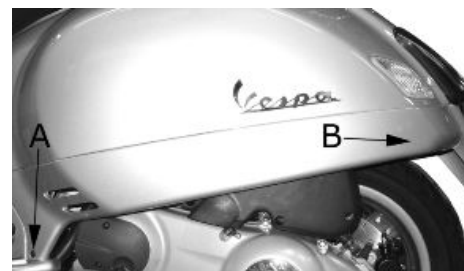


- Remove the screws under the non-slip rubber mat of the footrest as indicated in the photograph



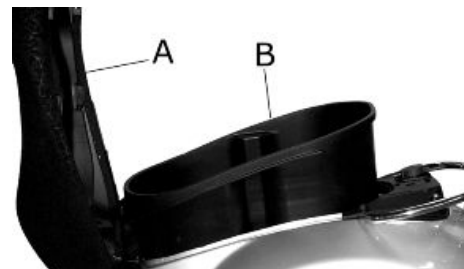
## Side fairings

- Unscrew the fixing screw "A"
- Unscrew the nut "B" under the body.



## Helmet bay

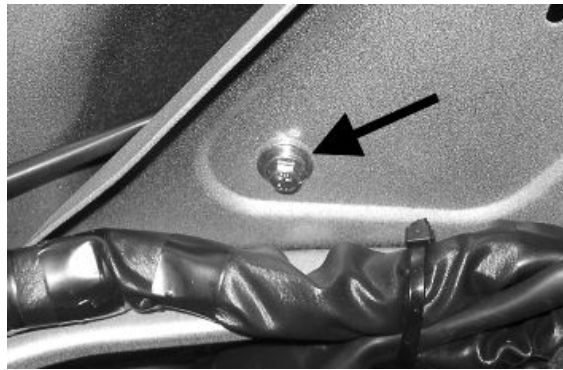
- Lift the saddle and remove the helmet compartment



## Fuel tank

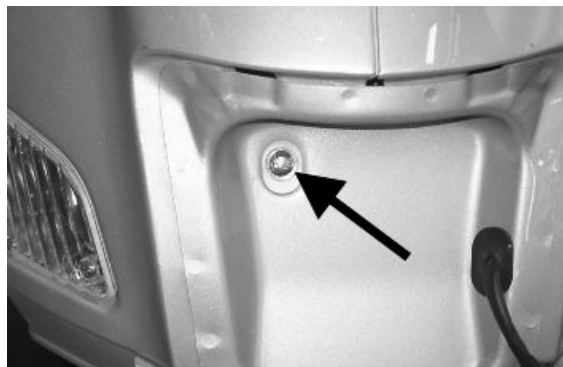
- Remove the helmet compartment
- Remove the side fairings
- Remove the muffler
- Remove the luggage rack
- Remove the shock absorber upper clamps
- Remove the two screws, indicated in the figure, that fix the tank to the body





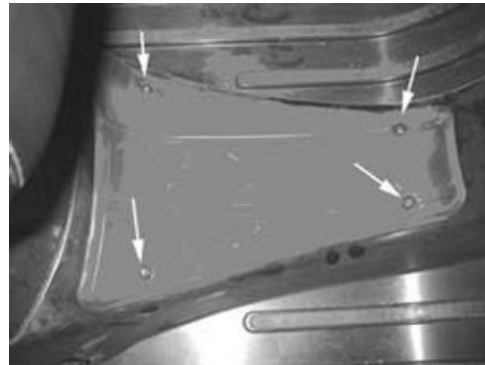
- Remove the screw indicated in the figure that fixes the tank to the body after removing the rear headlight assembly

- Remove the two turn indicators
  - Use a jack to lift the body so that there is enough space between the vehicle rear side and the engine to slide off the tank
- To refit, perform the steps in the reverse direction to disassembly



## Rear central cover

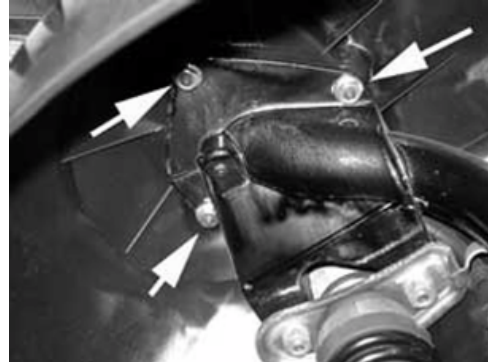
- Remove the four screws indicated in the figure



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## Front mudguard

- First remove the steering tube and uncouple the front brake pipes from the calliper in order to remove the front mudguard
- Remove the three mudguard-steering tube clamps indicated in the figure



---

## Radiator fan

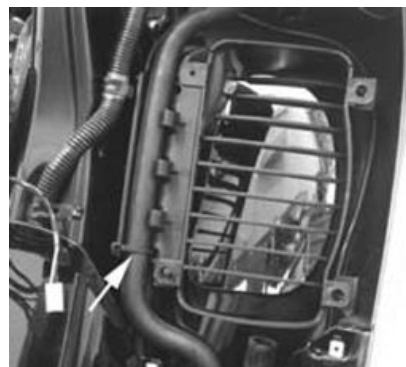
- In order to carry out any operation on the radiator unit, flow out the coolant in the coolant delivery pipe in the pump, indicated in the photograph.



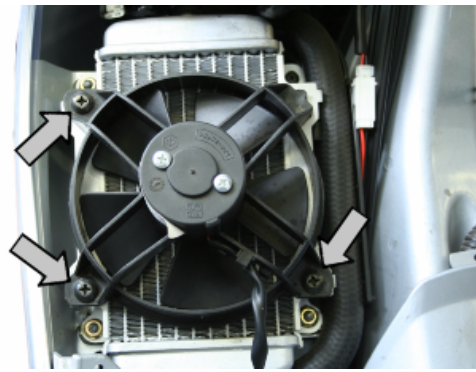
- Remove the shield back plate;
- Remove the coolant feed and return hoses from the right radiator;
- Unscrew the 4 screws fixing the radiator to the body;
- Detach the radiator



- Detach the pipe from the plastic duct by removing the plastic clip shown in the photograph. Then remove the duct.



- 
- The same procedure also applies to the left radiator for which it is necessary to remove the electric fan first by undoing the three screws indicated in the photograph and afterwards disconnect the connector.

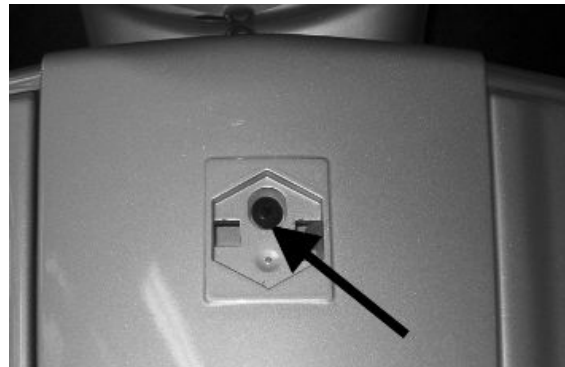


To refit, perform the removal operations but in reverse order being careful when positioning the new clips for the fluid hoses and when filling the cooling system.

---

### Front central cover

- Remove the "PIAGGIO" clip-on badge
- Unscrew the screw indicated in the figure
- Remove the grille



## INDEX OF TOPICS

**P**RE-DELIVERY

**P**RE DE

---

Carry out the listed tests before delivering the vehicle.

Warning - Be very careful when handling fuel.

---

## Aesthetic inspection

### Appearance check:

- Paintwork
  - Fitting of plastics
  - Scratches
  - Dirt
- 

## Tightening torques inspection

### Lock check

- Safety locks
- Fixing screws

### Safety locks

---

Rear shock absorber upper fixing

---

Rear shock absorber lower fixing

---

Lower front shock absorber fitting

---

Front wheel axle nut

---

Front wheel screws

---

Rear wheel screws

---

Front and rear wheel hub nut

---

Front and rear brake calliper clamping screws

---

Frame - swinging arm bolt \*

---

Swinging arm bolt - Engine

---

Engine arm pin - Frame arm

---

Handlebar lock nut

---

Steering lower ring nut

---

Upper steering ring nut

---

## Electrical system

- Main switch
  - Lights: high-beam lights, low-beam lights, taillights (front and rear) and relevant warning lights
    - Headlight adjustment according to the regulations currently in force
  - Front and rear stop light buttons and relative light • Turn indicators and relative telltales
  - Instrument lighting
  - instruments: fuel and temperature indicator
-

- Instrument panel lights
- Horn
- Electrical start up
- Engine stopping with emergency stop switch
- electric saddle opening 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 ONE.**

#### **WARNING**

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

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

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

**BATTERIES PRODUCE EXPLOSIVE GASES; 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 THAT RECOMMENDED. 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.
  - Rear hub oil level
  - Engine coolant level
  - Engine oil level
- 

## **Road test**

### **Test ride**

- Cold start
  - Instrument operations
  - Response to the throttle control
  - Stability on acceleration and braking
  - Rear and front brake efficiency
  - Rear and front suspension efficiency
-

- Abnormal noise

---

## Static test

### Static control after the test ride:

- 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 Checks:

- Hydraulic braking system: lever travel
  - Clutch: proper functioning check
  - Engine: proper general functioning and no abnormal noise check
  - Other: papers check, chassis and engine number check, tools and equipment, licence plate fitting, lock check, tyre pressure check, rear-view mirror and any accessory fitting
-



## INDEX OF TOPICS

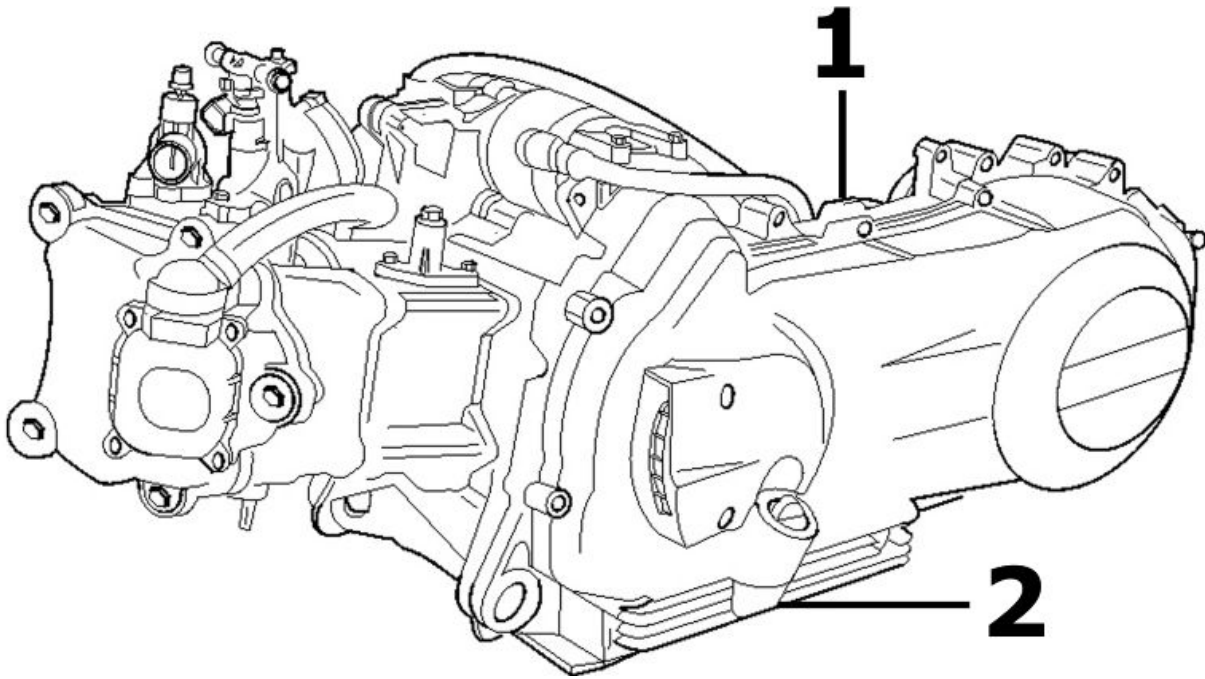
TIME

TIME

This section is devoted to the time necessary to carry out repairs.

For each operation, the description, code and time envisages are specified.

## Engine



### ENGINE

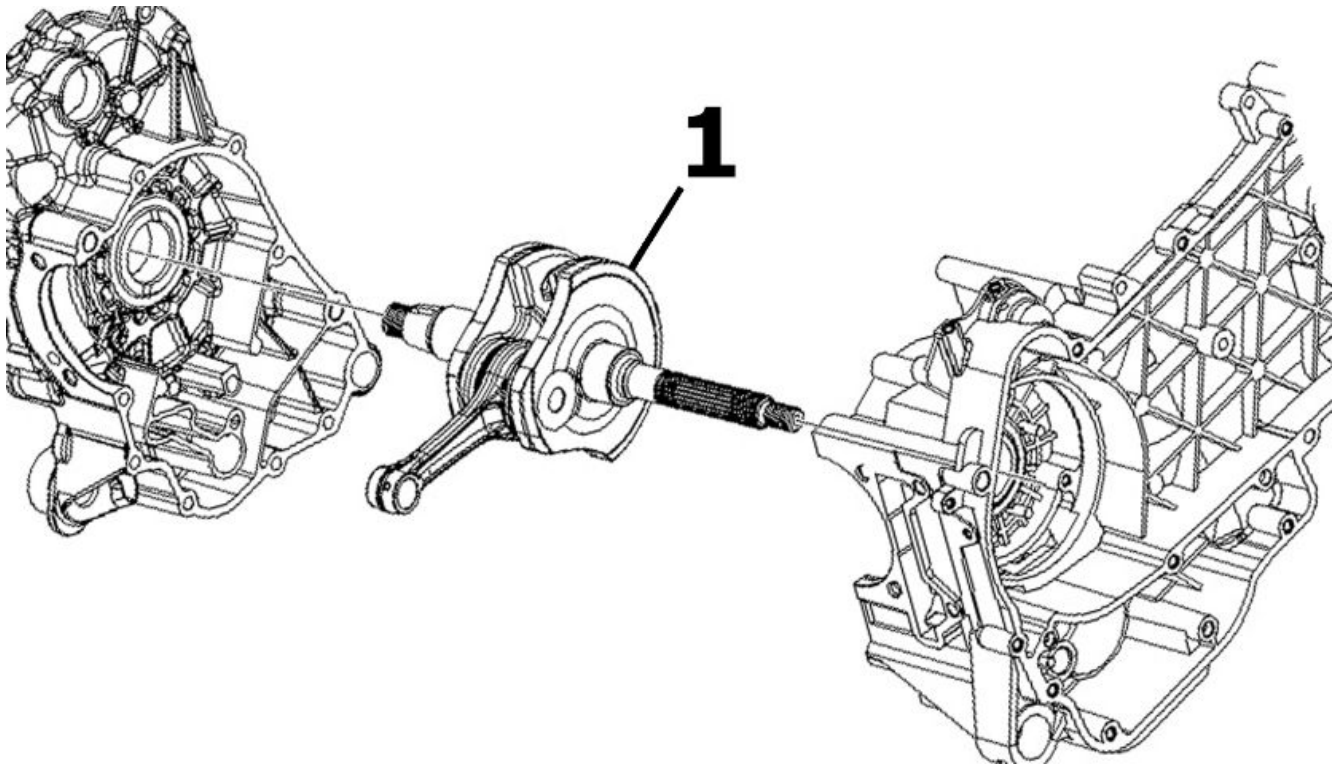
	<u>Code</u>	<u>Action</u>	<u>Duration</u>
1	001001	Engine from chassis - Removal and refit.	
2	003064	Engine oil - change	

## Crankcase

### CRANKCASE

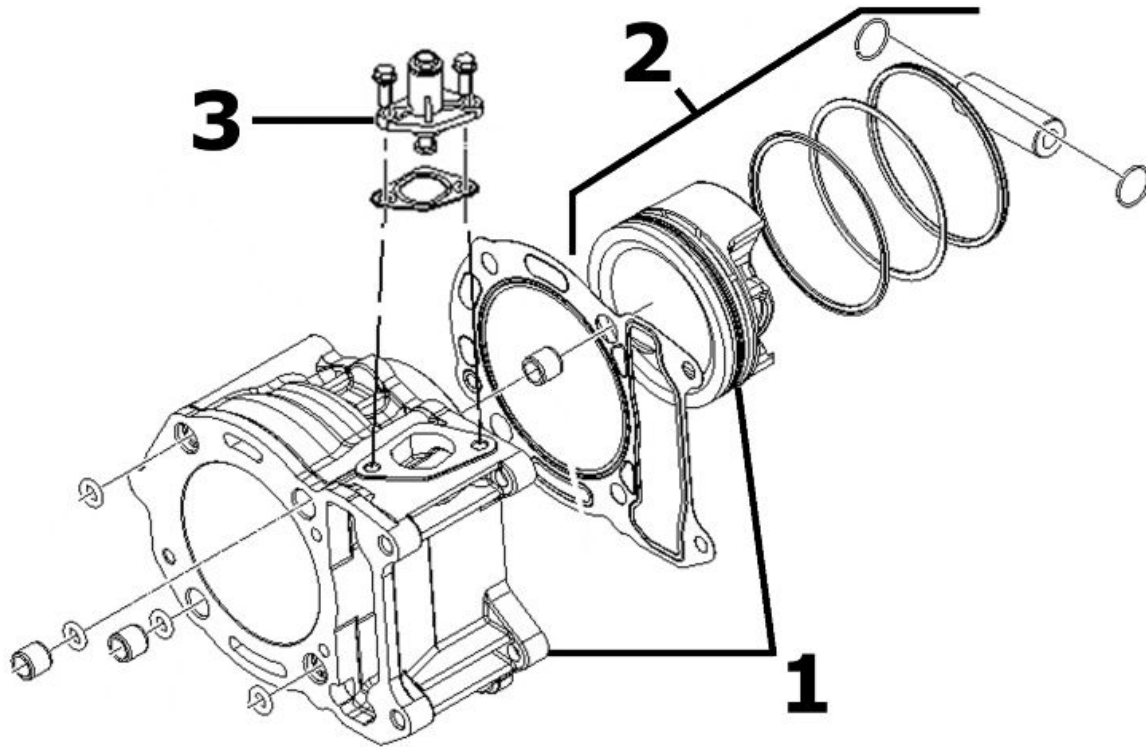
	<u>Code</u>	<u>Action</u>	<u>Duration</u>
1	001153	Crankcase halves gasket - Replacement	
2	001133	Engine crankcase - Replacement	

**Crankshaft**



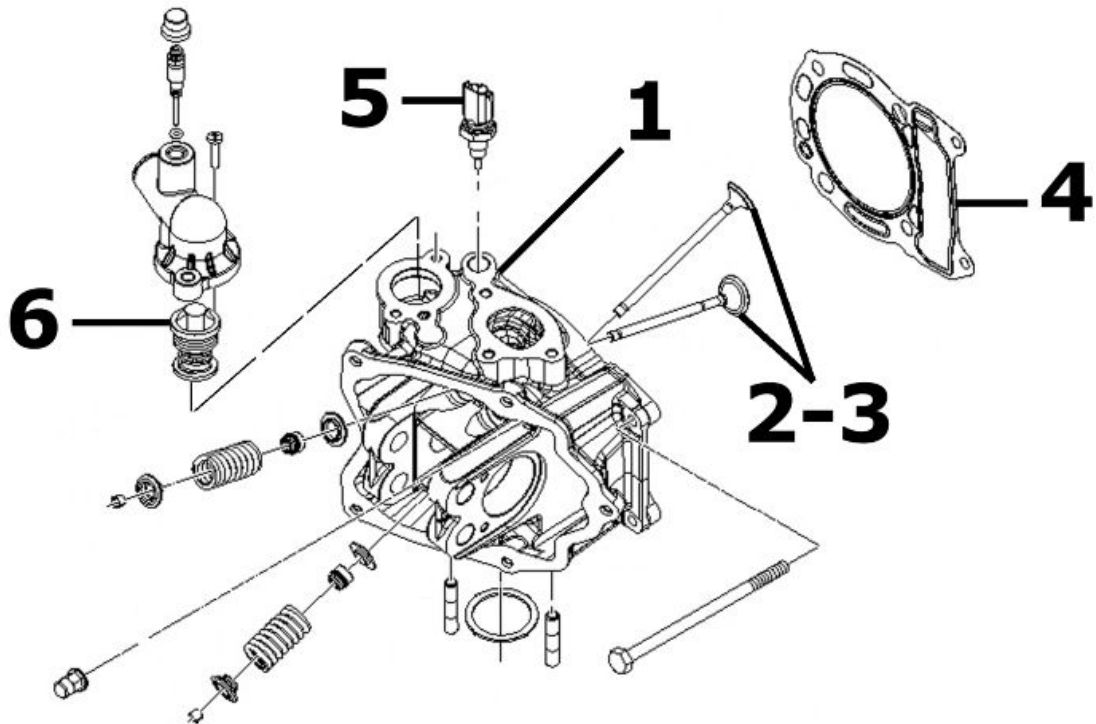
**CRANKSHAFT**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001117	Crankshaft - Replacement	

**Cylinder assy.****CYLINDER - PISTON**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001002	Cylinder / Piston - Replacement	
2	001154	Pistonsrings-pin assembly - Service	
3	001129	Chain tensioner - Service and Replacement	

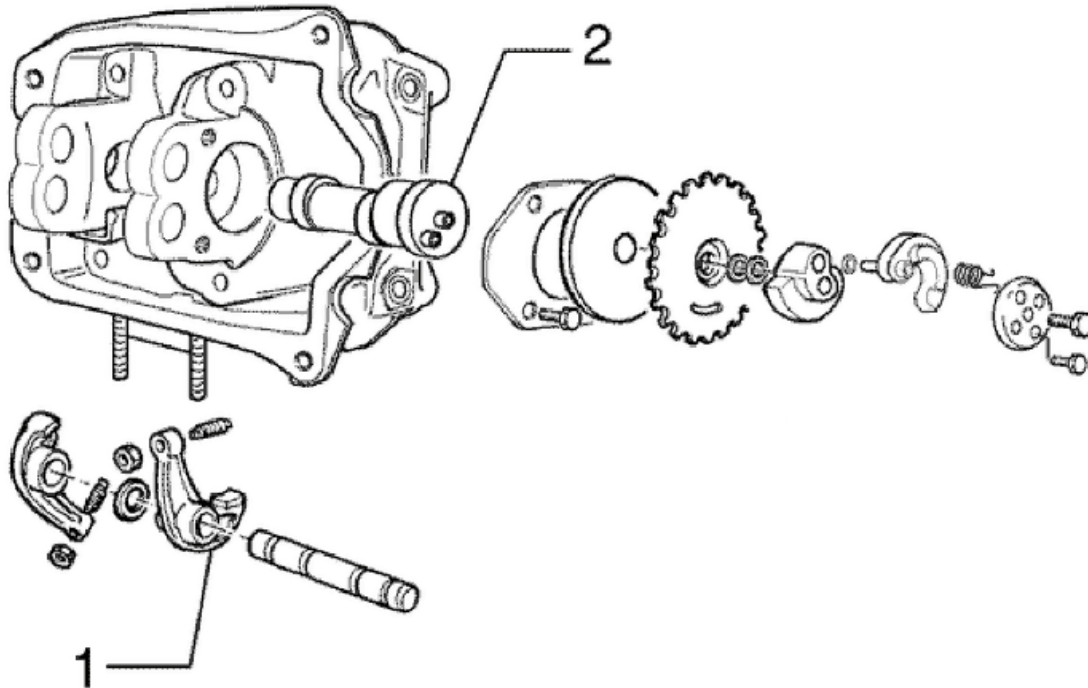
Cylinder head assy.



**VALVE HEAD**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001126	Head - Replacement	
2	001045	Valves - Replacement	
3	001049	Valves - adjust	
4	001056	Head gasket - change	
5	001083	Thermistor - Replacement	
6	001057	Thermostat - Replacement	

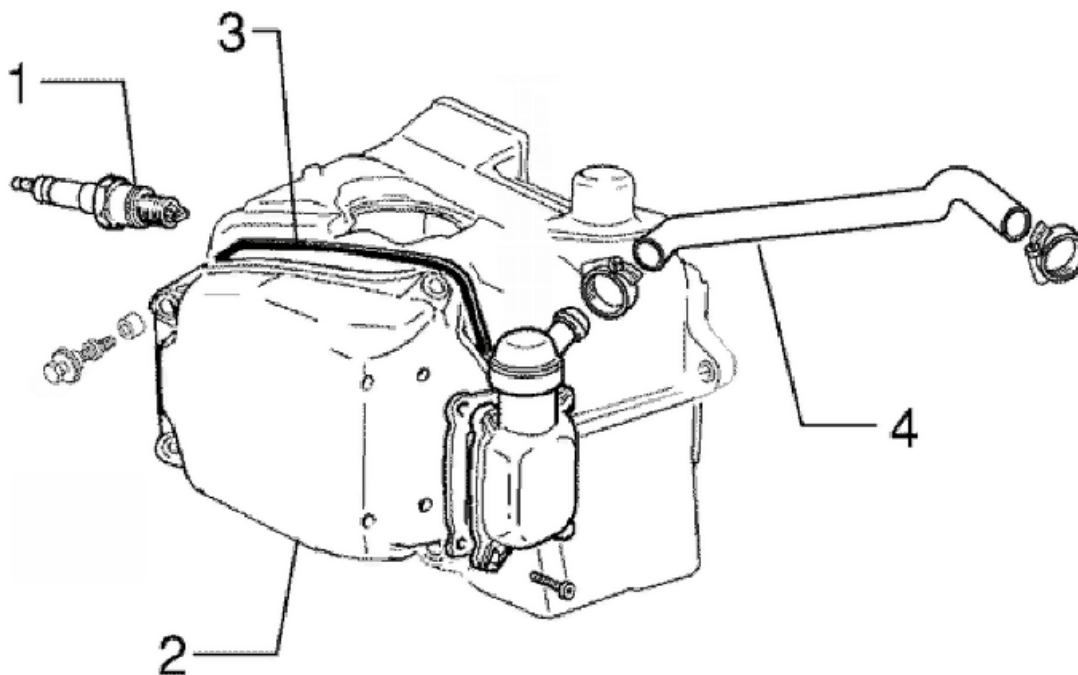
**Rocker arms support assy.**



**CAMSHAFT**

	Code	Action	Duration
1	001148	Rockers valves - Replacement	
2	001044	Camshaft - Replacement	

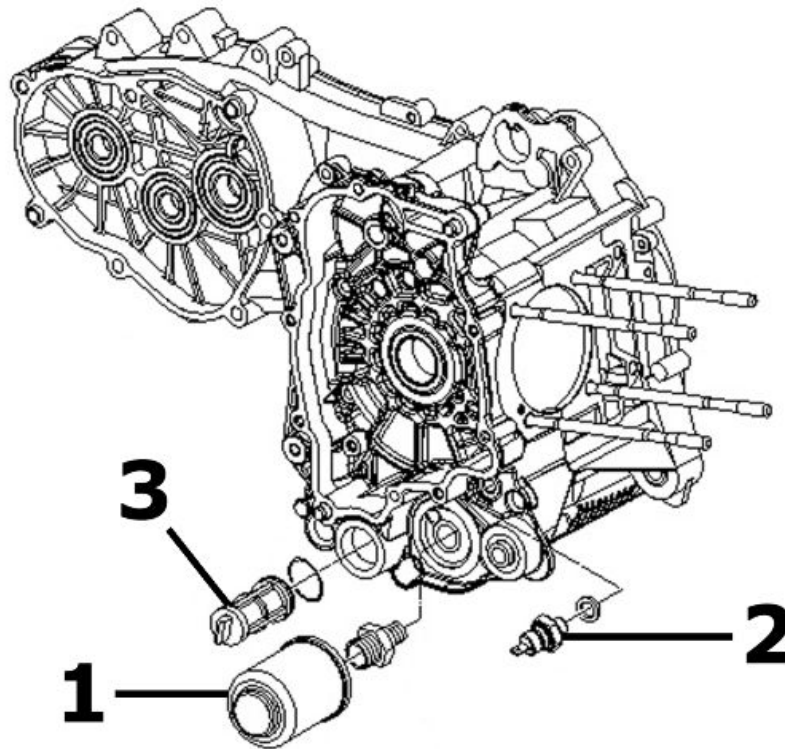
**Cylinder head cover**



**HEAD COVER**

	Code	Action	Duration
1	001093	Spark plug - Replacement	
2	001089	Head cover - Replacement	
3	001088	Head cover gasket - Replacement	
4	001074	Oil vapour recovery pipe - Replacement	

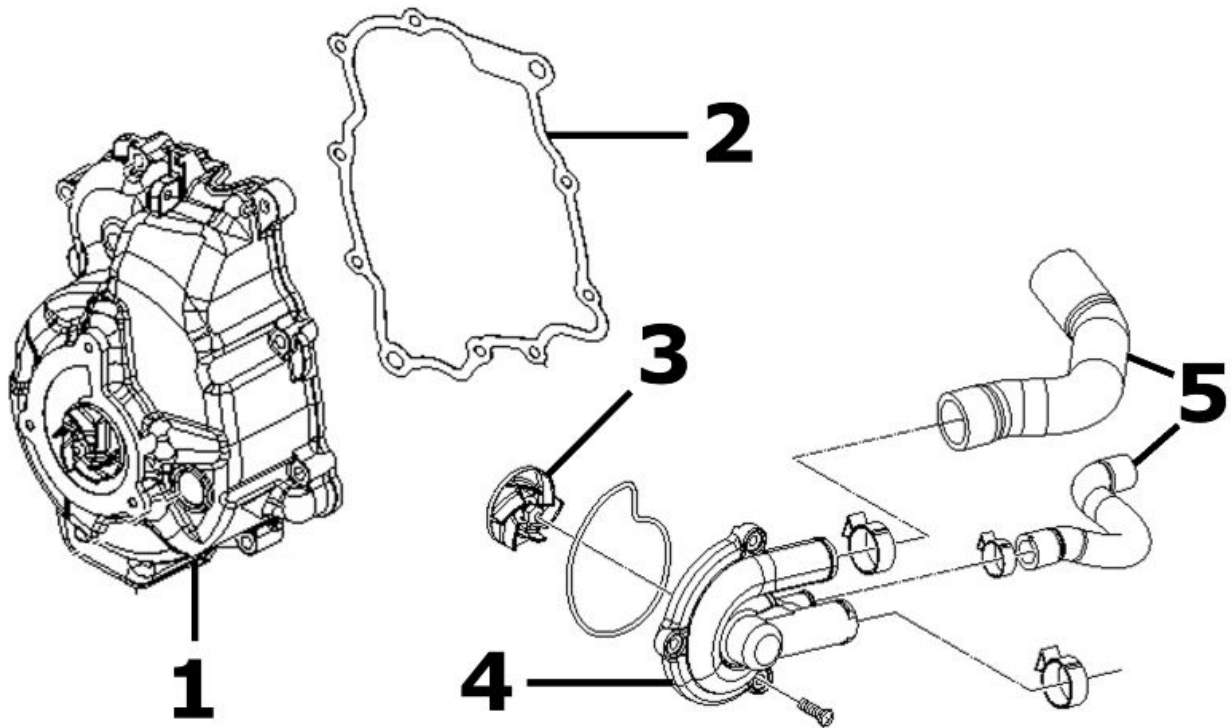
**Oil filter**



**OIL FILTER**

	Code	Action	Duration
1	001123	Oil filter -Replacement	
2	001160	Oil pressure sensor - change	
3	001102	Net oil filter - change / Cleaning	

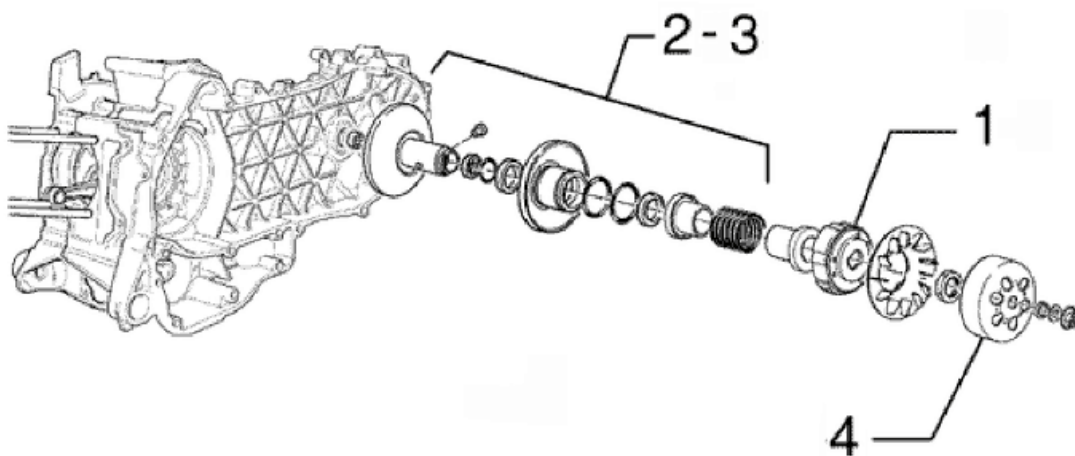
**Flywheel cover**



**FLYWHEEL COVER**

	Code	Action	Duration
1	001087	Flywheel cover - Replacement	
2	001150	Flywheel cover gasket - change	
3	007007	Water pump rotor - Replacement	
4	007017	Water pump cover - Replacement	
5	007003	Coolant delivery and return pipe - change	

**Driven pulley**

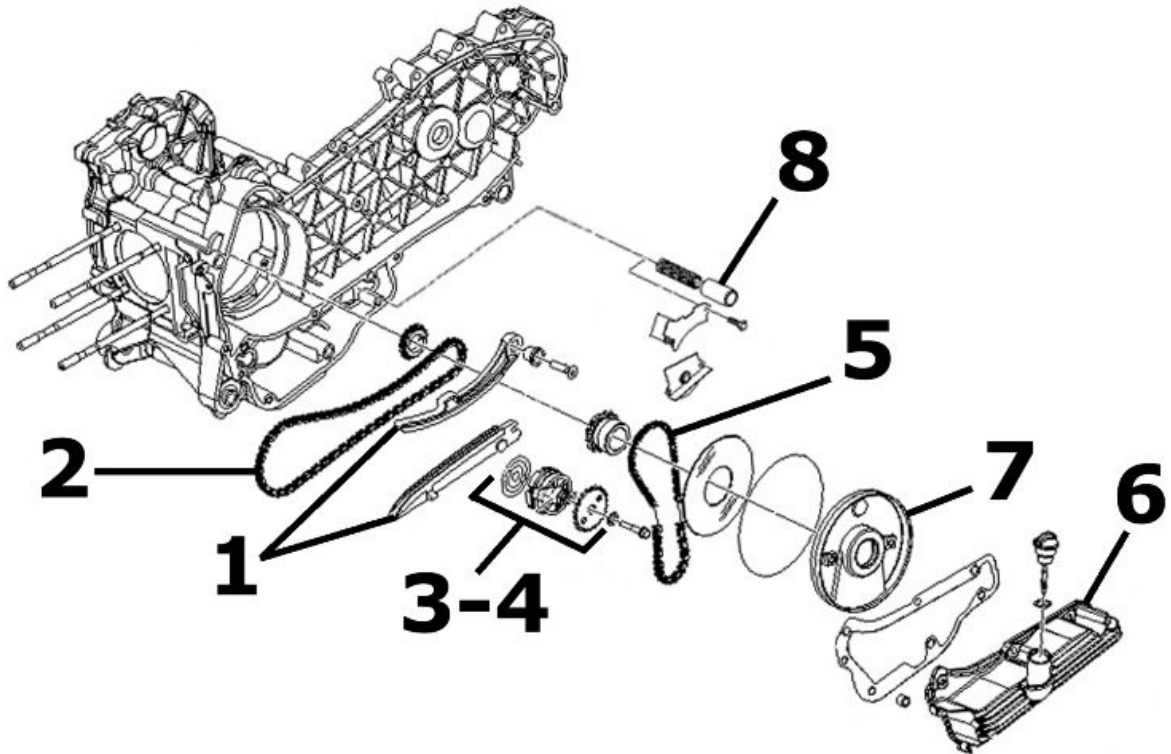




**DRIVEN PULLEY**

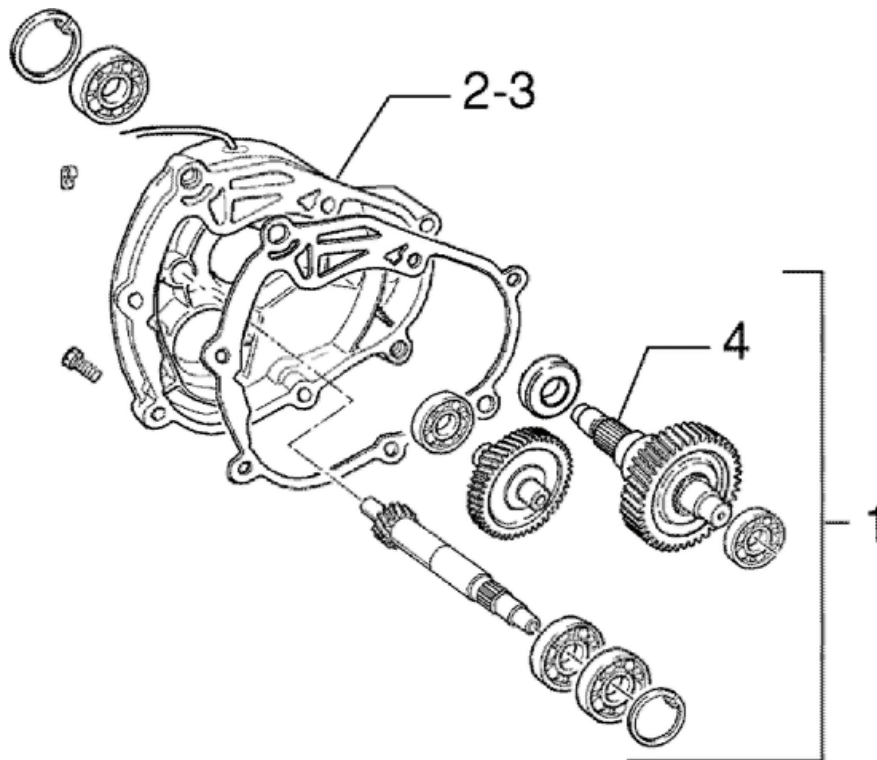
	Code	Action	Duration
1	001022	Clutch - Replacement	
2	001012	Driven pulley - overhaul	
3	001110	Driven pulley- Replacement	
4	001155	Clutch bell - Replacement	

**Oil pump**



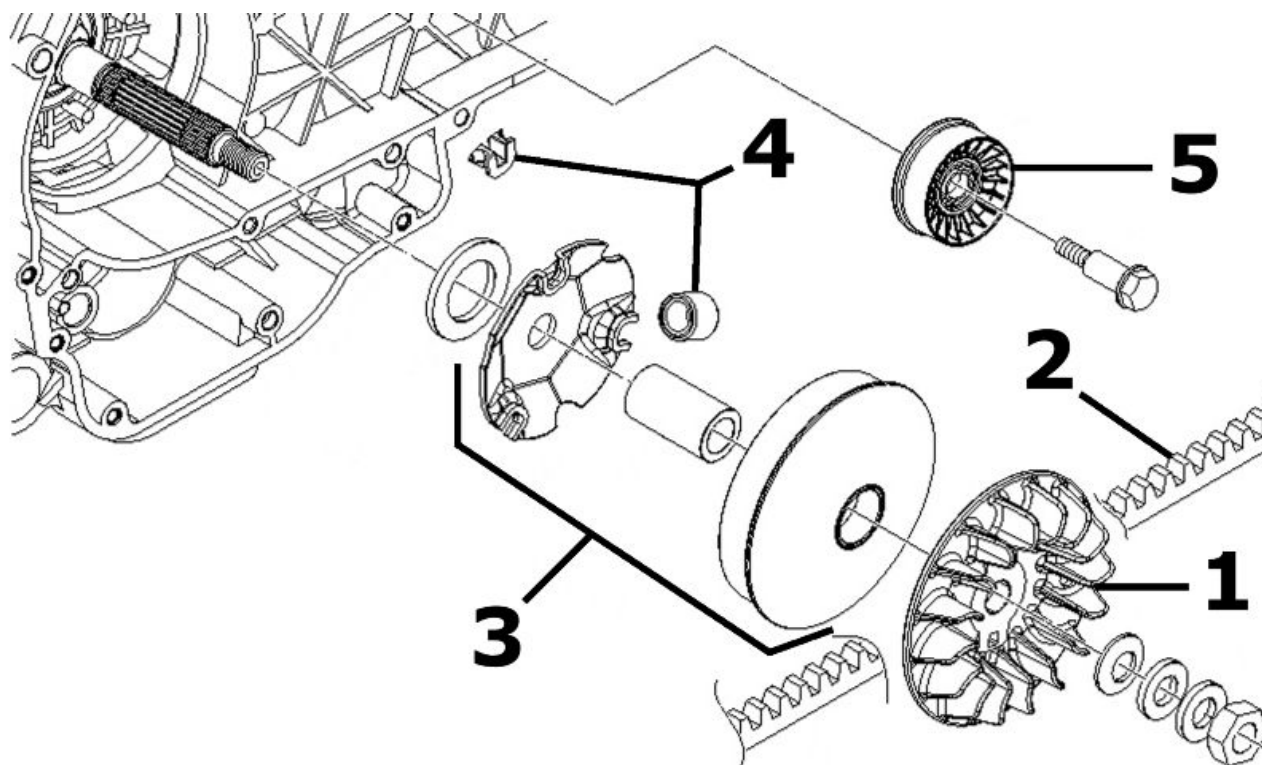
**OIL PUMP**

	Code	Action	Duration
1	001125	Chain guide pads - Replacement	
2	001051	Belt/Timing chain - Change	
3	001042	Oil pump - overhaul	
4	001112	Oil pump - change	
5	001122	Oil pump chain - Replacement	
6	001130	Oil sump - change	
7	001172	Chain cover flap - change	
8	001124	Lubrication by pass - Replacement	

**Final gear assy.****FINAL REDUCTION GEAR**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001010	Reduction gear - Replacement	
2	003065	Gear box oil - Replacement	
3	001156	Reduction gear cover - Replacement	
4	004125	Rear wheel axle - Replacement	

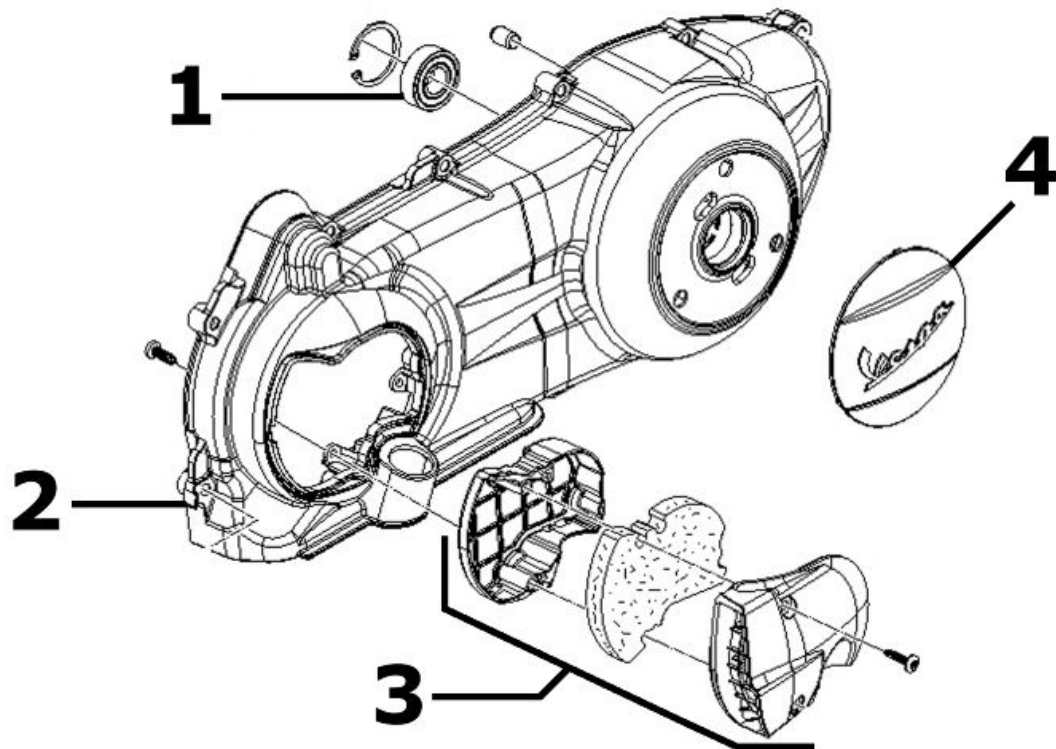
**Driving pulley**



**DRIVING PULLEY**

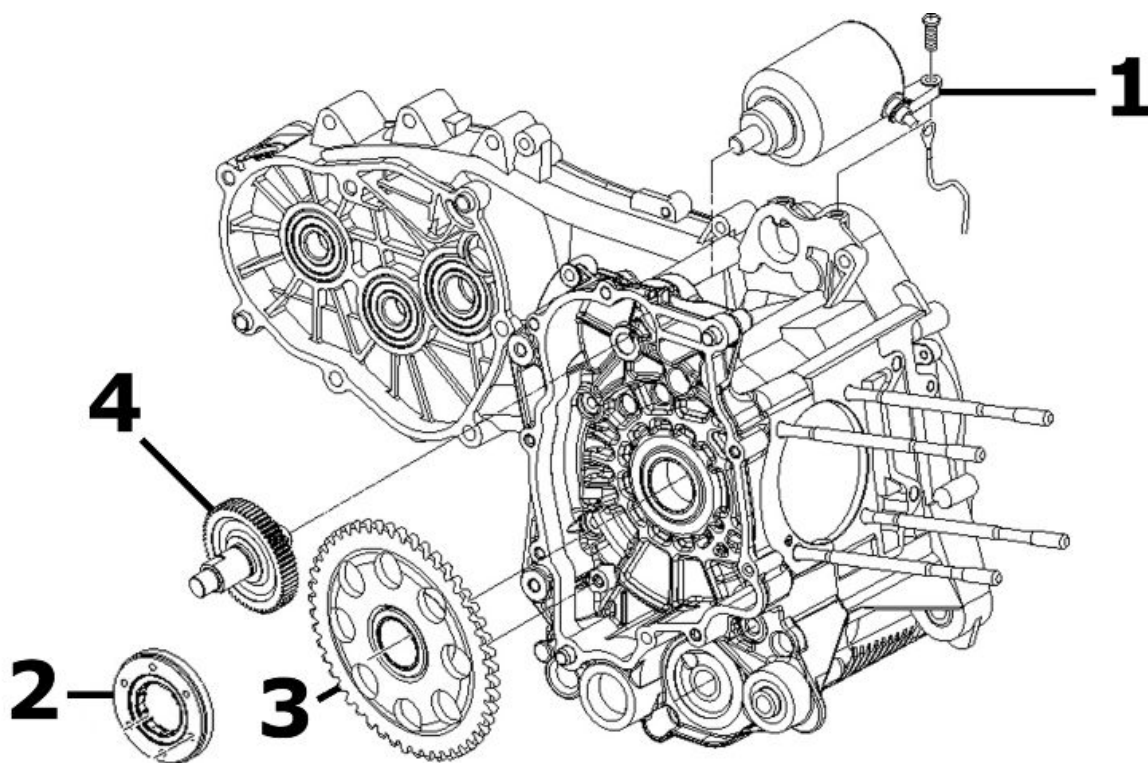
	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001086	Driving half-pulley - Replacement	
2	001011	Driving belt - Replacement	
3	001066	Driving pulley - Removal and refitting	
4	001177	Variator rollers / shoes - Replacement	
5	001141	Belt anti-flapping roller - Replacement	

## Transmission cover

**TRANSMISSION COVER**

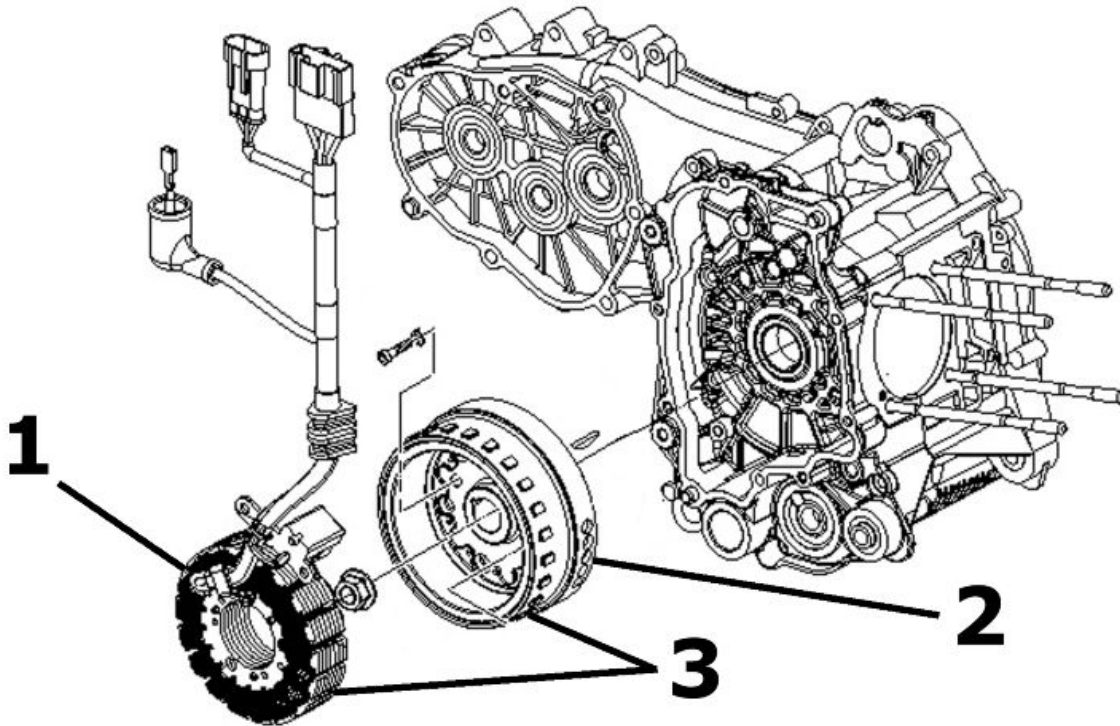
	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001135	Transmission cover bearing - Replacement	
2	001096	Transmission crankcase cover - Replacement	
3	001131	Transmission air intake - Replacement	
4	001065	Transmission cover - Replacement	

## Starter motor

**ELECTRICAL START-UP**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001020	Starter motor - Replacement	
2	001104	Start-up freewheel - Replacement	
3	001151	Starter driven gearing - Replacement	
4	001017	Start-up pinion - Replacement	

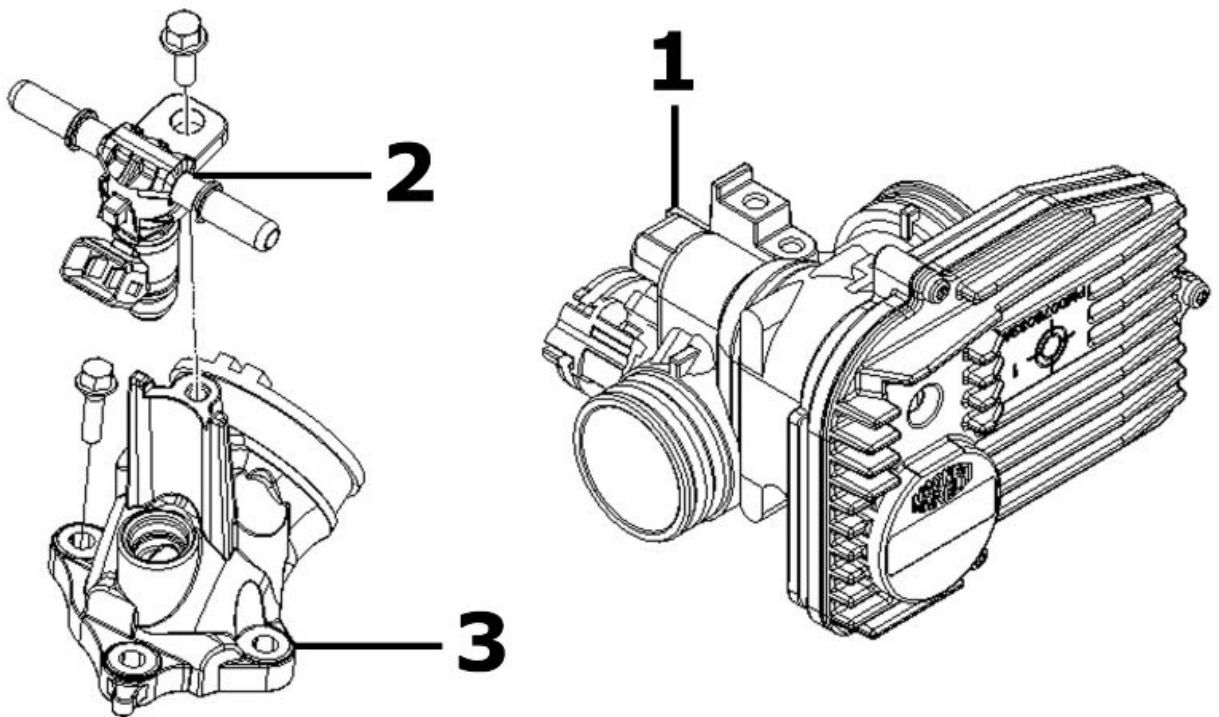
## Flywheel magneto



### MAGNETO FLYWHEEL

	Code	Action	Duration
1	001067	Stator - Removal and Refitting	
2	001173	Rotor - Replacement	
3	001058	Complete flywheel - change	

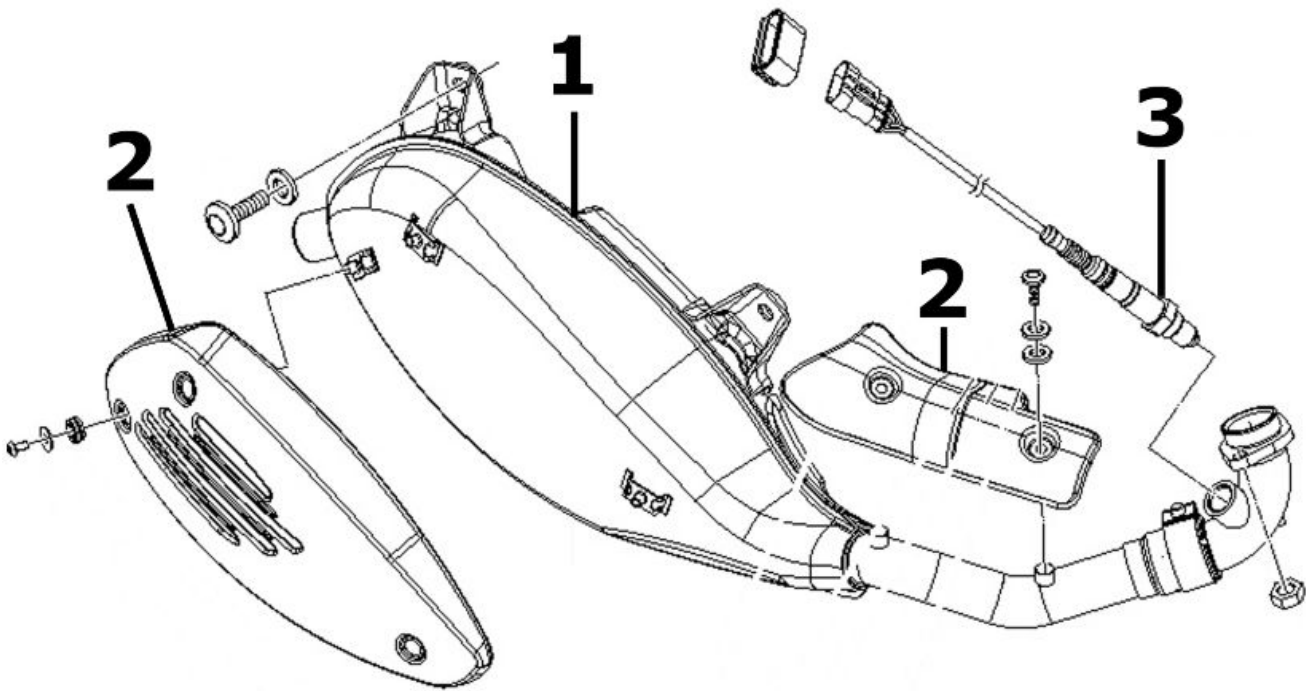
Butterfly valve



**THROTTLE BODY**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001166	Throttle body - Replacement	
2	001047	Injector - Replacement	
3	001013	Intake manifold - change	

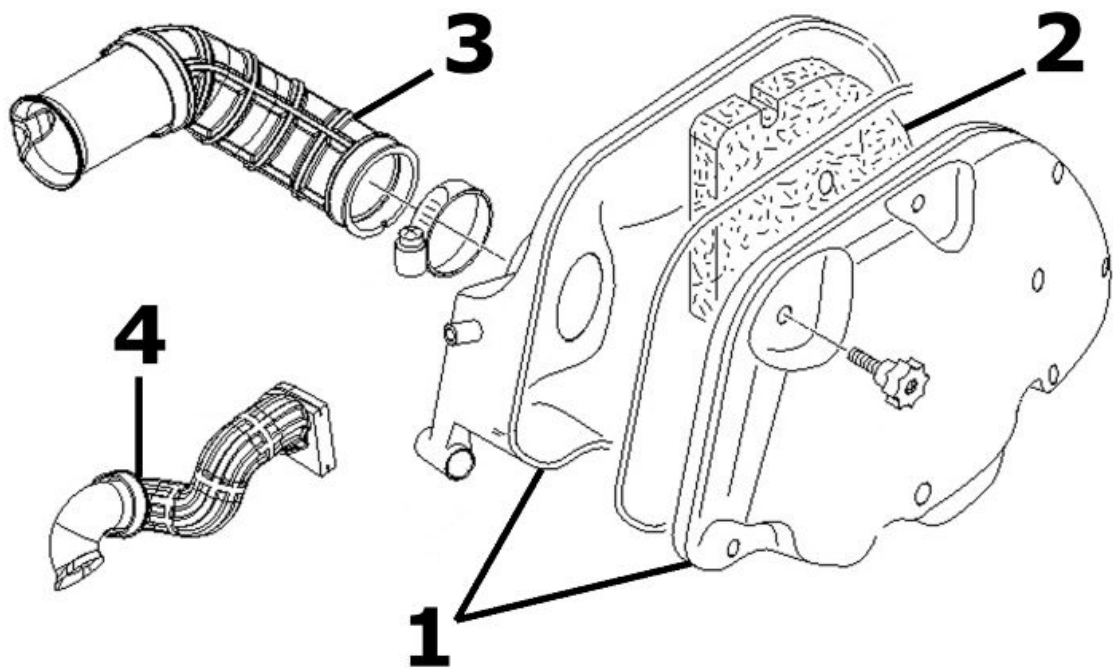
## Exhaust pipe

**MUFFLER**

	Code	Action	Duration
1	001009	Muffler - Replacement	
2	001095	Muffler guard - Replacement	
3	005138	Lambda probe - Replacement	



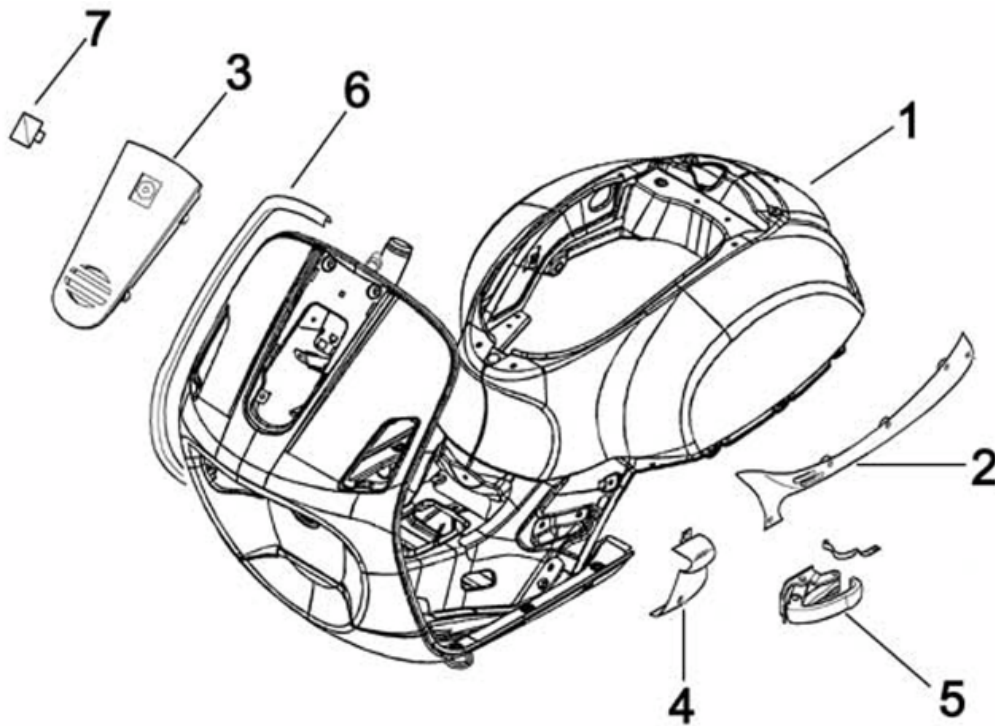
**Air cleaner**



**AIR CLEANER**

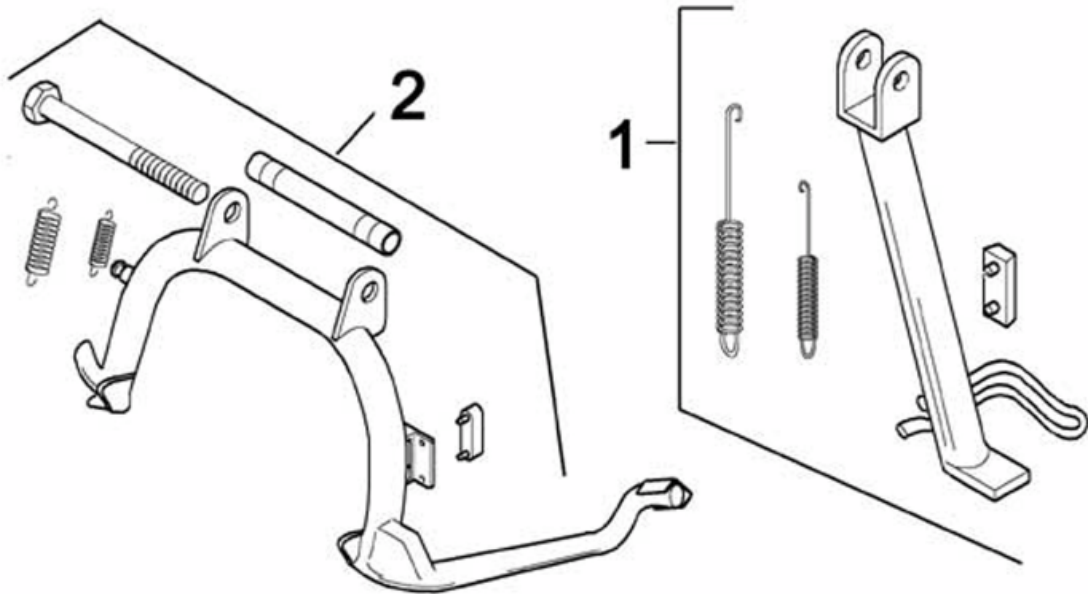
	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001015	Air filter box - Replacement	
2	001014	Air filter - Replacement / cleaning	
3	004122	Air cleaner/ carburettor union - Replacement	
4	001027	Body / air cleaner union - Replacement	

## Frame

**CHASSIS**

	Code	Action	Duration
1	004001	Chassis - Replacement	
2	004085	Fairing (1) - Replacement	
3	004149	Shield central cover - Replacement	
4	004053	Spoiler - Replacement	
5	004015	Footrest - Removal and Refitting	
6	004023	Shield rim - Replacement	
7	004159	Plates / Stickers - Replacement	

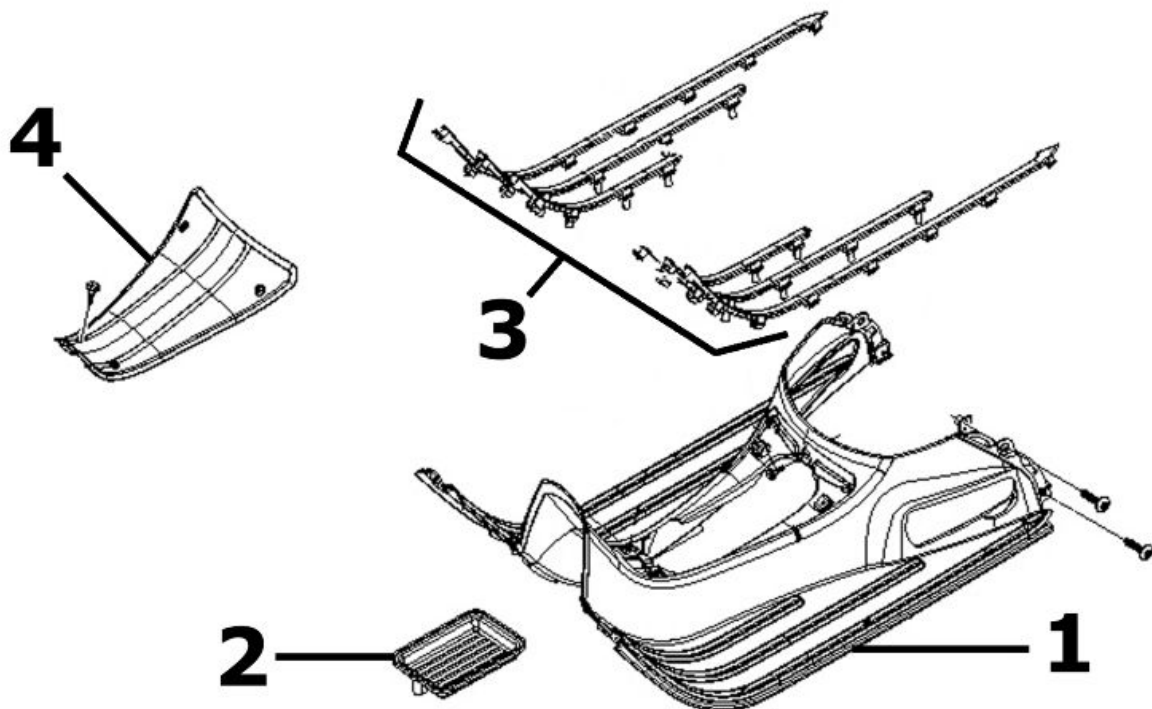
Centre-stand



**STAND**

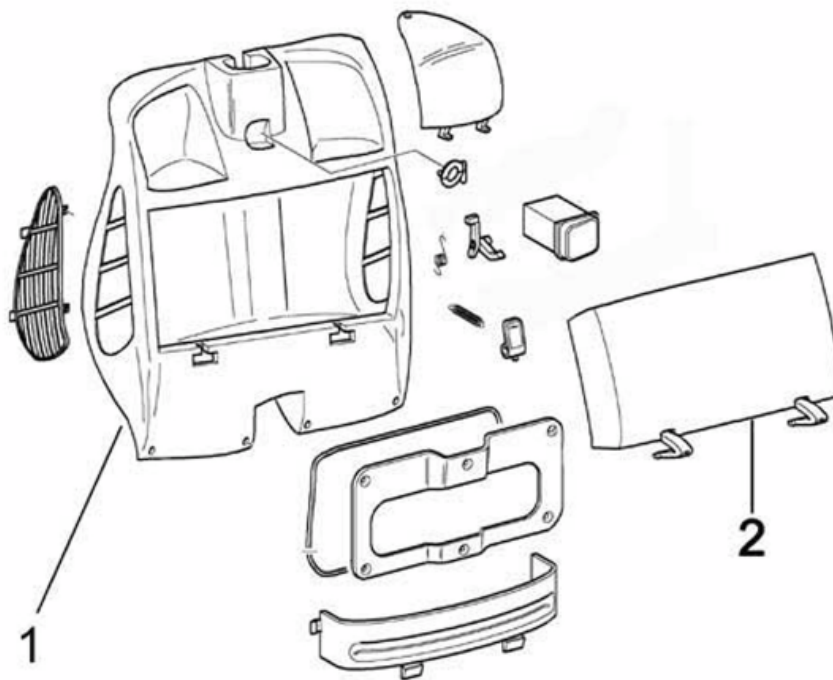
	Code	Action	Duration
1	004102	Side stand - Replacement	
2	004004	Stand - Replacement	

Footrests



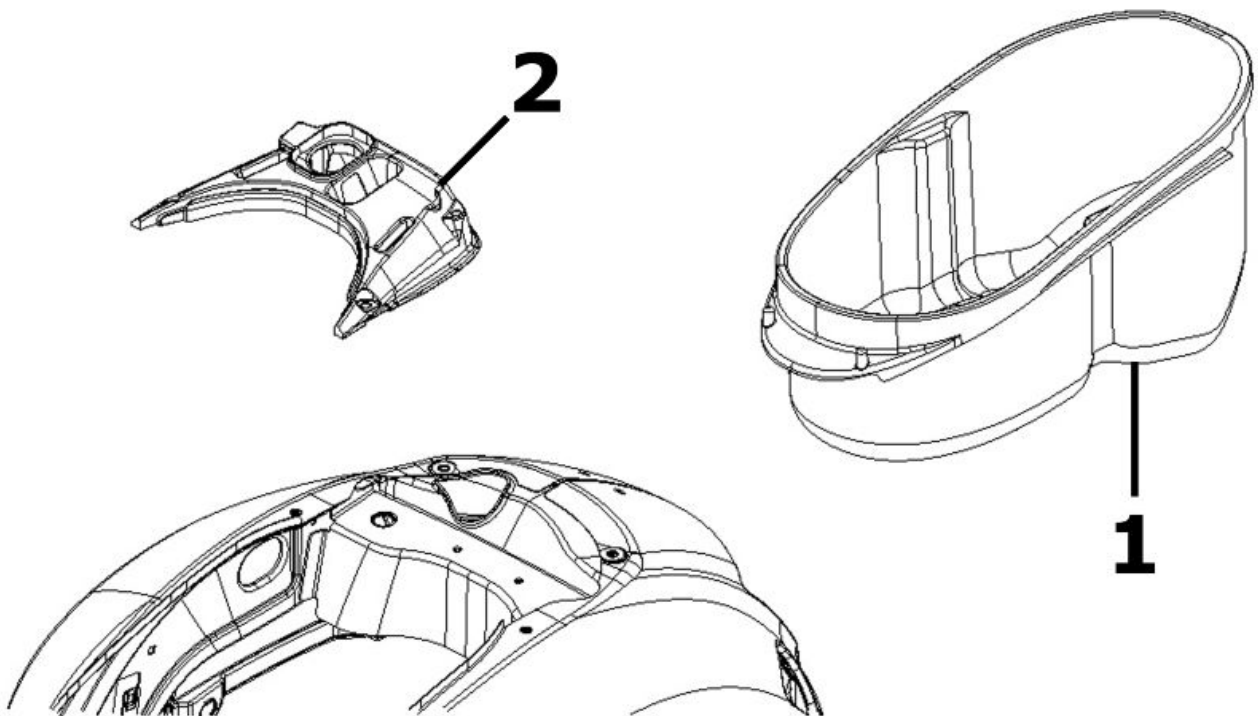
**MATS AND COVERS**

	Code	Action	Duration
1	004079	Footrest - replacement	
2	004071	Battery compartment - replacement	
3	004078	Front/rear footrest rubber - Replacement	
4	005046	Battery cover - change	

**Rear cover****REAR SHIELD**

	Code	Action	Duration
1	004083	Glove box - Replacement	
2	004081	Top box lid - Replacement	

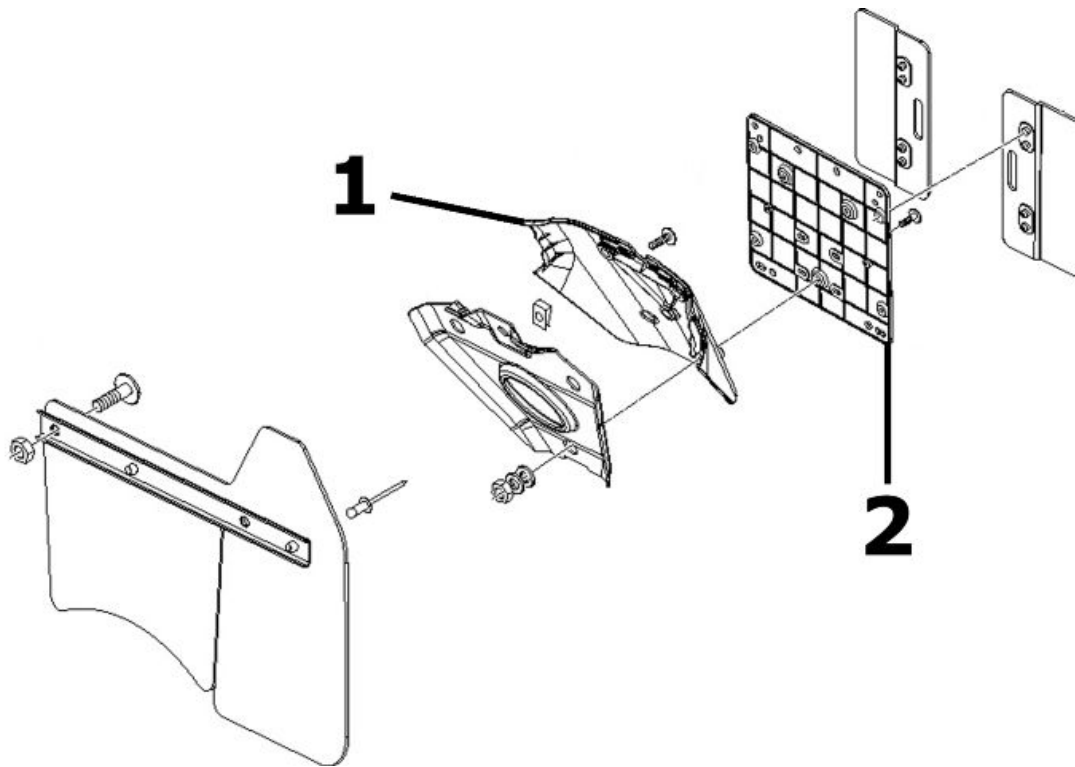
Underseat compartment



**HELMET COMPARTMENT**

	Code	Action	Duration
1	004016	Helmet compartment - Removal and Refitting	
2	004011	Central chassis cover - Replacement	

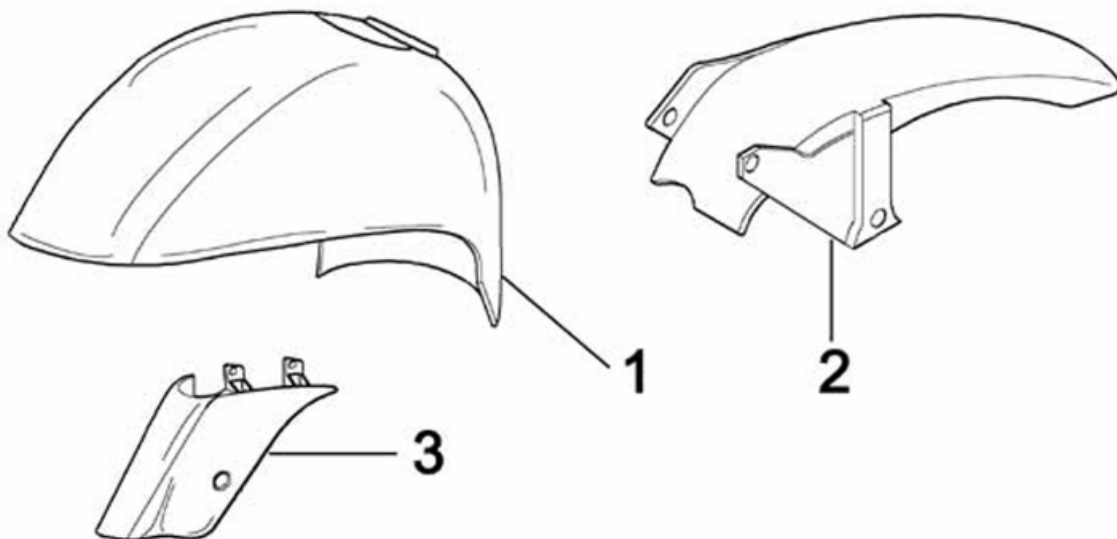
## Plate holder



### LICENSE PLATE HOLDER

	Code	Action	Duration
1	004136	License plate holder support - Replacement	
2	005048	number plate holder - Replacement	

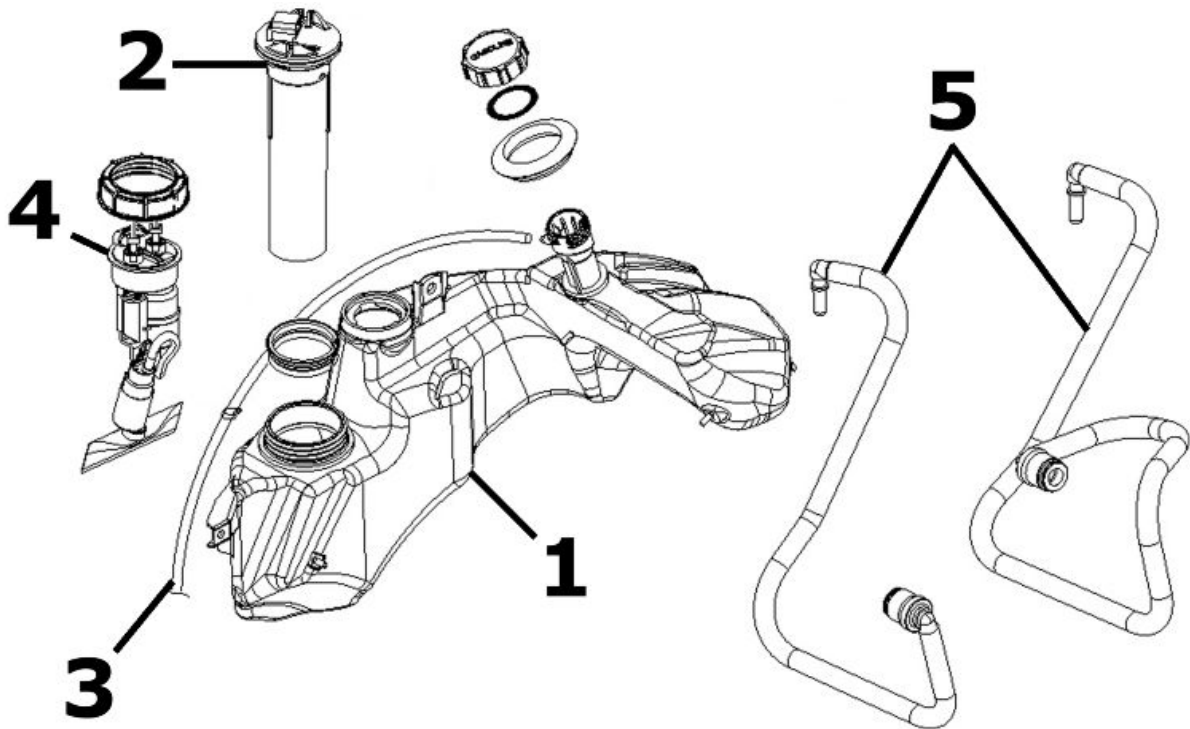
## Mudguard



**MUDGUARDS**

	Code	Action	Duration
1	004002	Front mudguard - change	
2	004009	Rear mudguard - Replacement	
3	003044	Shock absorber cover - Replacement	

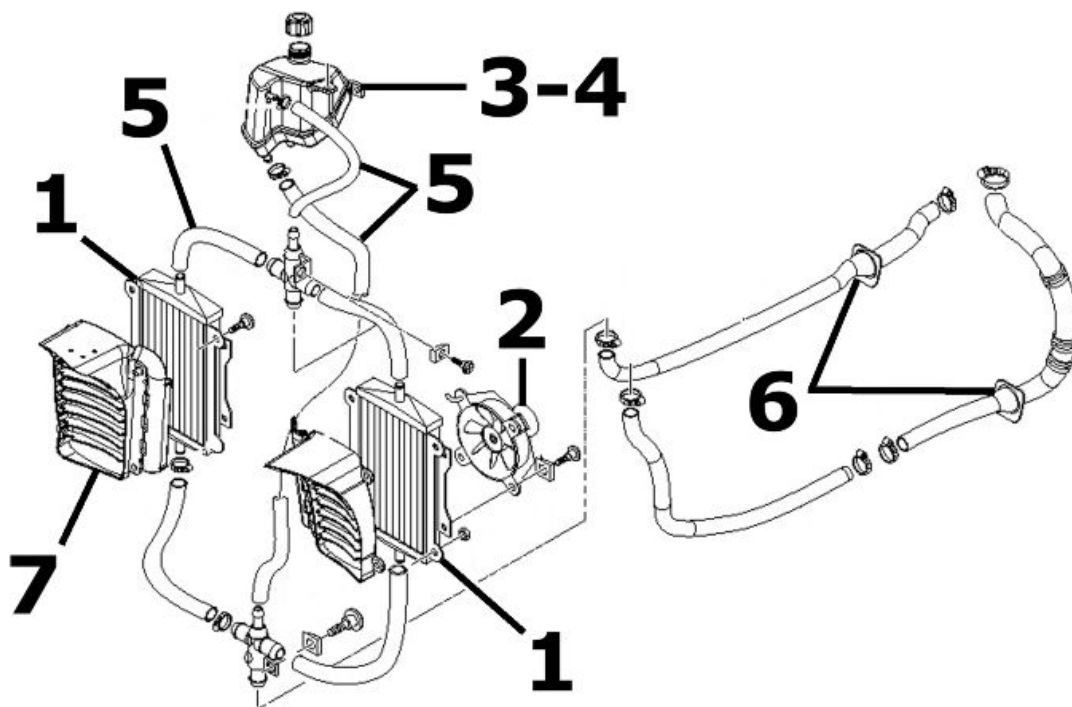
**Fuel tank**



**FUEL TANK**

	Code	Action	Duration
1	004005	Fuel tank - Replacement	
2	005010	Tank float - Replacement	
3	004109	Fuel tank breather - change	
4	004073	Fuel pump - Replacement	
5	004137	Injector pump pipe - Replacement	

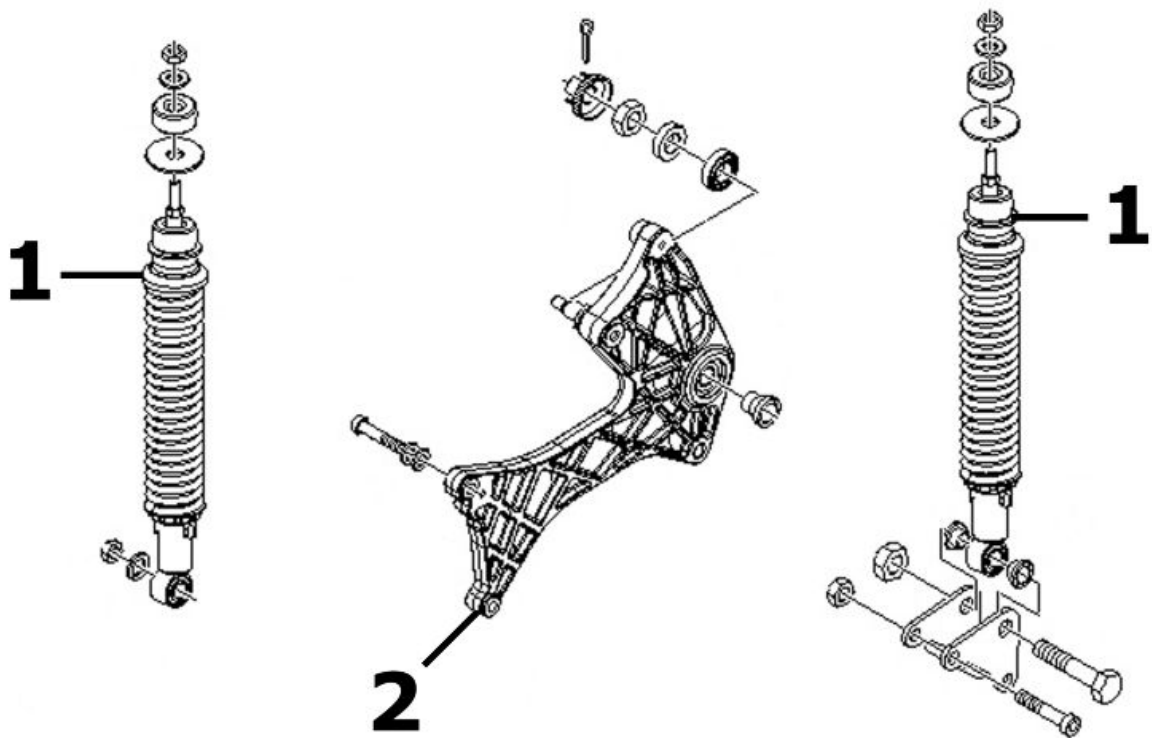
## Radiator

**RADIATOR**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	007002	Water cooling radiator - Replacement	
2	007016	Fan complete with support - Replacement	
3	007001	Expansion tank - Replacement	
4	001052	Coolant and air bleed - Replacement	
5	007013	Expansion tank / radiator connecting hose - Replacement	
6	007003	Delivery line and coolant return - Replacement	
7	001170	Air deflector - Replacement	

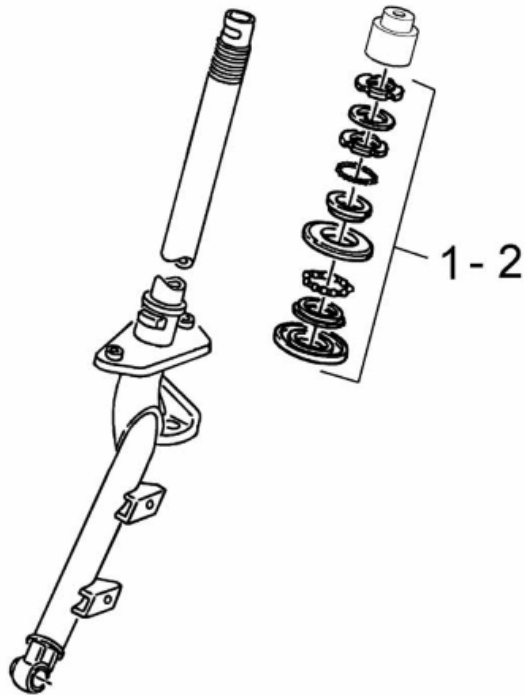


Rear shock-absorber



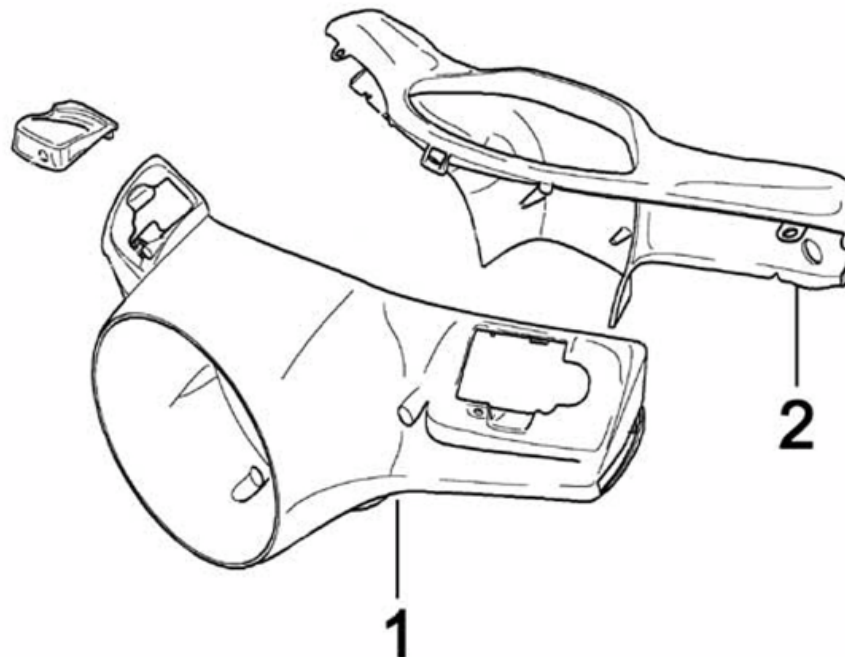
**REAR SHOCK ABSORBERS**

	Code	Action	Duration
1	003007	Rear shock absorber - Removal and Refitting	
2	003077	muffler/rear shock absorber support arm - Service	

**Steering column bearings****STEERING FIFTH WHEELS**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	003002	Steering fifth wheels - Replacement	
2	003073	Steering clearance - Adjustment	

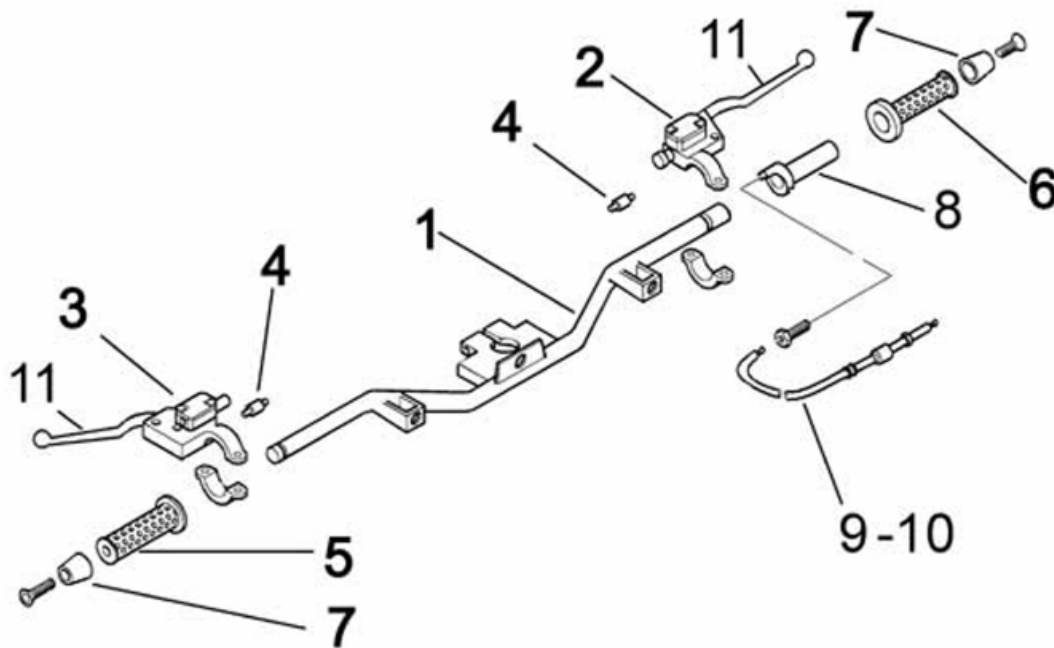
Handlebar covers



**HANDLEBAR COVERS**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	004018	Front handlebar covers - Replacement	
2	004019	Rear handlebar covers - Replacement	

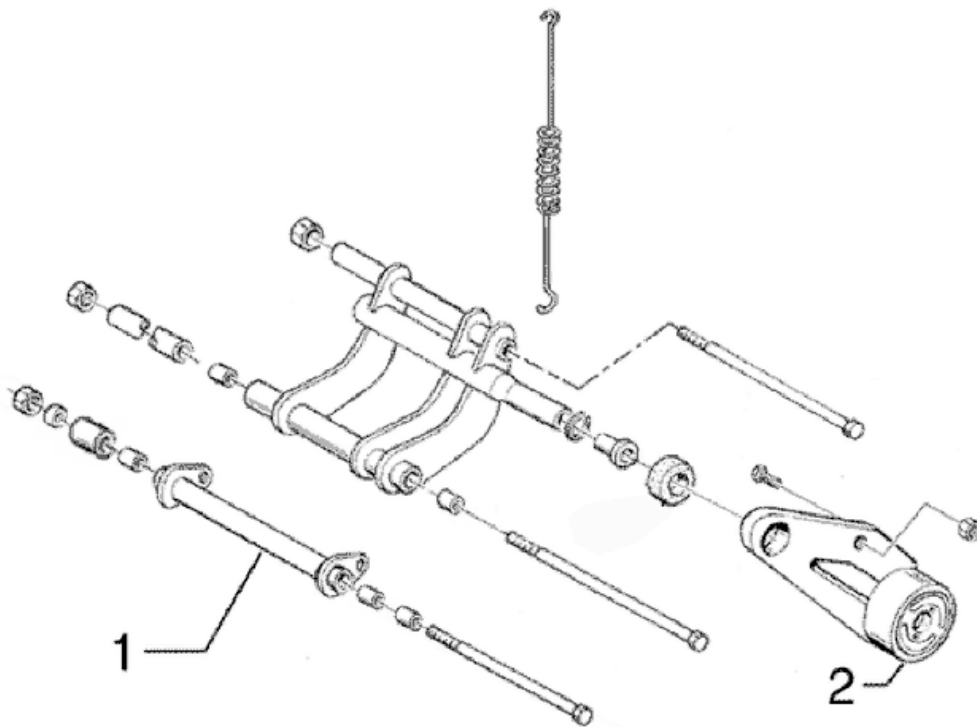
## Handlebar components



### HANDLEBAR COMPONENTS

	Code	Action	Duration
1	003001	Handlebar - Removal and refitting	
2	002067	Rear brake pump - Replacement	
3	002024	Front brake pump - Removal and refitting	
4	005017	Stop switch - Replacement	
5	002059	Right-hand knob - Replacement	
6	002071	Left hand grip - Replacement	
7	003059	Counterweight - Replacement	
8	002060	Throttle grip - Replacement	
9	002063	Throttle control transmission - Replacement	
10	003061	Accelerator transmission - adjust	
11	002037	Brake or clutch lever - Replacement	

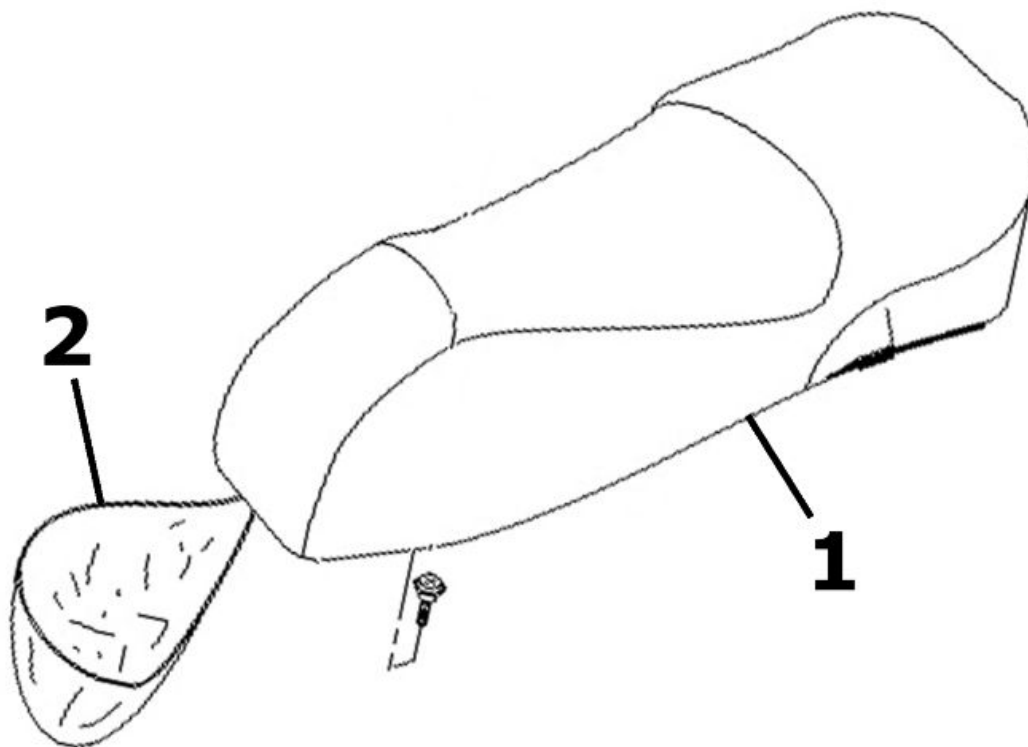
Swing-arm



**SWINGING ARM**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001072	Engine-chassis connection swinging arm - Replacement	
2	004058	Silent block - Replacement	

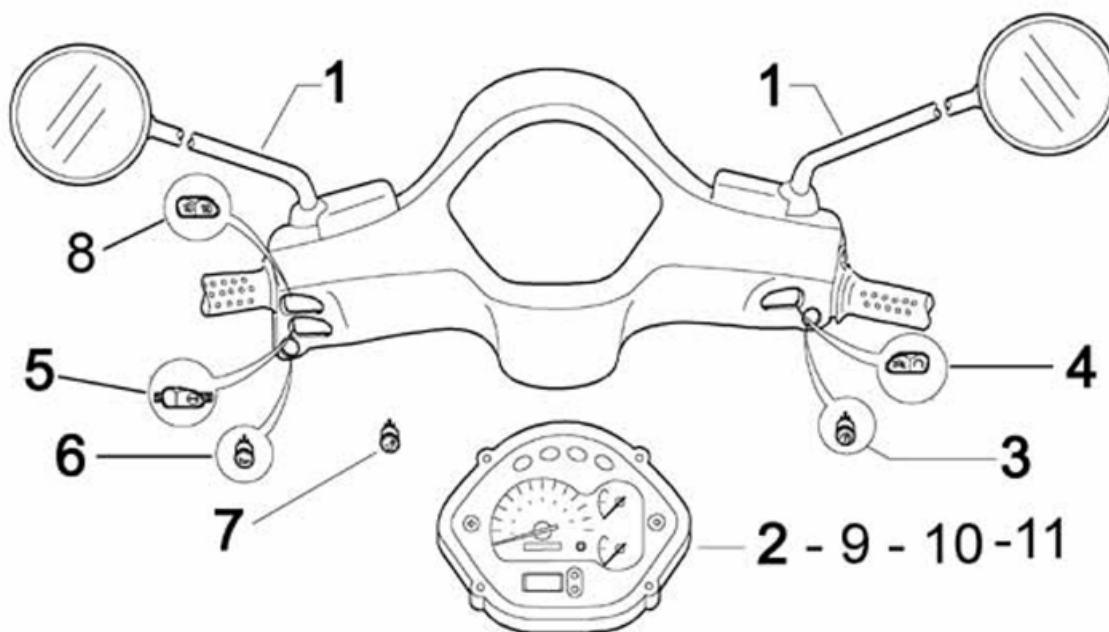
**Seat**



**SADDLE**

	Code	Action	Duration
1	004003	Saddle - Replacement	
2	004144	Saddle cover - Replacement	

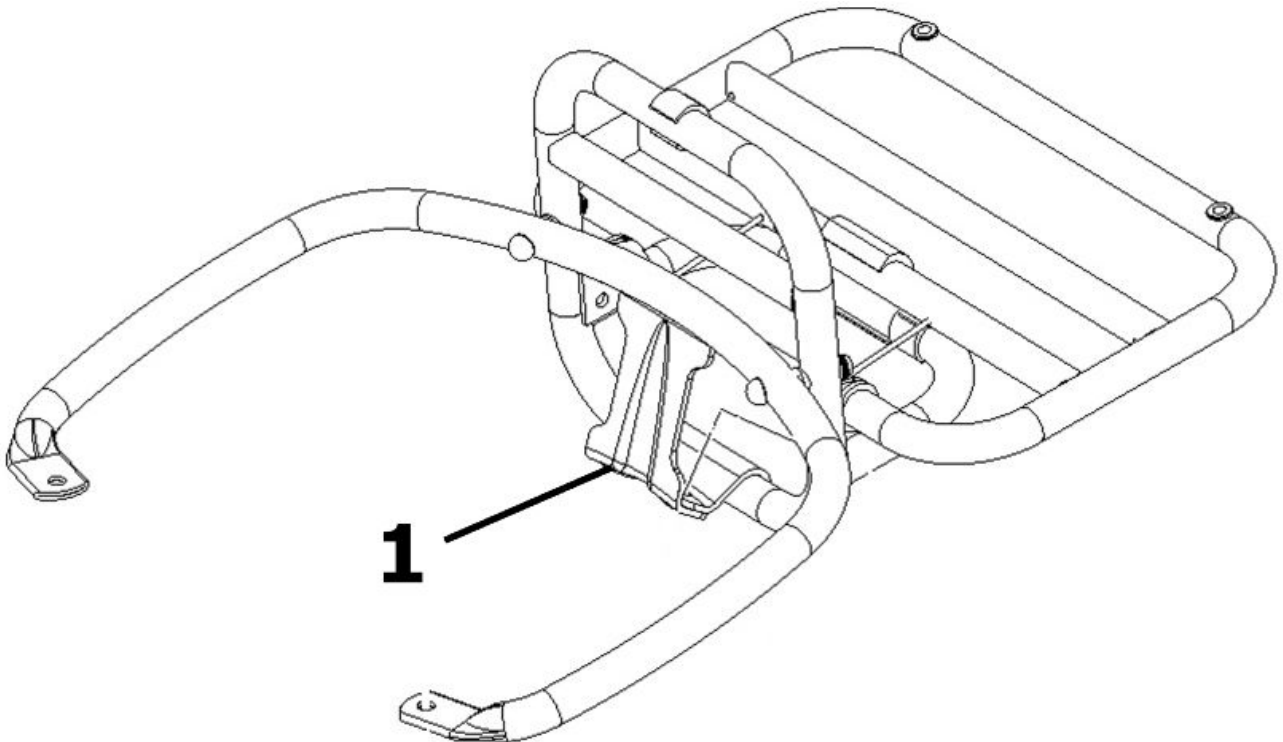
**Instrument panel**



**INSTRUMENT PANEL**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	004066	Driving mirror - Replacement	
2	005014	Odometer - Replacement	
3	005041	Starter button - Replacement	
4	005077	Emergency stop switch - Replacement	
5	005006	Light or turning indicator switch - Replacement	
6	005040	Horn button - Replacement	
7	005121	Saddle opening button - Replacement	
8	005039	Lights switch - Replacement	
9	005078	Odometer glass - Replacement	
10	005038	Instrument panel warning light bulbs - Replacement	
11	005076	Clock / Cell - Replacement	

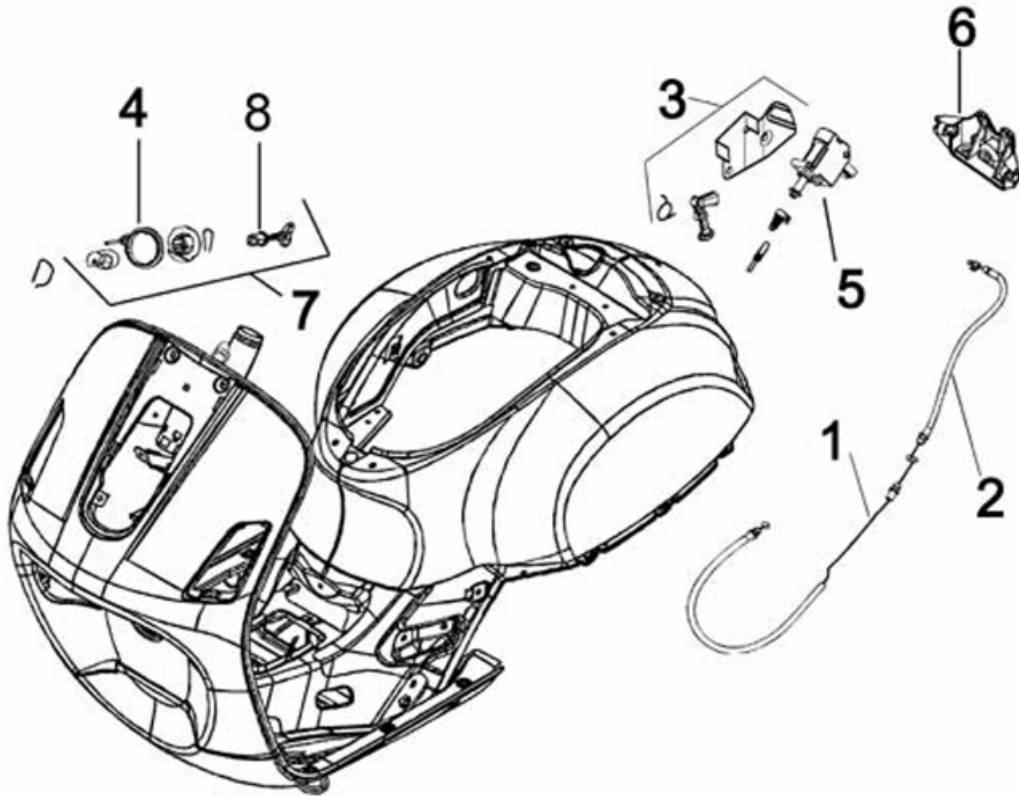
**Rear rack**



**LUGGAGE RACK**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	004008	Luggage rack - Replacement	

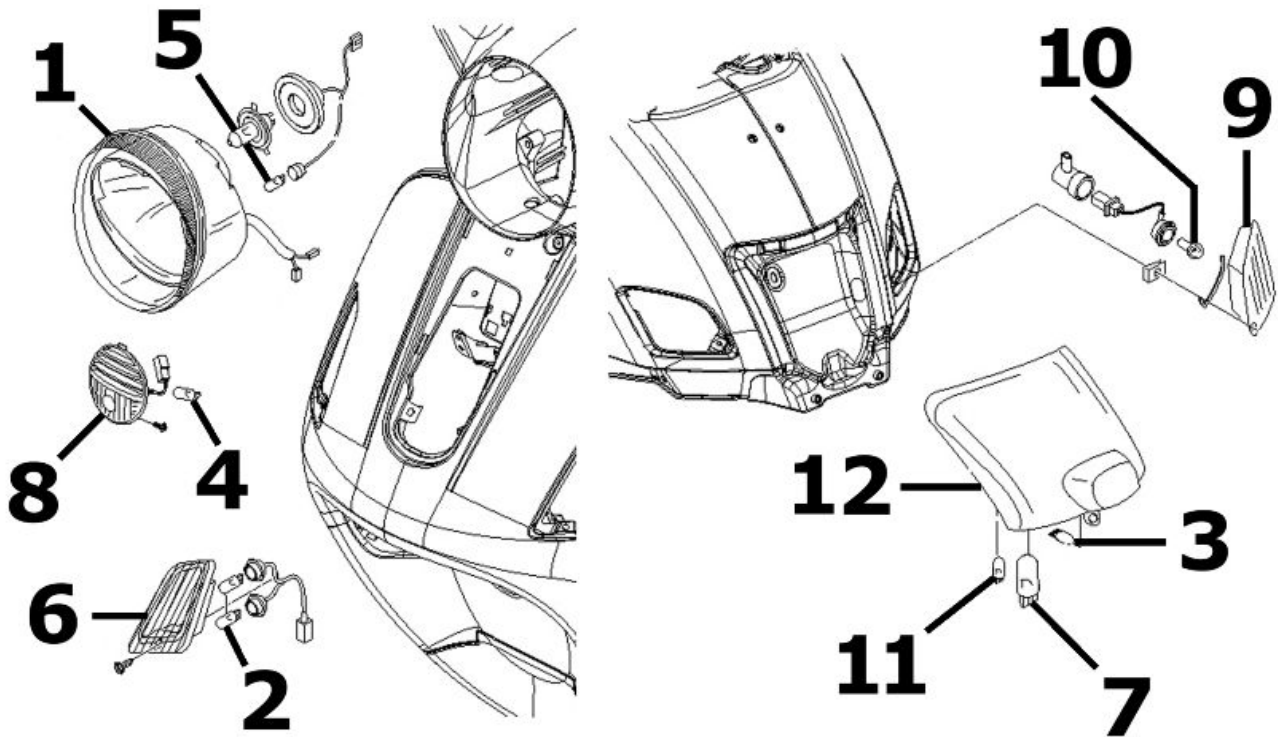
## Locks

**LOCKS**

	Code	Action	Duration
1	002083	Saddle opening transmission - Replacement	
2	002092	Transmission splitter/ hook transmission - Replacement	
3	004158	Saddle opening splitter - Replacement	
4	005072	Immobilizer aerial - Replacement	
5	005099	Electric saddle opening device - Replacement	
6	004054	Saddle lock catch - Replacement	
7	004010	Anti-theft lock - Replacement	
8	005016	Key switch - Replacement	



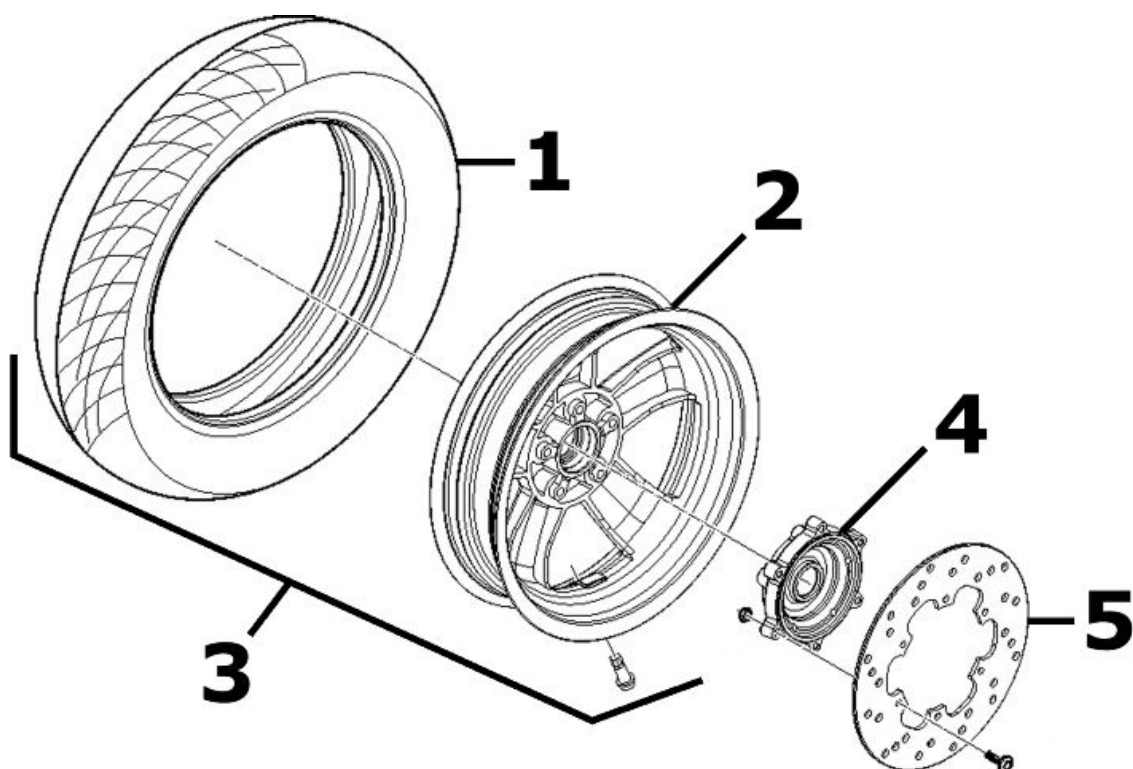
Turn signal lights



**INDICATORS AND LIGHTS**

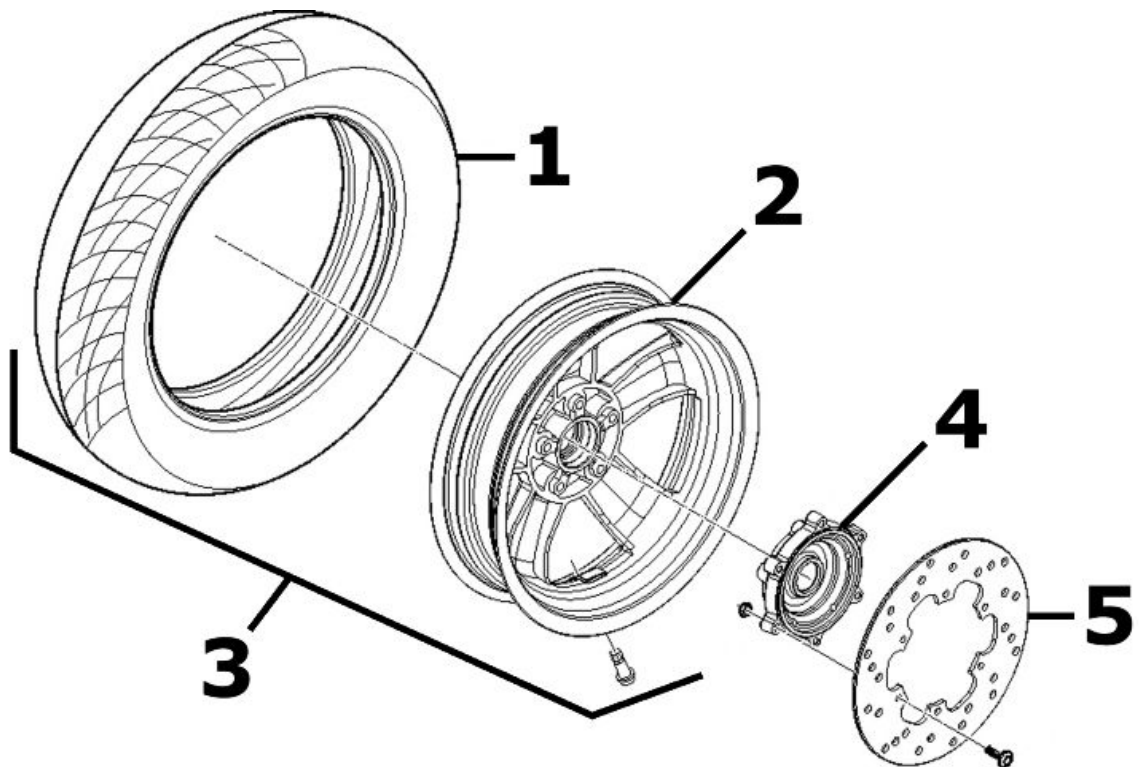
	Code	Action	Duration
1	005002	Front headlamp - Replacement	
2	005067	Front turn indicator bulb - Replacement	
3	005031	number plate light bulb - Replacement	
4	005139	Tail light bulb - Replacement	
5	005008	Headlight bulbs - Replacement	
6	005012	Front turn indicator - Replacement	
7	005090	Stop light bulb - Replacement	
8	005140	Front light - Replacement	
9	005022	Rear turning indicators - Replacement	
10	005068	Rear turning indicator bulb - Replacement	
11	005066	Rear light bulbs - Replacement	
12	005028	Rear light assembly glass - Replacement	

## Front wheel

**FRONT WHEEL**

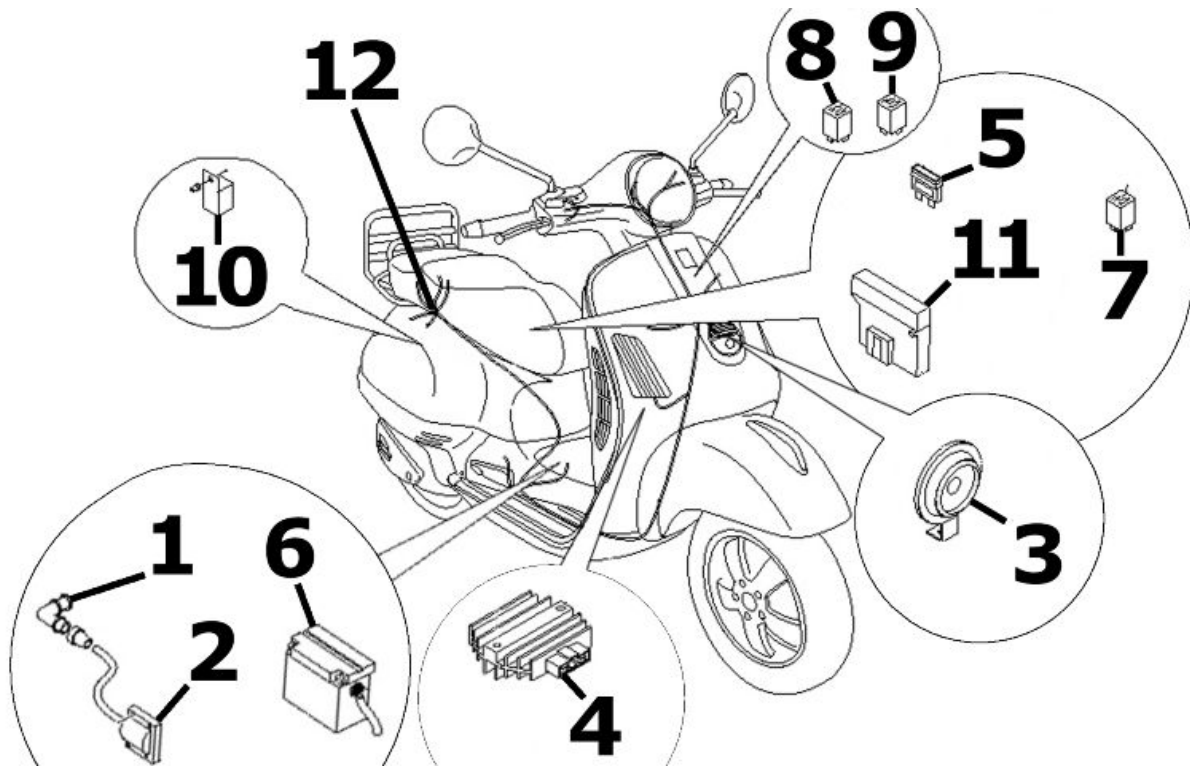
	Code	Action	Duration
1	003047	Front tyre - Replacement	
2	003037	Front wheel rim - Replacement	
3	004123	Front wheel - Replacement	
4	003033	Front wheel hub- Replacement	
5	002041	Brake disc - Replacement	

## Rear wheel

REAR WHEEL

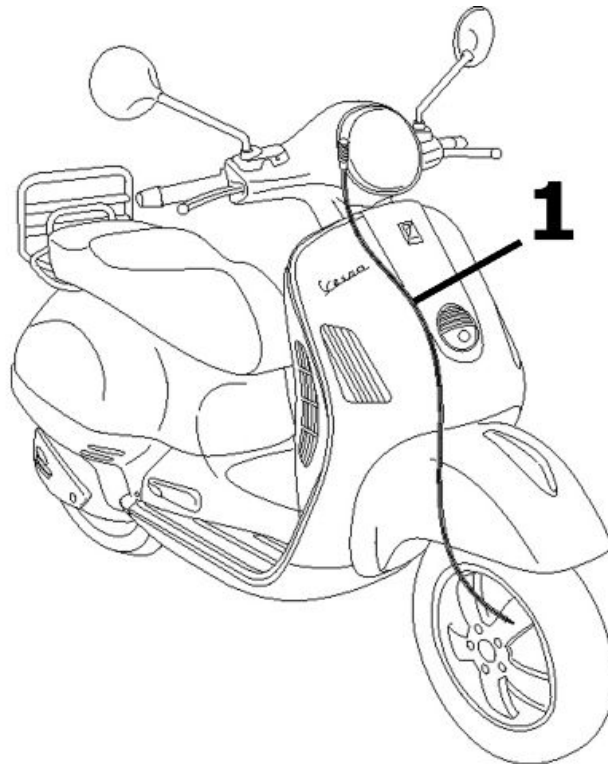
	Code	Action	Duration
1	004126	Rear wheel tyre - Replacement	
2	001071	Front wheel rim - Removal and Re-fitting	
3	001016	Rear wheel - Replacement	
4	002028	Rear wheel hub - Replacement	
5	002070	Rear brake disc - Replacement	

## Electric devices

**ELECTRIC DEVICES**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001094	Spark plug cap - Replacement	
2	001069	HV coil - Replacement	
3	005003	Horn - Replacement	
4	005009	Voltage regulator - Replacement	
5	005052	Fuse (1) - Replacement	
6	005007	Battery - change	
7	005120	Control unit power supply remote control - Replacement	
8	005035	Headlight remote control - Replacement	
9	005117	Electric fan contactor - Replacement	
10	005011	Start-up remote control switch - Replacement	
11	005054	Fuse block (1) - Replacement	
12	005001	Electrical system - Removal and re-fitting	

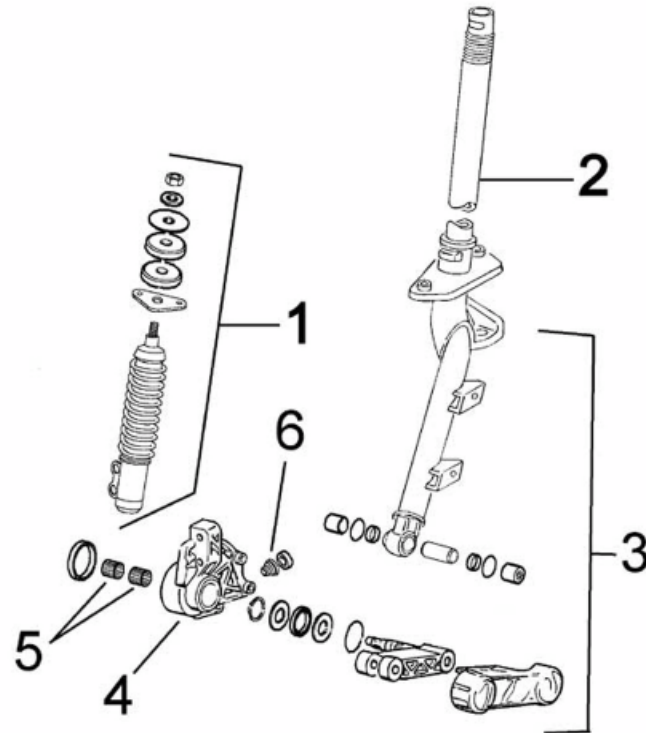
Transmissions



TRANSMISSIONS

	Code	Action	Duration
1	002051	Odometer transmission assembly - Replacement	

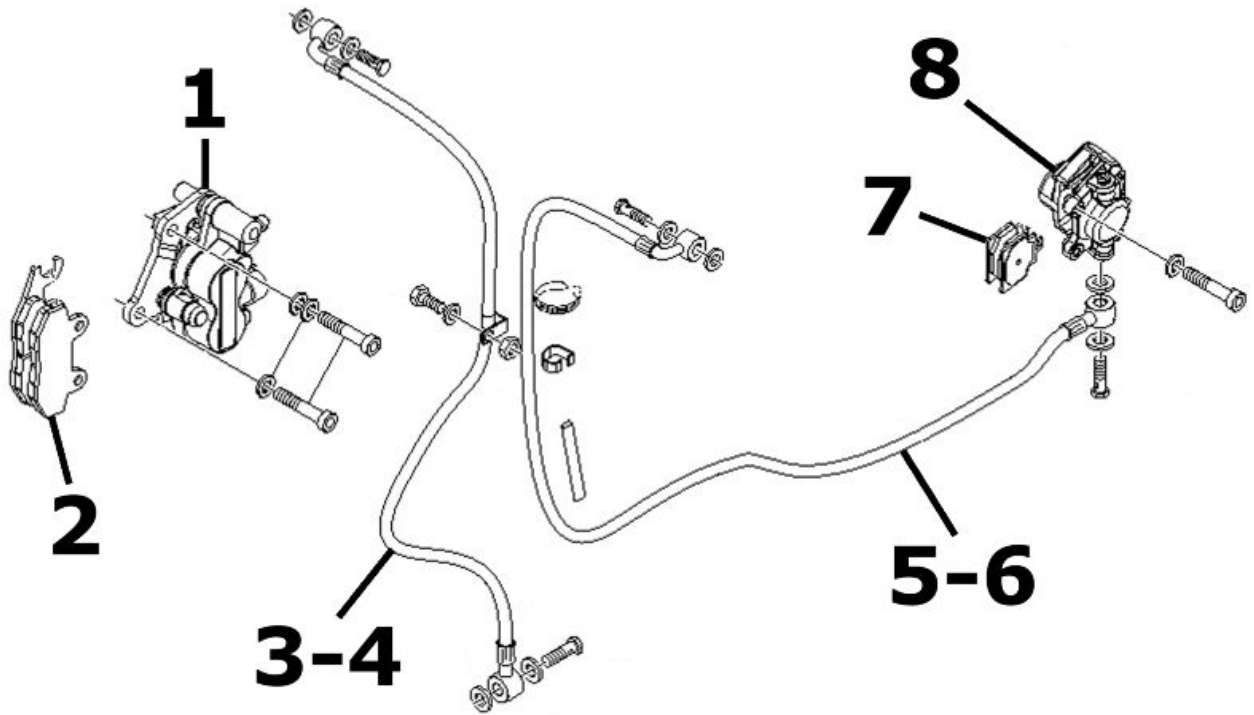
## Front suspension



### FRONT SUSPENSION

	Code	Action	Duration
1	003011	Front shock absorber - Removal and Refitting	
2	003045	Steering tube - Replacement	
3	003010	Front suspension - Service	
4	003035	Shock absorber mounting and brake calliper - Replacement	
5	003034	Front wheel hub bearing - Replacement	
6	001064	Odometer sprocket - Replacement	

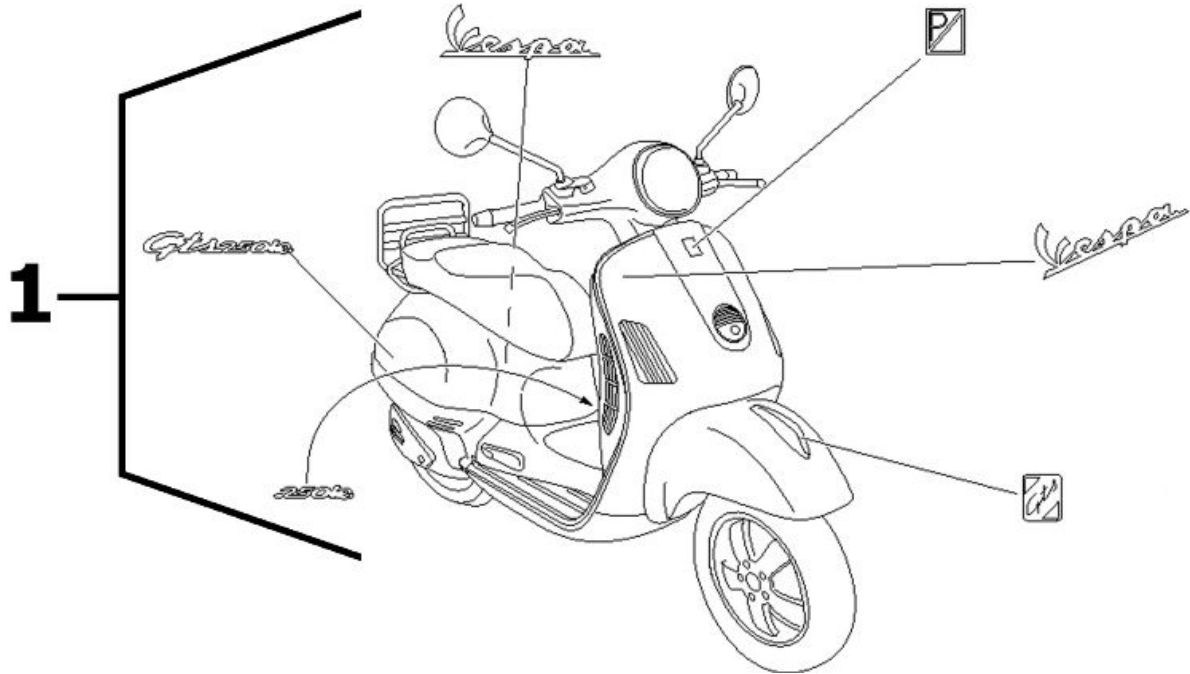
**Braking system**



**BRAKING SYSTEM**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	002039	Front brake calliper - Replacement	
2	002007	Front brake pads - Replacement	
3	002021	Front brake piping - Replacement	
4	002047	Front brake fluid and air bleed system - Replacement	
5	002020	Rear brake disc piping - Replacement	
6	002080	Rear brake oil bleed system - Change	
7	002002	Rear brake pads - Replacement	
8	002048	Rear brake calliper - Replacement	

## Stickers

TRANSFERS

	Code	Action	Duration
1	004159	Plates / Stickers - Replacement	



## **A**

Air filter: 46

## **B**

Battery: 64, 72, 81

Brake: 160, 162, 164–166, 168, 170, 171

Brake fluid: 170

## **C**

Checks: 66

Coolant: 127

## **E**

Electric: 228

Engine oil: 47

## **F**

Fuel: 107, 114, 185, 215

Fuses: 80

## **H**

Headlight: 52, 181

Horn: 76

Hub oil: 45

## **I**

Identification: 8

Instrument panel: 180, 222

## **L**

Luggage rack:

## **M**

Maintenance: 7, 44

## **O**

Oil filter: 49, 199

## **R**

Recommended products:

## **S**

Saddle:

Shock absorbers: 156

Spark plug: 44

Stand: 158

Start-up:

Suspension: 55, 56, 230

Switch:

## **T**

Tank: 185, 215

Transmission: 10, 54, 204

Turn indicators: 66

Tyre pressure:

Tyres: 15

## **V**

Vehicle: 8, 88, 89