PIAGGIO

SERVICE STATION MANUAL

xxxxxx (IT) - xxxxxx (EN) - xxxxxx (FR) - xxxxxx (DE) - xxxxxx (ES) - xxxxxx (PT) -xxxxxx (NL) - xxxxxx (EL)

Beverly Tourer 300 i.e.

SERVICE STATION MANUAL

Beverly Tourer 300 i.e.

The descriptions and illustrations given in this publication are not binding. While the basic specifications as described and illustrated in this manual remain unchanged, PIAGGIO-GILERA reserves the right, at any time and without being required to update this publication beforehand, to make any changes to components, parts or accessories, which it considers necessary to improve the product or which are required for manufacturing or construction reasons.
Not all versions/models shown in this publication are available in all countries. The availability of each model should be checked at the official Piaggio sales network.

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

SERVICE STATION MANUAL
Beverly Tourer 300 i.e.

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

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

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

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

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

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

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

INDEX OF TOPICS

INDEX OF TOPICS

This section describes the general specifications of the vehicle.

Rules

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

Safety rules

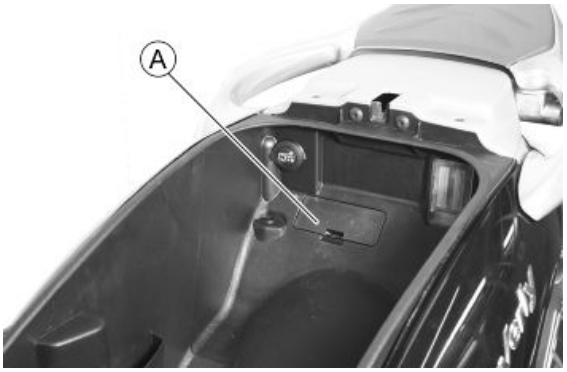
- If work can only be done on the vehicle with the engine running, make sure that the premises are well ventilated, using special extractors if necessary; never let the engine run in an enclosed area. Exhaust fumes are toxic.
- The battery electrolyte contains sulphuric acid. Protect your eyes, clothes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

Maintenance rules

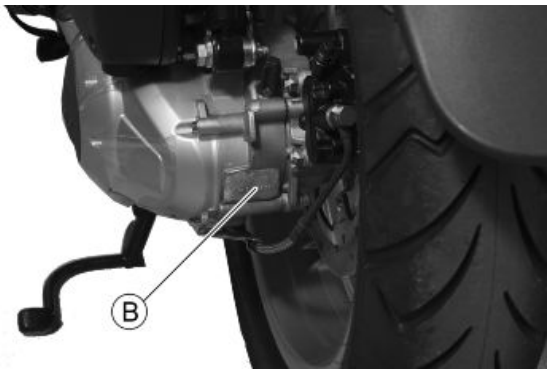
- Use original PIAGGIO spare parts and lubricants recommended by the Manufacturer. Non-original or non-conforming spares may damage the vehicle.
- Use only the appropriate tools designed for this vehicle.
- Always use new gaskets, sealing rings and split pins upon refitting.
- After removal, clean the components using non-flammable or low flash-point solvents. Lubricate all the work surfaces, except tapered couplings, before refitting these parts.
- After refitting, make sure that all the components have been installed correctly and work properly.
- Use only equipment with metric sizes for removal, service and reassembly operations. Metric bolts, nuts and screws are not interchangeable with coupling members using English measurements. 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 electrical connections have been made properly, particularly the ground and battery connections.

Vehicle identification

To read the chassis prefix, lift the saddle and remove the lid «**A**».



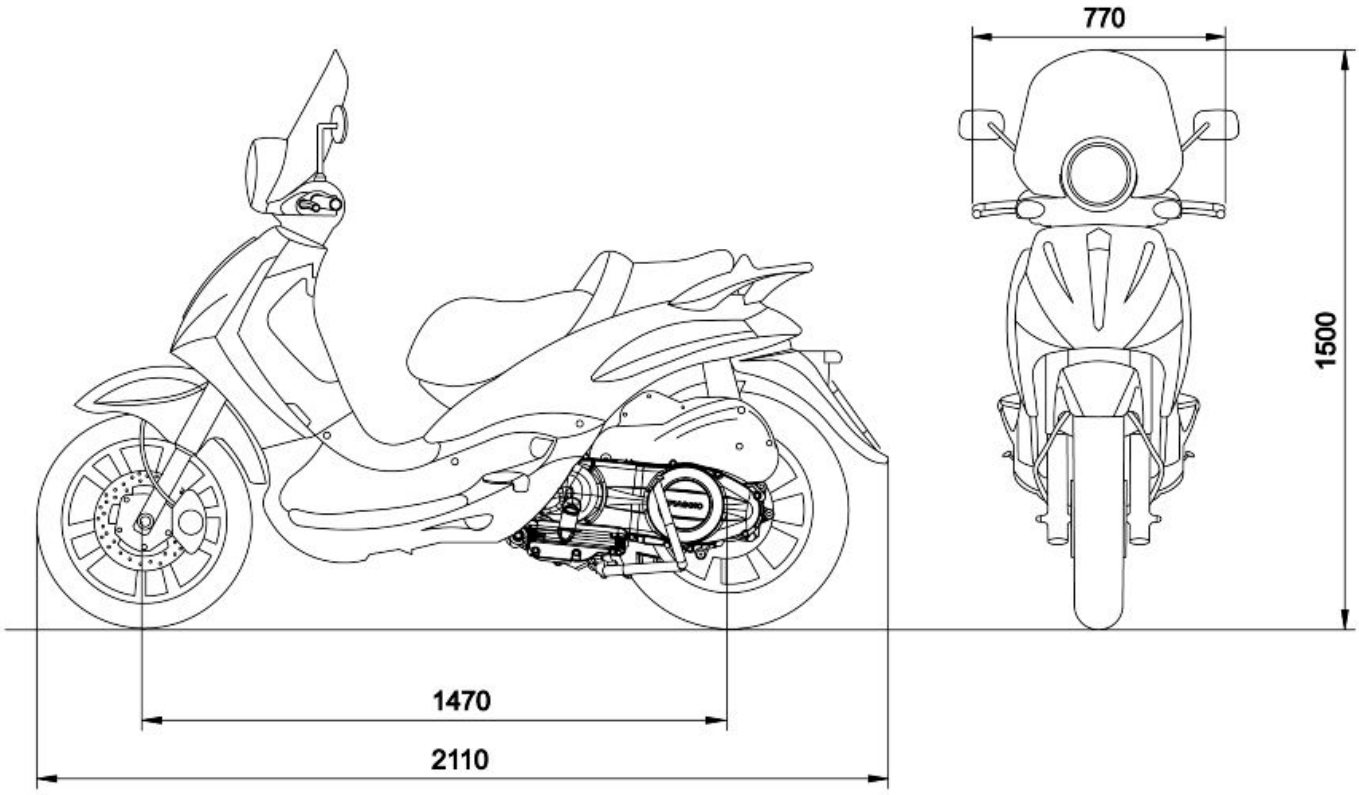
The engine prefix «**B**» is stamped near the rear left shock absorber lower support.



VEHICLE IDENTIFICATION

Specification	Desc./Quantity
Chassis prefix	M28A00
Engine prefix	M28MM

Dimensions and mass



WEIGHTS AND DIMENSIONS

Specification	Desc./Quantity
Length	2110 mm
Width to handlebar	770 mm
Wheelbase	1470 mm
Height	1500 mm
Kerb weight	165 kg ± 5 kg
Maximum weight allowed	350 kg

Engine

ENGINE

Specification	Desc./Quantity
Type	Single-cylinder, 4-stroke
Engine capacity	278 cm³
Bore x Stroke	75x63 mm
Compression ratio	11 ± 0.5 : 1
Engine idle speed	1,700 ± 100 rpm
Timing system	4 valves, single overhead camshaft, chain-driven.
Valve clearance	Intake: 0.10 mm Exhaust: 0.15 mm
Max. power	16.1 kW at 7,250 rpm
MAX. torque	23 Nm at 6,000 rpm
Lubrication	Engine lubrication with lobe pump (inside crankcase), chain-driven, with double filter: mesh and paper.
Lubrication pressure	4 bar
Minimum lubrication pressure (100° C)	0.8 bar

Specification	Desc./Quantity
Fuel system	Electronic injection with Ø 32-mm throttle body and electric fuel pump.
Cooling	Forced coolant circulation system.
Fuel	Unleaded petrol (95 RON)
Exhaust silencer	Absorption-type exhaust silencer with a 3-way catalytic converter and lambda probe.
Emissions compliance	EURO 3

Transmission

TRANSMISSION

Specification	Desc./Quantity
Transmission	Automatic expandable pulley variator with torque server, V-belt, self-ventilating dry automatic centrifugal clutch and transmission housing with forced-circulation air cooling.
Final reduction gear	Gear reduction unit in oil bath.

Capacities

CAPACITY

Specification	Desc./Quantity
Engine oil	1.3 l
Transmission oil	250 cm³
Cooling system fluid	1.75 l
Fuel tank (reserve)	10 l ± 0.5
Fork oil (quantity per stem)	133 cm³

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Starter	starter
Ignition	Electronic inductive discharge ignition, high efficiency, with separate HV coil.
Ignition advance	α/N three-dimensional map managed by control unit
Spark plug	NGK CR8EKB
Alternative spark plug	-
Battery	12V-12Ah
Alternator	alternating current

Frame and suspensions

WHEELS AND TYRES

Specification	Desc./Quantity
Wheel rim type	Light alloy wheel rims.
Front wheel rim	16" x 3.00
Rear rim	16 x 3.50"
Front tyre	Tubeless, 110/70 - 16" 52P
Rear tyre	Tubeless, 140/70 - 16" 65P
Front tyre pressure (with passenger)	2 bar (-)
Rear tyre pressure (with passenger)	2.2 bar (2.5 bar)

Brakes

BRAKES

Specification	Desc./Quantity
Front brake	Ø 260-mm disc brake with hydraulic control activated by handlebar right-side lever.
Rear brake	Ø 260-mm disc brake with hydraulic control activated by handlebar left-side lever.

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Wheel rim type	Light alloy wheel rims.
Front wheel rim	16'' x 3.00
Rear rim	16 x 3.50''
Front tyre	Tubeless, 110/70 - 16'' 52P
Rear tyre	Tubeless, 140/70 - 16'' 65P
Front tyre pressure (with passenger)	2 bar (-)
Rear tyre pressure (with passenger)	2.5 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

Name	Torque in Nm
Handlebar fixing screw (*)	45 to 50
Fixing screws for the handlebar control unit U-bolts	7 to 10
Steering tube upper ring nut	40 ÷ 45
Steering tube lower ring nut	14 ÷ 17

CHASSIS

Name	Torque in Nm
Centre stand bolt	40 ÷ 45
Side stand fixing bolt	40 ÷ 45

*Refer to the table in section **"Suspensions/Swinging arm/Fitting"** for the tightening torques of the swinging arm.*

FRONT SUSPENSION

Name	Torque in Nm
Front wheel axle	45 to 50
Fork leg screw	6 ÷ 7
front mudguard to plate fixing screw	4.5 ÷ 7
Fixing screw for mudguard plate to fork	9 ÷ 11
Stem support clamp tightening screws	20 to 25
Fork locking screws cap	15 ÷ 30
Hydraulic rod fixing screw	25 ÷ 35*

REAR SUSPENSION

Name	Torque in Nm
Rear wheel axle	104 to 126
Fixing screw for wheel rim to hub	34 ÷ 38
Right shock absorber lower retainer	40 ÷ 45
Left shock absorber lower retainer	33 ÷ 41
Muffler mounting arm to engine screws (*)	20 ÷ 25

Name	Torque in Nm
Upper shock absorber retainer	40 ÷ 45

FRONT BRAKE

Name	Torque in Nm
Brake fluid pump-hose fitting	16 ÷ 20
Oil bleed screw	12 - 16
Pad fixing pin	19.6 ÷ 24.5
Screw tightening calliper to support	24 ÷ 27
Brake disc screws	8 to 10
Brake fluid pipe-calliper fitting	20 to 25

REAR BRAKE

Name	Torque in Nm
Rear brake calliper-pipe fitting	20 to 25
Rigid / flexible pipe fitting	13 - 18
Rear brake pump-pipe fitting	16 - 20
Rear brake calliper fixing screws	20 to 25
Brake disc screws	8 to 10
Pad fixing pin	19.6 ÷ 24.5

MUFFLER

Name	Torque in Nm
Silencer heat guard fixing screw	4 to 5
Screw for fixing silencer to supporting arm	20 to 25
Lambda probe tightening on exhaust manifold	40 to 50
Exhaust manifold-silencer joint tightening	12-13
Nut fixing silencer to cylinder head	16 to 18

LUBRICATION

Name	Torque in Nm
Hub oil drainage plug	15 to 17
Oil filter on crankcase fitting	27 to 33
Engine oil drainage plug/ mesh filter	24 to 30
Oil filter	4 to 6
Oil pump cover screws	7 - 9
Screws fixing oil pump to the crankcase	5 to 6
Oil pump command sprocket screw	10 to 14
Oil pump cover plate screws	4 to 6
Oil sump screws	10 to 14
Minimum oil pressure sensor	12 to 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 to 8.5
Tappet adjustment check nut	6 - 8
Intake manifold screws	11 to 13
Timing chain tensioner slider screw	10 to 14
Starter counterweight support screw	11 to 15
Timing chain tensioner support screw	11 to 13
Timing chain tensioner central screw	5 to 6
Camshaft retention plate screw	4 to 6

TRANSMISSION

Name	Torque in Nm
Belt support roller screw	11 to 13
Clutch unit nut on driven pulley	45 to 50
Drive pulley nut	75 to 83
Transmission cover screws	11 to 13

Name	Torque in Nm
Driven pulley shaft nut	54 to 60
Rear hub cap screws	24 to 27

FLYWHEEL

Name	Torque in Nm
Flywheel cover screw	11 to 13
Stator assembly screws	3 - 4 (Apply LOCTITE medium type 242 threadlock)
Flywheel nut	94 - 102
Pickup fixing screws	3 to 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 to 6
Engine-crankcase coupling screws	11 to 13
Starter screws	11 to 13
Crankcase timing cover screws	3.5 - 4.5 (Apply LOCTITE medium type 242 threadlock)

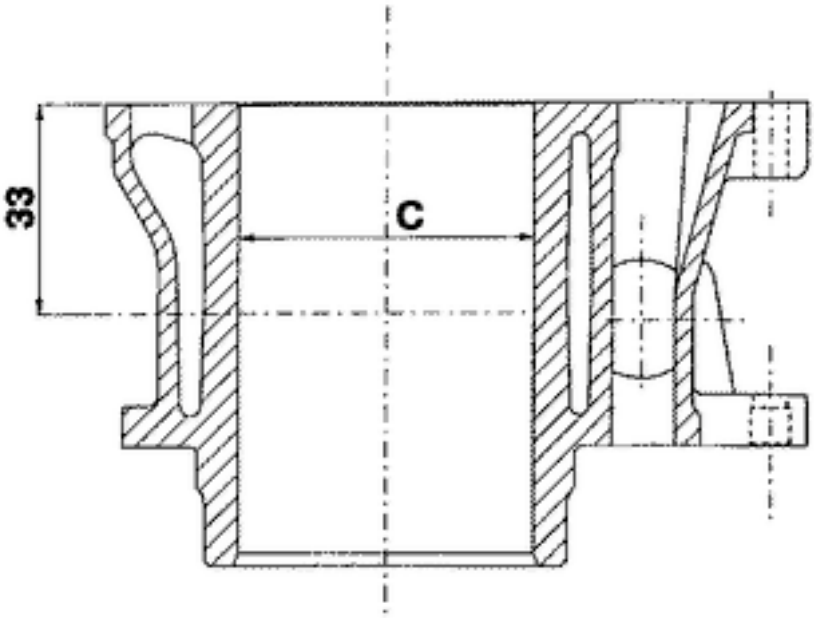
COOLING

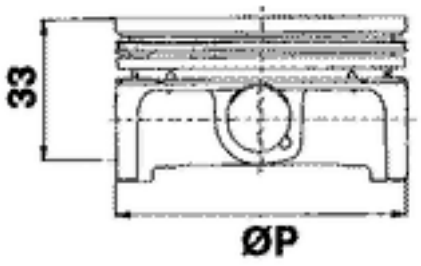
Name	Torque in Nm
Water pump rotor cover	3 ÷ 4
Screws for water pump rotor driving link	3 ÷ 4
Thermostat cover screws	3 ÷ 4
bleed screw:	3

Overhaul data

Assembly clearances

Cylinder - piston assy.





CYLINDER - PISTON

Specification	Desc./Quantity
Plunger diameter	74.967 +0.014 -0.014 mm
Cylinder diameter	75 +0.038 +0.01 mm

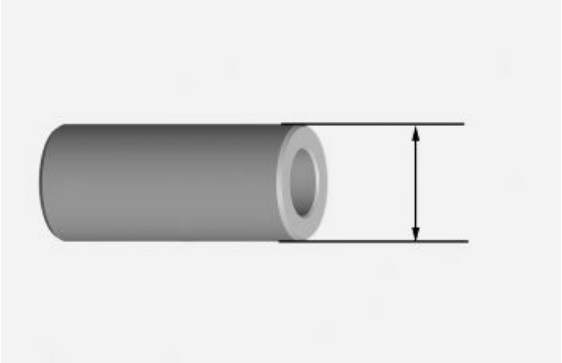
COUPLING CATEGORIES

Name	Initials	Cylinder	Piston	Play on fitting
cylinder-piston	M	75.01 ÷ 75.017	74.953 ÷ 74.960	0.050 ÷ 0.064
cylinder-piston	N	75.017 ÷ 75.024	74.960 ÷ 74.967	0.050 ÷ 0.064
cylinder-piston	O	75.024 ÷ 75.031	74.967 ÷ 74.974	0.050 ÷ 0.064
cylinder-piston	P	75.031 ÷ 75.038	74.974 ÷ 74.981	0.050 ÷ 0.064

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.

- Measure the outer diameter of the gudgeon pin.

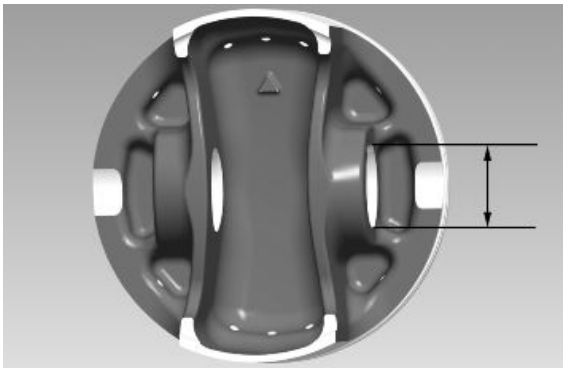


Characteristic

Pin outside diameter

16 +0 -0.004 mm

- Measure the diameter of the bearings on the piston.



Characteristic

Standard diameter

16 +0.006 +0.001 mm

- Calculate the piston pin coupling clearance.

N.B.

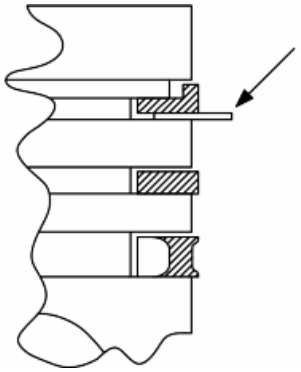
THE PIN HOUSINGS HAVE 2 LUBRICATION CHANNELS. FOR THIS REASON, MEASUREMENT MUST BE MADE ACCORDING TO THE PISTON AXIS.

Characteristic

Standard clearance:

0.001 - 0.010 mm

- Carefully clean the sealing ring housings.
- Measure the coupling clearance between the sealing rings and the piston grooves using suitable sensors, as shown in the diagram.
- If the clearance is greater than that indicated in the table, replace the piston.



N.B.

MEASURE THE CLEARANCE BY INSERTING THE BLADE OF THE FEELER THICKNESS GAUGE FROM THE SECOND SEAL SIDE.

Fitting clearance

Top piston ring - standard coupling clearance 0.015 - 0.06 mm **Top piston ring - maximum clearance allowed after use** 0.07 mm **Middle piston ring - standard coupling clearance** 0.015 - 0.06 mm **Middle piston ring - maximum clearance allowed after use** 0.07 mm **oil scraper ring - standard coupling clearance** 0.015 - 0.06 mm **oil scraper ring - maximum clearance allowed after use** 0.07 mm

- Check that the head coupling surface is not worn or misshapen.
- Pistons and cylinders are classified according to their diameter. The coupling must be made with those of the same type (M-M, N-N, O-O, P-P).

Characteristic

Maximum allowable run-out:

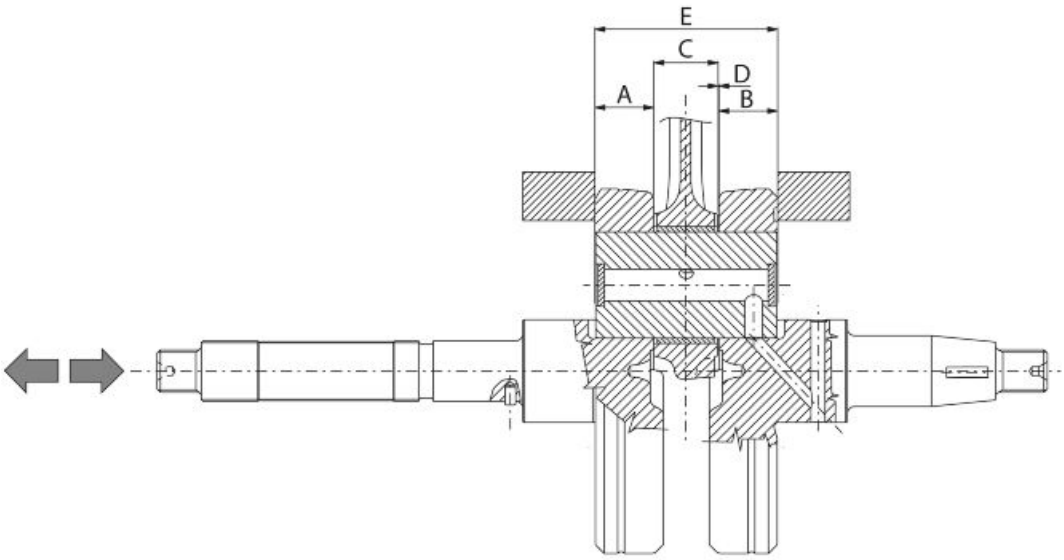
0.05 mm

Crankcase - crankshaft - connecting rod

CRANKSHAFT

Titolo	Durata/Valore	Testo Breve (< 4000 car.)	Indirizzo Immagine
Crankshaft		Axial clearance between crankshaft and connecting rod	

Axial clearance between crankshaft and connecting rod

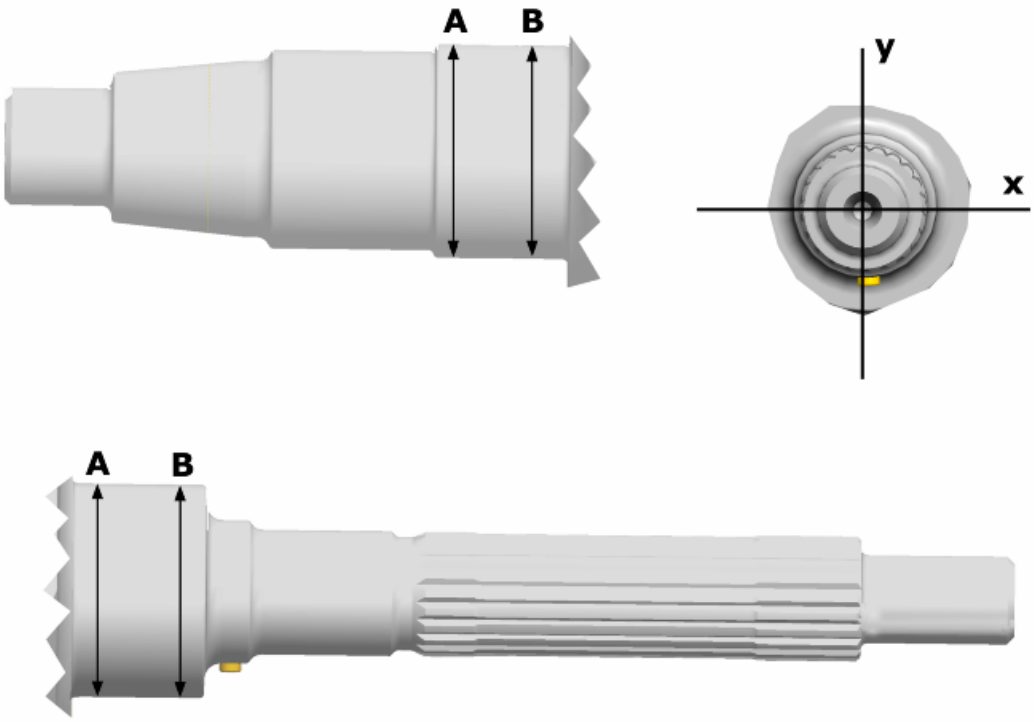


AXIAL CLEARANCE BETWEEN CRANKSHAFT AND CONNECTING ROD

Name	Description	Dimensions	Initials	Quantity
Transmissionside 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

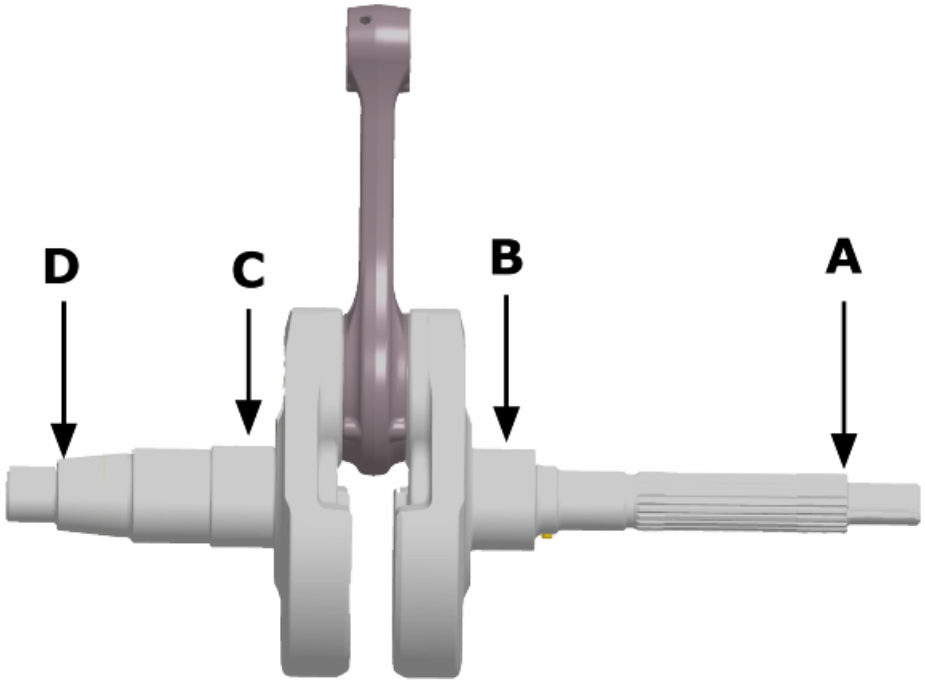
Diameter of crankshaft bearings.

Measure the bearings on both axes x-y.



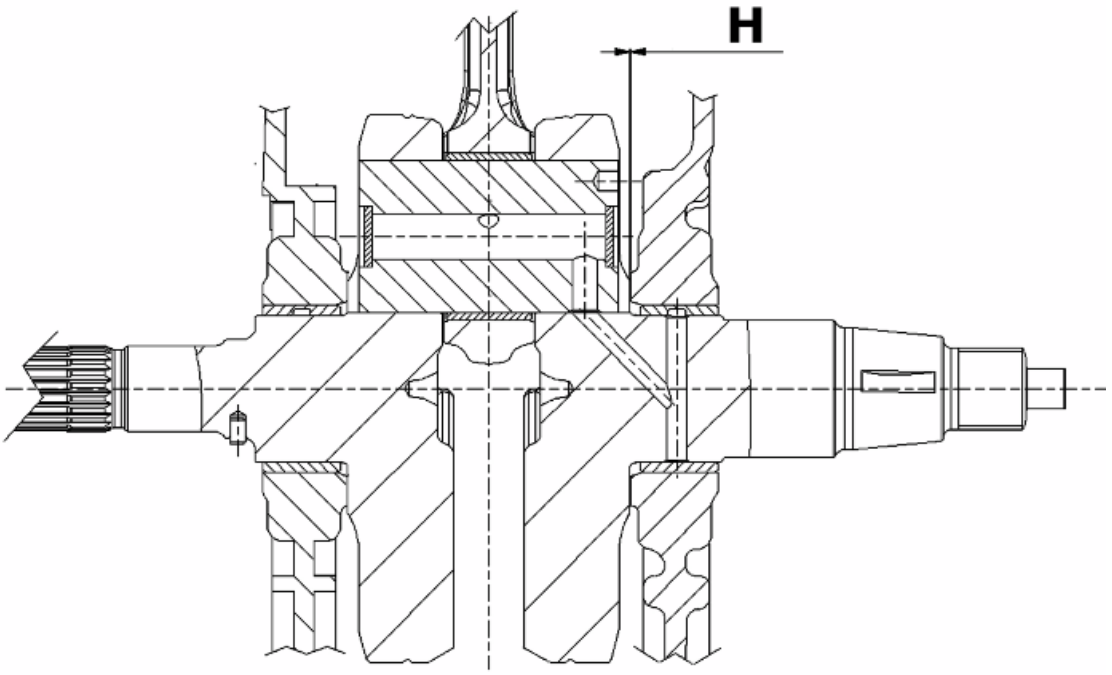
CRANKSHAFT

Specification	Desc./Quantity
Crankshaft bearings: Standard diameter: Cat. 1	28.998 ÷ 29.004 mm
Crankshaft bearings: Standard diameter: Cat. 2	29.004 ÷ 29.010 mm



MAX. ADMISSIBLE DISPLACEMENT

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



Characteristic

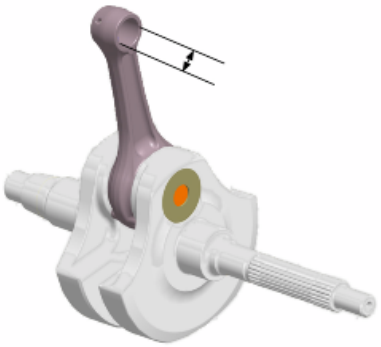
Crankshaft-crankcase axial clearance (H)

0.15 ÷ 0.43 mm

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

N.B.

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



Characteristic

Standard diameter

16 +0.025 +0.015 mm

- To obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.
- The main bushings are comprised of two half-bearings, one with holes and channels for lubrication whereas the other is solid.
- The solid half-bearing is intended to stand the thrusts caused by combustion, and for this reason it is arranged opposite the cylinder.
- To prevent shutters in the oil feeding channels, the matching surface of the two half-bearings must be perfectly orthogonal to the cylinder axis, as shown in the figure.
- The oil feeding channel section is also affected by the bushings driving depth compared with the crankshaft axial clearance of the limiting surface.
- Check the inside diameter of the main bushings in the three directions indicated in the diagram.
- Repeat the measurements for the other bushing half. see diagram.
- There are three crankcase versions: with BLUE bushings, with YELLOW bushings and with GREEN bushings.
- There is only one type of main bushing housing hole in the crankcase. The standard bushing diameter after driving is variable on the basis of a coupling selection.
- The bushing housings in the crankcase are classified into 2 categories - Cat. 1 and Cat. 2 - just like those for the crankshaft.
- The main bushings are available in three thickness categories, identified by colour markings, as shown in the table below.

BUSHINGS

TYPE	IDENTIFICATION	CRANKSHAFT HALF-BEARING
B	BLUE	1.973 to 1.976
C	YELLOW	1.976 to 1.979
E	GREEN	1.979 to 1.982

COUPLINGS

BUSHING CATEGORY	CRANKCASE HALVES CATEGORY	BUSHING INSIDE DIAMETER AFTER FITTING
B	2	29.024 ÷ 29.054
C	1	29.024 ÷ 29.054
	2	29.018 ÷ 29.048
E	1	29.018 ÷ 29.048

Combine the shaft with two category 1 crankwebs with the category 1 crankcase (or cat. 2 with cat. 2). Furthermore a spare crankcase cannot be matched with a crankshaft with mixed categories. The spare crankshaft has half-shafts of the same category.

CATEGORIES

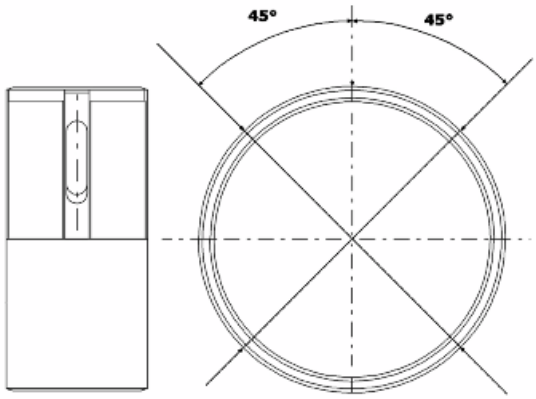
CRANKCASE HALVES	ENGINE HALF-SHAFT	BUSHING
Cat. 1	Cat. 1	E
Cat. 2	Cat. 2	B
Cat. 1	Cat. 2	C
Cat. 2	Cat. 1	C

N.B.

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

N.B.

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



Characteristic

Crankshaft-bushing maximum clearance admitted:

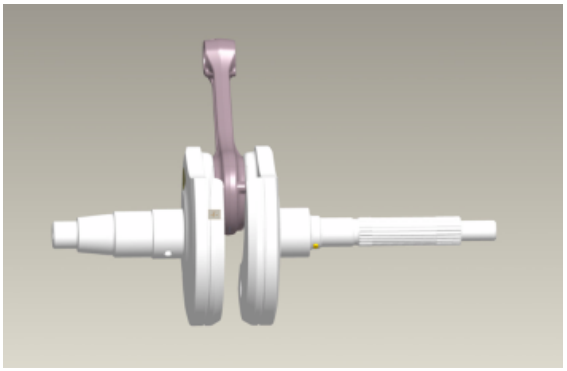
0.08 mm

Diameter of crankcase without bushing

CAT. 1: 32.959 ÷ 32.965 mm

CAT. 2: 32.953 ÷ 32.959 mm

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 gauge check that the cylinder head surface is not worn or distorted.

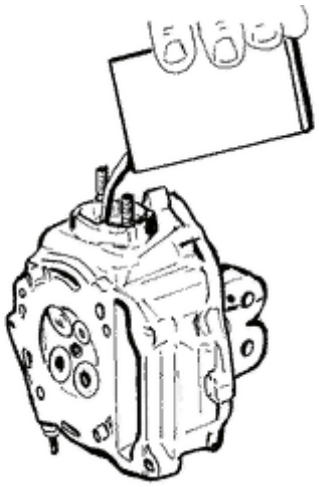
Characteristic

Maximum allowable run-out:

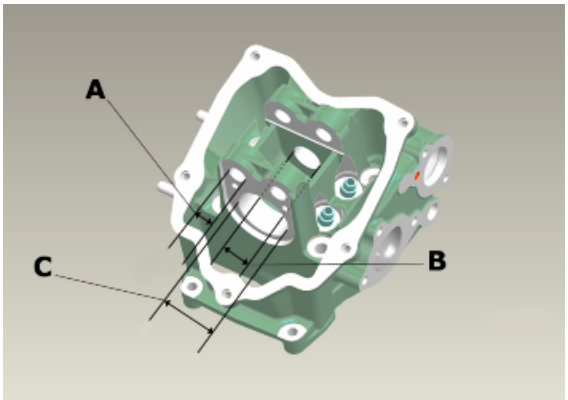
0.1 mm

- In case of faults, 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 seal plug 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.



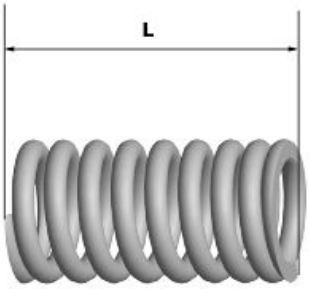
Measure the camshaft bearing seats and rocking lever support pins with a bore meter



HEAD BEARINGS

Specification	Desc./Quantity
bearing «A»	Diameter 12.000 - 12.018 mm
bearing «B»	Ø 20.000 ÷ 20.021 mm
bearing «C»	Ø 37.000 - 37.025 mm

Measure the unloaded spring length



Characteristic

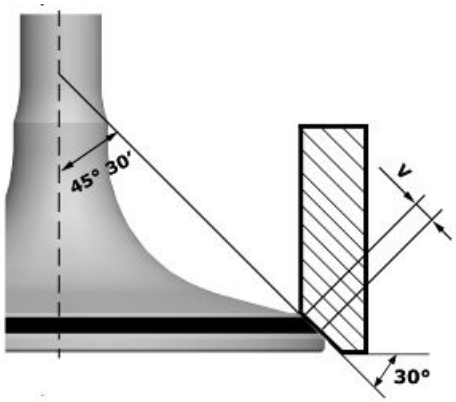
Standard length

40.2 mm

Allowable limit after use:

38.2 mm

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



Characteristic

Standard value:

1 - 1.3 mm

Admissible limit:

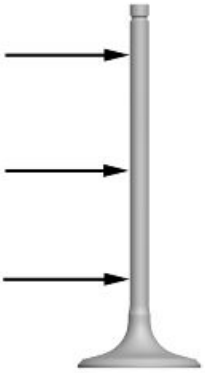
1.6 mm

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

STANDARD VALVE LENGTH

Specification	Desc./Quantity
Valve check Standard length	Intake: 94.6 mm
Valve check Standard length	Exhaust: 94.4 mm

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



STANDARD DIAMETER

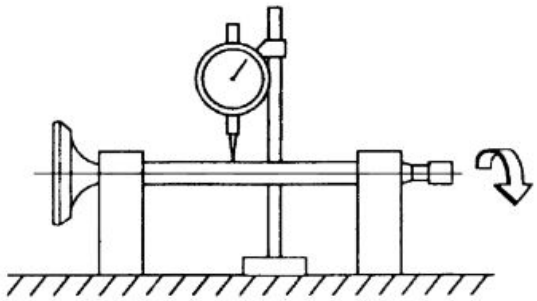
Specification	Desc./Quantity
Intake:	4.987 - 4.972 mm
Exhaust:	4.975 - 4.960 mm

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.

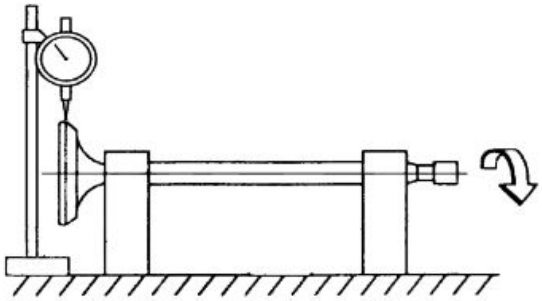


Characteristic

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.

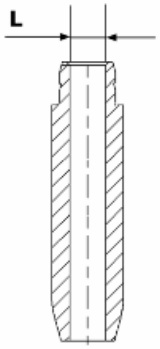


Characteristic

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.

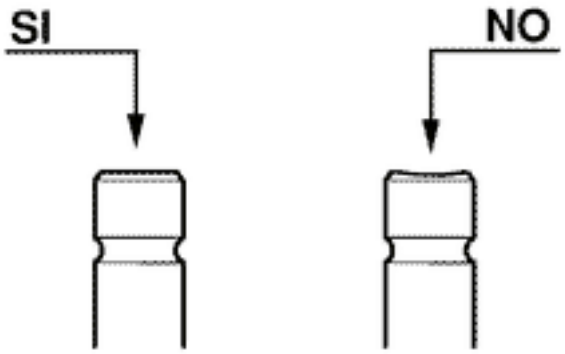
INTAKE

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

EXHAUST

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

- Check that there are no signs of wear on the surface of contact with the articulated register terminal.



- If no faults 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).

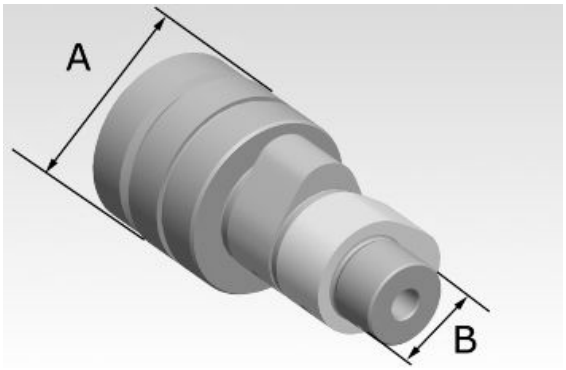
- Check that the camshaft bearings exhibit no scores or abnormal wear.
- Using a micrometer, measure the camshaft bearings.

STANDARD DIAMETER

Specification	Desc./Quantity
Camshaft check: Standard diameter	Bearing A Ø: 36.95 ÷ 36.975 mm
Camshaft check: Standard diameter	Bearing B diameter: 19.959 ÷ 19.98 mm

MINIMUM DIAMETER PERMITTED

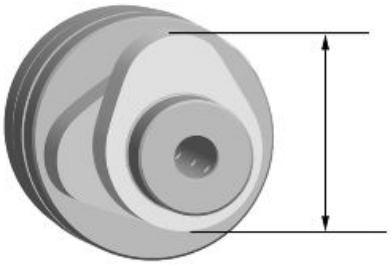
Specification	Desc./Quantity
Camshaft check: Minimum admissible diameter	Bearing A Ø: 36.94 mm
Camshaft check: Minimum admissible diameter	Bearing B diameter: 19.950 mm



-Using a gauge, measure the cam height.

STANDARD HEIGHT

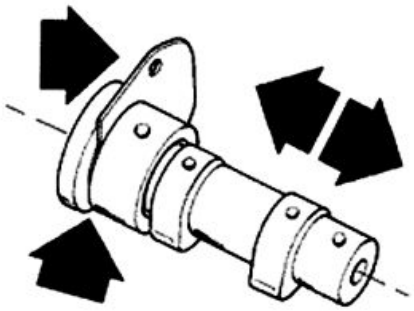
Specification	Desc./Quantity
Camshaft check: Standard height	Intake: 30.285 mm
Camshaft check: Standard height	Exhaust: 29.209 mm



Check the axial clearance of the camshaft

CAMSHAFT AXIAL CLEARANCE

Specification	Desc./Quantity
Camshaft check: Standard axial clearance:	0.11 - 0.41 mm
Camshaft check: Maximum admissible axial clearance	0.42 mm



- Measure the outside diameter of the rocking lever pins
- Check the rocking lever pins do not show signs of wear or scoring.
- Measure the internal diameter of each rocking lever.

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

ROCKING LEVERS AND PIN DIAMETER:

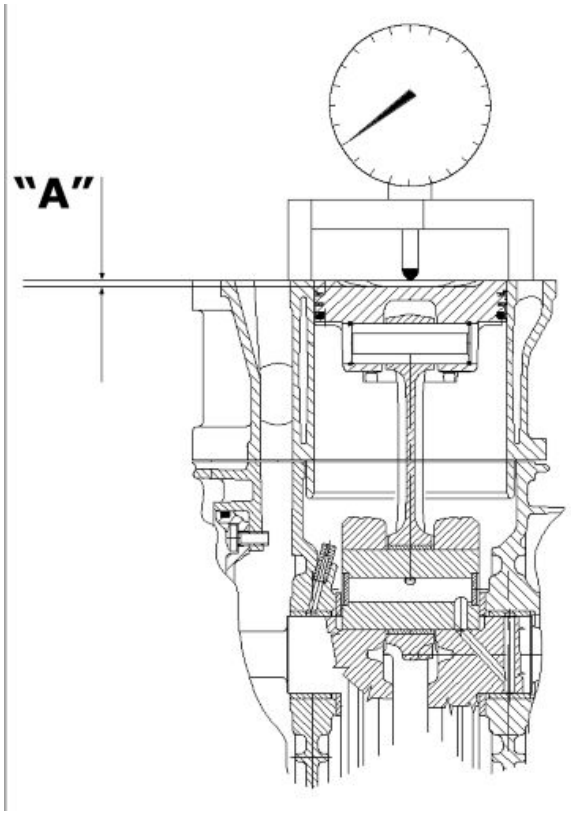
Specification	Desc./Quantity
Rocking lever inside diameter: Standard diameter	Diameter 12.000 - 12.011 mm
Rocking lever pin diameter: Standard diameter	Diameter 11.977 - 11.985 mm

Slot packing system

Characteristic

Compression ratio

10.5 ÷ 11.5 : 1



Measurement "**A**" to be taken is a value of piston re-entry, it indicates by how much the plane formed by the piston crown falls below the plane formed by the top of the cylinder. The further the piston falls inside the cylinder, the less the base gasket to be applied (to recover the compression ratio) and vice versa.

N.B.

MEASUREMENT "A" MUST BE TAKEN WITHOUT ANY GASKET FITTED BETWEEN THE CRANK-CASE AND CYLINDER AND AFTER RESETTING THE GAUGE, EQUIPPED WITH A SUPPORT, ON A GROUND PLANE

ENGINE 300 SHIMMING

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

Products

RECOMMENDED PRODUCTS TABLE

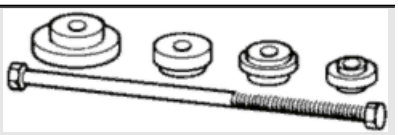
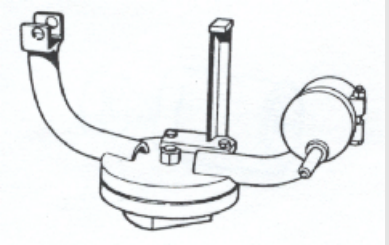
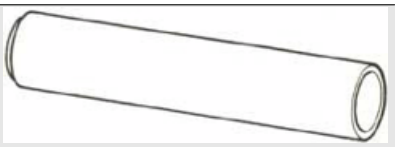
Product	Description	Specifications
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications
AGIP CITY HI TEC 4T	Oil to lubricate flexible transmissions (throttle control)	Oil for 4-stroke engines
AGIP FILTER OIL	Oil for air filter sponge	Mineral oil with specific additives for increased adhesiveness
AGIP GP 330	Grease for brake lever, gas	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 SPECIAL	coolant	Monoethylene glycol-based antifreeze fluid, CUNA NC 956-16

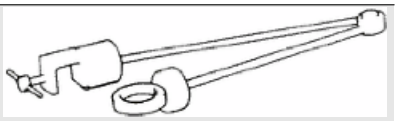
UNIT OF MEASURE - CONVERSION - ENGLISH SYSTEM TO INTERNATIONAL SYSTEM (IS).

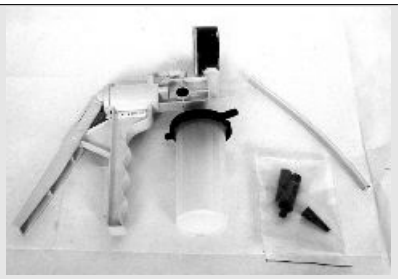
Specification	Desc./Quantity
1 Inch (in)	25.4 Millimetres (mm)
1 Foot (ft)	0.305 Meter (m)
1 Mile (mi)	1.609 Kilometre (km)
1 US Gallon (USgal)	3.785 Litre (l)
1 Pound (lb)	0.454 Kilogram (kg)
1 Cubic inch (in^3)	16.4 Cubic centimetres (cm^3)
1 Foot pound (ft lb)	1,356 Newton meter (Nm)
1 Mile per hour (mi/h)	1,602 Kilometres per hour (km/h)
1 Pound per square inch (PSI)	0.069 (bar)
1 Fahrenheit (°F)	32+(9/5) Celsius (°C)

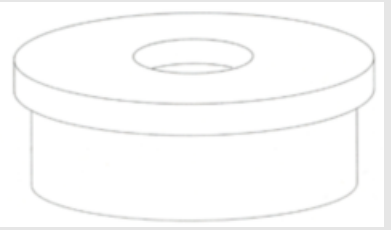
INDEX OF TOPICS

SPECIFIC TOOLS

Stores code	Description	
001330Y	Tool for fitting steering seats	
001467Y014	Calliper to extract ø 15-mm bearings	
005095Y	Engine support	
002465Y	Calliper for circlips	
006029Y	Punch for fitting fifth steering bearing on steering tube	
020004Y	Punch for removing steering bearings from headstock	
020055Y	Wrench for steering tube ring nut	

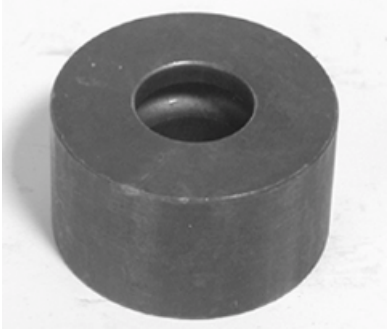
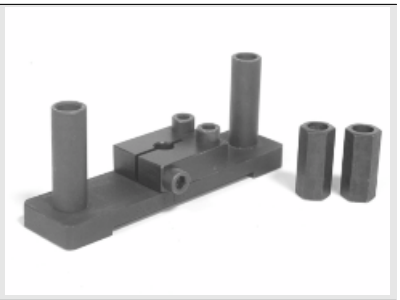
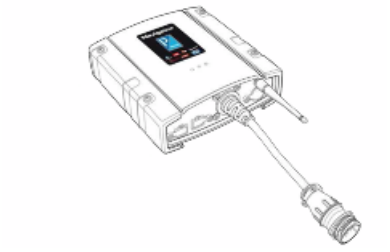
Stores code	Description	
020074Y	Support base for checking crankshaft alignment	
020150Y	Air heater mounting	
020151Y	Air heater	
020193Y	Oil pressure check gauge	
020262Y	Crankcase splitting plate	
020263Y	Driven pulley assembly sheath	

Stores code	Description	
020306Y	Punch for assembling valve seal rings	
020329Y	Mity-Vac vacuum-operated pump	
020330Y	Stroboscopic light to check timing	
020331Y	Digital multimeter	
020332Y	Digital rpm indicator	

Stores code	Description	
020648Y	Single battery charger	
020335Y	Magnetic mounting for dial gauge	
020357Y	32x35-mm Adaptor	
020359Y	42x47-mm Adaptor	
020360Y	52x55-mm Adaptor	
020363Y	20-mm guide	

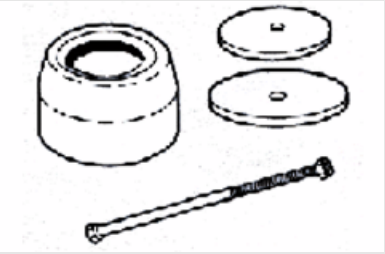
Stores code	Description	
020375Y	28 x 30 mm adaptor	
020376Y	Adaptor handle	
020382Y	Valve cotters equipped with part 012 removal tool	
020382Y011	adapter for valve removal tool	
020393Y	Piston assembly band	
020412Y	15-mm guide	

Stores code	Description	
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	
020444Y	Tool for fitting/ removing the driven pulley clutch	

Stores code	Description	
020456Y	Ø 24 mm adaptor	
020477Y	37 mm adaptor	
020483Y	30-mm guide	
020489Y	Hub cover support stud bolt kit	
020428Y	Piston position check mounting	
020680Y	Diagnosis Tool	

Stores code	Description	
020621Y	HV cable extraction adaptor	
020481Y	Control unit interface wiring	
001467Y035	Bearing housing, outside ø 47 mm	
020626Y	Driving pulley lock wrench	
001467Y013	Calliper to extract ø 15-mm bearings	
020627Y	Flywheel lock wrench	

Stores code	Description	
020467Y	Flywheel extractor	
020454Y	Tool for fitting piston pin stops (200 - 250)	
020622Y	Transmission-side oil seal punch	
020480Y	Petrol pressure check kit	
020244Y	15-mm diameter punch	
020115Y	Ø 18 punch	

Stores code	Description	
020271Y	Tool for removing-fitting silent bloc	
020638Y	250 I ENGINE SOFTWARE E. - ABS	
020469Y	Reprogramming kit for vehicle diagnostic tester	
020487Y	Fork oil seal extractor	
020458Y	Puller for lower bearing on steering tube	

INDEX OF TOPICS

Maintenance chart

MAINTENANCE TABLE

***I**: INSPECT AND CLEAN, ADJUST, LUBRICATE OR REPLACE, IF NECESSARY **C**: CLEAN, **R**: REPLACE, **A**: ADJUST, **L**: LUBRICATE*
** Replace every 2 years*

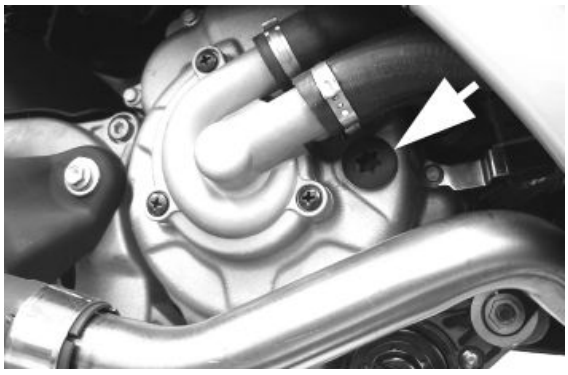
Km x 1,000	1	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Driven pulley roller casing			L		L		L		L		L		L		L		L
Safety fasteners	I		I				I				I				I		
Ignition spark plug			R		R		R		R		R		R		R		R
Centre stand bracket		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Driving belt			R		R		R		R		R		R		R		R
Throttle control	A		A		A		A		A		A		A		A		A
Air filter			I		I		I		I		I		I		I		I
Oil filter	R		R		R		R		R		R		R		R		R
Valve clearance					A				A				A				A
Electrical system and battery	I		I		I		I		I		I		I		I		I
Coolant level *	I		I		I		I		I		I		I		I		I
Brake fluid *	I		I		I		I		I		I		I		I		I
Engine oil	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R
Hub oil	R		I		R		I		R		I		R		I		R
Brake pads	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Sliding shoes / CVT rollers			R		R		R		R		R		R		R		R
Tyre pressure and wear	I		I		I		I		I		I		I		I		I
Vehicle road test	I		I		I		I		I		I		I		I		I
Suspension	I		I		I		I		I		I		I		I		I
Steering	I		I		I		I		I		I		I		I		I
Time	60'	10'	100'	45'	150'	10'	140'	10'	150'	45'	100'	10'	190'	10'	100'	45'	150'

MAINTENANCE TABLE - TIME

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

Checking the spark advance

The ignition advance is determined electronically on the basis of parameters known by the control unit. For this reason it is not possible to interpret the reference values based on the engine rpm. The ignition advance value is detectable at any time using the diagnostic tester. It is possible to check whether the ignition advance determined by the injection system matches the value actually activated on the engine, by means of the stroboscopic light.



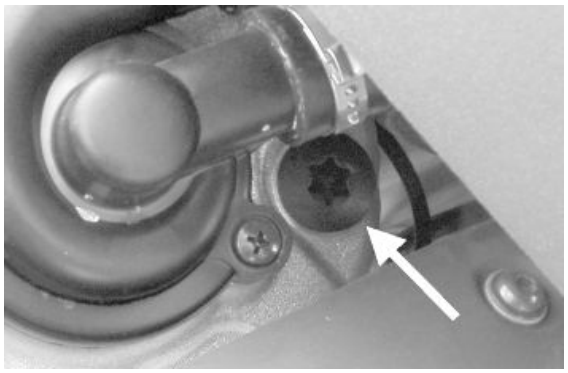
Proceed as follows:

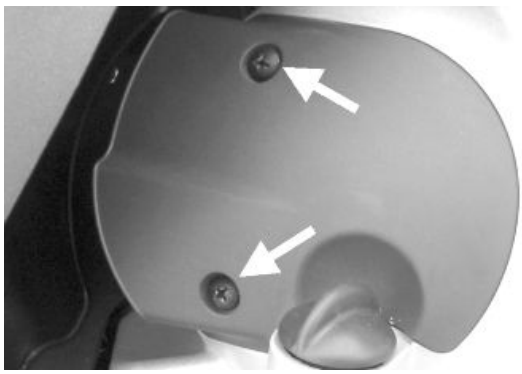
- Remove the spark plug.
- Remove the plastic cover on the flywheel cover shown in the picture.

- Remove the transmission compartment air intake cover shown in the picture.
- Rotate the driving pulley fan using a screwdriver until the reference marks between the flywheel and flywheel cover coincide as shown in the picture.
- Bring the reference mark onto the transmission side between the fan and the transmission cover as shown in the picture.
- Refit the spark plug.
- Refit the plastic cap on the flywheel cover.
- Adjust the spark gap to the contact position (no reference mark visible) and install it on the engine between the spark plug and spark plug cap
- Connect the induction clamp on the spark gap cable respecting the proper polarity (the arrow on the clamp must be pointing at the spark plug).
- Connect the diagnostic tester.
- Start the engine.
- Select the «Parameters» function in this menu.
- Set the stroboscopic light control to the traditional four-stroke engine position (1 spark, 2 revs).
- Check that the real values of rpm and ignition advance match those measured using the diagnostic tester.

If the values do not correspond, check:

- distribution timing
- revolution timing sensor
- injection control unit





Specific tooling

020680Y Diagnosis Tool

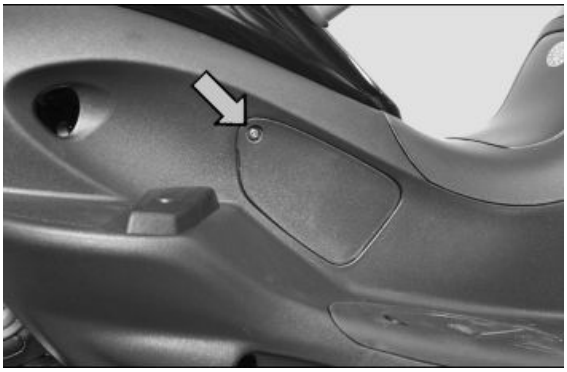
020330Y Stroboscopic light to check timing

020621Y HV cable extraction adaptor

Spark plug

To service the spark plug the engine must be cold; proceed as follows:

- Remove the spark plug inspection lid placed on the right side of the vehicle by undoing the specified screw.



- Remove the spark plug cap.

- Remove the spark plug with the supplied wrench.

- Examine it carefully and replace it if the insulator is chipped or cracked.

- Measure electrode gap with a thickness gauge and, if necessary, adjust the gap by carefully bending the outer electrode forward or away.

- Make sure the sealing washer is in good conditions.

- Fit the spark plug, screw it manually and lock it to the prescribed torque with a spark plug spanner.

- Refit the spark plug inspection lid.

CAUTION

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

Characteristic

Spark plug

NGK CR8EKB

Electrode gap

0.7 to 0.8 mm

Locking torques (N*m)

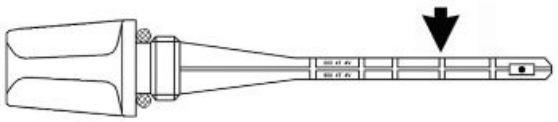
Spark plug **12 to 14**

Hub oil

Check

-Place the vehicle on the 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

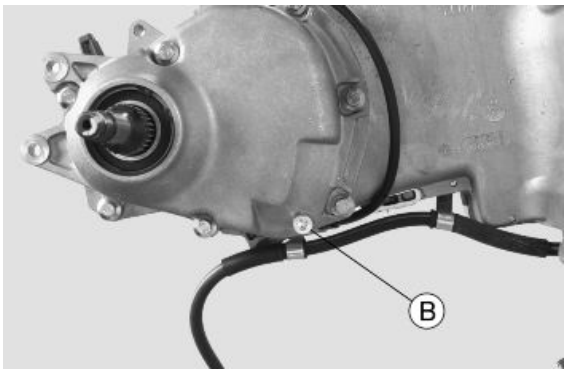
Characteristic

Rear hub oil

Capacity approximately 250 cc

Locking torques (N*m)

Hub oil drainage screw 15 to 17 Nm

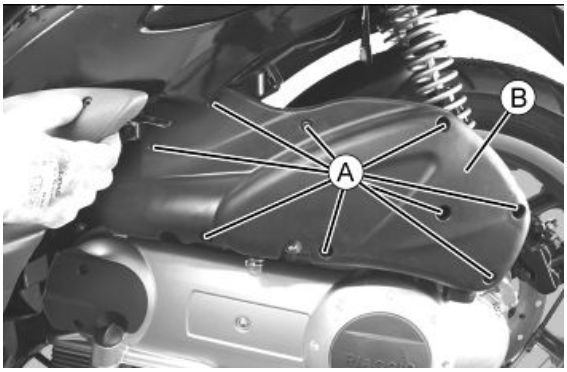


Air filter

To reach the air filter:

- Undo the nine screws «**A**».

- Remove the air-box cover «**B**»



Cleaning:

- Wash the sponge with water and mild soap.

- Dry it with a clean cloth and short blasts of compressed air.

- Soak it in a mixture of 50% petrol and 50% specified oil.

- Gently squeeze the filtering element with your hands but do not wring it; allow it to drip dry and then refit.

CAUTION

IF THE VEHICLE IS USED ON DUSTY ROADS IT IS NECESSARY TO CARRY OUT MAINTENANCE CHECKS OF 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

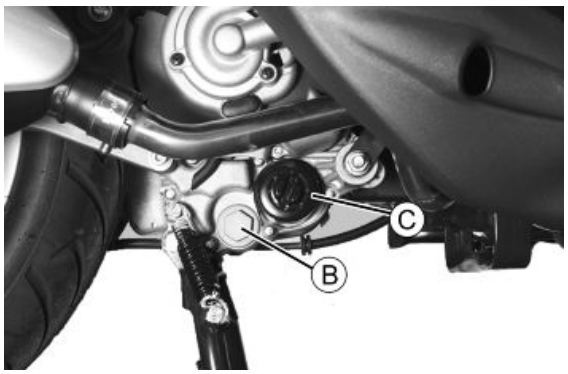
Engine oil

Replacement

Change oil and replace filter as indicated in the scheduled maintenance table.

- In order to facilitate oil drainage, unscrew the cap/ dipstick «**A**».

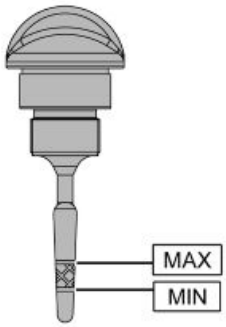
- Unscrew the mesh pre-filter drainage plug «**B**» on the flywheel side and let the oil drain off.
- Once all the oil has drained through the drainage hole, unscrew and remove the oil cartridge filter «**C** ».



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.

Add the recommended engine oil through plug «**A**». Then start up the vehicle, let it run for a few minutes and shut 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.



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

Characteristic

Engine oil

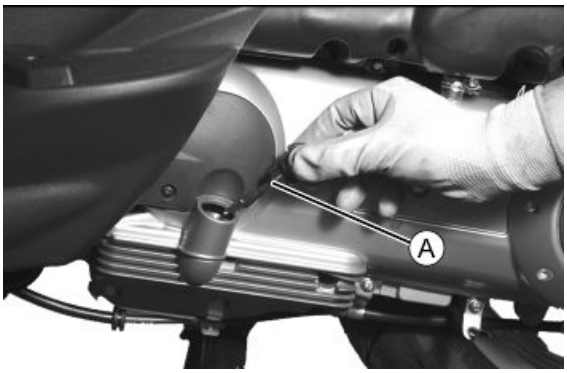
1.3 l

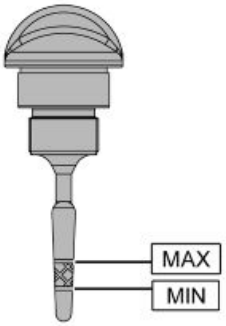
Check

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

- Place the vehicle on its centre stand and on flat ground.
- Make sure the adjustment of the rear suspension is set to the minimum preloading position.
- Unscrew the cap/dipstick «**A**», dry it with a clean cloth and reinsert it, **by screwing it in completely**.
-Remove the cap/dipstick «**A**» again and check that the level is between the **MAX** and **MIN** marks. top-up, if required.

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 exceeding the **MAX** level indicated on the cap/ dipstick.Restoring the level from **MIN** to **MAX** requires approximately 400 cm^3 of oil.

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

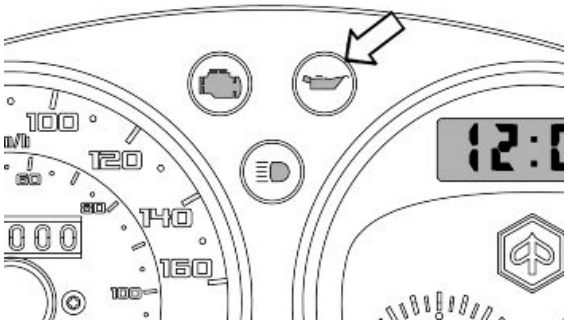
AGIP CITY HI TEC 4T Engine oil

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

Oil pressure warning light

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

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



Checking the ignition timing

- Remove the plastic cap on the flywheel cover

-Turn the flywheel until the reference mark «**T**» on the rotor matches the reference mark on the flywheel cover as shown in the figure (TDC). Make sure that the 4V reference point on the camshaft control pulley is aligned with the reference point on the head as shown in the second figure. If the reference is opposite the indicator on the head, turn the crankshaft once more.

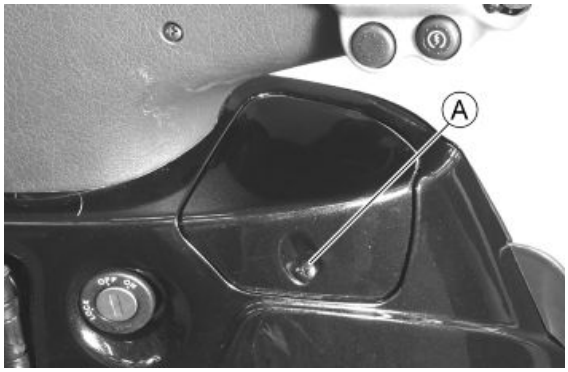
For the use of this reference mark, remove the spark plug and turn the engine in the direction that is the reverse of the normal direction using a calliper spanner applied to the camshaft command pulley casing.

Cooling system

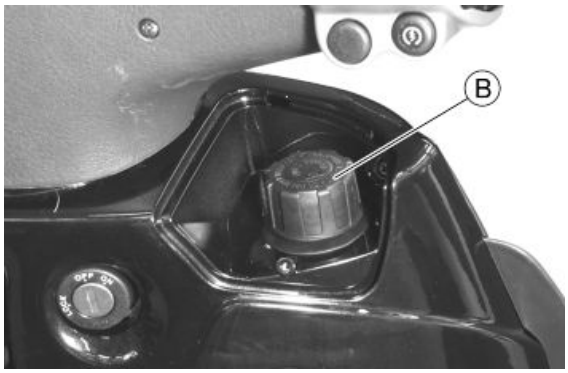
Level check

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

- Set the vehicle upright on the stand and remove the cover by undoing screw «**A**».

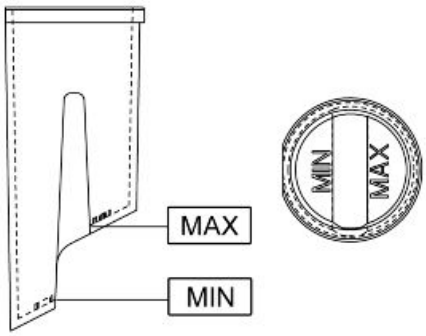


- Remove the expansion tank cover «**B**» by turning it anticlockwise.



- Look inside the expansion tank and check that the level is between **MIN** and **MAX**. Top up if the coolant is below the **MIN** level.

If the level is not correct, proceed to top-up when the engine is cold. If it is necessary to top up the coolant frequently, or if the expansion tank is completely dry, you should look for the cause in the cooling system.



WARNING

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

WARNING

IN ORDER TO AVOID HARMFUL FLUID LEAKS WHILE RIDING, IT IS IMPORTANT TO MAKE SURE THAT THE LEVEL DOES NOT EXCEED THE REFERENCE TONGUE TOO MUCH.
TO ENSURE CORRECT ENGINE OPERATION, KEEP THE RADIATOR GRILLE CLEAN.

Recommended products

AGIP PERMANENT SPECIAL coolant

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

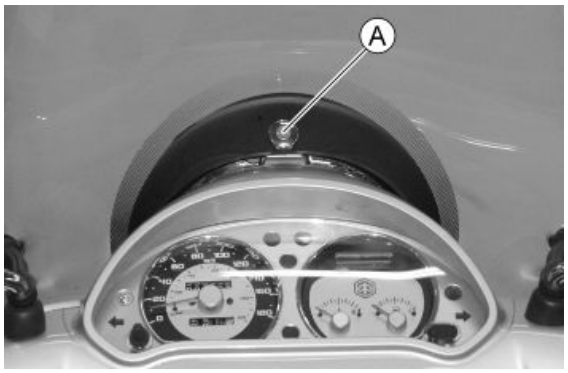
Braking system

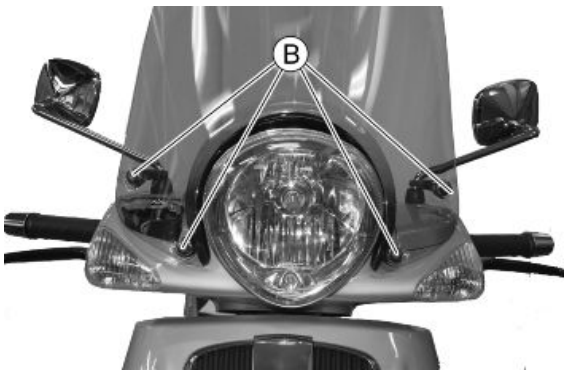
Level check

The front and rear brake fluid reservoirs are both positioned on the handlebar. Proceed as follows:
- Rest the vehicle onto the centre stand, with the handlebar centred.
- Check the fluid level through the sight glass «**A**».
A certain lowering of the level is caused by wear on the brake pads.

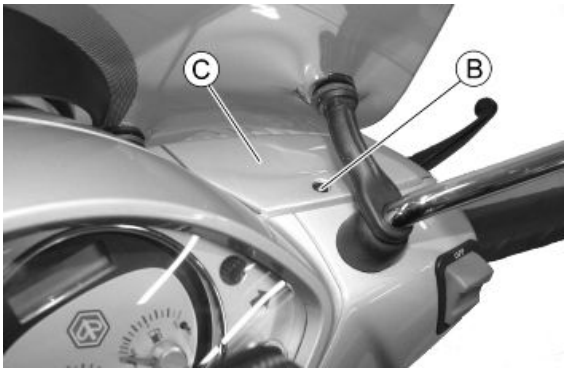
Top-up

Proceed as follows:
- Undo the five screws « **A**» and remove the windshield.



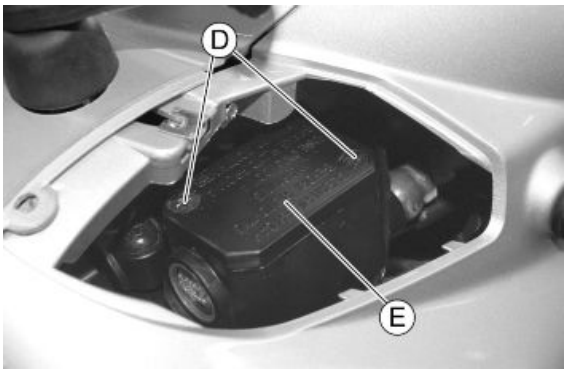


- Undo the screw «**B**», then remove cover «**C**» in order to get access to the reservoir cap below.



- Loosen the two fixing screws «**D**» and remove cover «**E**». Top-up the brake fluid level using only the prescribed brake fluid and without exceeding the maximum level.

Under normal climatic conditions, replace fluid as indicated in the scheduled maintenance tables.



CAUTION

BRAKING CIRCUIT FLUID IS HIGHLY CORROSIVE; MAKE SURE THAT IT DOES NOT COME INTO CONTACT WITH THE PAINTWORK.

CAUTION

ONLY USE DOT 4-CLASSIFIED BRAKE FLUID.

WARNING

THE BRAKE FLUID IS HAZARDOUS: IN CASE OF ACCIDENTAL CONTACT, WASH OFF WITH WATER.

WARNING

THE BRAKING CIRCUIT LIQUID IS HYGROSCOPIC, AND ABSORBS THE HUMIDITY OF SURROUNDING AIR. IF THE HUMIDITY IN THE BRAKING FLUID EXCEEDS A CERTAIN VALUE, IT WILL LEAD TO INEFFICIENT BRAKING. NEVER USE BRAKING FLUID KEPT IN CONTAINERS THAT HAVE ALREADY BEEN OPENED, OR PARTIALLY USED.

Recommended products

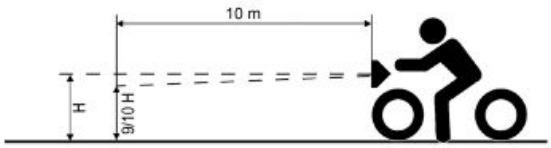
AGIP BRAKE 4 Brake fluid

FMVSS DOT 4 Synthetic fluid

Headlight adjustment

Proceed as follows:

- Position the unloaded vehicle, in running order and with the tyres inflated to the prescribed pressure, onto a flat surface, 10 m away from a half-lit white screen; make sure the vehicle axis is perpendicular to the screen;



- Turn on the headlight and check that the border of the projected light beam on the screen is not

higher than 9/10 or lower than 7/10 f the height from the ground to the centre of vehicle headlamp;

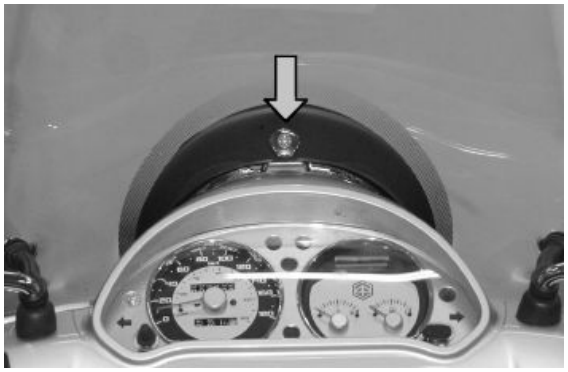
- Otherwise, adjust the headlight.

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.

To adjust light beams:

- Undo the five screws indicated and remove the windshield.



- Operate on the screw indicated in order to aim the light in the desired way.

INDEX OF TOPICS

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

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

Engine

Poor performance

POOR PERFORMANCE

Possible Cause	Operation
Fuel pump	Check the injection load relay
Excess of scales in the combustion chamber	Descale the cylinder, the piston, the head and the valves
Incorrect timing or worn timing system elements	Time the system again or replace the worn parts
Silencer obstructed	Replace
Air filter blocked or dirty.	Remove the sponge, wash with water and car shampoo, then soak it in a mixture of 50% petrol and 50% specific oil. Press with your hand without squeezing, allow it to drip dry and refit.
Oil level exceeds maximum	Check for causes and fill to reach the correct level
Lack of compression: parts, cylinder and valves worn	Replace the worn parts
Drive belt worn	Replace
Inefficient automatic transmission	Check the rollers, the pulley movement and make sure the drive belt is in good conditions; replace the damaged parts and lubricate the moveable driven pulley with specific grease.
Clutch slipping	Check the clutch system and/or the bell and replace if necessary
Overheated valves	Remove the head and the valves, grind or replace the valves
Wrong valve adjustment	Adjust the valve clearance properly
Valve seat distorted	Replace the head unit

Starting difficulties

DIFFICULT STARTING

Possible Cause	Operation
Rpm too low at start-up or engine and start-up system damaged	Check the starter motor, the system and the torque limiter
Incorrect valve sealing or valve adjustment	Inspect the head and/or restore the correct clearance
Engine flooded	Try starting-up with the throttle fully open. If the engine fails to start, remove the spark plug, dry it and before refitting, make the engine turn so as to expel the fuel excess taking care to connect the cap to the spark plug, and this in turn to the ground. If the fuel tank is empty, refuel and start up.
Air filter blocked or dirty.	Remove the sponge, wash with water and car shampoo, then soak it in a mixture of 50% petrol and 50% specific oil. Press with your hand without squeezing, allow it to drip dry and refit.
Faulty spark plug or incorrect ignition advance	Replace the spark plug or check the ignition circuit components
Flat battery	Check the charge of the battery, if there are any sulphur marks, replace and use the new battery following the instructions shown in the chapter
Intake coupling cracked or clamps incorrectly tightened	Replace the intake coupling and check the clamps are tightened

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

Possible Cause	Operation
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 replace brake fluid if necessary. Check there is no air in the circuits; if necessary, bleed the air. Check that the front brake calliper moves in axis with the disc.
Fluid leakage in hydraulic braking system	Failing elastic fittings, plunger or brake pump seals, replace
Brake disc slack or distorted	Check the brake disc screws are locked; measure the axial shift of the disc with a dial gauge and with wheel mounted on the vehicle.

Brakes overheating

BRAKE OVERHEAT

Possible Cause	Operation
Defective plunger sliding	Replace the calliper.
Brake disc slack or distorted	Check the brake disc screws are locked; use a dial gauge and a wheel mounted on the vehicle to measure the axial shift of the disc.
Clogged compensation holes on the pump	Clean carefully and blast with compressed air
Swollen or stuck rubber gaskets	Replace the calliper.

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 rotation seats and the steering fifth wheels.

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 rotation seats and the steering fifth wheels.

Noisy suspension

NOISY SUSPENSION

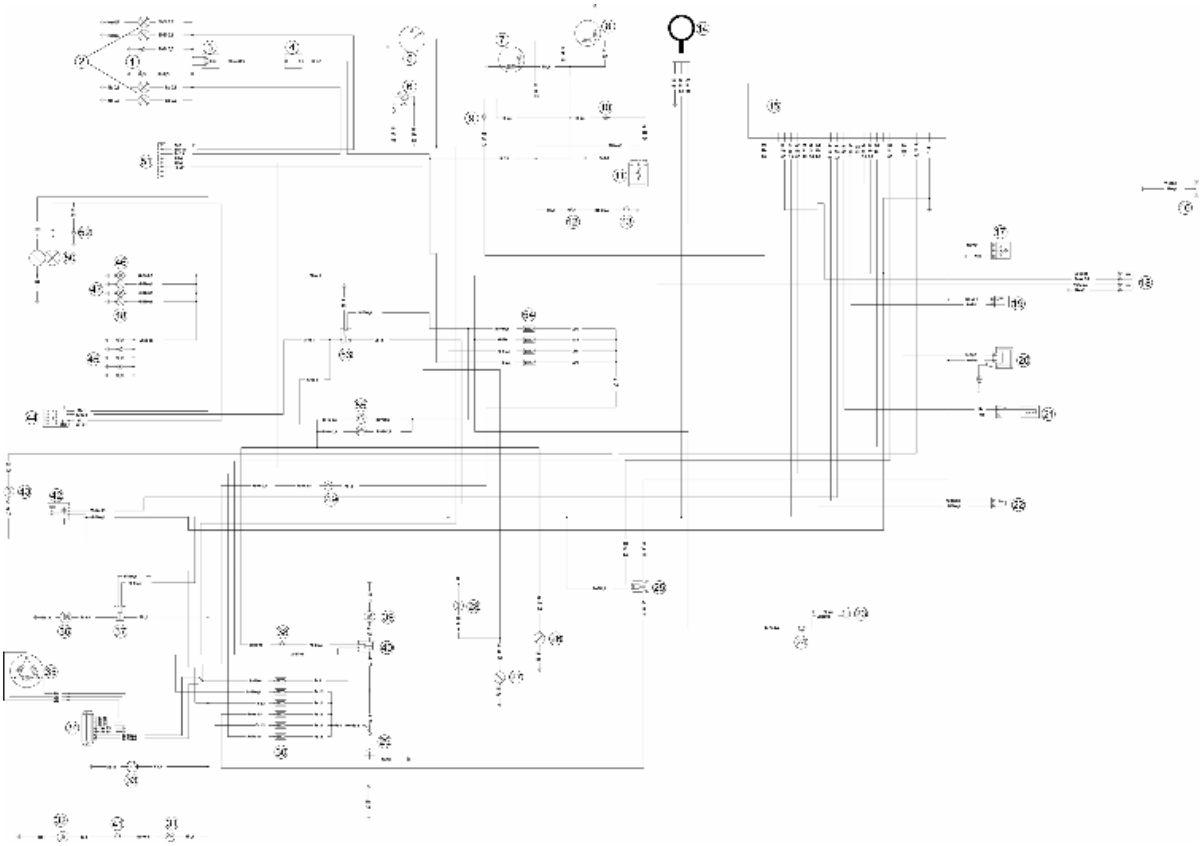
Possible Cause	Operation
Malfunctions in the suspension system	If the front suspension is noisy, check: tightening torques, headstock components, inspect forks.

Suspension oil leakage

OIL LEAKAGE FROM SUSPENSION

Possible Cause	Operation
Faulty or broken seals	Replace the shock absorber

INDEX OF TOPICS



KEY

1. bulbs for turn indicator warning lights

2. turn indicator bulbs

3. turn indicator switch

4. turn indicator control device

5. clock

6. immobilizer LED

7. fuel gauge

8. engine temperature gauge

9. injection telltale light

10. low fuel warning light

11. fuel level transmitter

12. oil pressure warning light

13. oil pressure sensor

14. immobilizer aerial

15. injection ECU

16. diagnostics socket

17. fuel pump

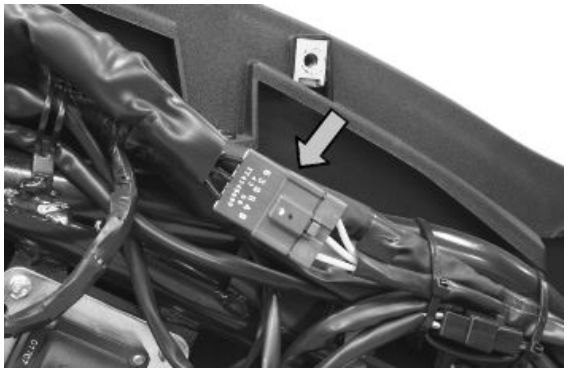
18. engine temperature sensor

19. fuel injector

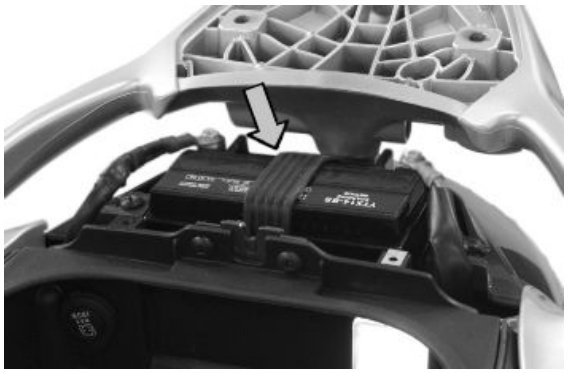
20. HV coil
21. engine revolution sensor
22. lambda probe
23. horn
24. horn button
25. injection load remote control
26. stop light bulb
27. helmet compartment light bulb
28. helmet compartment light control switch
29. battery
30 main fuses unit
31. key switch contacts
32. saddle opening actuator
33. LV socket
34. voltage regulator
35. magneto flywheel
36. radiator electric fan
37. electric fan remote control
38. starter button
39. starter motor
40. start-up remote control switch
41. saddle opening button
42. engine stop switch
43. side stand switch
44. light switch
45. instrument panel lighting bulbs
46. front tail light bulb
47. tail light bulb
48. license plate light bulb
49. key switch contacts
50. headlight with twin-filament bulb
51. pre-installation for anti-theft device
52. high-beam warning light
53. headlight remote control
54. auxiliary fuses unit
55. stop buttons

Components arrangement

1. Stator: remove the right side fairing to reach the connector.



2. Battery: remove the battery cover located in the helmet compartment to reach it.

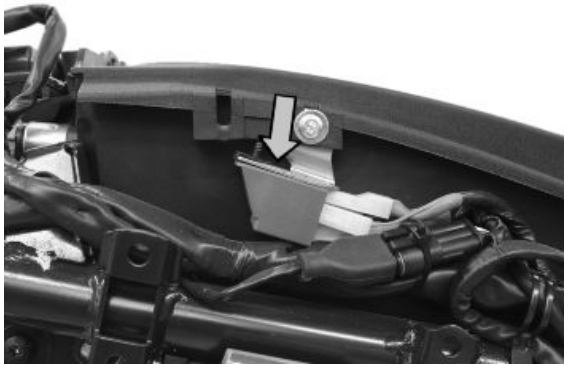


Characteristic

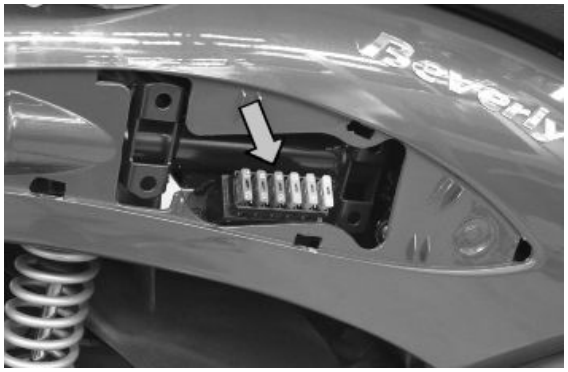
Battery

12V-12Ah

3. Start-up remote control switch: remove the right side fairing to reach it.



4. Primary fuses: remove the right side cover to reach them.



5. HV coil: remove the right side fairing in order to reach it.

Characteristic

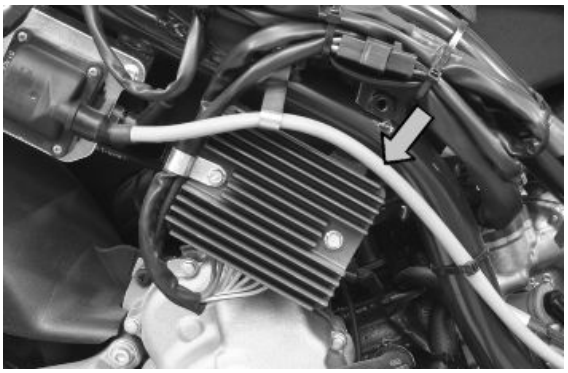
HV coil resistance primary value:

~ 0.9 Ω

HV coil secondary resistance value:

~ 3.4 kΩ

6. Voltage regulator: remove the right side fairing to reach it.



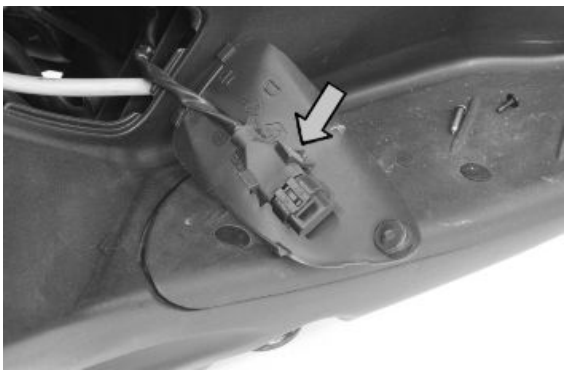
Electric characteristic

Control voltage

14÷15 V to 1500÷12000 rpm

7. Oil pressure sensor: placed at the bottom at the back of the vehicle RHS.

8. Diagnostics socket connector: remove the cover on the vehicle right side to reach it.



10. Horn: remove the shield back plate to reach it.

11. Immobilizer Aerial: remove the legshield to reach it.

12. Key switch: remove the legshield to reach it.

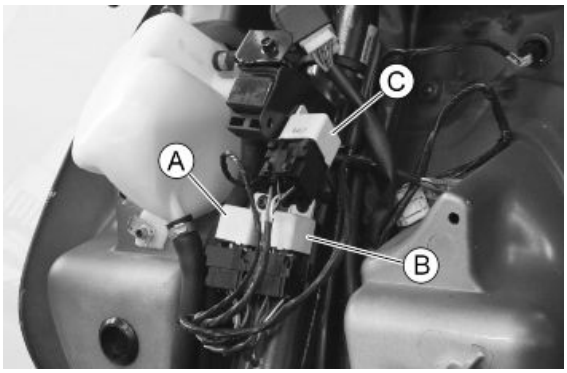
13. Turn indicator control device: remove the leg-shield to reach it.

14. Remote controls: remove the legshield to reach them.

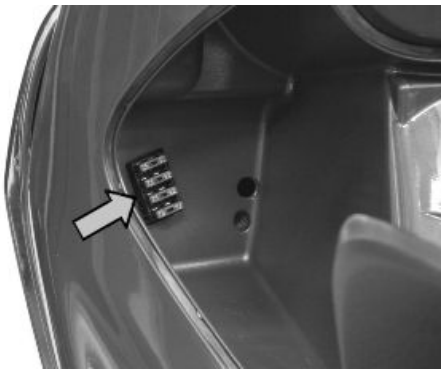
A. Light remote control

B. Electric fan remote control

C. Injection load remote control



15. Auxiliary fuses: located in the front glove-box.



16. Fuel level transmitter: remove the central cover to reach it.

Electric characteristic

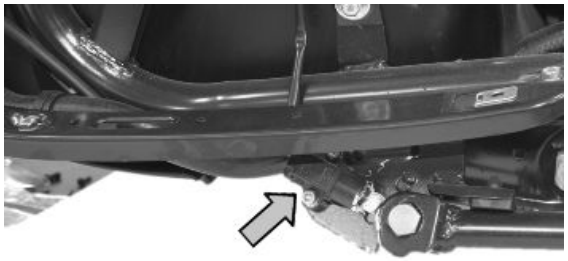
Resistance value when the tank is full

<= 7 Ω

Resistance value when the tank is empty

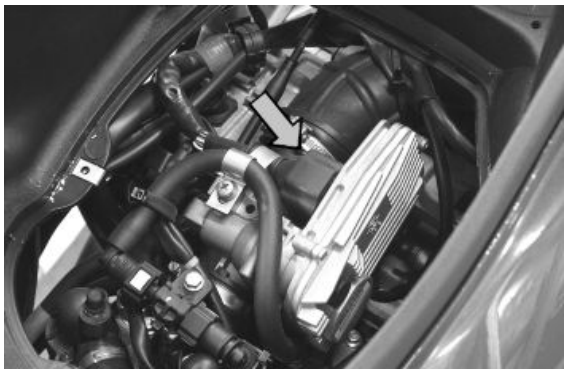
90 +13/-3 Ω

17. Stand switch: remove the left footrest to reach it.

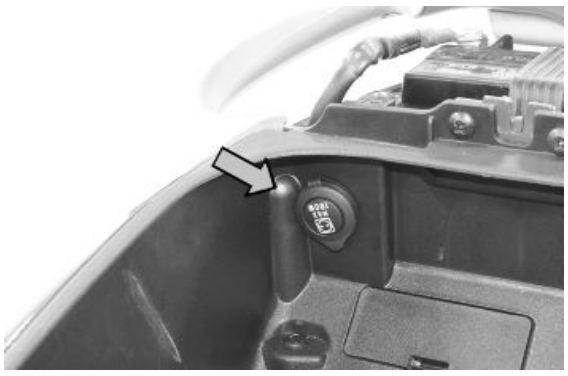


18. Saddle opening actuator: remove the left side panel to reach it.

19. Injection ECU: remove the inspection cover located in the helmet compartment to reach it.



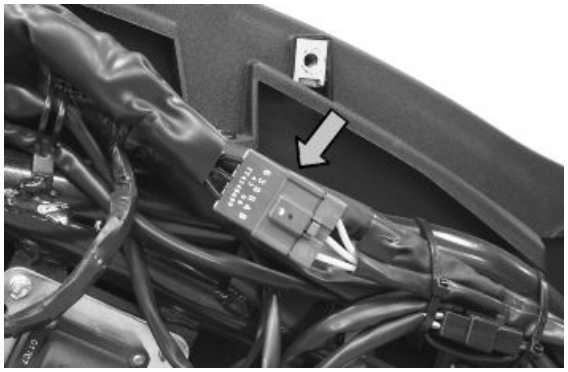
20. Plug socket: located in the helmet compartment.



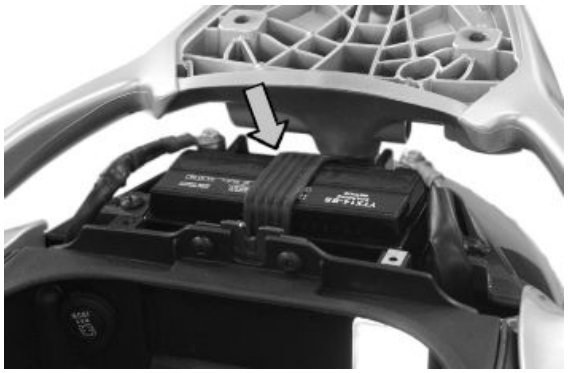

1
2
3
4
5
6
7
8
9
10
11


12
13
14
15
16
17
18
19
20

1. Stator: remove the right side fairing to reach the connector.



2. Battery: remove the battery cover located in the helmet compartment to reach it.

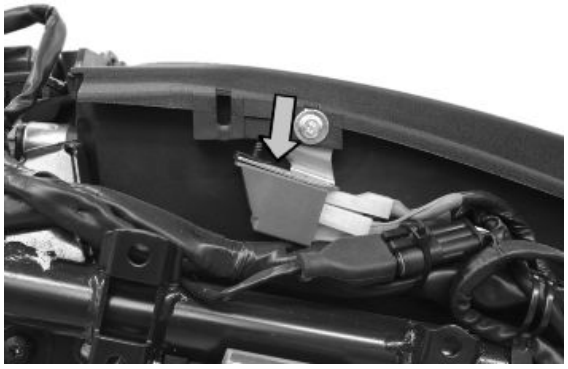


Characteristic

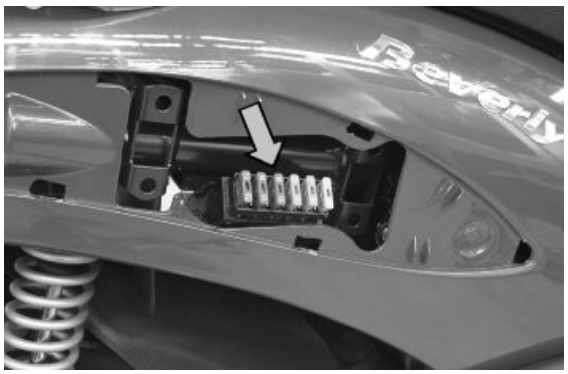
Battery

12V-12Ah

3. Start-up remote control switch: remove the right side fairing to reach it.



4. Primary fuses: remove the right side cover to reach them.



5. HV coil: remove the right side fairing in order to reach it.

Characteristic

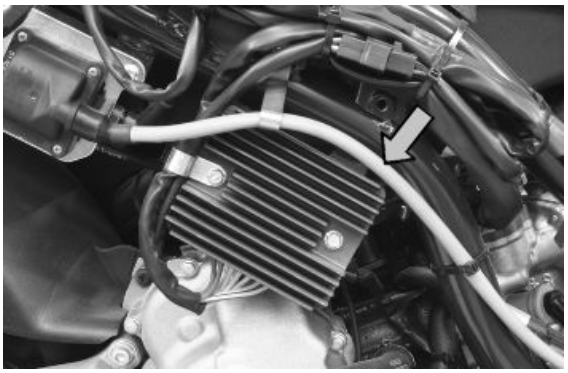
HV coil resistance primary value:

~ 0.9 Ω

HV coil secondary resistance value:

~ 3.4 kΩ

6. Voltage regulator: remove the right side fairing to reach it.



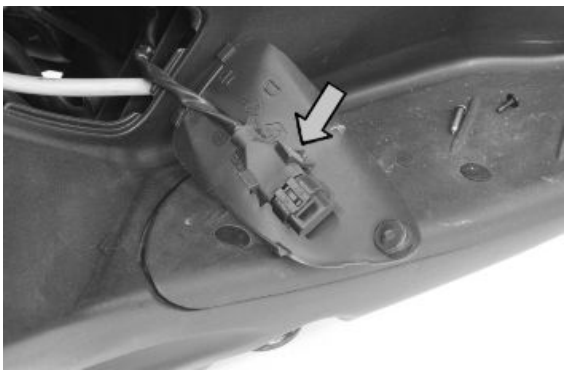
Electric characteristic

Control voltage

14÷15 V to 1500÷12000 rpm

7. Oil pressure sensor: placed at the bottom at the back of the vehicle RHS.

8. Diagnostics socket connector: remove the cover on the vehicle right side to reach it.



9. Spark plug: remove the cover on the vehicle right side to reach it.

10. Horn: remove the shield back plate to reach it.

11. Immobilizer Aerial: remove the legshield to reach it.

12. Key switch: remove the legshield to reach it.

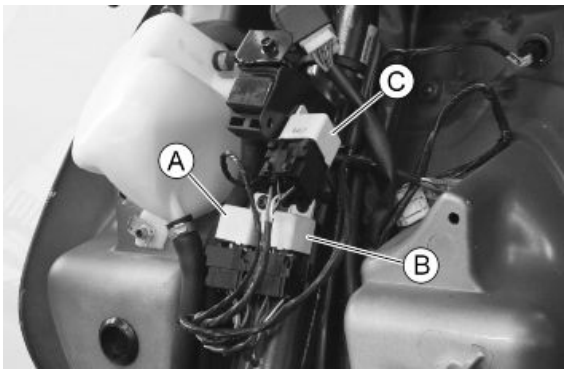
13. Turn indicator control device: remove the legshield to reach it.

14. Remote controls: remove the legshield to reach them.

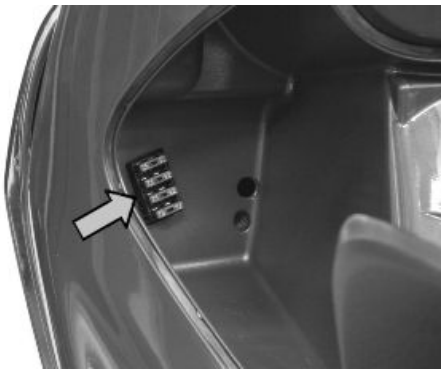
A. Light remote control

B. Electric fan remote control

C. Injection load remote control



15. Auxiliary fuses: located in the front glove-box.



16. Fuel level transmitter: remove the central cover to reach it.

Electric characteristic

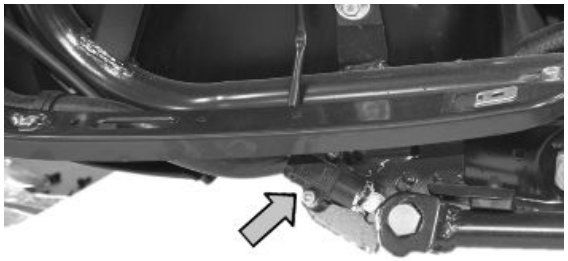
Resistance value when the tank is full

<= 7 Ω

Resistance value when the tank is empty

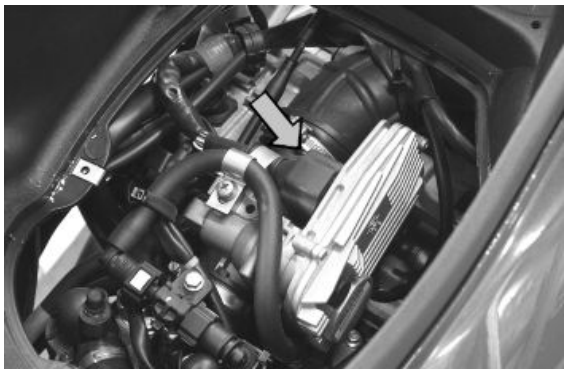
90 +13/-3 Ω

17. Stand switch: remove the left footrest to reach it.

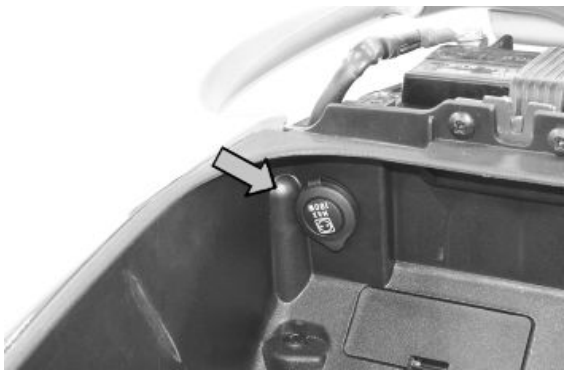


18. Saddle opening actuator: remove the left side panel to reach it.

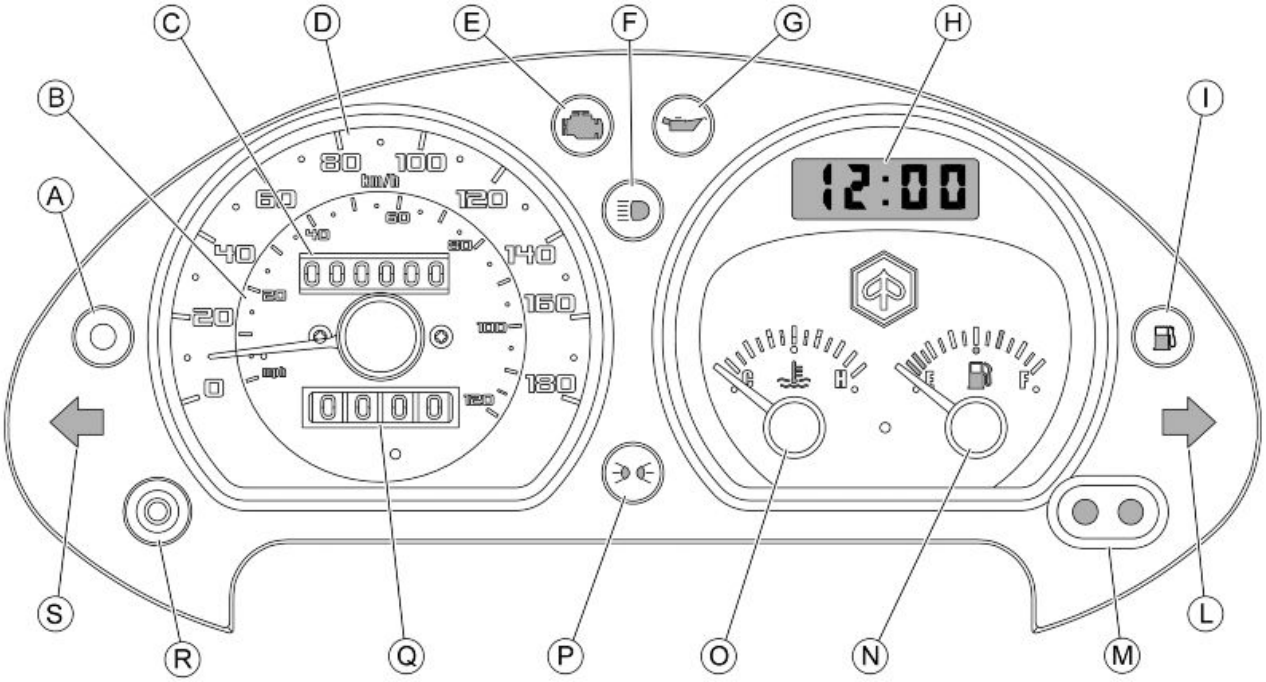
19. Injection ECU: remove the inspection cover located in the helmet compartment to reach it.



20. Plug socket: located in the helmet compartment.



Instrument panel



A = Immobilizer LED

B = Speedometer (mph)

C = Total Odometer

D = Speedometer (km/h)

E = Injection telltale light

F = High-beam warning light

G = Oil pressure warning light

H = Digital clock

I = Low fuel warning light

L = Right turn indicator warning light

M = Clock controls

N = Fuel gauge

O = Water temperature gauge

P = Headlight warning light

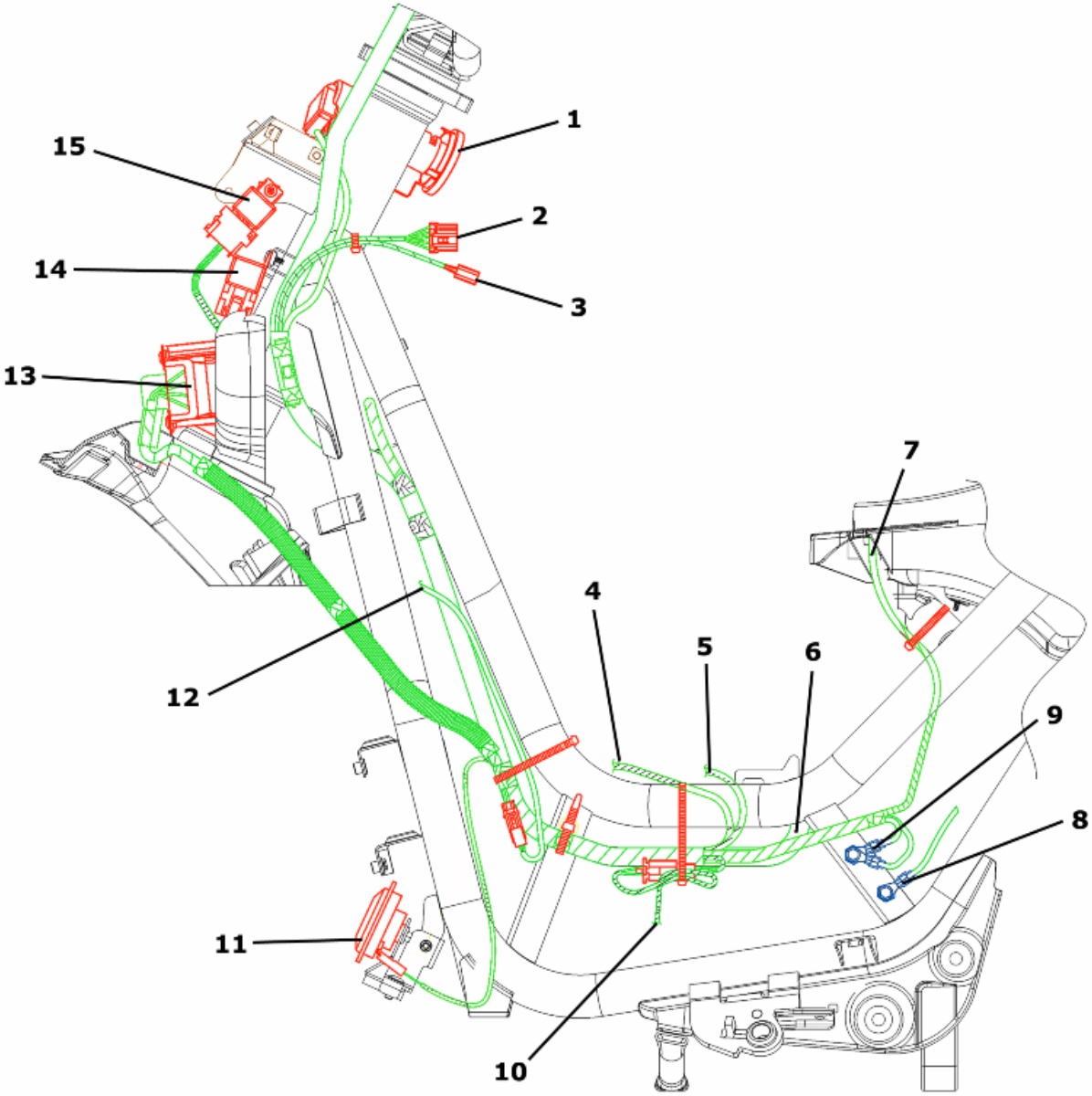
Q = Trip odometer

R = Odometer reset button

S = Left turn indicator warning light

Electrical system installation

Front side



1. Immobilizer aerial
2. Pre-installation for anti-theft ECU
3. Saddle opening switch
4. To fuel gauge
5. To fuel pump
6. Towards right fairing
7. To helmet compartment light switch
8. Engine ground lead
9. Ground lead clamping to chassis
10. To stand switch

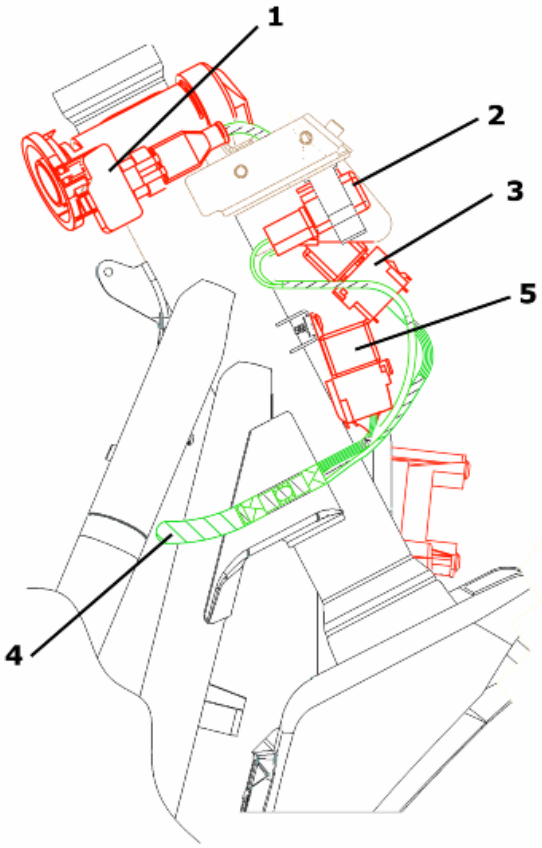
11.Horn

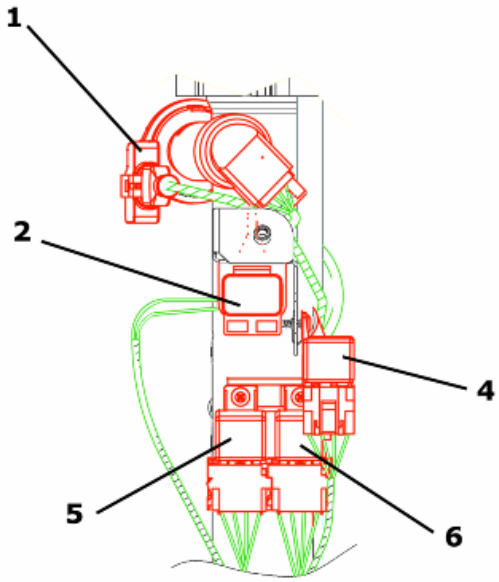
12.To electric fan

13.Front fuse-box

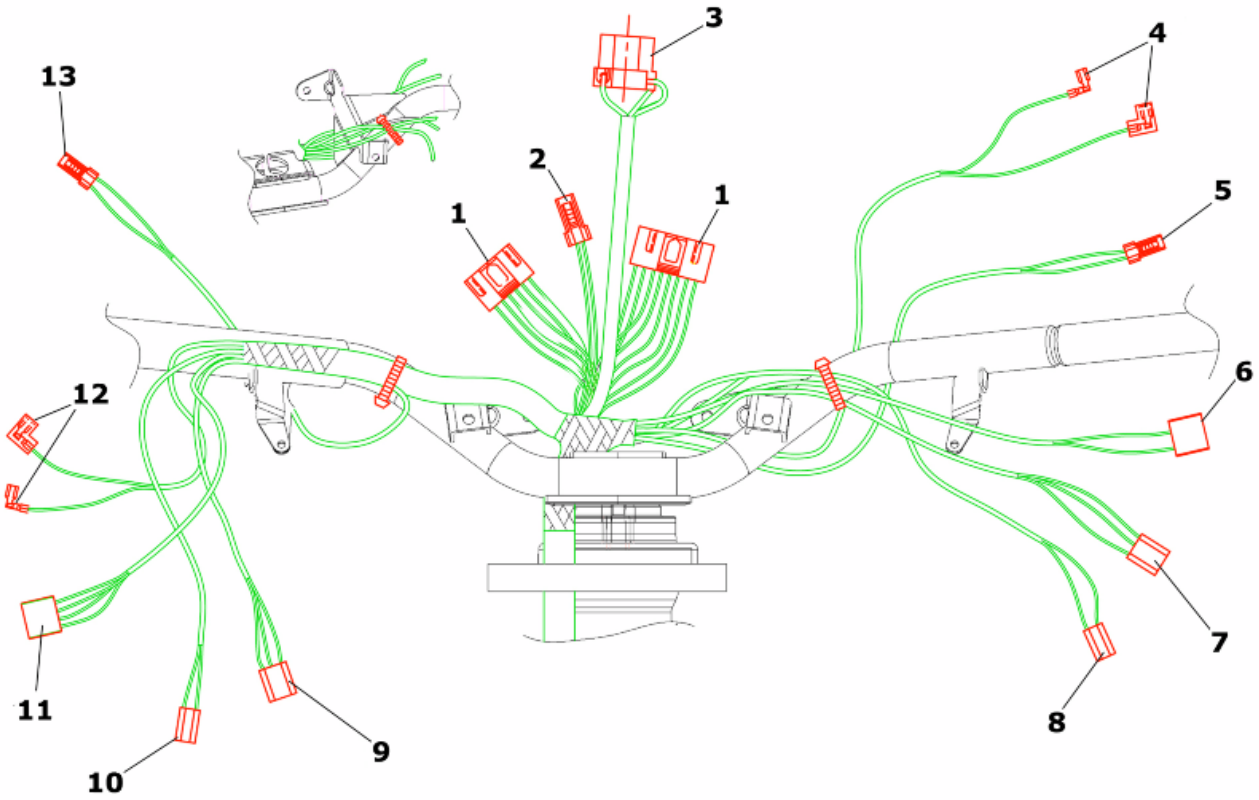
14.Electric fan remote control

15.Injection load remote control



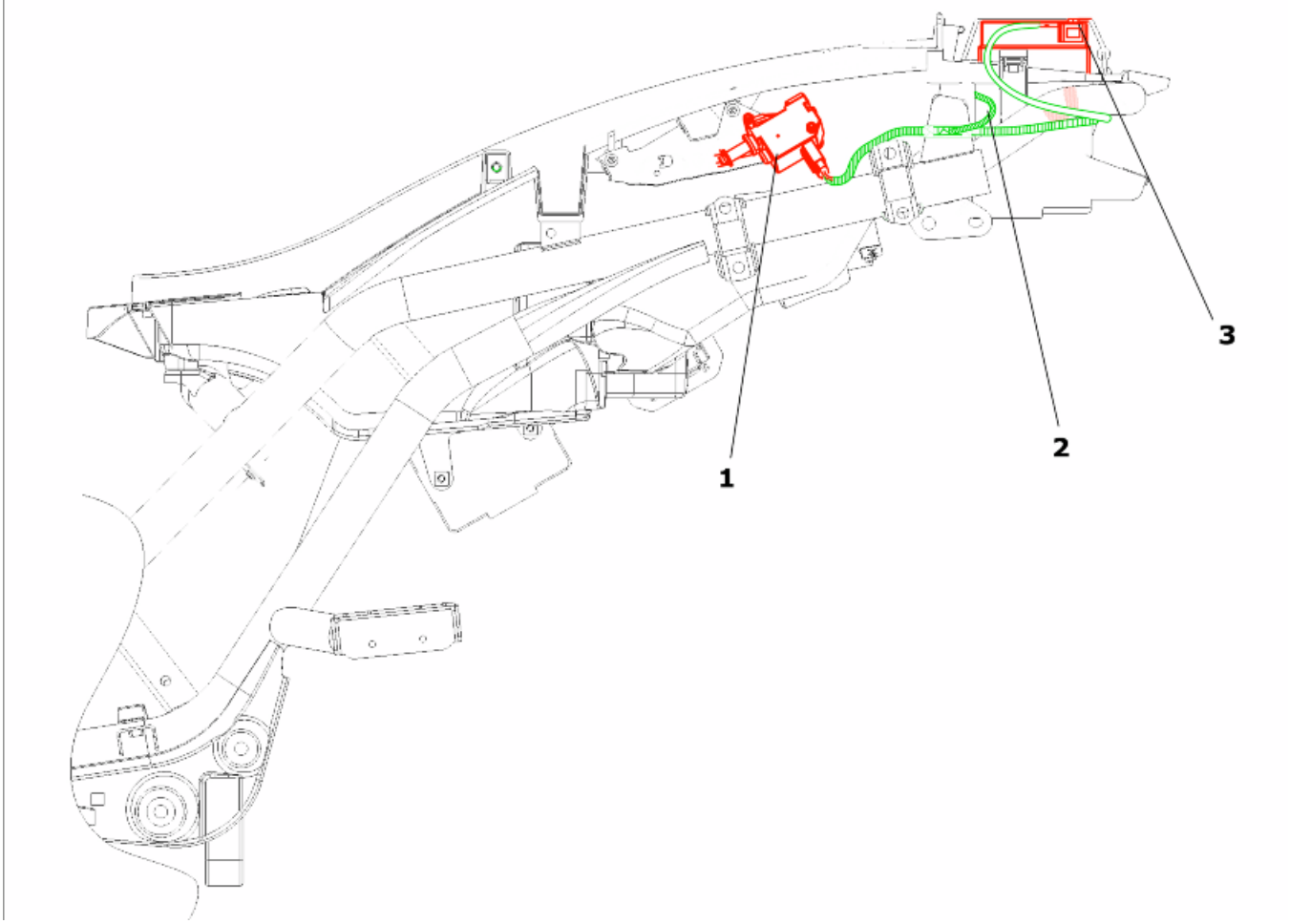


1. Immobilizer aerial
2. Turn indicator control device
3. Injection load remote control
4. On the left side
5. Light remote control
6. Electric fan remote control

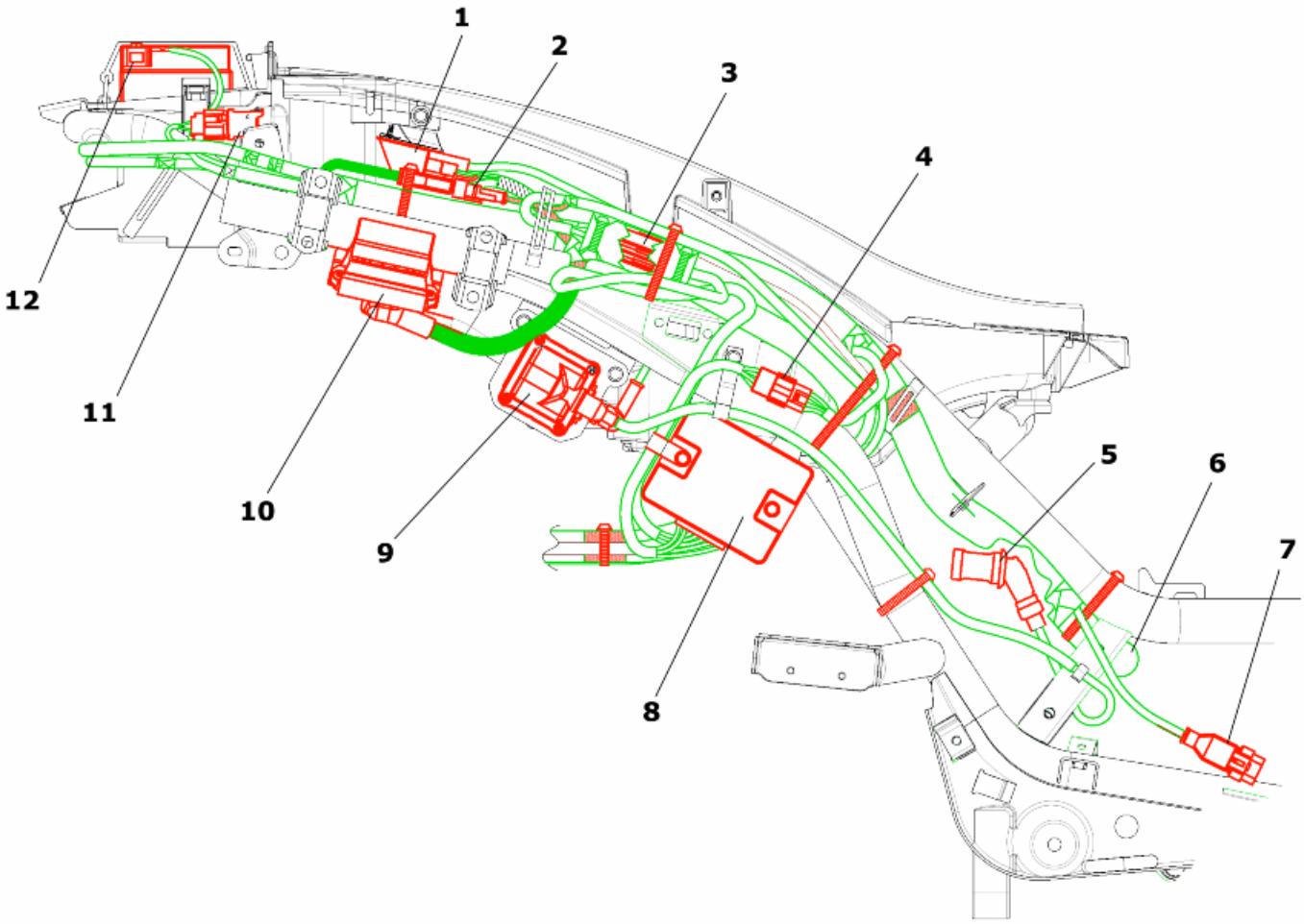


1. To instrument panel
2. To front position light
3. To headlight
4. To right turn indicator
5. To front brake stop button
6. To engine stop switch
7. To light switch
8. To starter button
9. To turn indicator switch
10. To horn button
11. To light switch
12. To left turn indicator
13. To front brake stop button

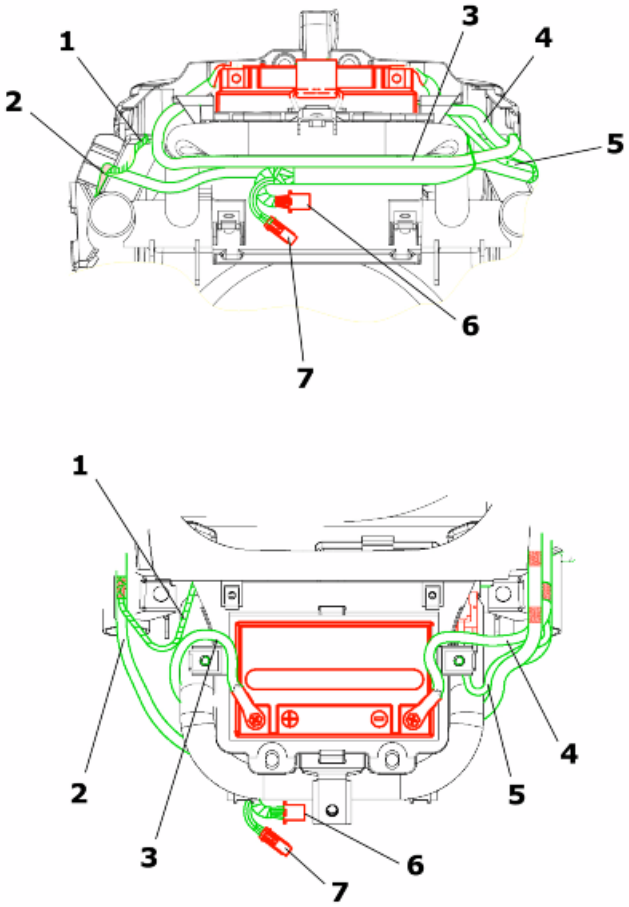
Back side



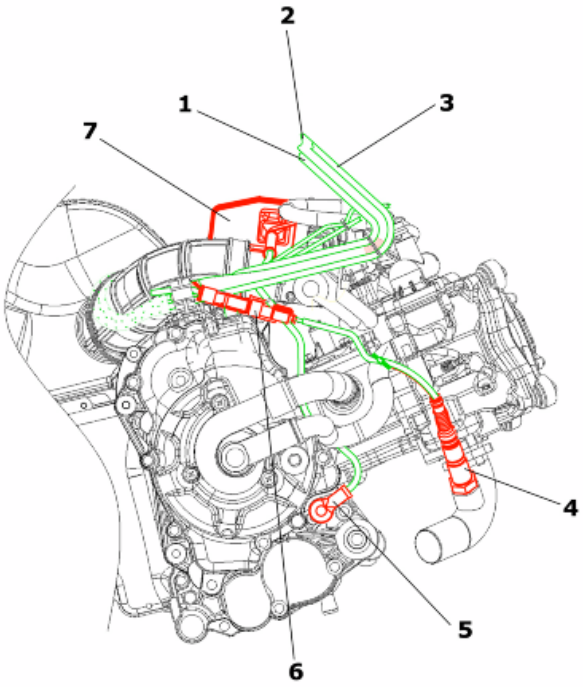
1. Saddle opening actuator
2. To internal light
3. Battery positive

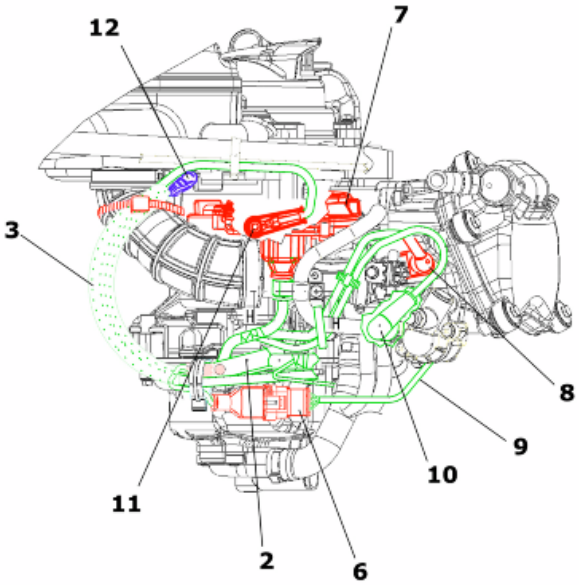


1. Start-up remote control switch
2. Pick-up connection
3. Flywheel - regulator connection
4. Regulator - system connection
5. Spark plug cap
6. Main wire unit
7. Diagnostics socket
8. Voltage regulator
9. HV coil
10. Rear fuse-box
11. Plug socket for accessories
12. Battery negative



1. To internal light
2. To actuator
3. To battery positive
4. To battery negative
5. To plug socket for accessories
6. To rear light
7. To the license plate light

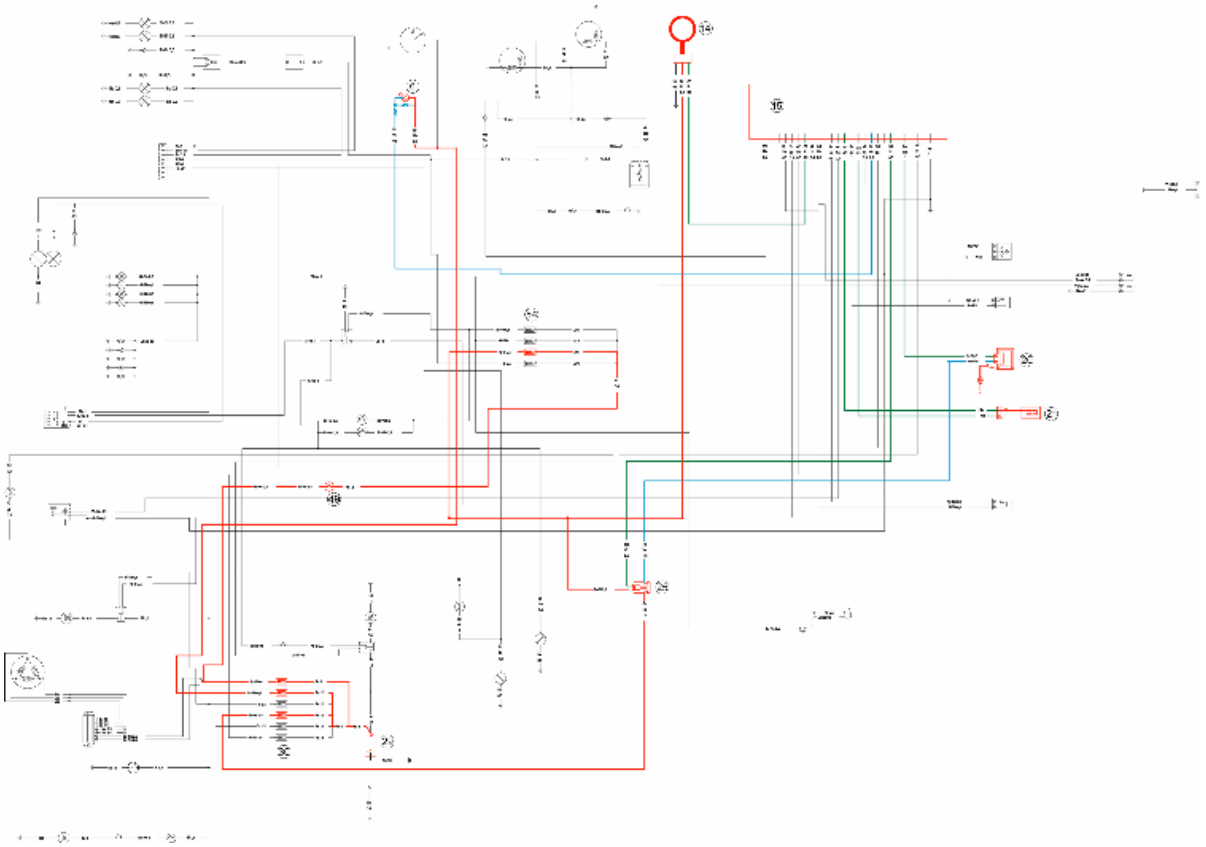




1. Flywheel cables
2. To wire unit
3. Starter motor positive wire
4. Lambda sensor
5. Oil pressure sensor
6. Lambda probe connector
7. Injection ECU
8. Injector
9. To lambda probe
10. Engine temperature sensor
11. Starter motor positive
12. Starter motor ground lead clamping

Conceptual diagrams

Ignition



6. immobilizer LED

14. immobilizer aerial

15. injection ECU

20. HV coil

21. engine revolution sensor

25. injection load remote control

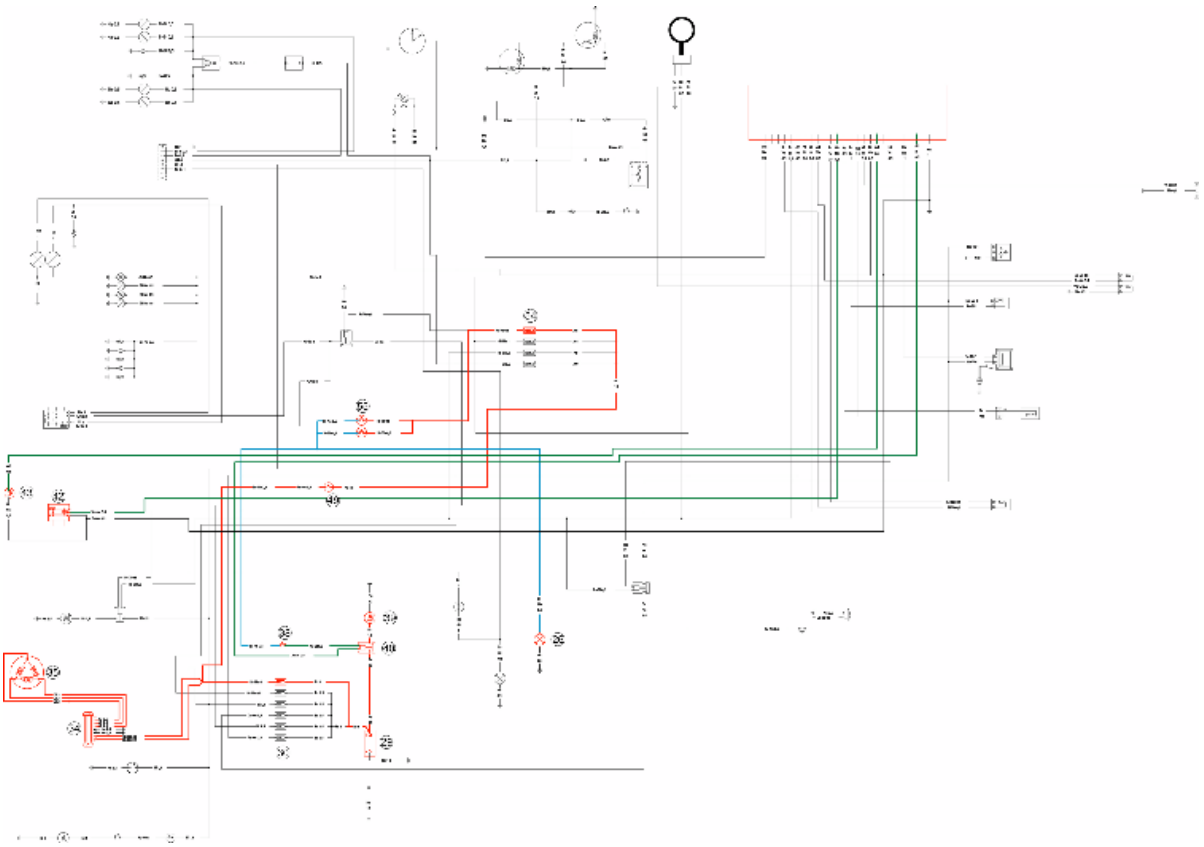
29. battery

30. main fuses unit: fuses 1,2,4

49. key switch contacts

54. auxiliary fuses unit: Fuses 9

Battery recharge and starting



15. injection ECU

26. stop light bulb

29. battery

30. main fuses unit: Fuses 1

34. voltage regulator

35. magneto flywheel

38. starter button

39. starter motor

40. start-up remote control switch

42. engine stop switch

43. side stand switch

49. key switch contacts

54. auxiliary fuses unit: Fuses 7

55. stop buttons

Level indicators and enable signals section

7. fuel gauge

8. engine temperature gauge

9. injection telltale light
10. low fuel warning light
11. Fuel level transmitter
12. oil pressure warning light
13. oil pressure sensor
15. injection ECU
18. engine temperature sensor
19. fuel injector
21. engine revolution sensor
22. lambda probe
25. injection load remote control
29. battery
30. main fuses unit: fuses 1,4,6
49. key switch contacts
54. auxiliary fuses unit: fuses 9,10

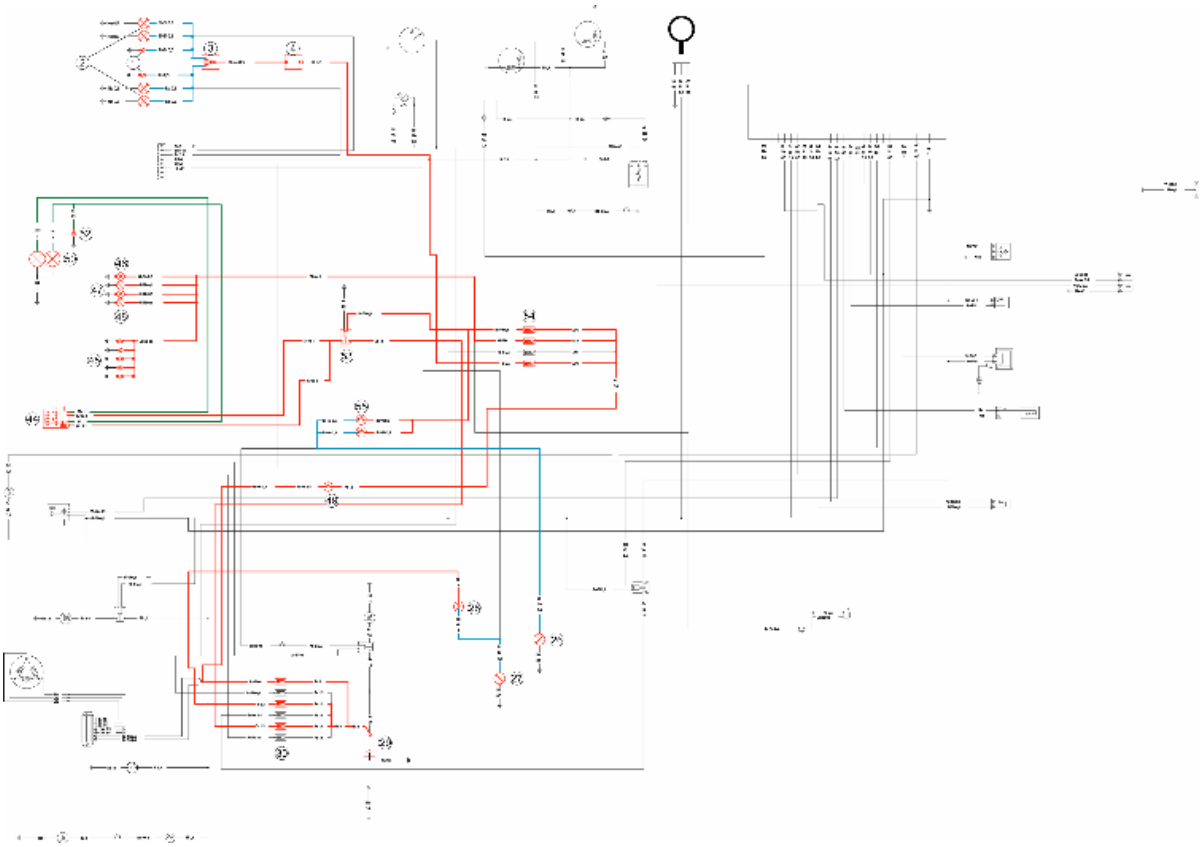
Devices and accessories

1. bulbs for turn indicator warning lights
2. turn indicator bulbs
3. turn indicator switch
4. turn indicator control device
5. clock
15. injection ECU
16. diagnostics socket
17. fuel pump
23. horn
24. horn button
25. injection load remote control
27. helmet compartment light bulb
28. helmet compartment light control switch
29. battery
30. main fuses unit: fuses 1,2,3,4
31. key switch contacts
32. saddle opening actuator
33. LV socket
41. saddle opening button
49. key switch contacts

51. pre-installation for anti-theft device

54. auxiliary fuses unit: fuses 8,9,10

Lights and turn indicators



1. bulbs for turn indicator warning lights

2. turn indicator bulbs

3. turn indicator switch

4. turn indicator control device

26. stop light bulb

27. helmet compartment light bulb

28. helmet compartment light control switch

29. battery

30. main fuses unit: fuses 1,3,5

44. light switch

45. instrument panel lighting bulbs

46. front tail light bulb

47. tail light bulb

48. license plate light bulb

49. key switch contacts

50. headlight with twin-filament bulb

52. high-beam warning light

53. headlight remote control

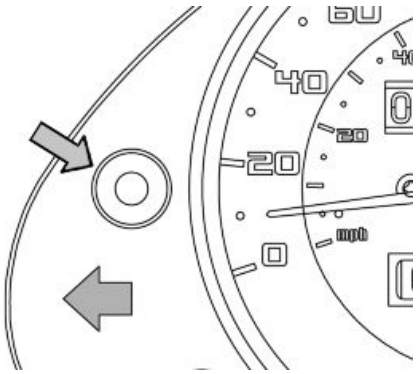
54. auxiliary fuses unit: fuses 7,8,10

55. stop buttons

Checks and inspections

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

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:

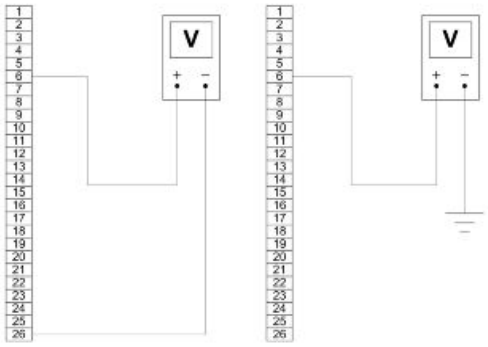
- an electronic control unit
- immobilizer aerial
- master key with built-in transponder
- service key with built-in transponder
- diagnosis LED

The diagnosis LED also works as a theft-deterrent blinker. This function is activated every time the key switch is set to «OFF» or the engine emergency cut-off switch is set to «OFF». It remains activated for 48 hours in order not to affect the battery charge. When the ignition switch is turned to «ON», the deterring blinker function is deactivated. Subsequently, a flash confirms the switching to « 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
- fuses No. 1; 2; 6 and 9 are in working order
- there is power to the control unit as specified below:

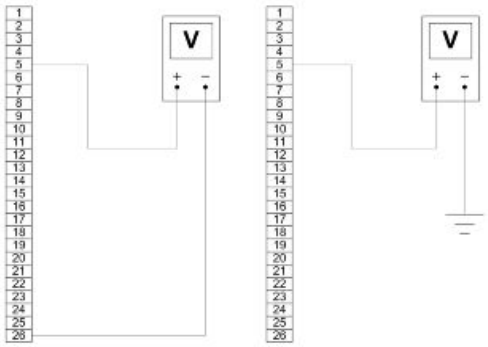
2 With the key switch set to OFF:

- if there is battery voltage between terminals 6-26 and terminal 6-chassis ground (fixed power supply). If there is no voltage, check that fuse 6 and its cable harness are in working order.

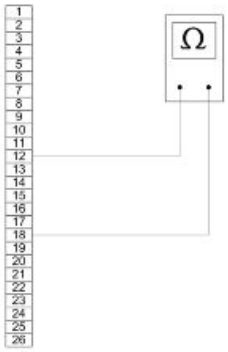


With the key switch in the OFF position:

- if there is battery voltage between terminals 5-26 and terminals 5-chassis ground (fixed power supply). If there is no voltage, check the key switch contacts, and that fuses No. 1 and 9 and their cable harnesses are in working order.



- There is continuity between terminals 12-18 and the emergency cut-off switch is set to «RUN» and the side stand is folded up. If there is no continuity, check the contacts of the latter.



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

Remove the protective base from the connector.

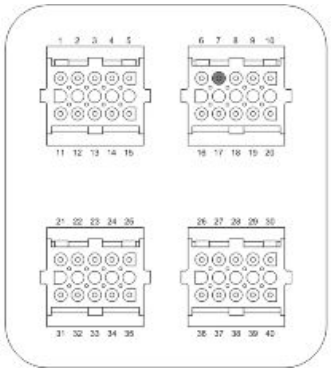
With the ignition key switch at «ON» check if there is battery voltage between the Red-White and Black cables

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 not programmed control unit provides for the recognition of the Master 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 service key and turn it 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.

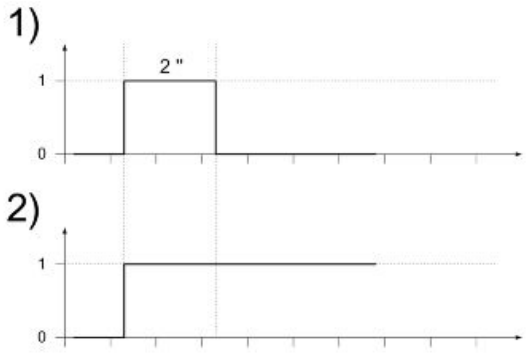
A maximum of 7 service keys can be programmed at one time.

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, the Master key transponder is strictly matched with the control unit. 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; to add or delete a key it is therefore necessary to repeat the procedure using all the keys that you intend to keep in use. 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.

Diagnostic codes

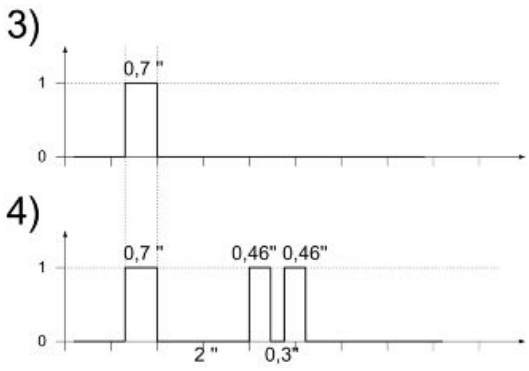
The Immobilizer system is tested each time the key switch is turned from «OFF» to «ON». During this diagnosis phase a number of control unit statuses can be identified and various light codes displayed. Regardless of the code transmitted, if at the end of the diagnosis the LED remains off permanently,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



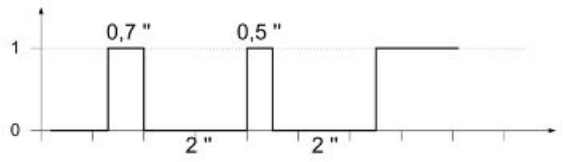
4. **Programmed control unit - Master key in**: a 0.7 sec. flash is displayed followed by the LED remaining off for 2 sec. and then by short 0.46 sec. flashes the same number of times as there are keys stored in the memory including the Master key. When the diagnosis has been completed, the LED remains 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

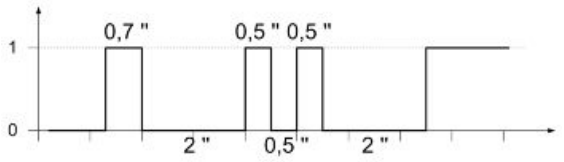
Diagnostic code - 1 flash

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.



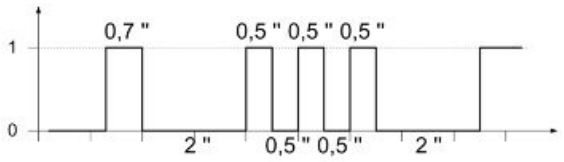
Diagnostic code - 2 flashes

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.



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.



Ignition circuit

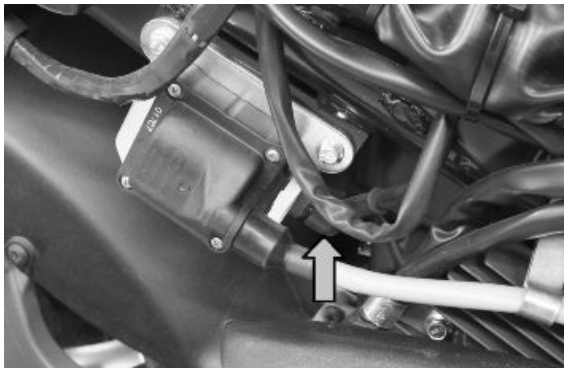
No spark plug

WARNING

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

HV coil primary resistance value:

Disconnect the connector of the HV coil and measure the resistance between the two terminals.



Characteristic

HV coil resistance primary value:

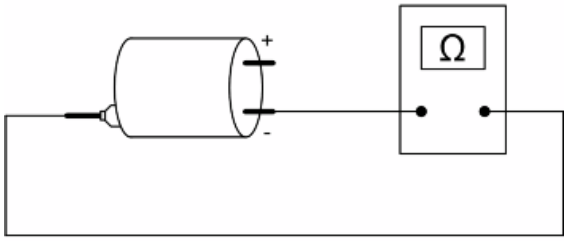
~ 0.9 Ω

HV coil secondary resistance value:

1) Disconnect the HV cable from the spark plug and measure the resistance between the spark plug cap and the HV coil negative terminal.

2)Disconnect the spark plug cap from the HV cable and measure the resistance between the HV cable end and the HV coil negative terminal (see figure).

3) Measure the resistance between the 2 ends of the spark plug cap.



Characteristic

HV coil secondary resistance value with spark plug cap

~ 8.4 kΩ

HV coil secondary resistance value:

~ 3.4 kΩ

Spark plug cap resistance value

~ 5 kΩ

Battery recharge circuit

The charging circuit consists of three-phase alternator and a 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 alternator provides good recharge power and at low revs a good compromise is achieved between generated power and idle stability.

Remote controls check

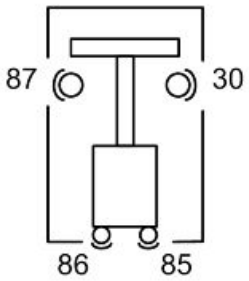
To check the operation of a solenoid:

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

2) Apply a 12V voltage to power terminals 86 and 85 of the solenoid.

3) With the solenoid fed, check that there is continuity between terminals 87 and 30.

4) If these conditions are not met, the solenoid is surely damaged and, therefore, it should be replaced.



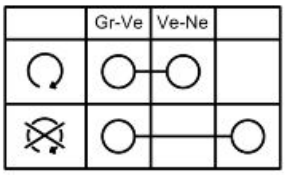
Switches check

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

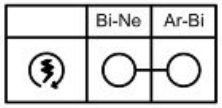
KEY

Or: Orange **SB:** Sky Blue **Wh:** White **Bl:** Blue **Y:** Yellow **Gr:** Grey **Br:** Brown **B:** Black **Pi:** Pink **R:** Red **Gre:** Green **Pr:** Purple

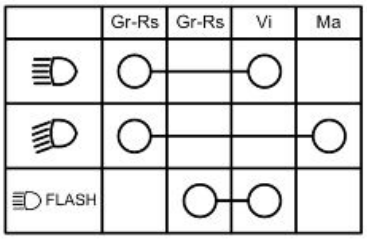
ENGINE STOP SWITCH



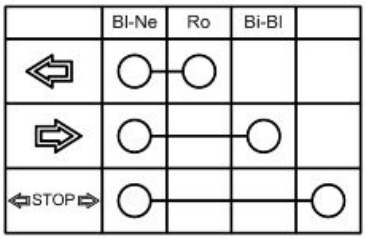
STARTER BUTTON



LIGHT SWITCH

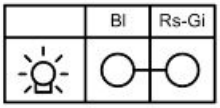


TURN INDICATOR SWITCH



HORN BUTTON

HELMET COMPARTMENT LIGHT SWITCH



SADDLE OPENING SWITCH

Stator check

Checking the stator windings

WARNING

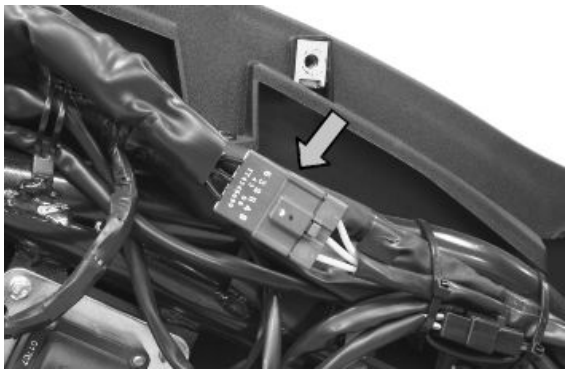
THIS CHECK-UP CAN BE MADE WITH THE STATOR PROPERLY INSTALLED.

1) Remove the right side panel.

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.

4) Check that there is insulation between the each yellow cable and the ground.



Electric characteristic

Resistance:

0.2 - 1 Ω

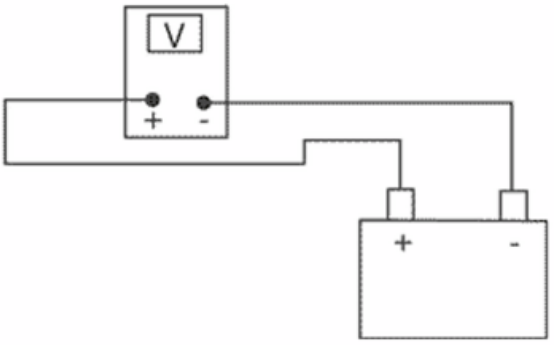
Voltage regulator check

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

Voltage should not exceed 15 Volt.

In case higher voltages are detected, replace the regulator.

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



Electric characteristic

Control voltage

14÷15 V to 1500÷12000 rpm

Recharge system voltage check

Look for any leakage

1) Access the battery by removing its cover under the saddle.

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

3) Turn the ignition key to «OFF», connect the multimeter leads between the battery negative pole (-) and the Black cable. Only then disconnect the Black cable from the battery negative pole (-).

4) With the ignition key always «OFF», the reading indicated by the ammeter must be must be ≤ 0.5 mA.

Charging current check

WARNING

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

1) Place the vehicle on its centre stand

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

3) Turn on the engine, increase the engine rpm 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.

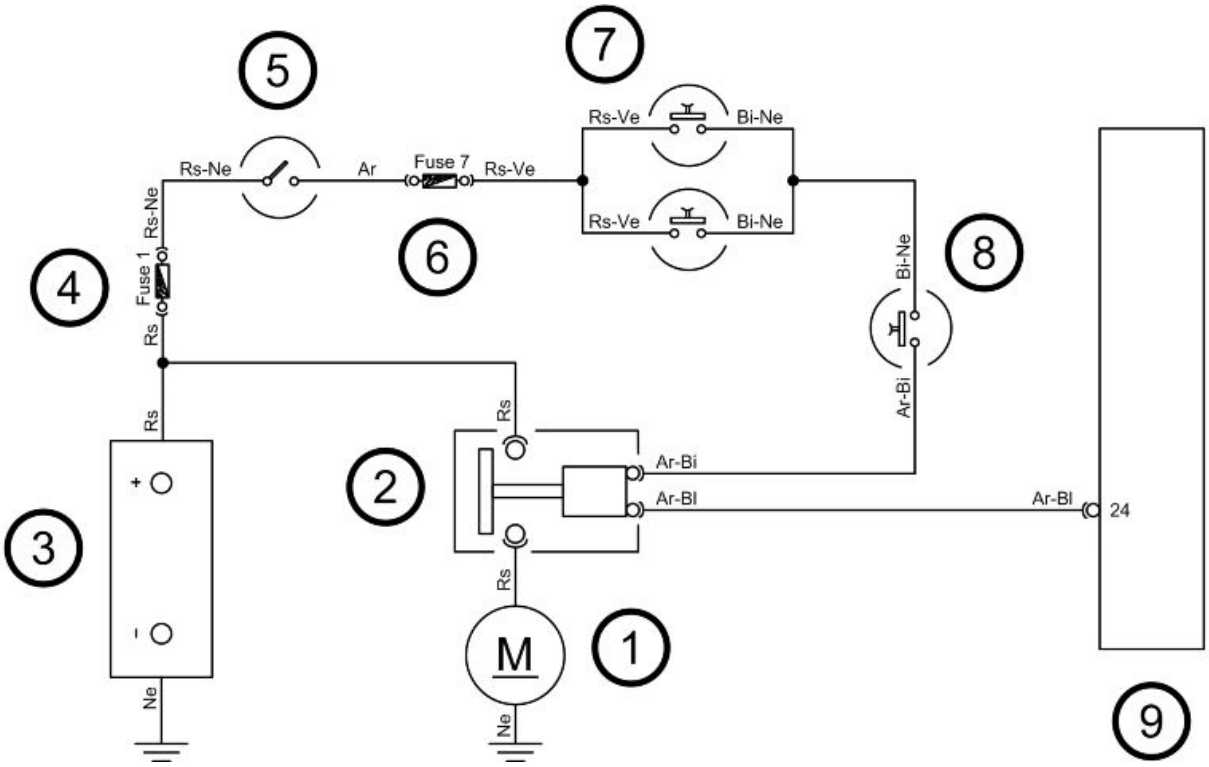
- With the engine off and the panel at «ON» with the lights on, allow the battery voltage to stop at 12V.
- Connect ammeter pliers to the 2 recharge positive poles in output from the regulator.
- Start the engine and rev it up to a high engine speed while reading the value on the pincer.

With an efficient battery a value must be detected: > 20A

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. Starter motor

2. Starter remote control

3. Battery

4. Fuse No. 1

5. Key switch contacts

6. Fuse No. 7

7. Stop buttons

8. Starter button

9. Injection ECU

WARNING

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

1) Check if there is continuity of the Red cable connecting the battery, the start-up remote control switch and the starter motor.

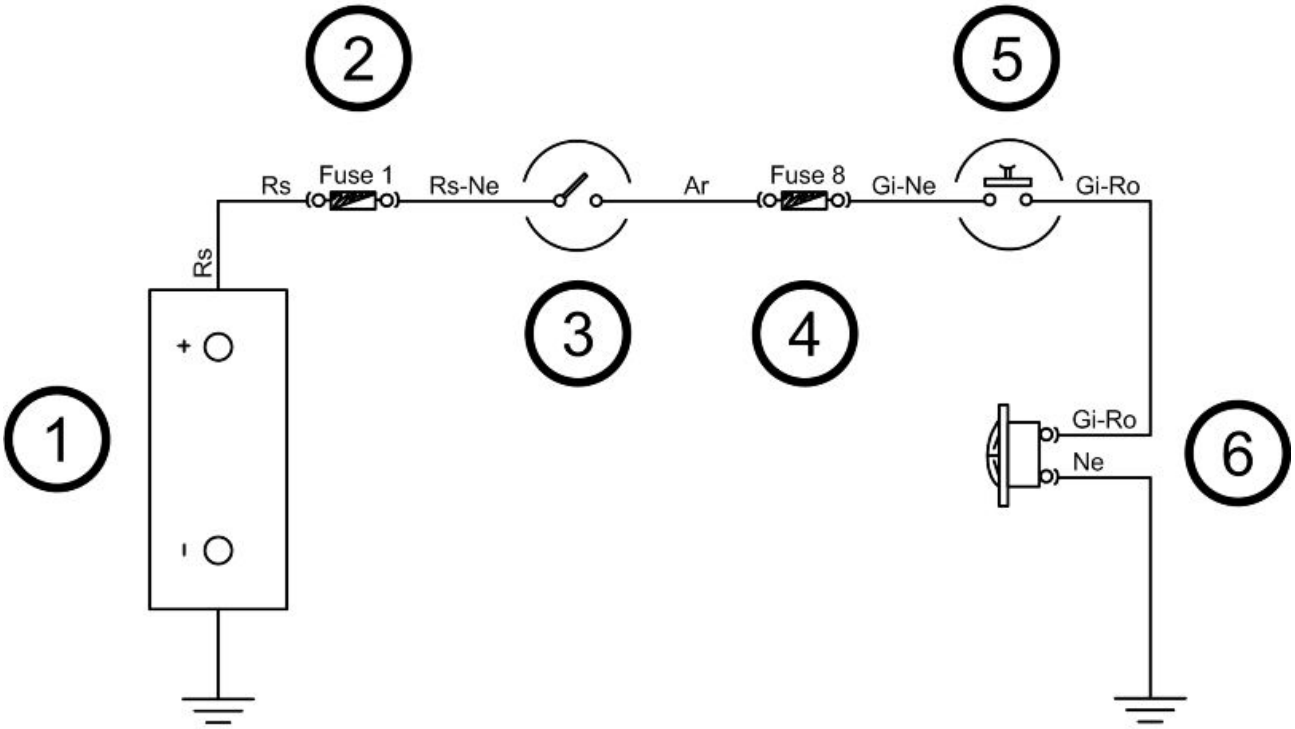
2) Check fuses No. 1 and 7, the key switch contacts, the stop buttons and the starter button.

3) Check the start-up remote control switch.

4) If components are in good conditions, check that the wiring connecting them is not interrupted.

5) Check if there is continuity of the Orange-Blue cable between the start-up remote control switch and the control unit connector.

Horn control



KEY

1. Battery

2. Fuse No. 1

3. Key switch contacts

4. Fuse No. 8

5. Horn button

6. Horn

WARNING

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

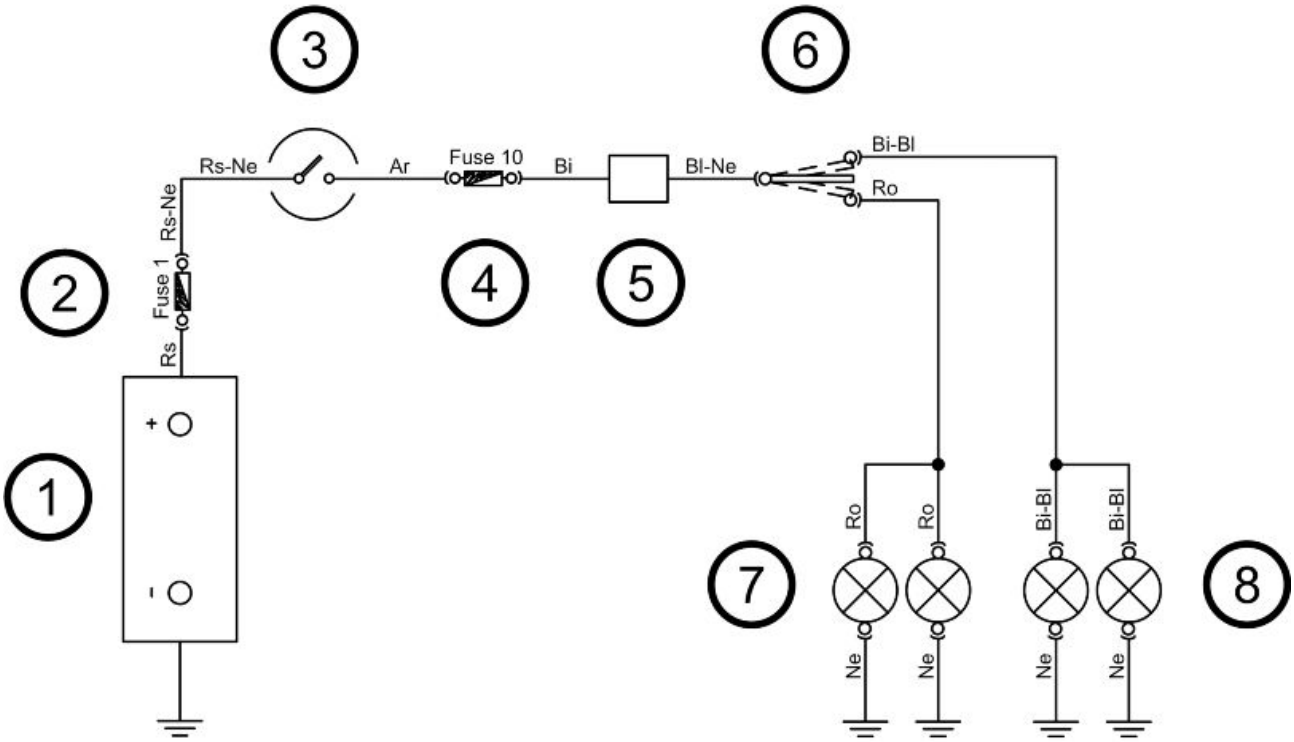
1) Check fuses No. 1 and 8, key switch contacts and the horn button.

2) If the components are not damaged, check wiring for continuity.

3) Check that the Yellow-Pink cable between the horn and horn button is not interrupted.

4) Check that the Black cable of the horn is earthed.

Turn signals system check



KEY

1. Battery

2. Fuse No. 1

3. Key switch contacts

4. Fuse No. 10

5. Turn indicator control device

6. Turn indicator switch

7. LH turn indicators

8. RH turn indicators

WARNING

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

1) Check the working order of bulbs.

2) Check fuses No. 1 and 10 and the key switch contacts.

3) Check if there is intermittent voltage between the Blue-Black cable of the turn indicator control device and the ground connection.

4) If there is no voltage, check that the wiring is not interrupted.

5) Check the turn indicator switch.

6) Check that the Blue-Black cable between the turn indicator control device and the turn indicator switch is not interrupted.

7) Check that the Pink and White-Blue cables connecting the bulbs and the turn indicator switches are not interrupted.

8) Check the bulbs ground connection.

level indicators

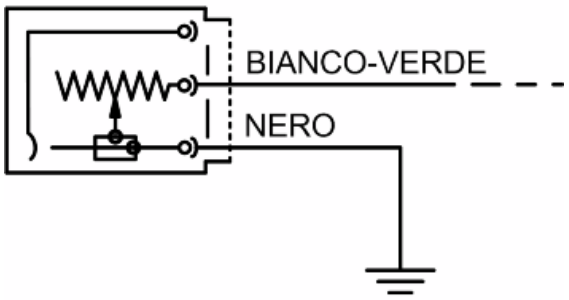
WARNING

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 by moving the arm with the float.

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

<= 7 Ω

Resistance value when the tank is empty

90 +13/-3 Ω

Lights list

LIST OF BULBS

	Specification	Desc./Quantity
1	High-/low-beam bulb	**Type**: Halogen (H4) **Quantity**: 1 **Power**: 12V - 55/60W
2	Front tail light bulb	**Type**: All glass **Quantity**: 1 **Power**: 12V - 5W
3	Turn indicator bulbs	**Type**: Spherical **Quantity**: 4 **Power**: 12V - 10W
4	Rear tail light bulb	**Type**: All glass **Quantity**: 2 **Power**: 12V - 3W
5	Stop light bulb	**Type**: Spherical **Quantity**: 1 **Power**: 12V - 10W
6	Instrument panel lighting bulbs	**Type:** All glass **Quantity:**5 **Power:** 12V - 1.2W
7	Helmet compartment light bulb	**Type**: Cylindrical **Quantity**: 1 **Power**: 12V - 5W

	Specification	Desc./Quantity
8	License plate light bulb	**Type**: All glass **Quantity**: 1 **Power**: 12V - 5W

Tail lights and instrument panel lighting line

In the event of a malfunction, check:

- Efficiency of the bulbs
- Fuses No. 1 and 8
- Key switch contacts
- Cable harness continuity

High-beam/low-beam light line

In the event of a malfunction, check:

- Efficiency of the bulbs
- Light switch
- Headlight remote control
- Fuses No. 1, 5 and 7
- Key switch contacts
- Cable harness continuity

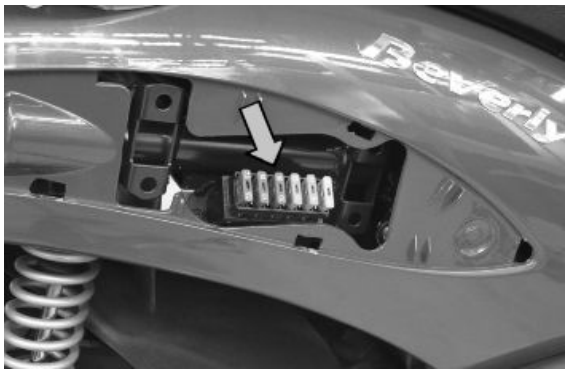
Fuses

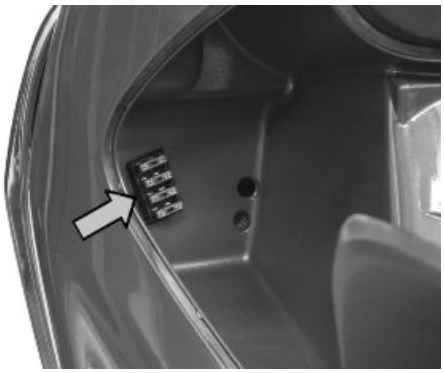
The electrical system is equipped with:

1. Six protective fuses «**A**» located inside the side panel on the right-hand side;

2. Four protective fuses «**B**» located inside the compartment on the upper left-hand side.

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).

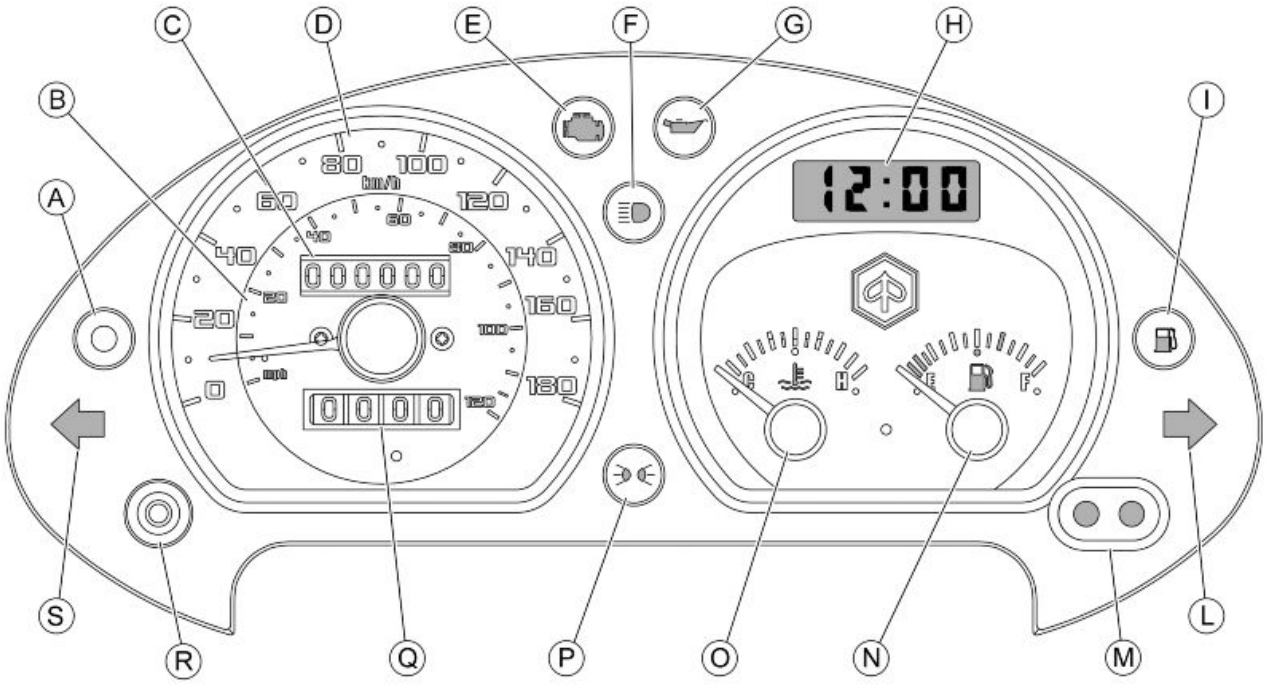
CAUTION

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 No. 1	**Capacity:**30 A **Protected circuits:**Battery recharge circuit. **Live:**Fuses No.7-8-9-10.
2	Fuse No. 2	**Capacity:**5A **Protected circuits:**Clock, Immobilizer.
3	Fuse No. 3	**Capacity:**15A **Protected circuits:**Plug socket, helmet compartment light switch, electric fan (with remote control), pre-installation for anti-theft device. **Live:**Saddle opening actuator.
4	Fuse No. 4	**Capacity:**10 A **Protected circuits:**Injection load (via remote control).
5	Fuse No. 5	**Capacity:**15A **Protected circuits:**Light switch (via remote control)
6	Fuse No. 6	**Capacity:**7.5 A **Protected circuits:**Injection ECU.
7	Fuse No. 7	**Capacity:**7.5 A **Protected circuits:**Headlight remote control, stop lights, starter circuit.
8	Fuse No. 8	**Capacity:**7.5 A **Protected circuits:**Side lights, license plate light, instrument panel lighting, horn.
9	Fuse No. 9	**Capacity:**7.5 A **Protected circuits:**Electric fan remote control, injection load remote control, Immobilizer aerial, injection ECU.
10	Fuse No. 10	**Capacity:**7.5 A **Protected circuits:**Pre-installation for anti-theft device, turn indicators, instrument panel.

Dashboard



A = Immobilizer LED

B = Speedometer (mph)

C = Total Odometer

D = Speedometer (km/h)

E = Injection telltale light

F = High-beam warning light

G = Oil pressure warning light

H = Digital clock

I = Low fuel warning light

L = Right turn indicator warning light

M = Clock controls

N = Fuel gauge

O = Water temperature gauge

P = Headlight warning light

Q = Trip odometer

R = Odometer reset button

S = Left turn indicator warning light

Sealed battery

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

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

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

INSTRUCTIONS FOR THE 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

Battery installation

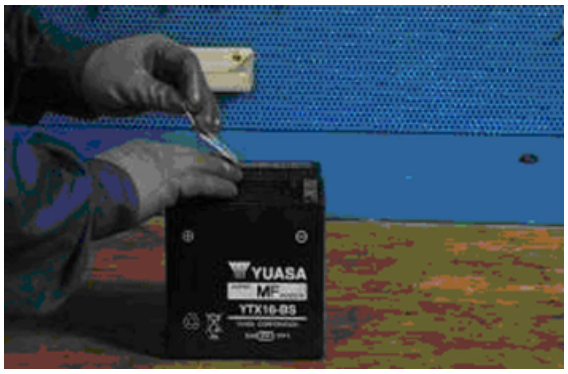
VRLA battery (valve-regulated lead-acid battery) Maintenance Free (MF)

WARNING

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH YOUR EYES, SKIN AND CLOTHING. IF COMING INTO CONTACT WITH EYES OR SKIN, WASH ABUNDANTLY WITH WATER FOR APPROX. 15 MIN. AND SEEK IMMEDIATE MEDICAL ATTENTION.
IN THE EVENT OF ACCIDENTAL INGESTION OF THE LIQUID, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR MILK, MAGNESIUM MILK, BATTERED EGG OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.
BATTERIES PRODUCE EXPLOSIVE GASES; KEEP CLEAR OF NAKED FLAMES, SPARKS OR CIGARETTES; VENTILATE THE AREA WHEN RECHARGING INDOORS.
ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES.
KEEP OUT OF THE REACH OF CHILDREN

1) Battery preparation

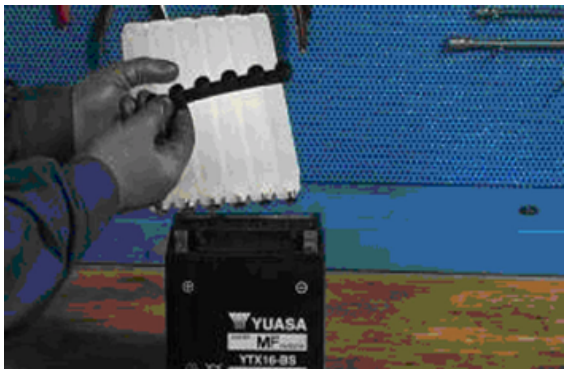
Position the battery on a flat surface. Remove the adhesive sheet closing cells and proceed as quickly as possible to run the subsequent activation phases.



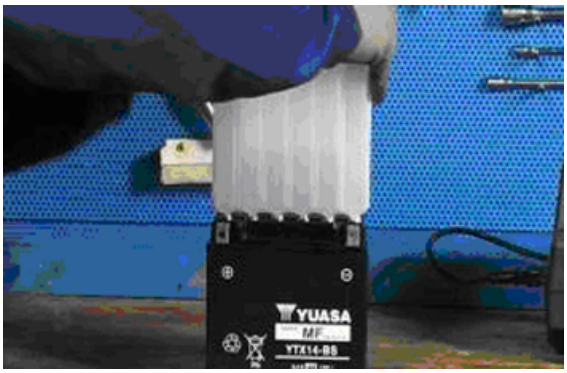
2) Electrolyte preparation.

Remove the container of the electrolyte from the pack. Remove and preserve cover strips from the container, in fact, the strip will later be used as a closing cover.

Note: Do not pierce the sealing of the container or the container itself because inside there is sulfuric acid.



3) Procedure for filling the battery with acid.



Position the electrolyte container upside down with the six areas sealed in line with the six battery filler holes. Push the container down with enough force to break the seals. The electrolyte should start to flow inside the battery.

Note: Do not tilt the container to prevent the flow of electrolyte from pausing or stopping.

4) Control the flow of electrolyte

Make sure air bubbles are rising from all six filling holes. Leave the container in this position for 20 minutes or more.

Note: If there are no air bubbles coming out of the filling holes, lightly tap the bottom of the container two or three times. Do not remove the container from the battery.

5) Take out the container.

Make sure all the electrolyte in the battery is drained. Gently tap the bottom of the container if electrolyte remains in the container. Now, gently pull the container out from the battery, only do this when the container is completely empty, and proceed immediately to the next point.

6) Battery closing.

Insert the airtight cover strips into the filling holes. Press horizontally with both hands and make sure that the strip is levelled with the top part of the battery.

Note: To do this, do not use sharp objects that could damage the closing strip, use gloves to protect your hands and do not bring your face close to the battery.

The filling process is now complete.

Do not remove the strip of caps under any circumstances, do not add water or electrolyte.

Place the battery down for 1 to 2 hours prior to the charging from the battery.

7) Recharging the new battery

With the above-mentioned procedure, the battery will have gained around 70% - 75% of its total electrical capacity. Before installing the battery on the vehicle, it must be fully charged and then must be recharged.

If the battery is to be installed on the vehicle prior to this pre-charged one, the battery will not be able to exceed 75% charge without jeopardising its useful life on vehicle.

The dry charge battery MF like the completely loaded YTX, must have a no-load voltage between

12.8 - 13.15 V Bring the battery to full charge, using the 020648Y battery charger:
a - select the type of battery with the red switch on the left of the panel battery charger panel
b - select NEW on the yellow timer
c - connect the clamps of the battery charger to the battery poles (black clamp to negative pole (-) and red clamp to positive pole (+)).

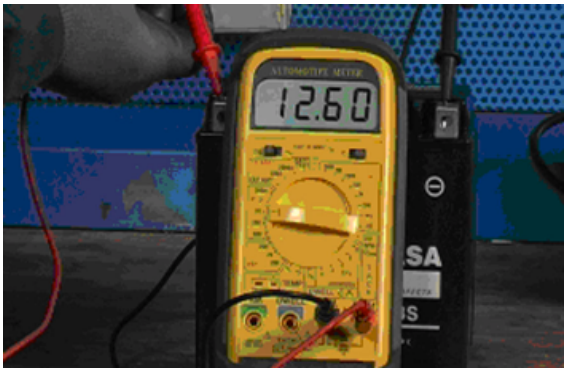
d - Press the red button, as shown in figure.

e - Press the "MF" black button to activate the battery recharge **Maintenance Free** as shown in figure.

f - Check the ignition of the green LED indicated with a red arrow in figure.

g - The activation cycle of the new battery lasts for 30 minutes after the ignition of the recharge LED has taken place

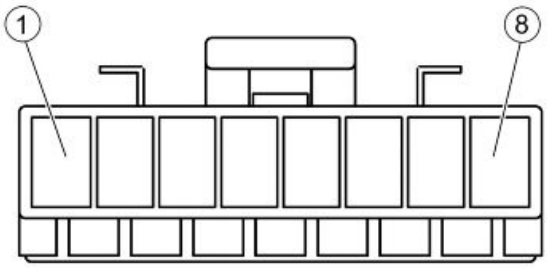
h - Disconnect the clamps from the battery and check the voltage, if voltages are detected of less than 12.8 V, proceed with a new recharge of the battery starting from point c of the recharge procedure of **the new battery**, otherwise go to point i



i - The battery is now completely activated, disconnect the battery charger from the fuel supply grid, disconnect the clamps from the battery and proceed to fitting the battery on the vehicle.

Connectors

INSTRUMENT PANEL CONNECTOR «A»



1. Left turn indicator warning light (Pink)
2. Immobilizer (Red-Green)
3. Battery-powered (Red-Black)
4. Coolant temperature sensor (Green-Yellow)
5. Not connected
6. Fuel level transmitter (White-Green)
7. Right turn indicator warning light (White-Blue)
8. Low fuel warning light (Grey-Black)

INSTRUMENT PANEL CONNECTOR «B»

1. High-beam warning light (Violet)

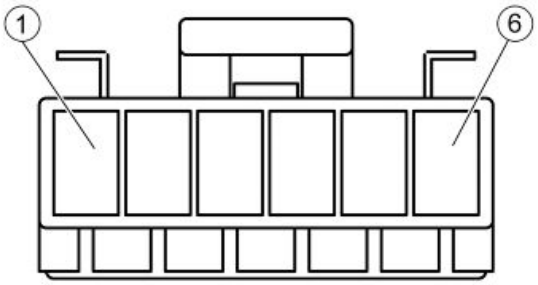
2. Ground lead (Black)

3. Injection warning light (Brown-Black)

4. Oil pressure sensor (Pink-White)

5. Live power supply (White)

6. Instrument panel lighting (Yellow-Black)

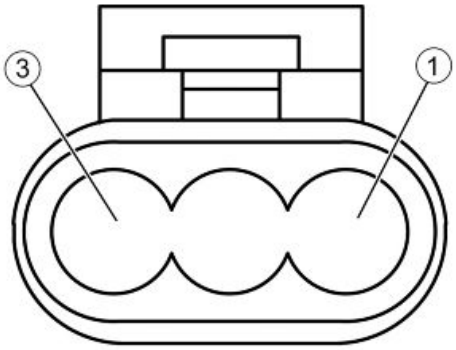


IMMOBILIZER AERIAL CONNECTOR

1. Live power supply (Red-White)

2. Ground lead (Black)

3. Injection ECU (Orange-White)



FUEL PUMP CONNECTOR

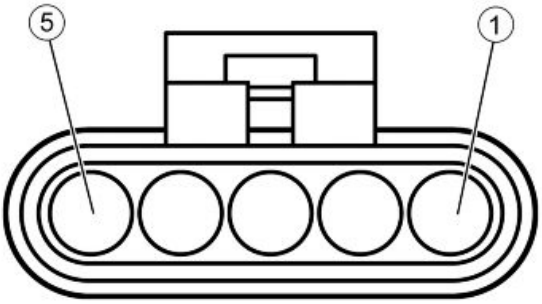
1. Not connected

2. Ground lead (Black)

3. Not connected

4. Not connected

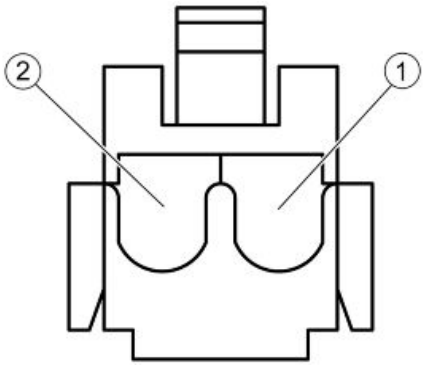
5. Power from solenoid (Black-Green)



ELECTRIC FAN CONNECTOR

1. Ground lead (Black)

2.Power from solenoid (Red)

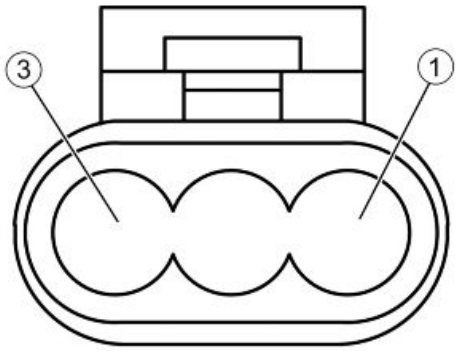


PICKUP CONNECTOR

1.Engine speed sensor ECU positive (Red)

2.Engine speed sensor ECU negative (Brown)

3. Oil pressure sensor (White-Pink)



ANTITHEFT DEVICE PRE-INSTALLATION CONNECTOR

1. Left turn indicator bulbs (Pink)

2. Right turn indicator bulbs (White-Blue)

3. Ground lead (Black)

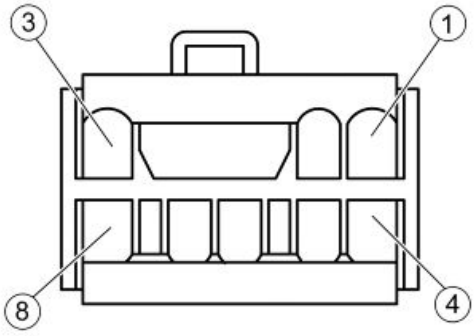
4. Battery-powered (Blue)

5. Live power supply (White)

6. Helmet compartment light (Red-Yellow)

7. Not connected

8. Not connected



2-PIN CONNECTOR ONLY

1 Sky blue-black positive from control unit

2 White-Green negative from control unit

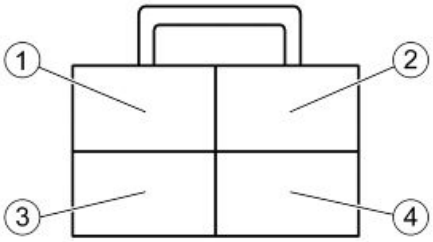
VOLTAGE REGULATOR CONNECTOR

1. Battery positive (Red-Black)

2. Ground lead (Black)

3. Battery positive (Red-Black)

4. Ground lead (Black)



INJECTION ELECTRONIC CONTROL UNIT CONNECTOR

1. Injection telltale light (Brown-Black)

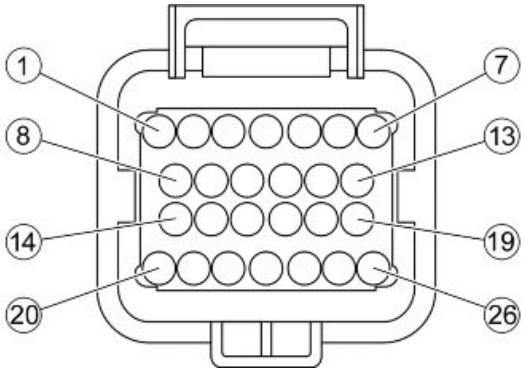
2. Not connected

3. Not connected

4. Lambda probe negative (White-Green)

5. Live (Red-White)

6. Battery-powered (Orange-Black)



7. Immobilizer aerial (Orange-White)

8. Electric fan remote control (Blue-Yellow)

9. Coolant 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 negative (Yellow-Red)

15. Engine rpm sensor negative (Brown)

16. Diagnostics socket (Purple-White)

17. Immobilizer LED (Red-Green)

18. Side stand (Sky blue)

19. Not connected

20. Injection load remote control (Black-Purple)

21. Not connected

22. HV coil negative (Pink-Black)

23. Not connected

24. Start-up remote control switch (Orange-Blue)

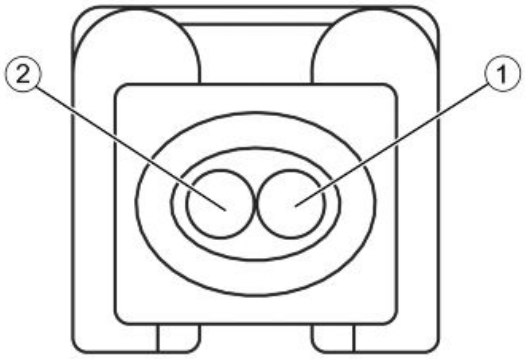
25. Not connected

26. Ground lead (Black)

INJECTOR CONNECTOR

1. Power from solenoid (Black-Green)

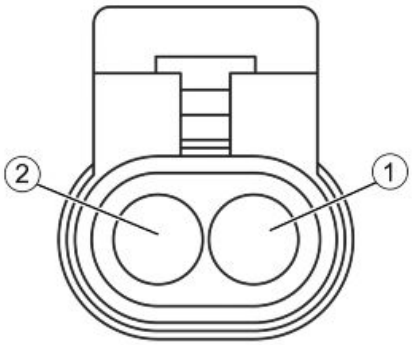
2. Negative from control unit (Yellow-Red)



HV COIL CONNECTOR

1. Negative from control unit (Red-Black)

2. Power from solenoid (Black-Green)

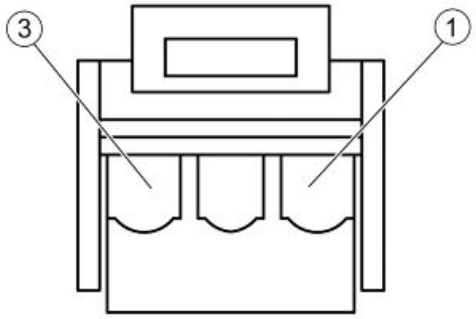


FUEL LEVEL TRANSMITTER CONNECTOR

1. Low fuel warning light (Grey-Black)

2. Ground lead (Black)

3. Fuel level indicator (White-Green)



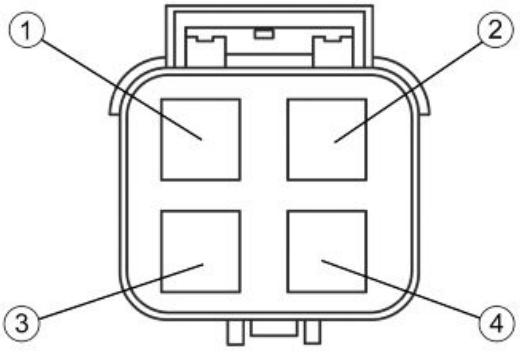
COOLANT TEMPERATURE SENSOR CONNECTOR

1. Ground lead (Grey-Green)

2.Instrument panel (Green-Yellow)

3. Injection ECU (Sky blue-Green)

4. Ground lead (Black)

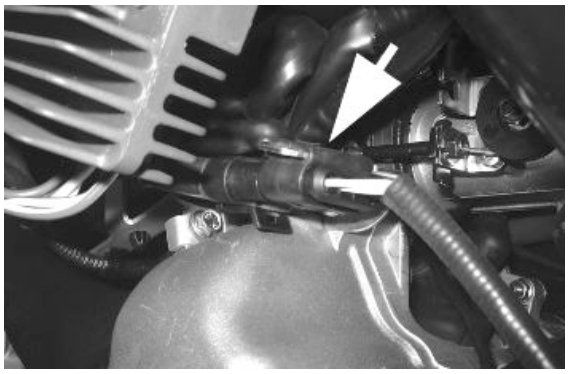


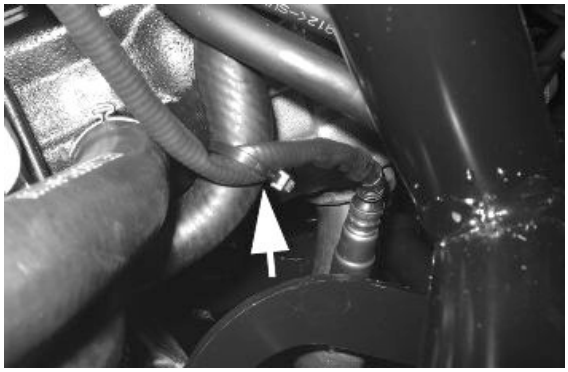
INDEX OF TOPICS

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

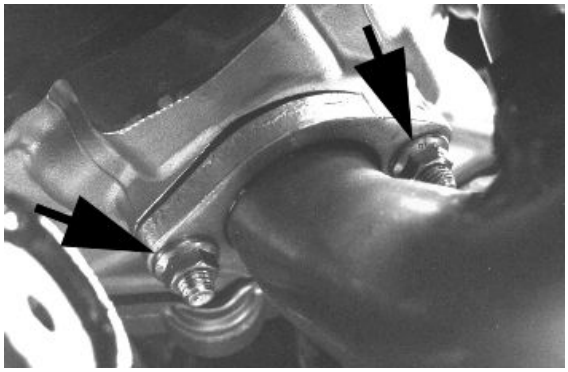
Exhaust assy. Removal

- Remove the RH footrest.
- Remove the Lambda probe from its support and disconnect it.
- Cut the fastening clamp on the lambda probe cable.

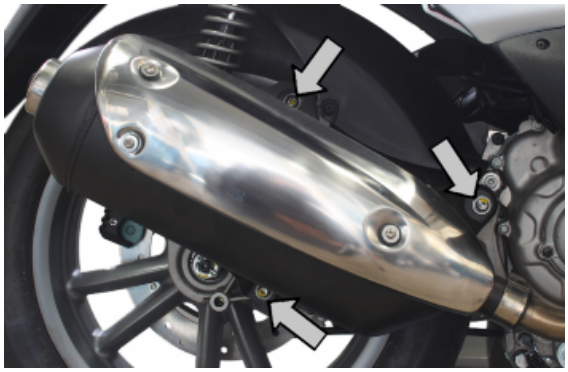




- Undo the two exhaust manifold fixings on the head. To unscrew the nuts that fix the silencer flange to the head properly, use a jointed wrench that allows, according to the travel direction, to get also at the right nut. That is difficult to do with a traditional straight wrench.



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



Remove the lambda probe from the manifold.

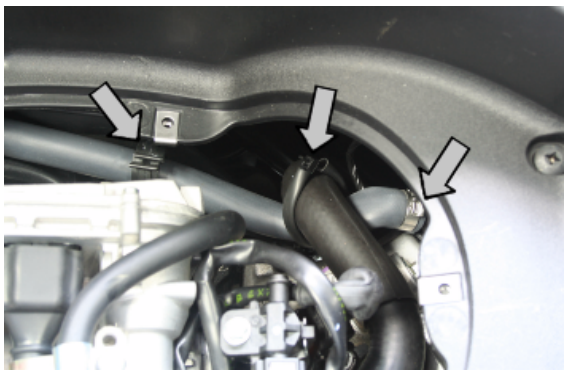
Removal of the engine from the vehicle

CAUTION

SUPPORT THE VEHICLE ADEQUATELY.

Disconnect the battery.

- Remove the side fairings.
- Remove the inspection cover in helmet compartment.
- Remove the full silencer unit.
- Remove the air filter.
- Release the blow-by return pipe from the clamp and disconnect it from the head.

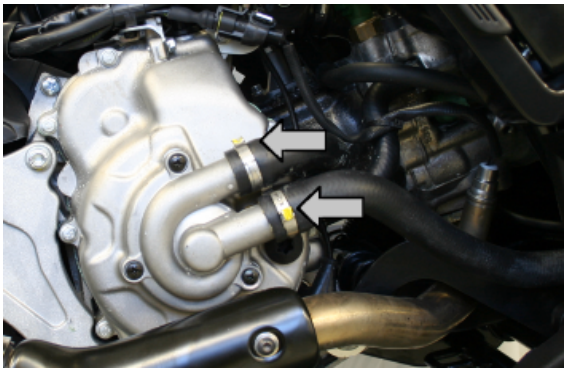


CAUTION

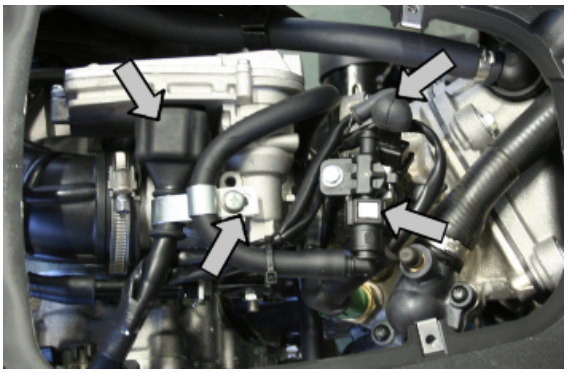
THIS OPERATION MUST BE CARRIED OUT WHEN THE ENGINE IS COLD.

- Remove the rear brake calliper and release the rear brake piping from the four clamps of the engine.

- Get a + 2 l container in order to collect the coolant and place it under the vehicle.
- Remove the pipe that feeds coolant into the pump as shown in the picture and then empty the system.
- Remove the engine coolant outlet pipe as indicated.



- Disconnect:
- fuel piping and retainer clamp.
- injector connector.
- control unit connector.

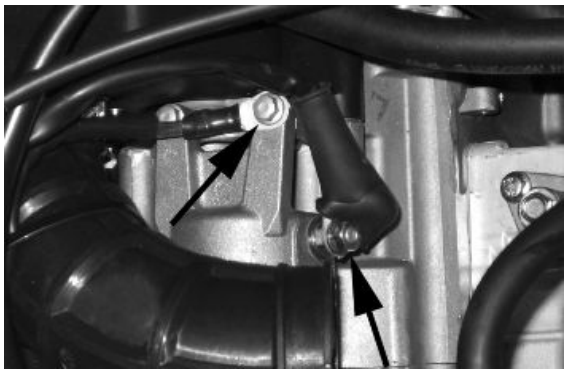


- Remove the coolant outlet pipe from the engine as indicated.

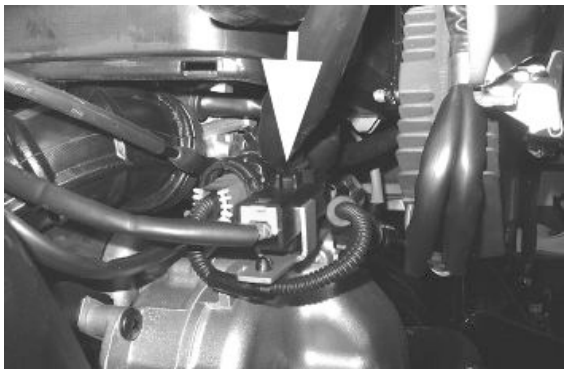
- Remove the spark plug cap.
- Remove the coolant temperature sensor connector indicated in the picture.

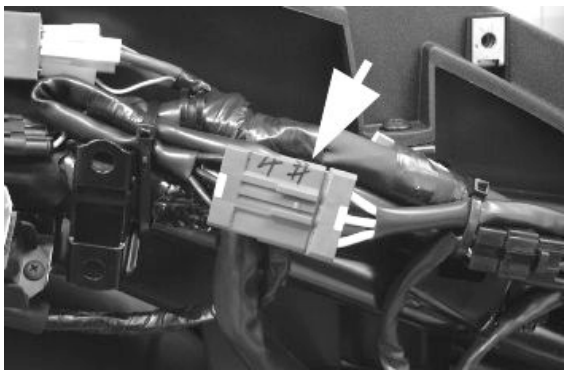
- Remove the throttle cables from the throttle body by undoing the nuts indicated in the picture.

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

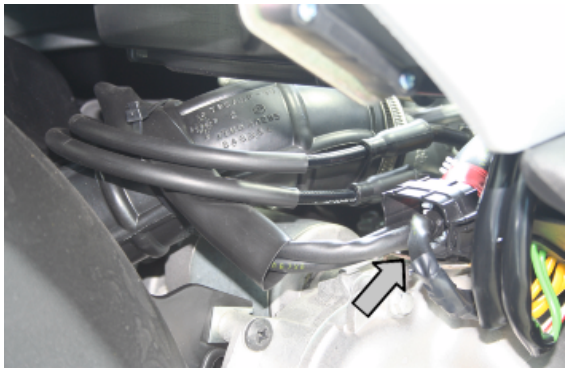


- Disconnect the connectors from the flywheel wiring harness.
- Disconnect the relevant cable from the retaining clamps.



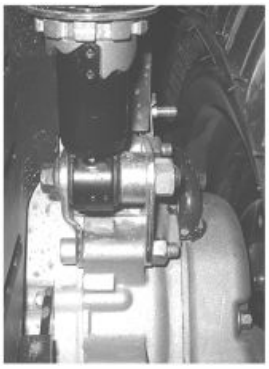


- Remove the cables from the retainer clamps on the flywheel cover.
- Remove the clamp indicated.



- Disconnect the oil minimum pressure sensor.

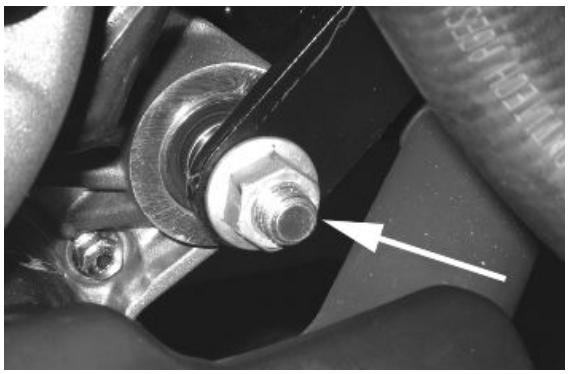
- Remove the lower screws of the right and left shock absorber.

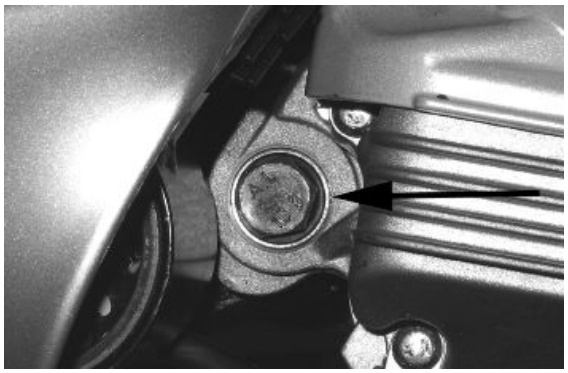


When refitting the engine onto the vehicle, carry out the removal operations but in reverse order and respect the tightening torques shown in the Specifications Chapter.
- Check the engine oil level and if necessary, top it up with the recommended type.
- Fill and bleed the cooling circuit.
- Check accelerator and electric devices for correct functioning.

CAUTION

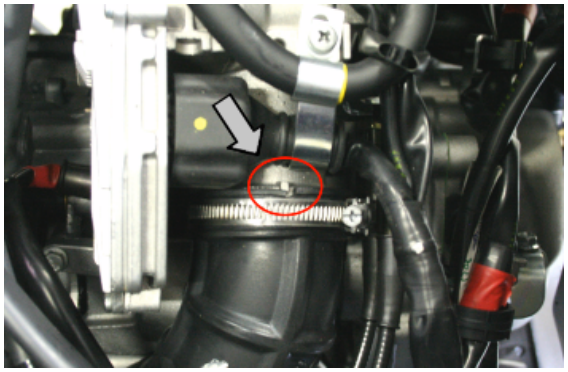
PAY PARTICULAR ATTENTION TO POSITIONING THE THROTTLE CONTROL TRANSMISSION PROPERLY.

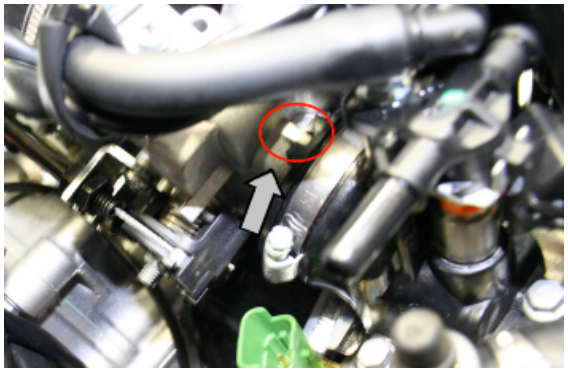




Upon refitting the engine to the vehicle, carry out the removal operations but in reverse order, and respect the tightening torques shown in the «Specifications» Chapter.

- 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

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

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

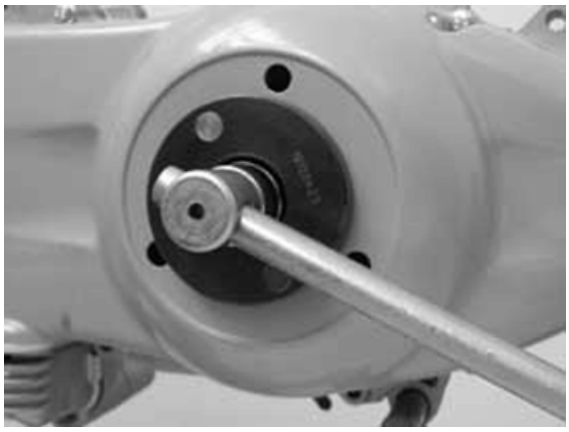
Automatic transmission

Transmission cover

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

Specific tooling

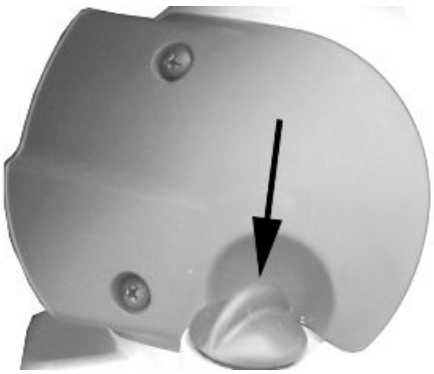
020423Y Driven pulley lock wrench



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

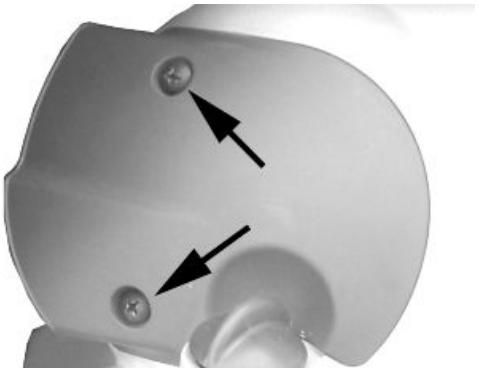
N.B.

WHEN YOU ARE REMOVING THE TRANSMISSION COVER YOU MUST BE CAREFUL NOT TO DROP THE CLUTCH BELL.

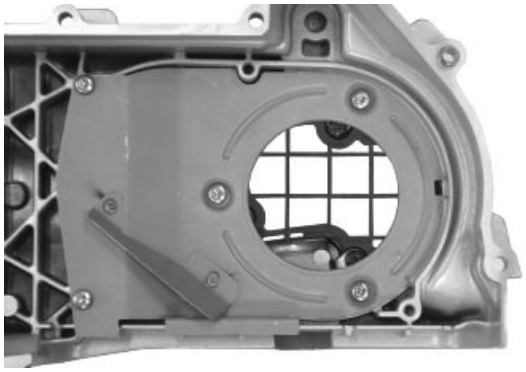


Air duct

- Remove the transmission compartment air intake cover shown in the picture.



- Remove the 5 screws, found on two different levels, as well as the small casing.



Removing the driven pulley shaft bearing

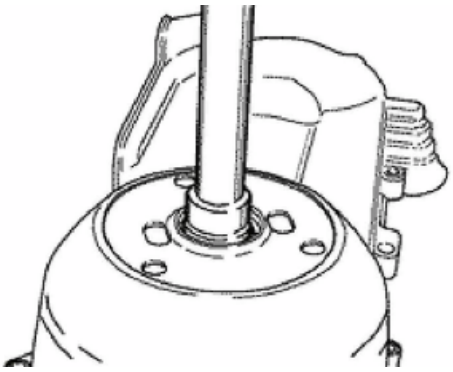
- Remove the clip from the inside of the cover.
- Remove the bearing from the crankcase by means of:

Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor

020412Y 15-mm guide



Refitting the driven pulley shaft bearing

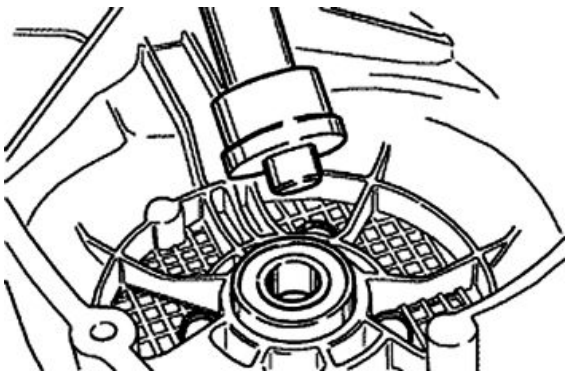
- Slightly heat the crankcase from the inside so as not to damage the painted surface.
- Insert the bearing in its seat.
- Refit the Seeger ring.

CAUTION

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

N.B.

ALWAYS REPLACE THE BEARING WITH A NEW ONE UPON REFITTING.



Specific tooling

020376Y Adaptor handle

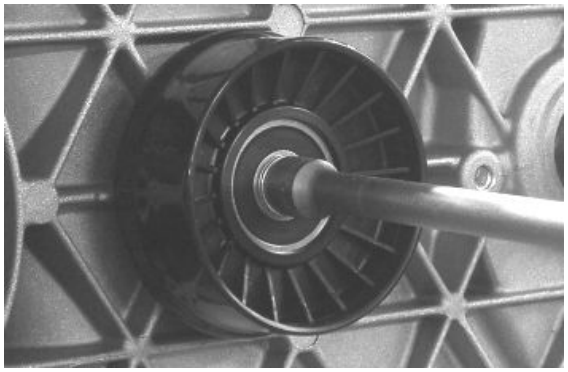
020357Y 32x35-mm Adaptor

020412Y 15-mm guide

Baffle roller

Plastic roller

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



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

Locking torques (N*m)

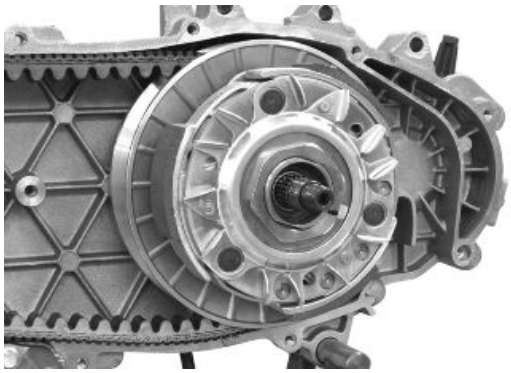
Anti-flapping roller **12 - 16**

Removing the driven pulley

- Remove the clutch bell housing and the driven pulley assembly.

N.B.

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



Inspecting the clutch drum

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

Characteristic

Max. value clutch bell

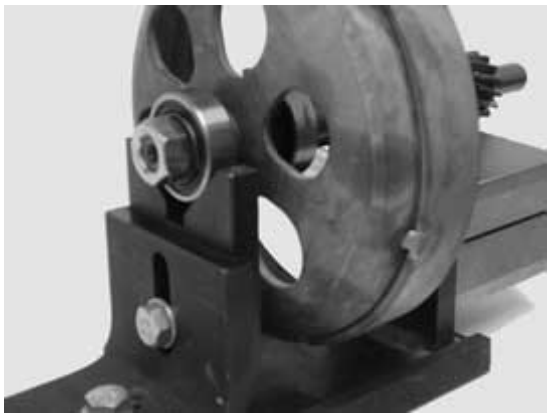
Max. value: Ø 134.5 mm

Clutch bell standard value

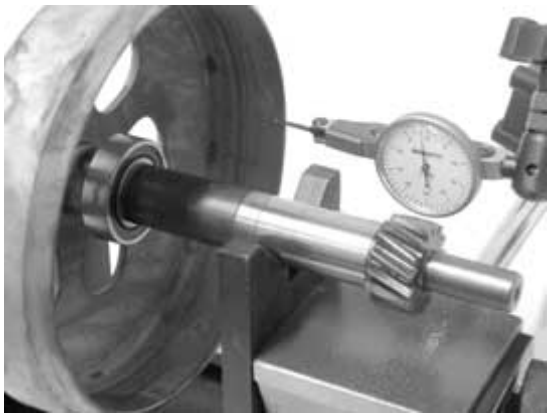
Standard value: Ø 134 - 134.2 mm

Checking the bell working surface eccentricity

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



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



Specific tooling

020074Y Support base for checking crankshaft alignment

020335Y Magnetic mounting for dial gauge

Characteristic

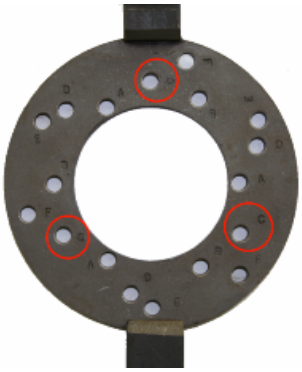
clutch bell inspection: Limit eccentricity.

Admissible limit eccentricity: 0.15 mm

Removing the clutch

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

- Introduce the adapter ring 11 with the chamfering facing the inside of the tool.
- Fit the driven pulley unit on the tool with the insertion of the 3 pins in the ventilation holes in the mass holder support.
- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to loosen/tighten the clutch nut.
- Use the special 46x55 wrench component 9 to remove the nut fixing the clutch in place.
- Dismantle the driven pulley components (Clutch and spring with its plastic holder)



CAUTION

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

Specific tooling

020444Y011 adapter ring

020444Y009 wrench 46 x 55

020444Y Tool for fitting/ removing the driven pulley clutch

Inspecting the clutch

- Check the thickness of the clutch mass friction material.
- The masses must not show traces of lubricants; otherwise, check the driven pulley unit seals.

N.B.

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

CAUTION

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

Characteristic

Check minimum thickness

1 mm

Pin retaining collar

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

N.B.

USE TWO SCREWDRIVERS IF YOU HAVE ANY DIFFICULTY.

N.B.

BE CAREFUL NOT TO PUSH THE SCREWDRIVERS IN TOO FAR TO AVOID DAMAGE THAT COULD COMPROMISE THE O-RING SEAL.

- Remove the 4 torque server pins and pull the pulley halves apart.

Removing the driven half-pulley bearing

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

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

Specific tooling

001467Y035 Bearing housing, outside ø 47 mm

- Remove the roller bearing using the modular punch.

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020363Y 20-mm guide

Inspecting the driven fixed half-pulley

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

Characteristic

Half-pulley minimum diameter

Minimum admissible diameter: Ø 40.96 mm

Half-pulley standard diameter

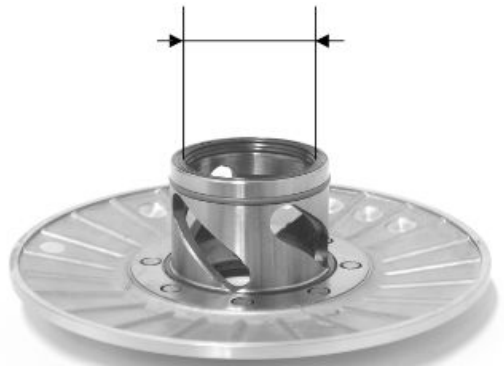
Standard diameter: Ø 40.985 mm

Wear limit

0.3 mm

Inspecting the driven sliding half-pulley

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



MOVABLE DRIVEN HALF-PULLEY DIMENSIONS

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

Refitting the driven half-pulley bearing

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

Fit the retainer ring

WARNING

N.B.

FIT THE BALL BEARING WITH THE VISIBLE SHIELDING

Specific tooling

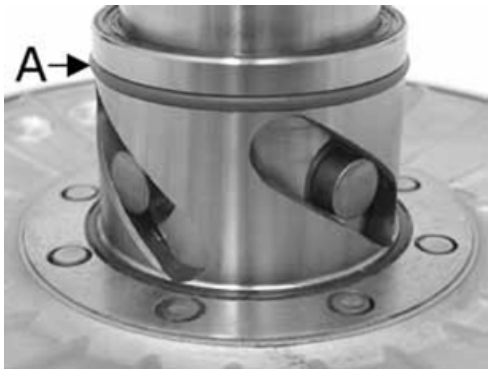
020376Y Adaptor handle

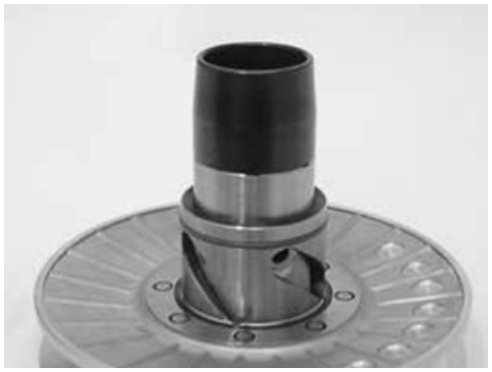
020375Y 28 x 30 mm adaptor

020424Y Driven pulley roller casing fitting punch

Refitting the driven pulley

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





N.B.

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

Specific tooling

020263Y Driven pulley assembly sheath

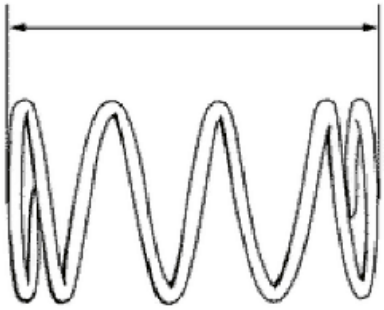
Recommended products

AGIP GREASE SM 2 Grease for the C-ring of the tone wheel

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

Inspecting the clutch spring

- Measure the length of the spring when it is relaxed.



Characteristic

Standard length

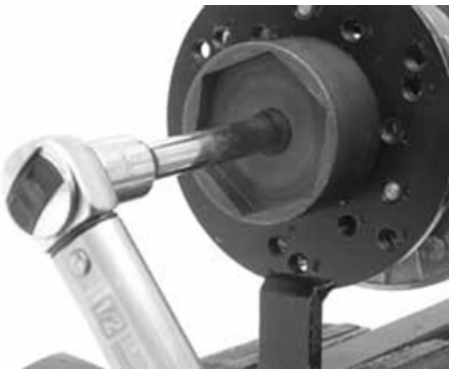
123 mm

Acceptable limit after use:

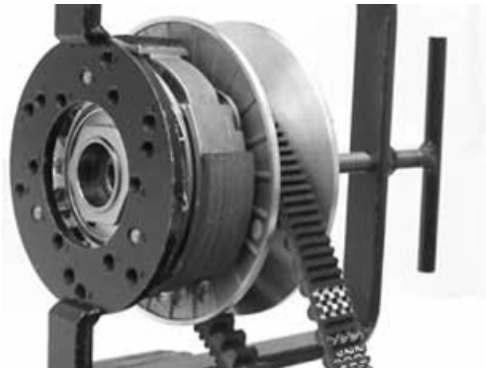
118 mm

Refitting the clutch

- Support the driven pulley spring compressor specific tool with the control screw in vertical axis.
- Arrange the tool with the medium length pins screwed in position "**C**" on the inside.
- Introduce the adapter ring No. 11 with the chamfering facing upwards.
- Insert the clutch on the adapter ring.
- Lubricate the end of the spring that abuts against the torque server closing collar.
- Insert the spring with its plastic holder in contact with the clutch.
- Insert the drive belt into the pulley unit according to their direction of rotation.
- Insert the pulley unit with the belt into the tool.
- Slightly preload the spring.
- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to tighten the clutch nut.
- Place the tool in the clamp with the control screw on the horizontal axis.
- Fully preload the spring.
- Apply the clutch fixing nut and tighten it to the prescribed torque using the special 46x55 wrench.
- Loosen the tool clamp and insert the belt according to its direction of rotation.



- Lock the driven pulley again using the specific tool.
- Preload the clutch return spring with a traction/ rotation combined action and place the belt in the smaller diameter rolling position.
- Remove the driven pulley /belt unit from the tool.



N.B.

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

N.B.

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

Specific tooling

020444Y Tool for fitting/ removing the driven pulley clutch

020444Y011 adapter ring

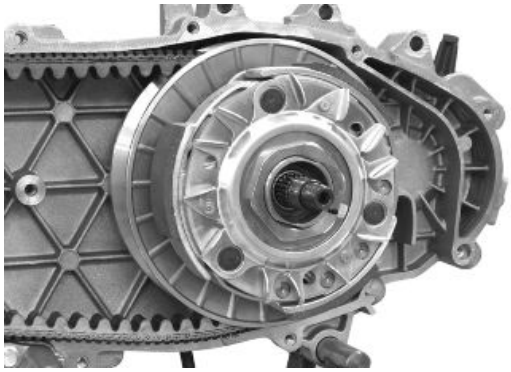
020444Y009 wrench 46 x 55

Locking torques (N*m)

Clutch unit nut on driven pulley **45 to 50**

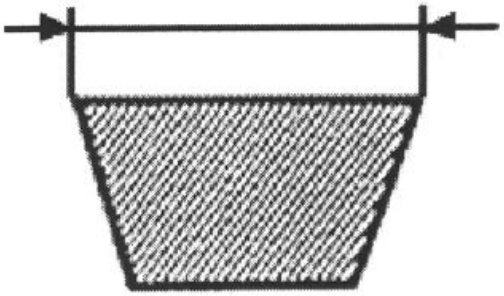
Refitting the driven pulley

- Refit the clutch bell.



Drive-belt

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



Characteristic

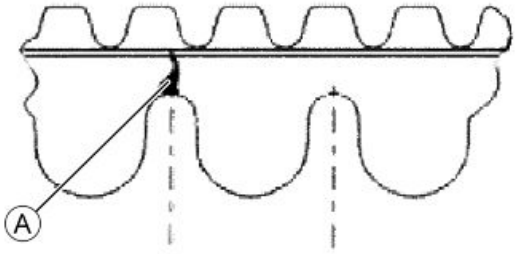
Driving belt - minimum width

19.5 mm

Driving belt - standard width

21.3 ± 0.2 mm

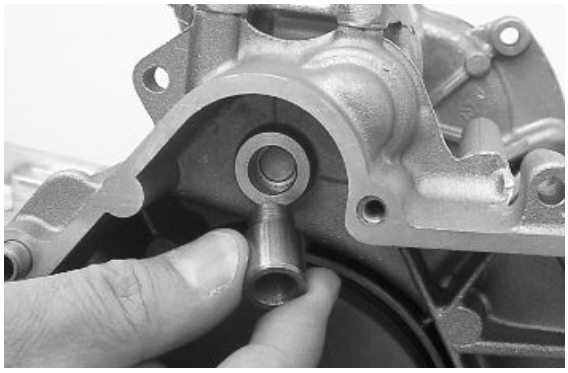
During the wear checks in foreseen in the scheduled maintenance program, you are advised to check that the rim bottom of the toothing does not show signs of incisions or cracking (see figure): The rim bottom of the tooth must not have incisions or cracking; if it does, replace the belt.



Removing the driving pulley

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

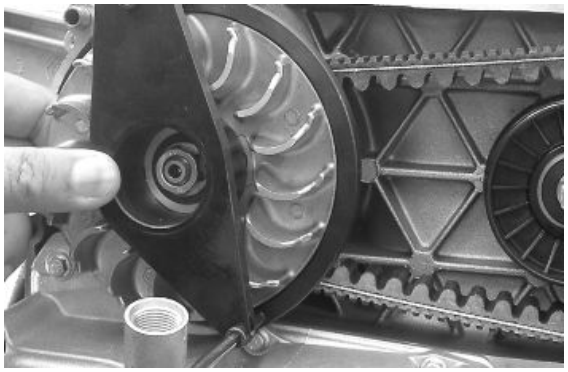
- Insert the adaptor sleeve of the appropriate tool in the hole shown in the picture



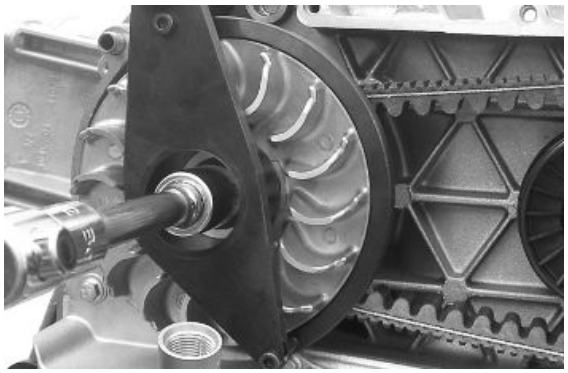
- Insert the tool in the hollows and apply the retention ring
- Bring in the ring's clamping screws while keeping the tool to support the pulley

Specific tooling

020626Y Driving pulley lock wrench



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



Inspecting the rollers case

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

CAUTION

DO NOT LUBRICATE OR CLEAN SINTERED BUSHINGS

Characteristic

movable driving half-pulley bushing: Standard Diameter

26.000 - 26.021 mm

movable driving half-pulley bushing: Maximum allowable diameter

Ø 26.12 mm

Sliding bushing: Standard Diameter

Ø 25.959 - 25.98 mm

Sliding bushing: Minimum admissible diameter

Ø 25.95 mm

Roller: Standard Diameter

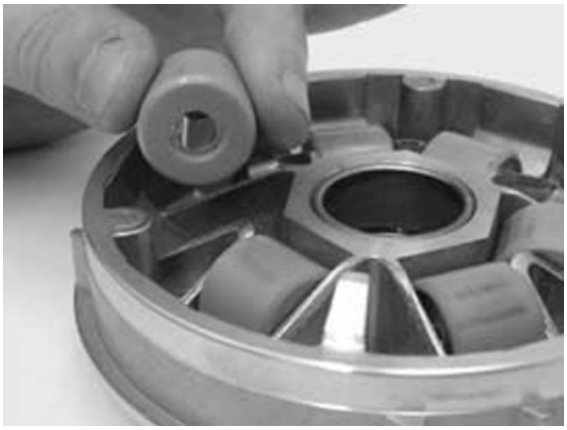
Diameter 20.5 - 20.7 mm

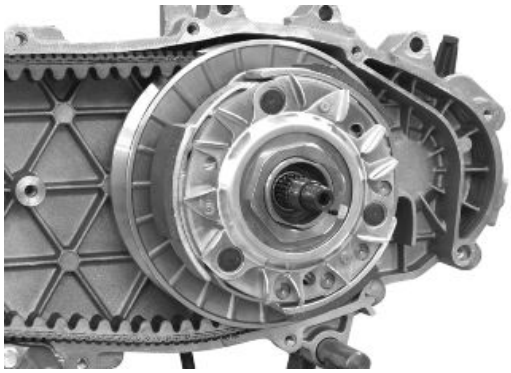
Roller: Minimum diameter allowed

Ø 20 mm

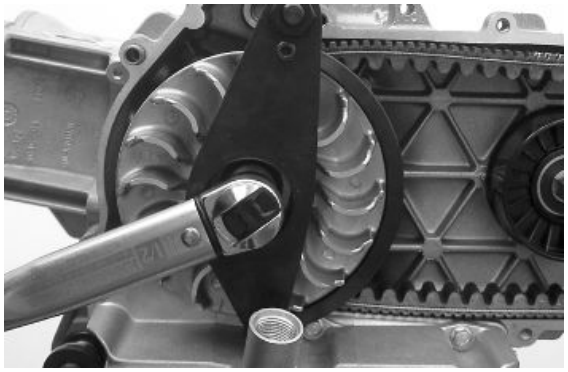
Refitting the driving pulley

- Preassemble the movable half-pulley with the roller contrast plate by putting the rollers in their housings with the larger support surface touching the pulley according to the direction of rotation.
- Check that the roller contact plate does not have flaws and is not damaged on the grooved edge.
- Mount the complete bushing unit on the crankshaft.
- Fit the driven pulley/Clutch/belt unit on the engine.





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



Specific tooling

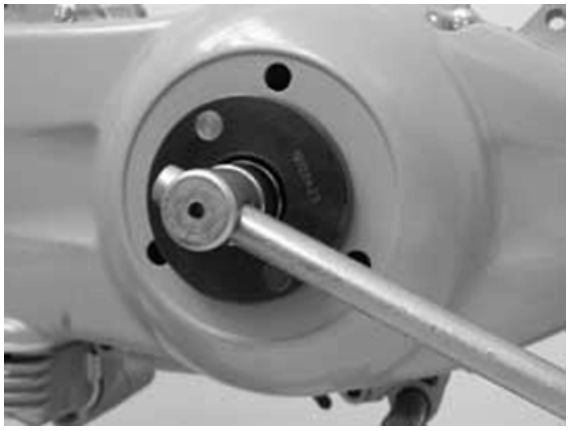
020626Y Driving pulley lock wrench

Locking torques (N*m)

Drive pulley nut 75 - 83

Refitting the transmission cover

- Check that there are 2 alignment dowels and that the sealing gasket for the oil sump on the transmission cover is adequately fitted.
- Replace the cover and tighten the 10 screws to the specified torque.
- Refit the oil loading cap/bar.
- Refit the steel washer and the driven pulley nut.
- Tighten the nut to the prescribed torque using the lock wrench and the torque wrench tools.
- Refit the plastic cover.



Specific tooling

020423Y Driven pulley lock wrench

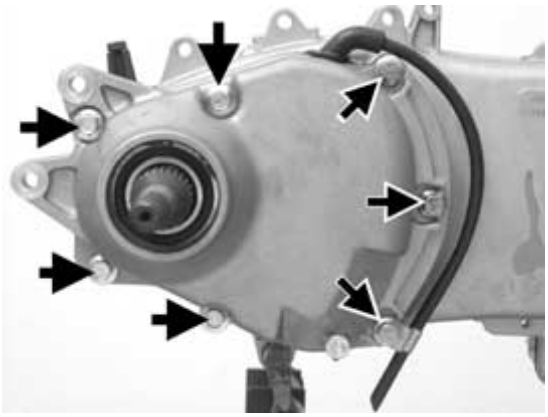
Locking torques (N*m)

Transmission cover screws 11 to 13 Driven pulley shaft nut 54 to 60

End gear

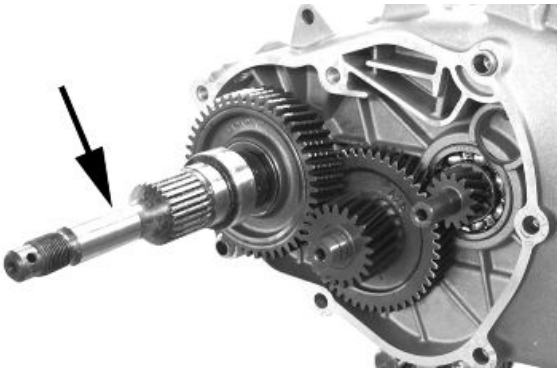
Removing the hub cover

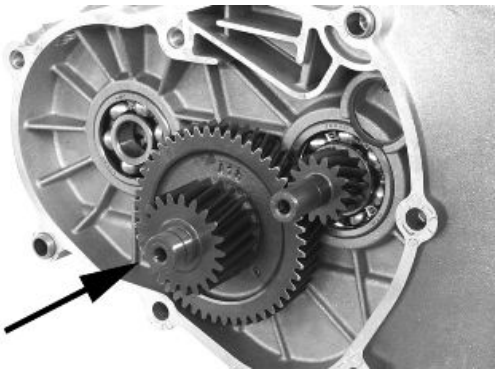
- Empty the rear hub through the oil drainage plug.
- Remove the 7 flanged screws indicated in the figure.
- Remove the hub cover and its gasket.



Removing the wheel axle

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





Removing the hub bearings

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

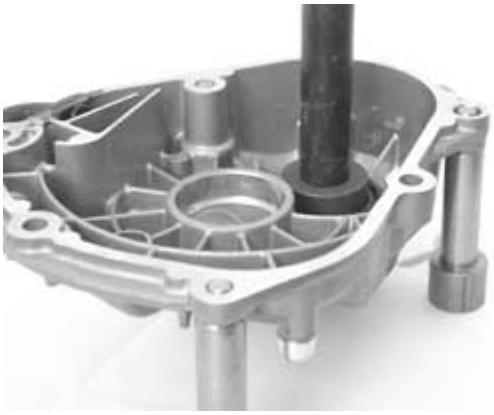
Specific tooling

001467Y013 Calliper to extract ø 15-mm bearings

Removing the wheel axle bearings

- Take out the clip on the outside of the gearbox cover.
- Support the hub cover and expel the bearing.

By means of the appropriate tools, remove the oil seal as in the figure.



Specific tooling

020376Y Adaptor handle

020477Y 37 mm adaptor

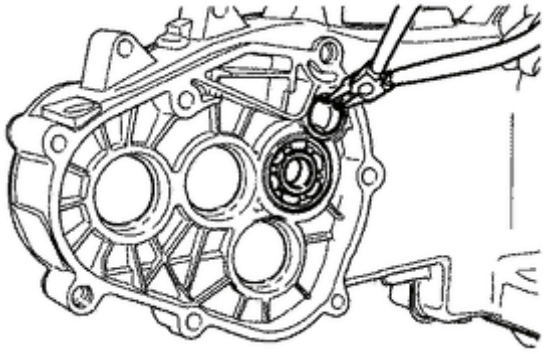
020483Y 30-mm guide

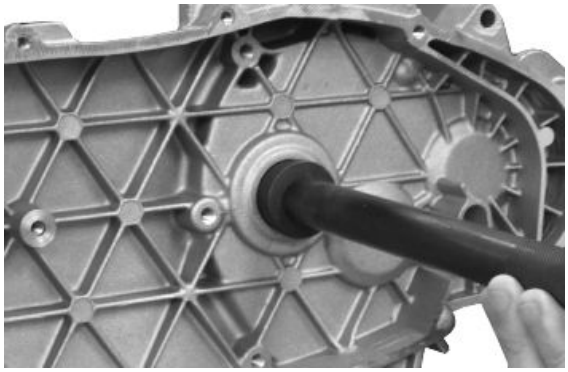
020359Y 42x47-mm Adaptor

020489Y Hub cover support stud bolt kit

Removing the driven pulley shaft bearing

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





Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor

020363Y 20-mm guide

Inspecting the hub shaft

- Check the three shafts for wear or distortion of the toothed surfaces, the bearing housings, and the oil seal housings.
- If faults are found, replace the damaged components.

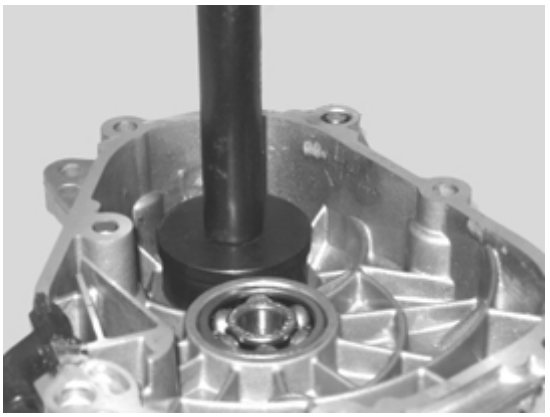
Inspecting the hub cover

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

Refitting the wheel axle bearing

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

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



Specific tooling

020376Y Adaptor handle

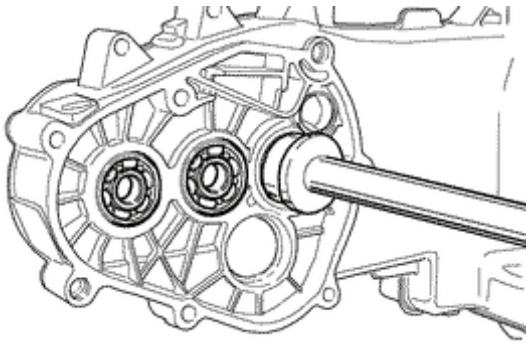
020360Y 52x55-mm Adaptor

020483Y 30-mm guide

Refitting the hub cover bearings

In order to fit the hub box bearings, the engine crankcase and the cover must be heated with the special heat gun.

- The three 15-mm bearings must be fitted using the appropriate tools:
- The 42-mm side of the adapter must be turned towards the bearing.



Specific tooling

020150Y Air heater mounting

020151Y Air heater

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

020412Y 15-mm guide

N.B.

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

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

N.B.

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

Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

020363Y 20-mm guide

N.B.

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

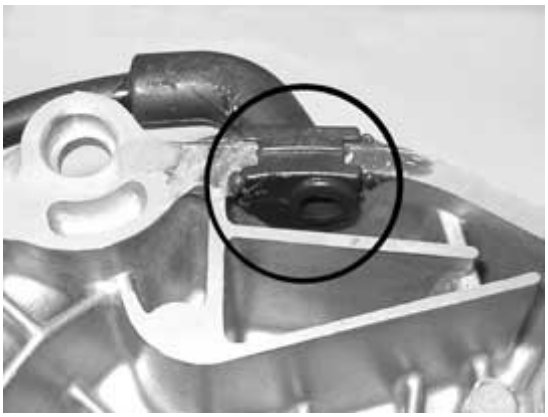
- Refit the Seeger ring with the opening facing the bearing and fit a new oil seal flush with the crankcase from the pulley side.

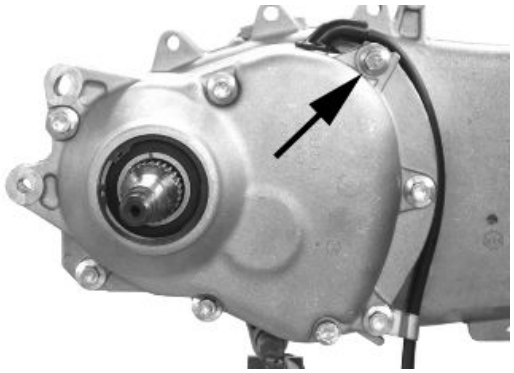
Refitting the hub bearings

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

Refitting the ub cover

- Fit a new gasket together with the centring dowels.
- Seal the gasket of the breather pipe using black silicone sealant.
- Fit the gearbox cover, making sure the breather pipe is in the correct position.
- Position the shorter screw that can also be recognised from the different colour as shown in the figure.
- Fix the breather tube support by means of the lower screw.
- Fit the remaining screws and tighten the seven screws to the prescribed torque.

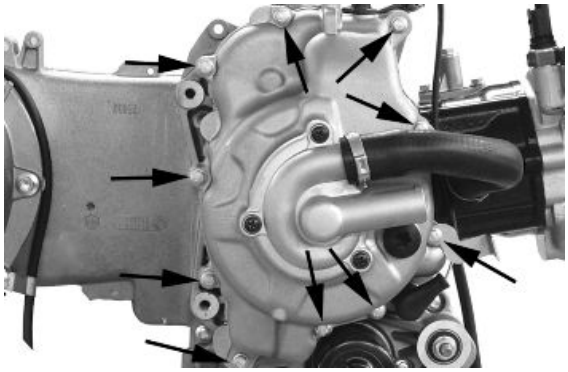




Flywheel cover

Removing the hub cover

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



Removing the stator

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

Refitting the stator

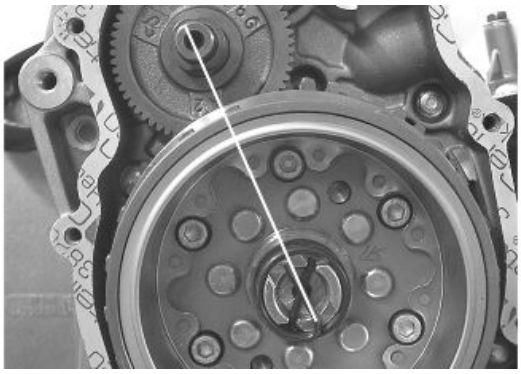
- Refit the stator and flywheel carrying out the removal procedure in reverse, tightening the retainers to the specified torque.

Locking torques (N*m)

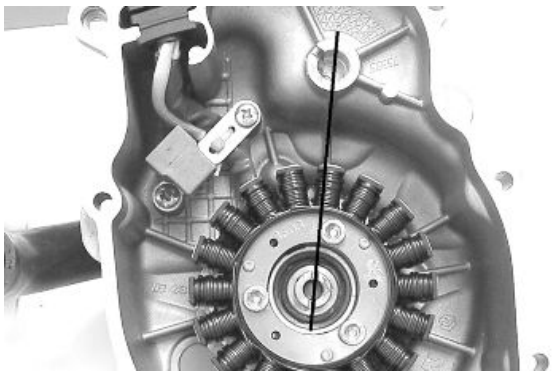
Stator assembly screws (°) **3 to 4**

Refitting the flywheel cover

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



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



- Refit the cover over the engine and tighten the screws to the prescribed torque.
- Carry out the removal steps but in the reverse order.

CAUTION

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

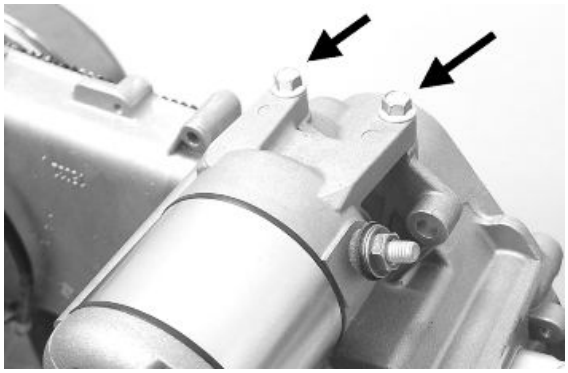
Locking torques (N*m)

Flywheel cover screws 11 - 13

Flywheel and starting

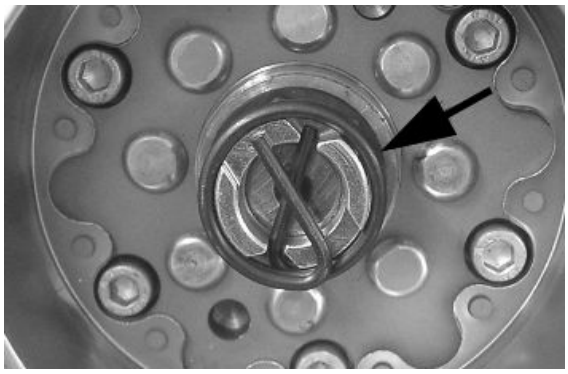
Removing the starter motor

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

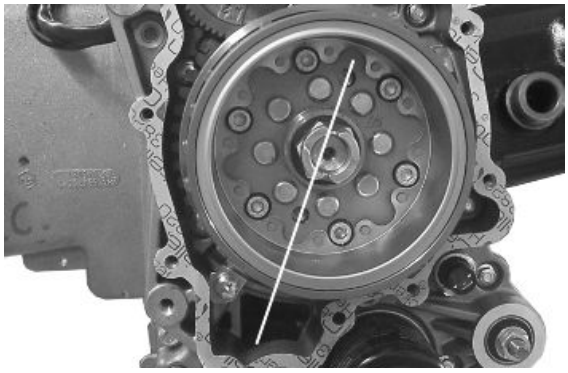


Removing the flywheel magneto

- Remove the water pump shaft and crankshaft spline clip



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



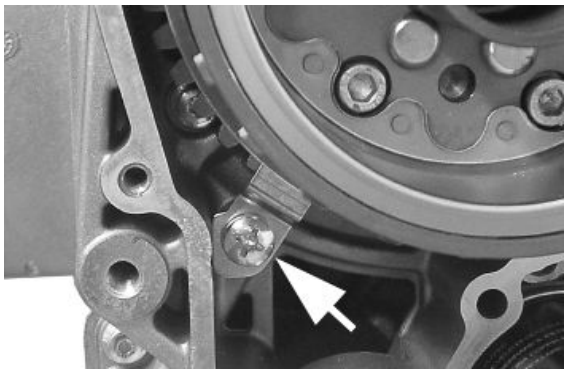
- Screw in the guide bushing that is part of the special flywheel stop tool on the flywheel as shown in the picture

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

Specific tooling

020627Y Flywheel lock wrench

Remove the plate indicated in the picture.



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

Specific tooling

020467Y Flywheel extractor

Inspecting the flywheel components

- Check the integrity of the internal plastic parts of the flywheel and the Pickup control plate.

Refitting the free wheel

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

Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

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

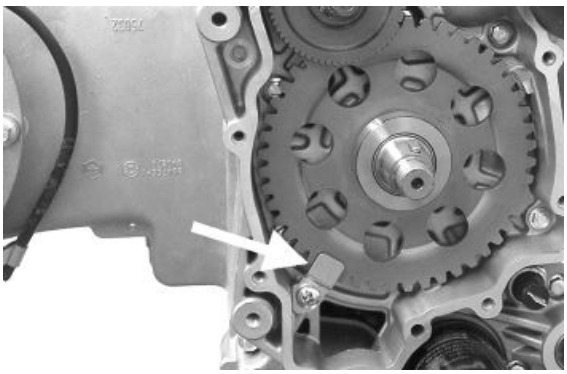
Locking torques (N*m)

Screw fixing freewheel to flywheel 13 - 15

- Oil the free wheel "rollers".

Refitting the flywheel magneto

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



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

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

Specific tooling

020627Y Flywheel lock wrench

Locking torques (N*m)

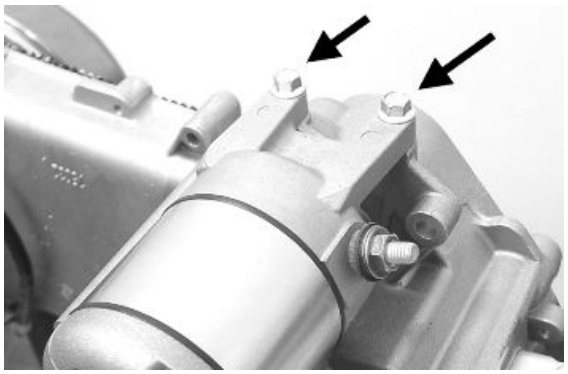
Flywheel nut 94 - 102

Refitting the starter motor

- Fit a new O-ring on the starter motor and lubricate it.
- Fit the starter motor on the crankcase and lock the 2 screws to the prescribed torque.

Locking torques (N*m)

Starter screws 11 to 13



Cylinder assy. and timing system

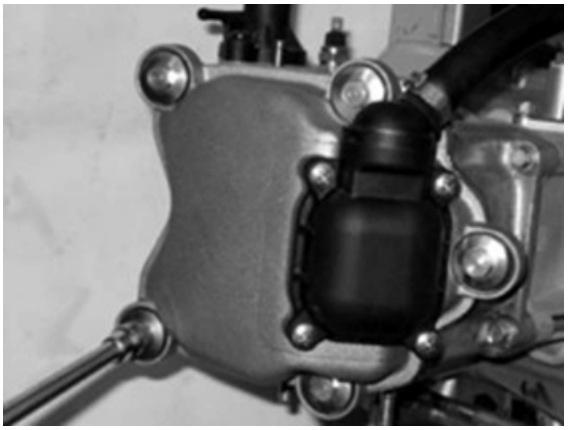
Removing the intake manifold

Loosen the 3 screws and remove the air intake manifold.

- Upon refitting, secure to the specified torque.

Removing the rocker-arms cover

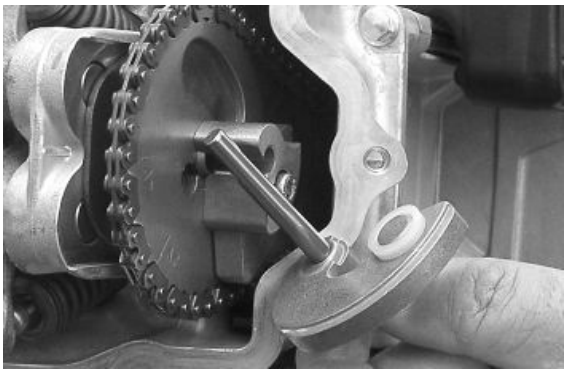
- Remove the 5 screws indicated in the figure



Removing the timing system drive

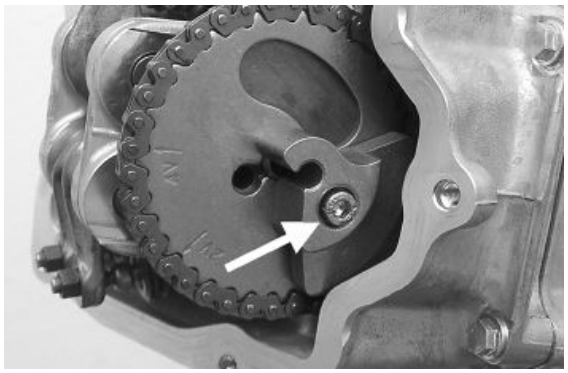
- First remove the parts listed below: transmission cover, drive pulley with belt, oil sump with spring and by-pass piston, oil pump pulley cover, O-ring on the crankshaft and the sprocket wheel separation washer.
- Remove the tappet cover.
- Remove the central screw fastener and the automatic valve-lifter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

- Remove the return spring of the automatic valve lifter unit and the automatic valve lifter unit and its end of stroke washer.



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

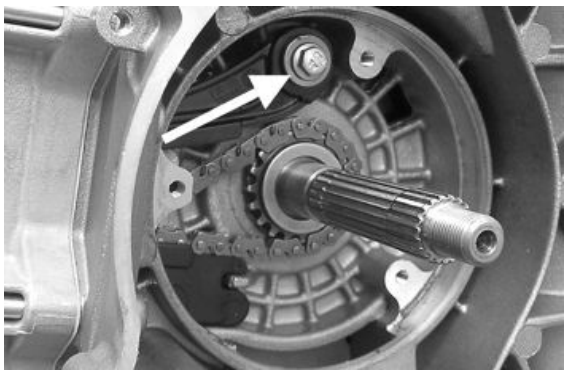
- Remove the internal hex screw and the counter-weight shown in the figure.



- Remove the camshaft control pulley with its washer.

- Remove the command sprocket wheel and the timing chain.
- Remove the screws indicated in the figure, the spacer bar and the tensioner slider.

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



N.B.

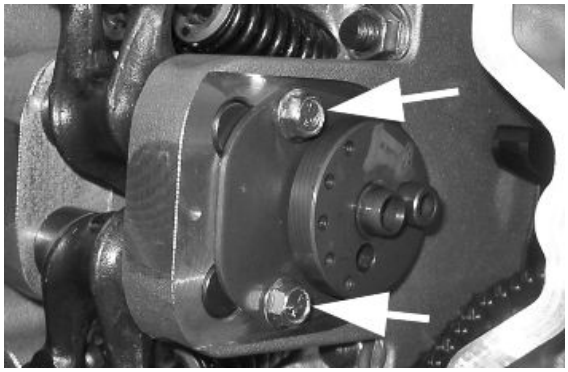
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

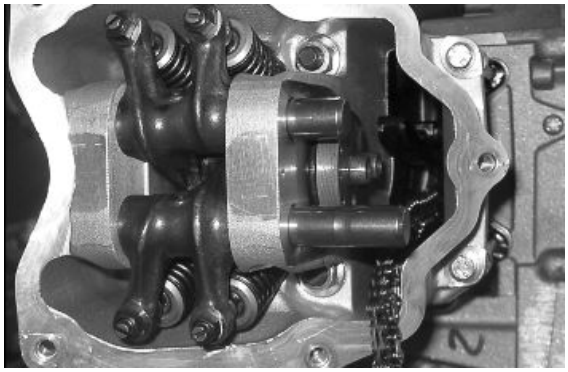
Removing the cam shaft

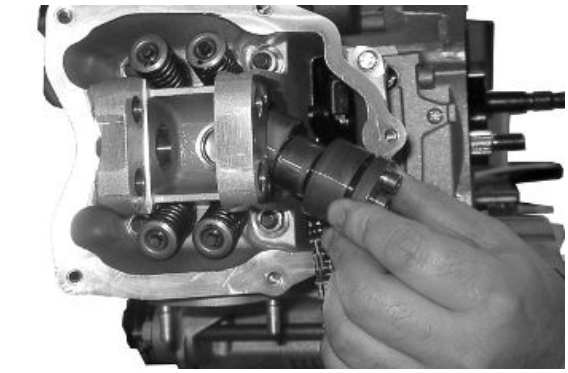
- Remove the 2 screws and the camshaft retainer shown in the diagram.
- Remove the camshaft.
- Remove the pins and the rocking levers from the flywheel side holes.

N.B.

IF NEEDED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, ROCKER PINS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT REMOVING THE CHAIN AND THE CRANKSHAFT CHAIN TENSIONER.





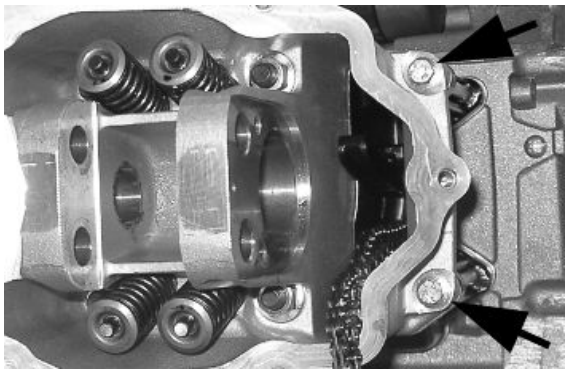


Removing the cylinder head

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

N.B.

IF NEEDED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, ROCKER PINS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT REMOVING THE CHAIN AND THE CRANKSHAFT CHAIN TENSIONER.



Removing the valves

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

CAUTION

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

Specific tooling

020382Y011 adapter for valve removal tool

020382Y Valve cotters equipped with part 012 removal tool

020431Y Valve oil seal extractor

Removing the cylinder - piston assy.

Removing cylinder and piston

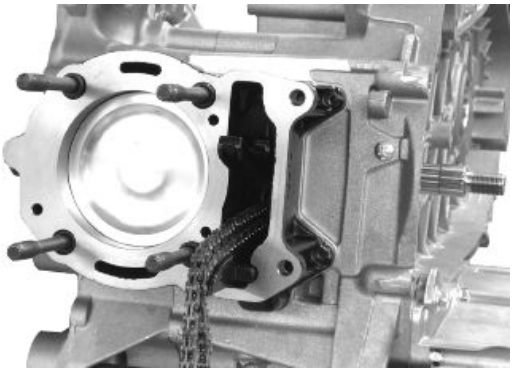
- Remove the chain guide slider.
- Remove the 4 O-rings on the stud bolts.
- Pull out the cylinder.
- Remove the cylinder base gasket.
- Remove the two stop rings, the wrist pin and the piston.
- Remove the piston seals.

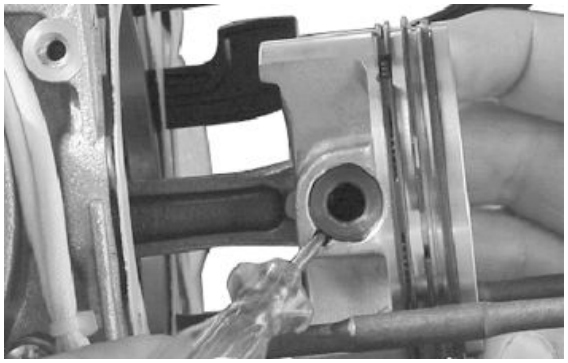
CAUTION

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

N.B.

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.





Inspecting the small end

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Crankcase - crankshaft - connecting rod

Inspecting the wrist pin

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder - piston assy.

Inspecting the piston

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder - piston assy.

Inspecting the cylinder

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder - piston assy.

Inspecting the piston rings

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Piston rings

Removing the piston

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

N.B.

THE TOOL FOR INSTALLING THE RETAINER RINGS MUST BE USED MANUALLY.

CAUTION

USING A HAMMER MIGHT DAMAGE THE STOPS' HOUSING.

Specific tooling

020454Y Pin lock fitting tool

Choosing the gasket

- Provisionally fit the piston into the cylinder, without any base gasket.
- Assemble a dial gauge on the specific tool.

Specific tooling

020428Y Piston position check mounting

- Using an abutment plane, reset the dial gauge with a preload of a few millimetres.
- Finally fix the dial gauge.
- Check the perfect sliding of the feeler pin.
- Install the tool on the cylinder without changing the dial gauge position.
- Lock the tool using the original head fixing nuts.
- Rotate the crankshaft up to the TDC (the inversion point of the dial gauge rotation)
- Measure the deviation from the reset value.

- By means of the table, see the Specifications chapter identify the cylinder base gasket thickness to be used for refitting. Correctly identify the cylinder base gasket thickness to keep the correct compression ratio.
- Remove the special tool and the cylinder.

N.B.

IF DEVIATIONS (OR RECESSES OR PROJECTIONS) CLOSE TO THE CHANGE OF CATEGORY ARE MEASURED, REPEAT THE MEASUREMENT AT THE OPPOSED SIDE. TO DO SO, REPEAT THE TOOL INSTALLATION BY INVERTING ITS POSITION.

See also

Slot packing system

Refitting the piston rings

- Place the scraper ring spring on the piston.
- Install the scraper ring keeping the opening opposed to the spring junction and with the writing "top" facing the piston crown. The chamfered side of the oil scraper ring should always be facing the piston crown.
- Fit the second lining with the identification letter or the writing "top" facing the piston crown. In any case, the step must be facing opposite the piston crown.
- Install the first compression lining in the direction imposed by the housing.
- It is advisable to use a fitter to facilitate the installation of the linings.

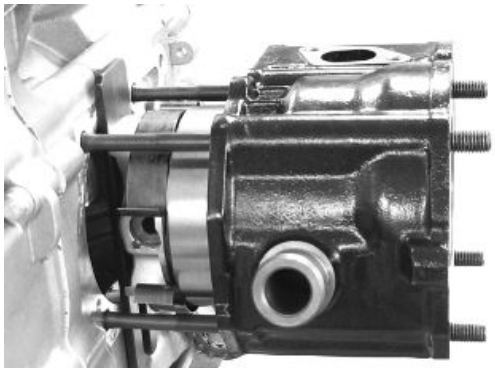
N.B.

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

- Misalign the lining openings at 120° as shown in the figure.
- Lubricate the components with engine oil.
- The engine uses the first compression lining with an L section.

Refitting the cylinder

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



N.B.

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

Specific tooling

020426Y Piston fitting fork

020393Y Piston assembly band

Inspecting the cylinder head

N.B.

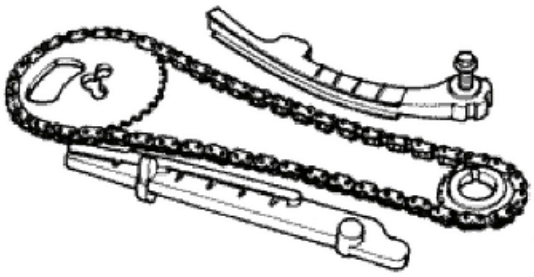
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

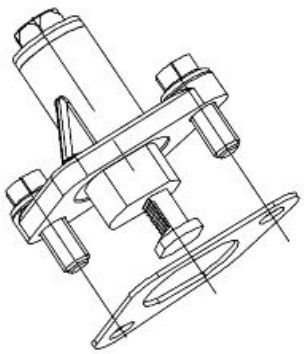
Cylinder Head

Inspecting the timing system components

- Check that the guide slider and the tensioner slider are not worn out.
- Ensure that the camshaft control pulley chain assembly and the sprocket wheel are not worn.
- If you detect wear, replace the parts or, if the chain, sprocket wheel and pulley are worn, replace the whole unit.



- Remove the centre screw with the washer and the tensioner spring. Check that the one-way mechanism is not worn.
- Check the condition of the tensioner spring.
- If examples of wear are found, replace the whole unit.



Inspecting the valve sealings

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder Head

Inspecting the valves

N.B.

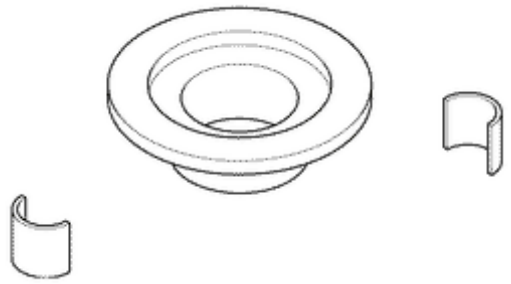
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder Head

Inspecting the springs and half-cones

- Check that the upper and lower supporting spring washers, the cotters and the oil seal show exhibit no signs of abnormal wear. Replace a component when worn.



- Measure the unloaded spring length.

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder Head

Refitting the valves

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

N.B.

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

Specific tooling

020306Y Punch for assembling valve seal rings

020382Y Valve cotters equipped with part 012 removal tool

020382Y011 adapter for valve removal tool

Inspecting the cam shaft

N.B.

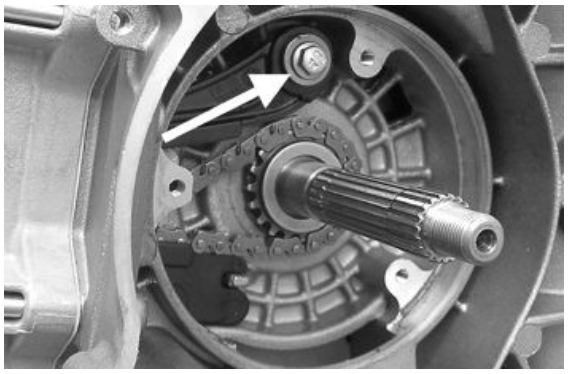
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

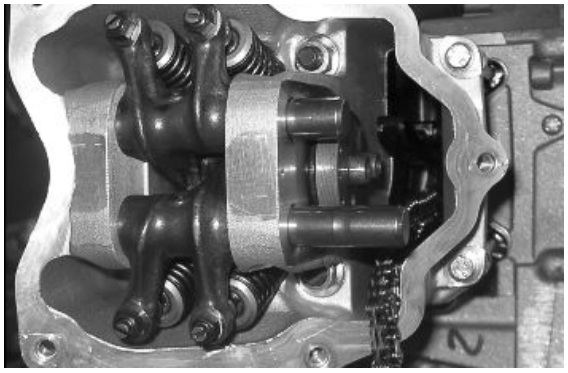
See also

Cylinder Head

Refitting the head and timing system components

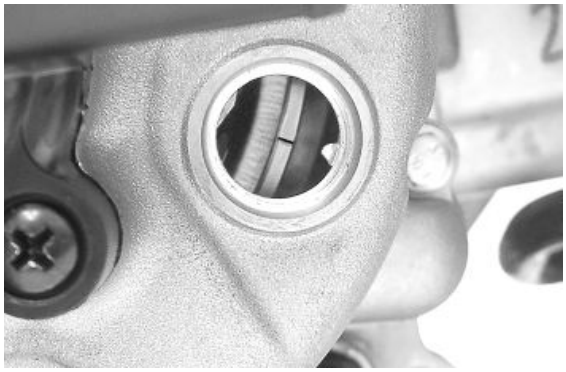
- Refit the lower timing chain sprocket wheel on the crankshaft, with the chamfer facing the insertion side.
- Loop the timing chain around the sprocket on the crankshaft.
- Fit the chain tensioner slider from the cylinder head side.
- Fit the spacer and the screw fastener.
- Tighten the screws to the prescribed torque.
- Fit the pins and rocking levers.
- Lubricate the two rocking levers through the holes at the top.
- Lubricate the 2 bearings and insert the camshaft in the cylinder head with the cams corresponding to the rocking levers.
- Insert the retention plate and tighten the two screws shown in the figure to the prescribed torque.
- Refit the spacer on the camshaft.

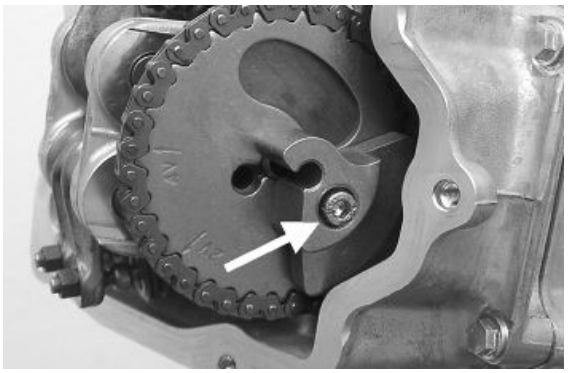




- Rotate the engine so that the piston is at top dead centre, using the reference marks on the flywheel and the crankcase.
- Holding this position insert the chain on the camshaft control pulley.
- Insert the pulley on the camshaft while keeping the reference **4V** in correspondence with the reference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

Electrode distance 0.8 mm



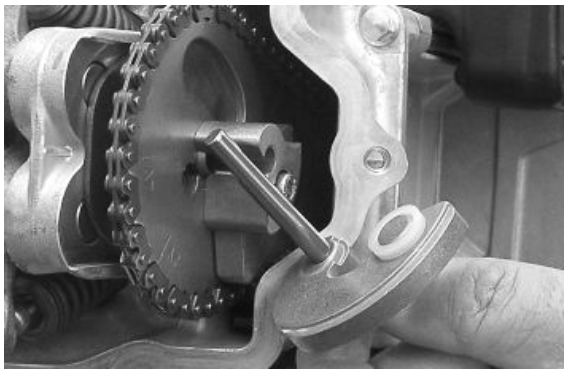


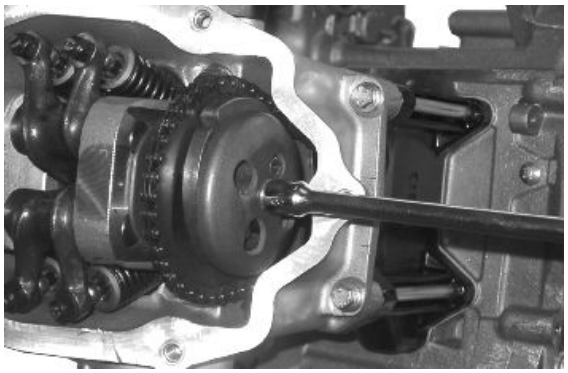
N.B.

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

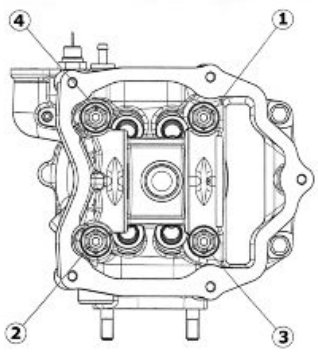
Locking torques (N*m)

Timing chain tensioner support screw 11 to 13
Spark plug 12 to 14 **Starter ground screw** 7 to 8.5
Timing chain tensioner slider screw 10 to 14
Starter counterweight support screw 11 to 15
Timing chain tensioner central screw 5 to 6
Camshaft retention plate screw 4 to 6





- Fit the timing chain guide slider.
- Insert the centring dowel between the cylinder head to the cylinder, fit the cylinder head gasket and the cylinder head.
- Lubricate the stud bolt threading.
- Tighten up the nuts to an initial pre-torque of 7±1 N·m
- Tighten up the nuts to a second pre-torque of 10 ±1 N·m
- Rotate by an angle of 270°
- To carry out the operations described above, follow the tightening sequence in the figure.



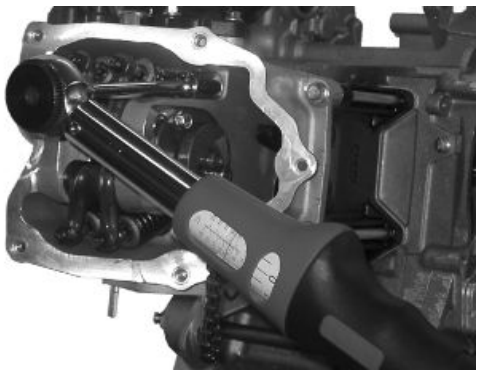
- Fit the two screws on the outside of the timing chain side and tighten them to the specified torque.

N.B.

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

Locking torques (N*m)

Timing chain tensioner support screw **11 to 13**

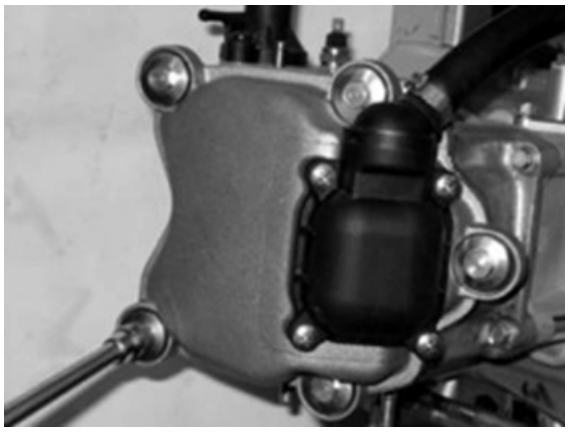


Refitting the rocker-arms cover

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

Locking torques (N*m)

Tappet cover screws **6 - 7 Nm**



Refitting the intake manifold

- Fit the intake manifold and do up the three screws.

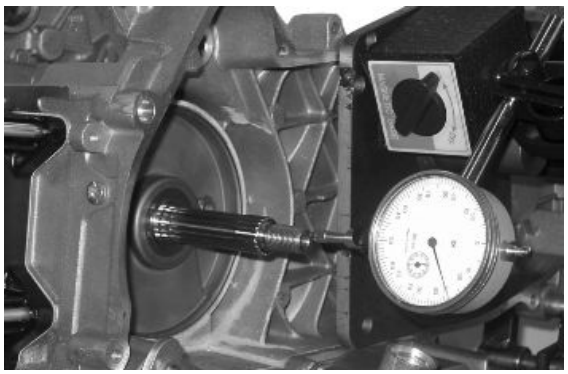
Locking torques (N*m)

Intake manifold screws **11 to 13**

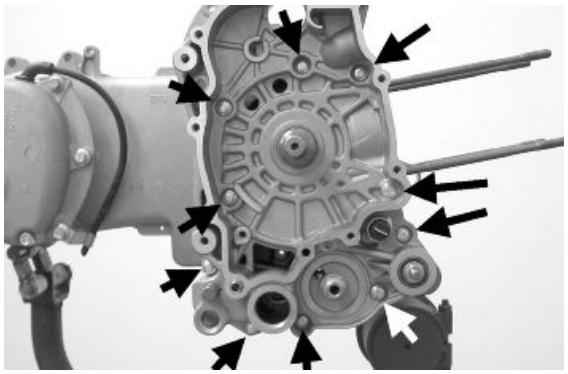
Crankcase - crankshaft

Splitting the crankcase halves

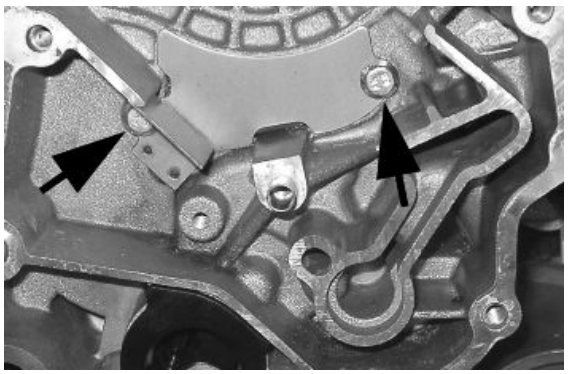
- Before opening the crankcase, it is advisable to check the axial clearance of the crankshaft. To do this, use a plate and a support with appropriate tool dial gauge.



- Upper clearances are an indication of wear on the surfaces of the crankshaft casing support.
- Remove the 10 crankshaft coupling screws.
- Separate the crankcase while keeping the crankshaft in one of the two halves of the crankcase.
- Remove the crankshaft.
- Remove the half crankcase coupling gasket.
- Remove the two screws and the internal cover shown in the diagram.



- Remove the oil guard on the flywheel side.
- Remove the oil filter fitting shown in the diagram.
- Check the axial clearance on the connecting rod.
- Check the radial clearance on the connecting rod.
-Check the surfaces that limit the axial free-play are not scored and measure the width of the crankshaft between these surfaces, as shown in the diagram.



- If the axial clearance between crankshaft and crankcase is exceeding and the crankshaft does not have any defect, the problem must be due to either excessive wear or wrong machining on the crankcase.
- Check the diameters of both the bearings of the crankshaft in accordance with the axes and surfaces shown in the figure. The half-shafts are classified in two categories Cat. 1 and Cat. 2 as shown the chart below.

CAUTION

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

CAUTION

WHILE OPENING THE CRANKCASES AND REMOVING THE CRANKSHAFT, CHECK THAT THE THREADED SHAFT ENDS DO NOT INTERFERE WITH THE MAIN BUSHINGS. FAILURE TO OBSERVE THIS PRECAUTION CAN DAMAGE THE MAIN BUSHINGS.

CAUTION

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

N.B.

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

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Crankcase - crankshaft - connecting rod

Inspecting the crankshaft alignment

N.B.

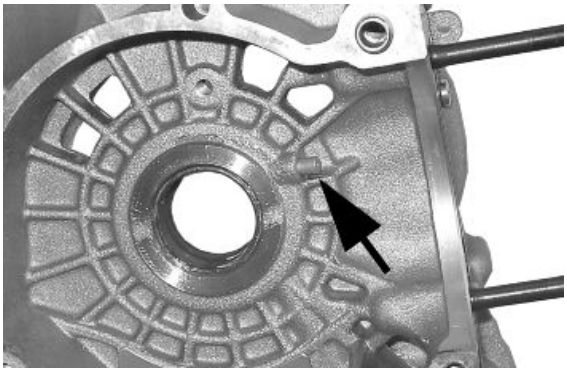
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

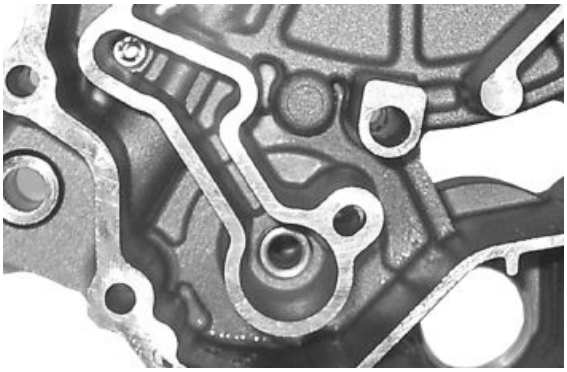
See also

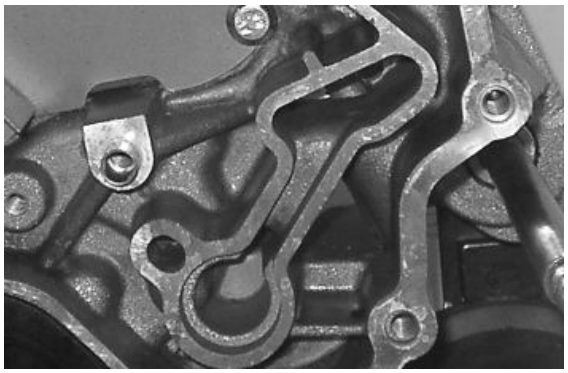
Crankcase - crankshaft - connecting rod

Inspecting the crankcase halves

- Before proceeding to check the crankcase halves, thoroughly clean all surfaces and oil ducts.
- On the transmission-side crankcase half, take particular care when handling the oil pump compartment and the oil ducts, the by-pass duct, the main bushings and the cooling jet on the transmission side (see diagram).
- Take particular care, also, that there are no signs wear in the oil by-pass valve housing (see Chapter Lubrication), as this could prevent a good seal in the piston, which regulates the oil pressure.
- On the flywheel side crankcase half, take particular care cleaning the oil ducts for the main bushings, the oil duct for the jet that lubricates the cylinder head and the oil drainage duct at the flywheel side oil seal.







- Inspect the coupling surfaces on the crankcase halves for scratches or deformation, taking particular care with the cylinder/crankcase surfaces and the crankcase halves surfaces.
- Defects in the crankcase coupling gasket between the crankcase halves or the mating surfaces shown in the diagram, could cause a drop in the oil pressure lubricating the main bushings and connecting rod.
- Check the main bearing seats that limit axial clearance in the crankshaft show no signs of wear. The dimension between these seats is measured by way of the procedure described previously for measuring the crankshaft axial clearance and dimensions.

N.B.

THE JET IS FED THROUGH THE MAIN BUSHINGS. PROPER OPERATION OF THIS COMPONENT IMPROVES PISTON CROWN COOLING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAKS CAN CAUSE A CONSIDERABLE DROP IN THE LUBRICATION PRESSURE FOR MAIN BUSHINGS AND CONNECTING ROD.

N.B.

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

Inspecting the crankshaft plain bearings

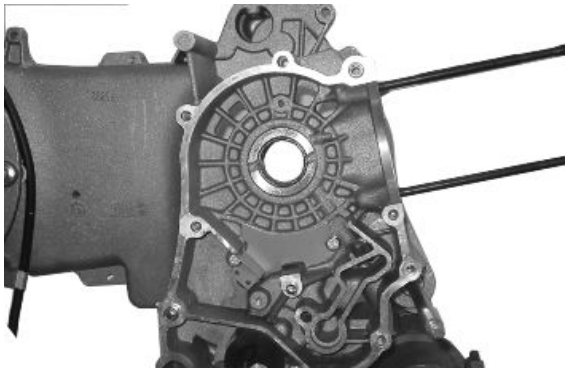
- To obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.
- The main bushings are comprised of two half-bearings, one with holes and channels for lubrication whereas the other is solid.

Characteristic

Lubrication pressure

3.5 to 4 bar

- The solid half-bearing is intended to stand the thrusts caused by combustion, and for this reason it is arranged opposite the cylinder.
- To prevent shutters in the oil feeding channels, the matching surface of the two half-bearings must be perfectly orthogonal to the cylinder axis, as shown in the figure.
- The oil feeding channel section is also affected by the bushings driving depth compared with the crankshaft axial clearance of the limiting surface.



N.B.

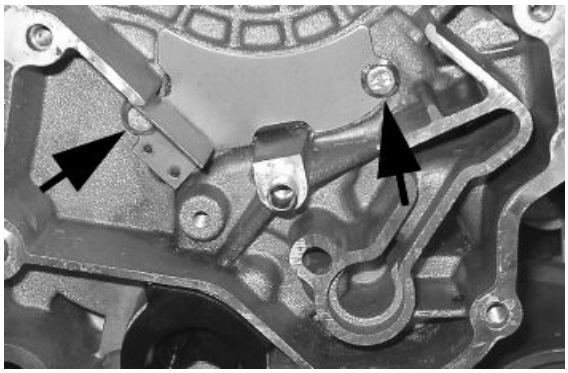
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Crankcase - crankshaft - connecting rod

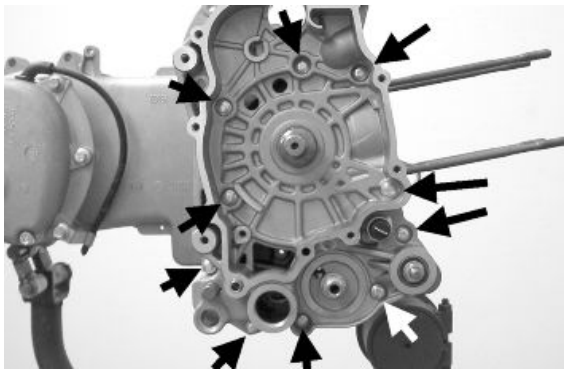
Refitting the crankcase halves

- Fit the internal bulkhead and lock the 2 screws to the prescribed torque.
- Fit the oil filter fitting and tighten it to the prescribed torque.
- Position the oil pre-filter element as shown in the picture.
- Place a new gasket on one of the crankcase halves, preferably on the transmission side, together with the centring dowels.
- Lubricate the main bushings and insert the crankshaft in the transmission side crankcase half.
- Reassemble both crankcase halves.
- Fit the 10 screws and tighten them to the specified torque.
- Fit a new O-ring on the pre-filter and lubricate it.
- Insert the filter on the engine with the relative cap. Tighten to the prescribed torque.



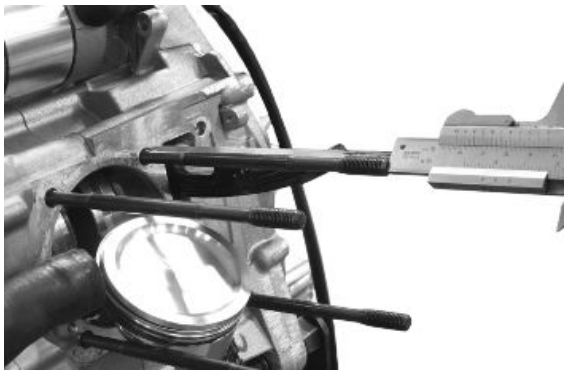
Locking torques (N*m)

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



Studs

Check that the stud bolts have not worked loose from their seat in the crankcase.
Check the depth of stud bolt driving with a gauge, as indicated in the picture. If it varies significantly from the driving depth indicated, it means that the stud bolt has yielded.
In this case, replace it.

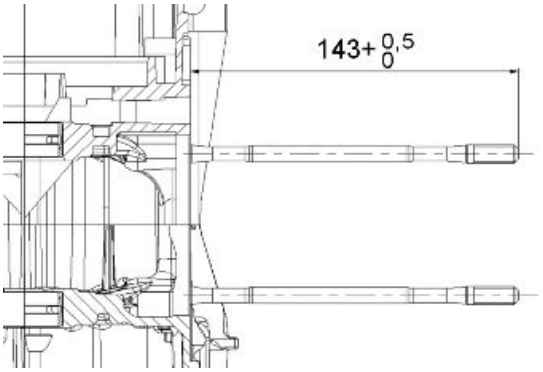


By working on two fitted cylinder head fixing nuts, nut and lock nut, as shown in the picture, remove the stud bolt from its seat.

Clean the threaded seat on the carter thoroughly.

Refit a new stud bolt and apply the special product on the threading crankcase side.

Tighten up to the depth of the driving indicated.



Recommended products

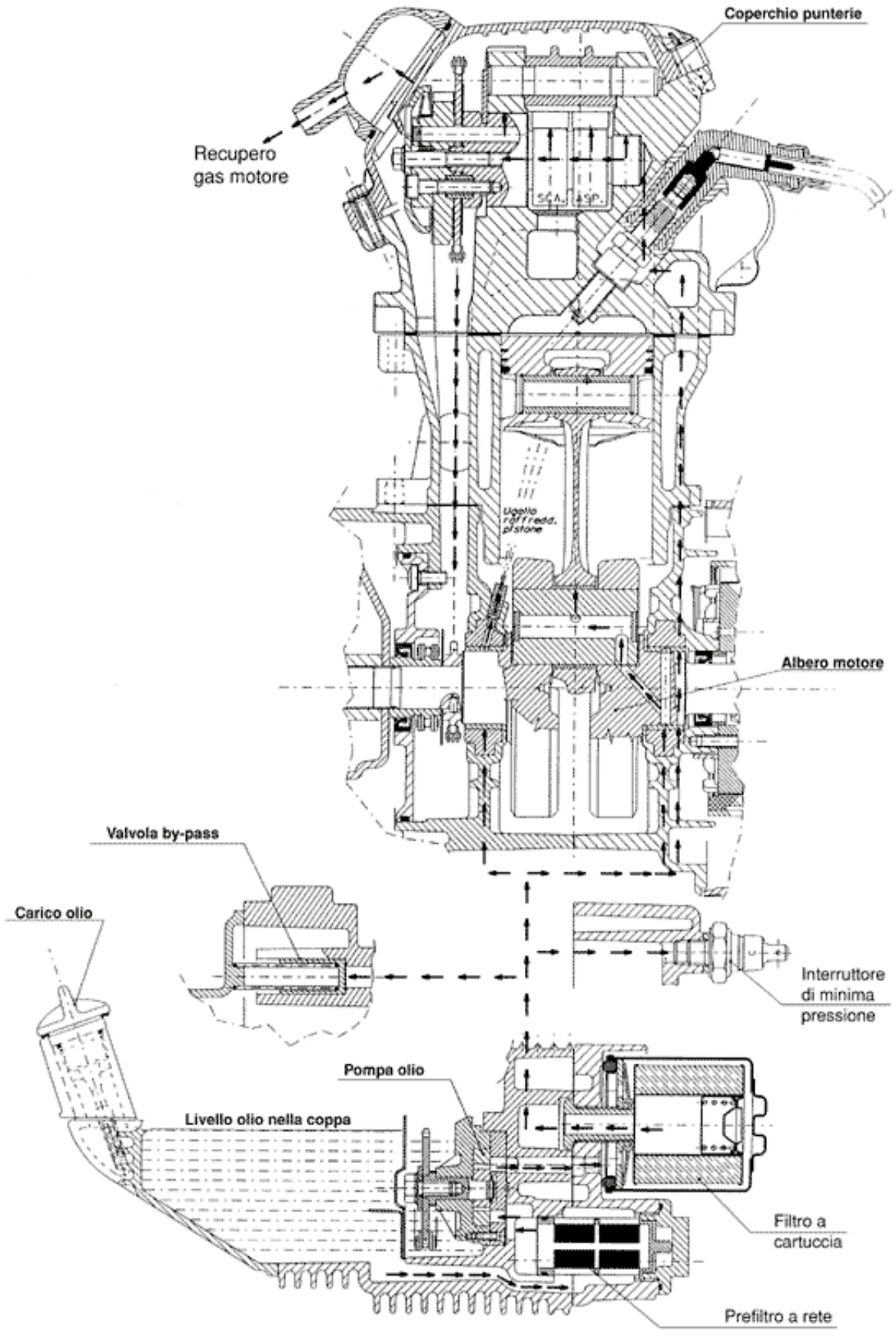
Loctite Quick Set Loctite 270 high strength threadlock

Loctite 270 high strength threadlock

Lubrication

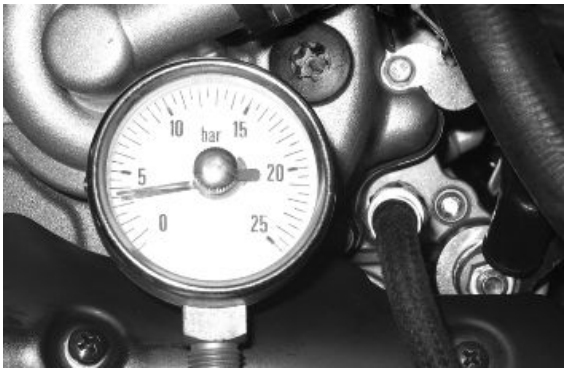
Conceptual diagrams

LUBRICATION CIRCUIT


Coperchio punterie
Recupero
gas motore
Albero motore
Valvola by-pass
Carico olio
Interruttore
di minima
pressione
Pompa olio
Livello olio nella coppa
Filtro a
cartuccia
Prefiltro a rete

Oil pressure check

- Remove the electrical minimum oil pressure switch connection and remove the switch.
- Check that the oil pressure reading is between 0.5 and 1.2 atm with the engine idling at 1650 rpm and the oil at the required temperature (wait for at least one electric ventilation).
- Check that the oil pressure is between 3.2 and 4.2 atm with the engine running at 6000 rpm and the oil at the required temperature.
- Remove the appropriate tools once the measurement is complete, refit the oil pressure switch and washer, tightening it to the specified torque and fit the fan cover.
- If the oil pressure is not within the specified limits, in the following order, check: the oil filter, the oil by-pass valve, the oil pump and the crankshaft seals.



N.B.

THE CHECK MUST BE CARRIED OUT WITH OIL AT THE CORRECT LEVEL AND WITH AN OIL FILTER IN PROPER CONDITION.

Characteristic

Oil pressure

Minimum pressure admitted at 6000 rpm: 3.2 atm.

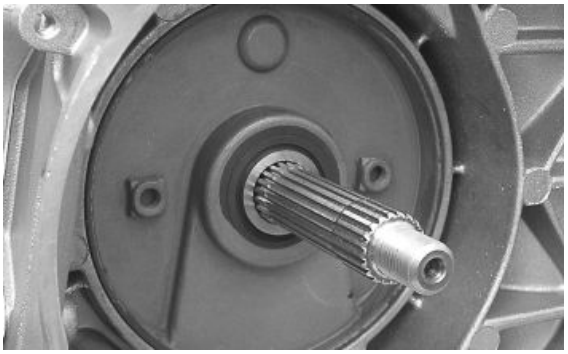
Locking torques (N*m)

Minimum oil pressure sensor **12 to 14**

Crankshaft oil seals

Removal

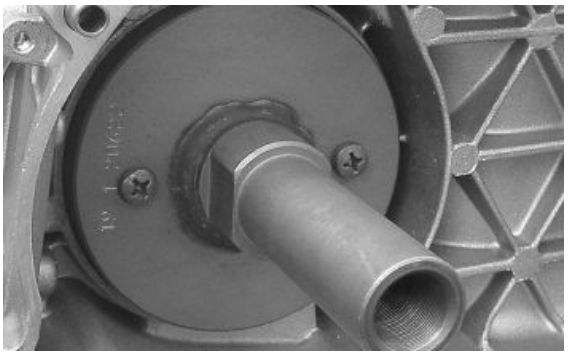
- Remove the transmission cover and the complete drive pulley beforehand



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

Specific tooling

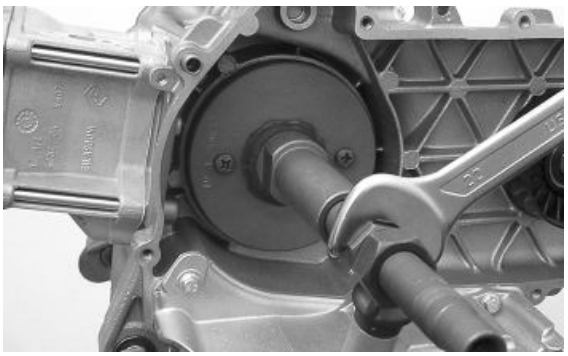
020622Y Transmission-side oil seal punch



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

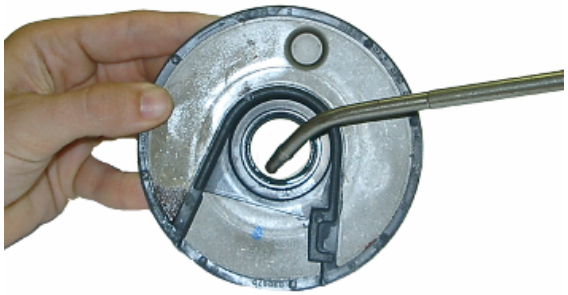
Specific tooling

020622Y Transmission-side oil seal punch



Refitting

- Always use a new oil seal upon refitting
- Prepare the new oil seal by lubricating the sealing lip.
- Preassemble the oil seal with the appropriate tool by positioning the screws.
- Insert the sheath over the crankshaft.
- Insert the tool with the oil seal on the crankshaft until it comes into contact with the crankcase.
- Insert the adaptor bushing of the tool in the hole on the crankcase.



- Orientate the oil guard by inserting the bracket which is part of the appropriate tool.
- Tighten the threaded bar onto the crankshaft as far as it will go.
- Use the nut to move the base of the tool until you can see the end of the oil seal driving stroke
- Remove all the tool components following the procedure but in reverse order

CAUTION

DO NOT LUBRICATE THE KEYING SURFACE ONTO THE ENGINE CRANKCASE.

CAUTION

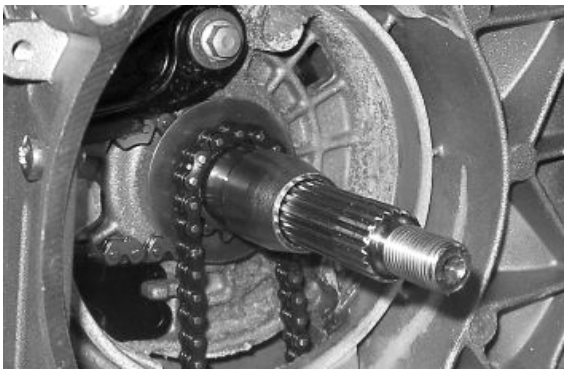
ORIENT THE OIL SEAL BY POSITIONING THE CHAIN HOUSING CHANNEL FACING DOWNWARDS. WHEN THE POSITION IS REACHED, DO NOT RETRACT THE OIL SEAL. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE A WRONG POSITIONING OF THE OIL SEAL SHEATH.

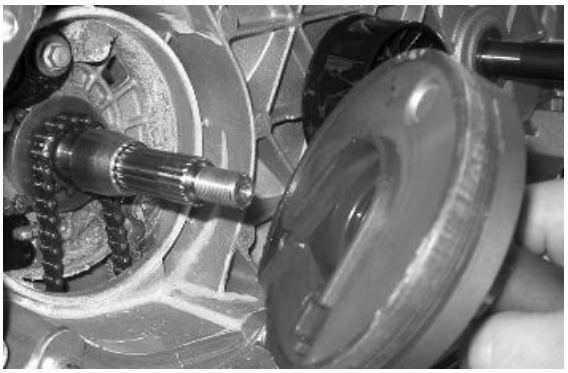
CAUTION

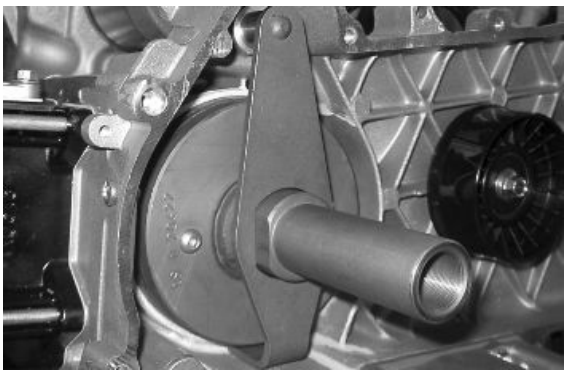
FAILURE TO COMPLY WITH THIS ASSEMBLY PROCEDURE CAN SERIOUSLY DAMAGE THE ENGINE DUE TO THE WRONG TENSIONING OF THE OIL PUMP CONTROL CHAIN.

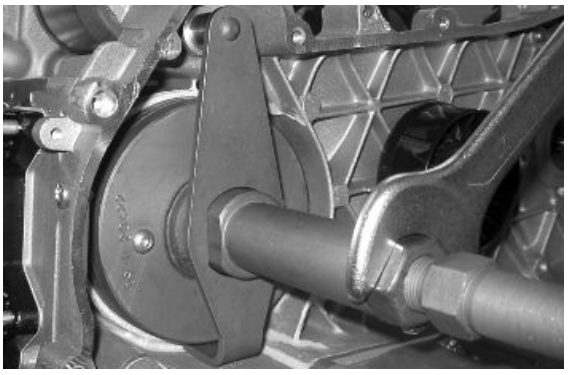
Specific tooling

020622Y Transmission-side oil seal punch





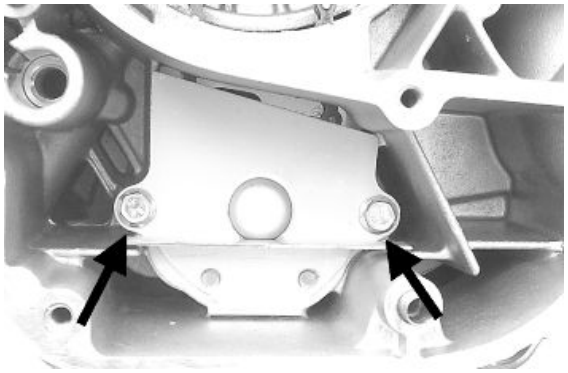




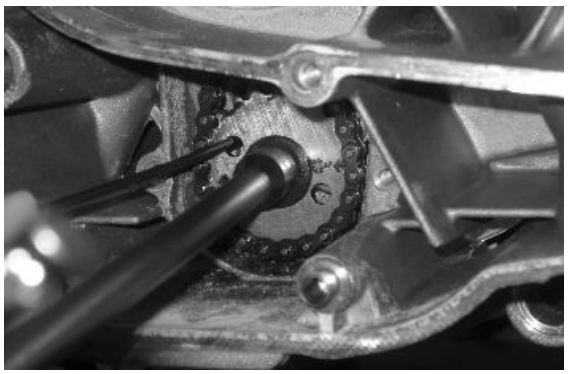
Oil pump

Removal

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



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



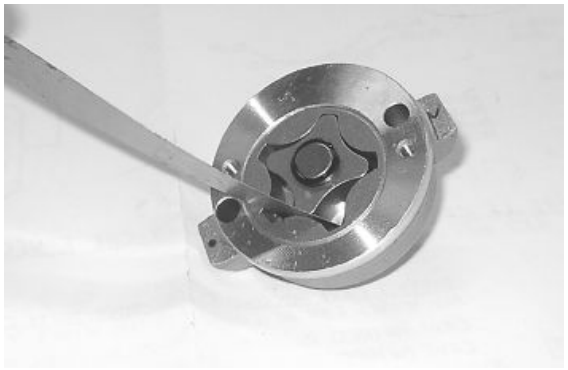
- Remove the oil pump by undoing the two screws in the figure.
- Remove the oil pump seal.

N.B.

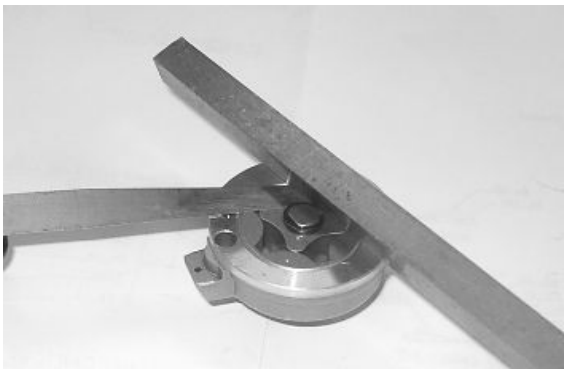
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

Inspection

- Remove the two screws and the oil pump cover.
- Remove the circlip retaining the innermost rotor.
- Remove and wash the rotors thoroughly with petrol and compressed air.
- Reassemble the rotors in the pump body, keeping the two reference marks visible Replace the retainer ring.



- Check the clearance between the rotors in the position shown in the diagram using a feeler gauge.
Measure the distance between the outer rotor and the pump body (see figure).
- Check the axial clearance of the rotors using a trued bar as shown in the figure.



Characteristic

Axial rotor clearance

Limit values admitted: 0.09 mm

Distance between the outer rotor and the pump body

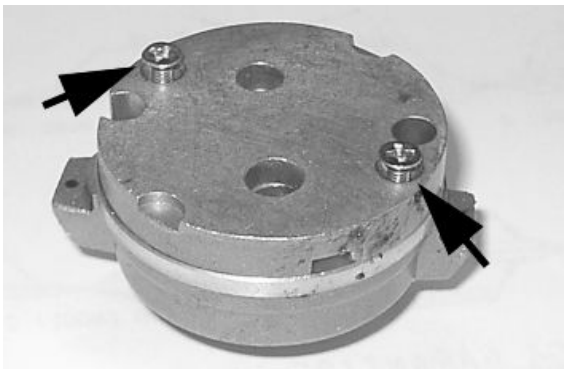
Admissible limit clearance: 0.20 mm

Distance between the rotors

Admissible limit clearance: 0.12 mm

Refitting

- Check there are no signs of wear on the oil pump shaft or body.
- Check there are no signs of scoring or wear on the oil pump cover.
- If you detect non-conforming measurements or scoring, replace the faulty parts or the unit.
- Fit the pump cover in the position that permits the crankcase clamping screws to be aligned.
- Make sure the gasket is positioned properly and refit the pump on the engine crankcase. The pump can only be fitted in one position. - Tighten the screws to the prescribed torque.



- Fit the sprocket wheel with a new O-ring.
- Fit the chain.
- Fit the central screw and the belleville washer.

Tighten to the prescribed torque.

-Fit the oil pump cover, by tightening the two screws to the prescribed torque.

N.B.

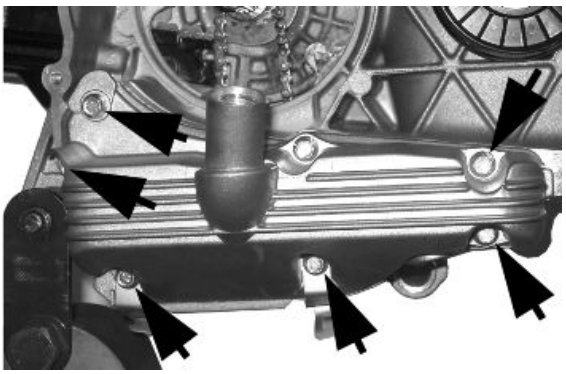
FIT THE CUP WASHER SO THAT ITS OUTER RIM TOUCHES THE PULLEY. MAKE SURE THAT THE PUMP TURNS FREELY.

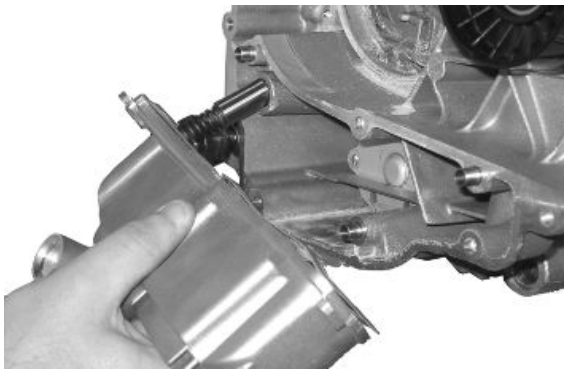
Locking torques (N*m)

Screws fixing oil pump to the crankcase 5 to 6
Oil pump command sprocket screw 10 to 14 **Oil pump cover screws** 0.7 - 0.9

Removing the oil sump

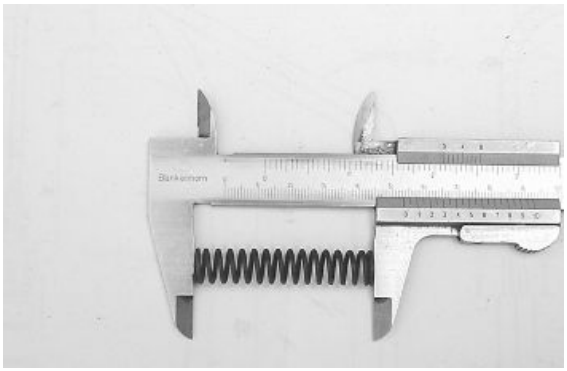
- Remove the oil filler plug, the transmission cover, the complete driving pulley assembly with belt and the sprocket wheel, as described in the "Transmission" chapter.
- Drain the oil as described above.
- Remove the 7 screws, shown in the diagram, and the 2 rear brake fluid pipe fixing brackets.
- Remove the screw, the by-pass piston, the gasket and the centring dowels shown in the figure.





Inspecting the by-pass valve

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



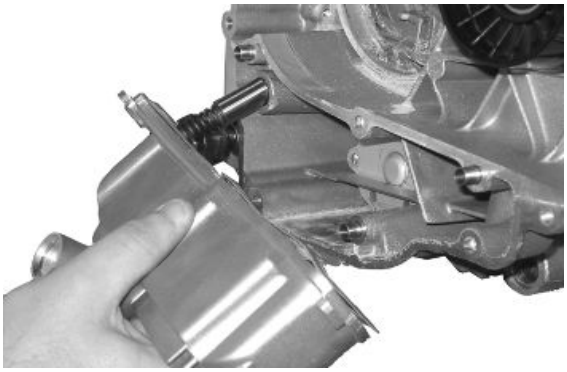
Characteristic

By-pass check up: Standard length

54.2 mm

Refitting the oil sump

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



- When testing the lubrication system, refer to chapter "Crankcase and Crankshaft", regarding lubrication of the crankshaft and connecting rod

Locking torques (N*m)

Oil sump screws **10 to 14**

INDEX OF TOPICS

COMPONENT LAYOUT

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

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 two pipes provided with quick couplings. This allows obtaining a continuous circulation, thereby avoiding the risk of fuel boiling. The pressure regulator is situated at the end of the circuit.
The fuel pump is controlled by the MIU control unit; this ensures the scooter safety

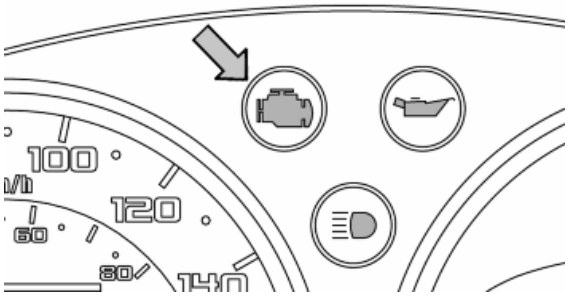
The **ignition circuit** consists of:

- 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.

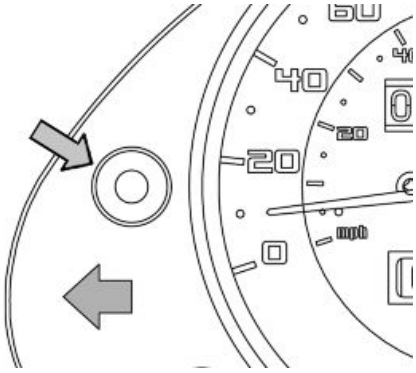


Failures are detected and restored by the diagnostic tester.
In any case, when the fault is no longer present, the data storage is automatically cleared after 16 cycles of use (cold start, running at regular engine temperature, stop).
The diagnostic tester is also required to adjust the idle mixture.

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.Burnt fuse

c.Remote control switches

d.Connectors

B: Chassis ground

C: Fuel system

a. Faulty fuel pump

b.Dirty fuel filter

D: Ignition system

a.Faulty spark plug

b. Faulty coil

c. Faulty screened cap

E: Intake circuit

a.Air filter dirty

b. Dirty by-pass circuit

c. Faulty stepper motor

F: Other

a. Wrong distribution timing

b. Incorrect idle speed carburetion

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

4 For troubleshooting, use a multimeter with an internal resistance of more than 10 K W /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 higher 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 supply system is pressurised at 250 kPa (2.5 BAR). Before disconnecting the fast-release fitting of the fuel supply pipe, check that there are no naked flames. Do not smoke. Act with caution to avoid spraying fuel to your eyes.

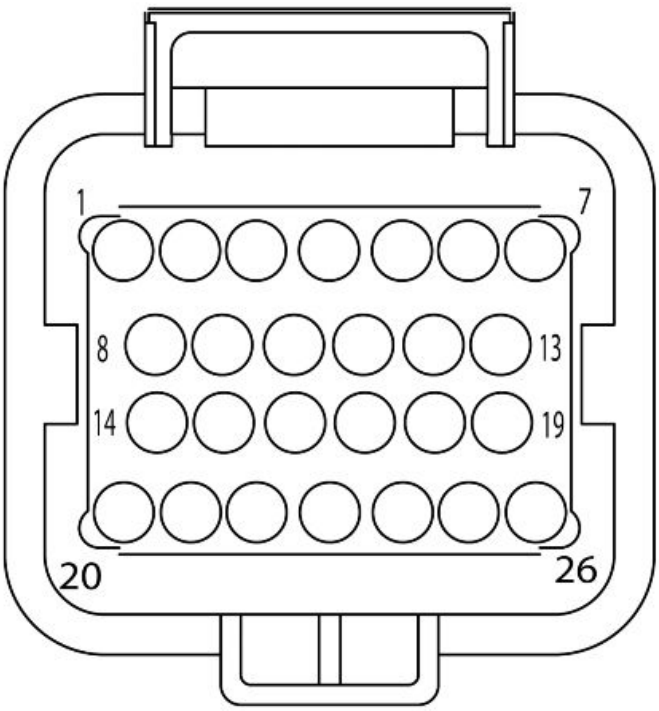
3. When fixing electric components, operate with the battery connected only when actually required.

4. When functional checks are performed, check that the battery voltage is over 12V.

5. Before any attempt 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 cable harnesses.
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.

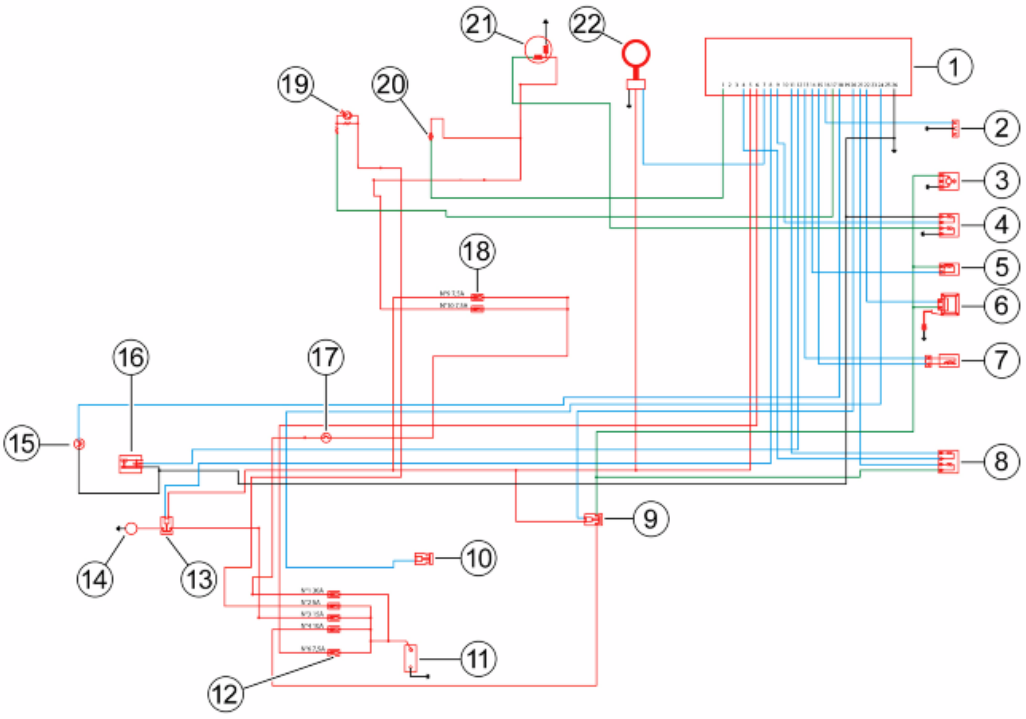
Terminals setup



TERMINAL LAYOUT

	Specification	Desc./Quantity
1	Injection telltale light	
2	-	
3	-	
4	Lambda probe negative	
5	Live supply	
6	Battery-powered	
7	Immobilizer aerial	
8	Electric fan solenoid	
9	Water temperature sensor	
10	-	
11	Lambda probe positive	
12	Engine stop switch	
13	Engine speed sensor (+)	
14	Fuel injector	
15	Engine speed sensor (-)	
16	Diagnostics socket output	
17	Immobilizer LED	
18	Side stand	
19	-	
20	Injection load solenoid	
21	-	
22	HV coil	
23	-	
24	Start up enabling	
25	-	
26	Ground lead	Connected with: water temperature sensor, stand witch and engine stop switch.

EMS circuit diagram



SYSTEM DIAGRAM

	Specification	Desc./Quantity
1	Injection ECU	
2	Diagnostics socket connector	
3	Fuel pump	
4	Water temperature sensor	
5	Fuel injector	
6	HV coil	
7	Engine Speed sensor	
8	Lambda probe	
9	Injection load solenoid	
10	Start-up solenoid	
11	Battery	12V - 12 Ah
12	Main fuses	
13	Electric fan solenoid	
14	Electric fan	
15	Stand switch	
16	Engine stop switch	
17	Ignition key contacts	
18	Auxiliary fuses	
19	Immobilizer LED	
20	"WARNING" light	
21	Water temperature gauge	
22	Immobilizer aerial	

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 STARTER PROBLEMS

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature
Starter speed	Starter motor and solenoid

Possible Cause	Operation
	Battery Ground connections
End of compression pressure	End of compression pressure
Power to the spark plug	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 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

Possible Cause	Operation
	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 - silencer silencer 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 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)

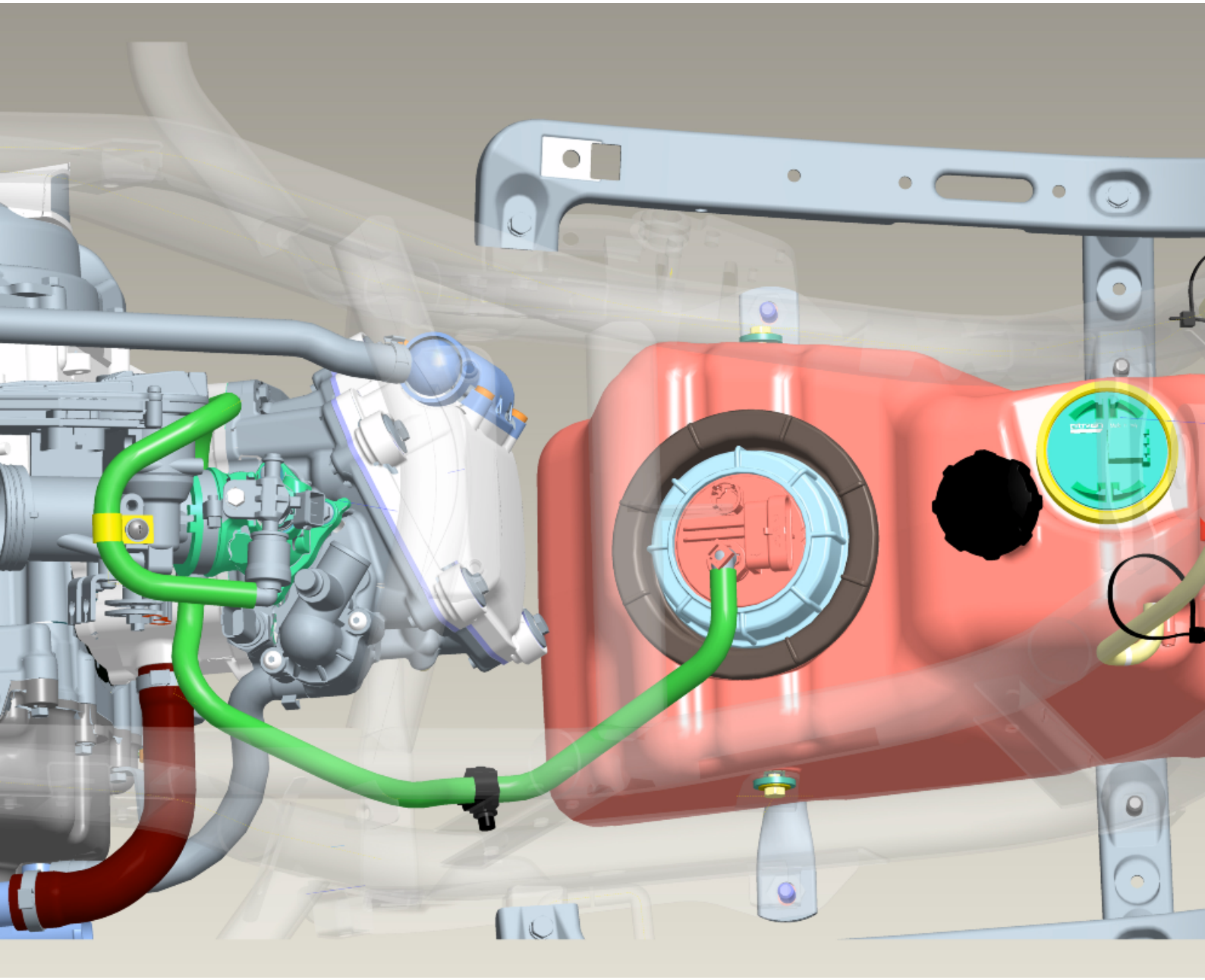
Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature Lambda probe
Ignition efficiency	Spark plug
Parameter reliability	Throttle valve position signal Coolant temperature indicator Intake air 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 supply circuit includes the electric pump, the filter, the pressure regulator, the electro-injector and the fuel delivery pipes.

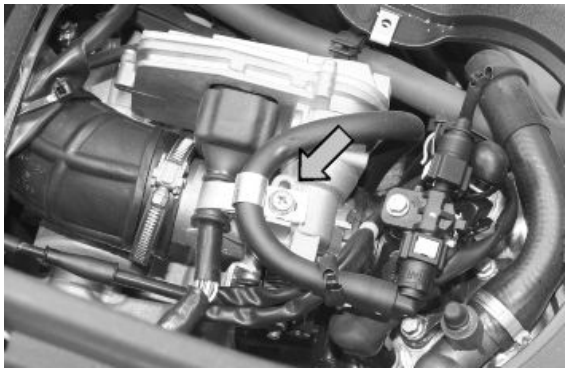
The electrical pump is located in the tank from which the fuel is pumped and sent to the injector through the filter.

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

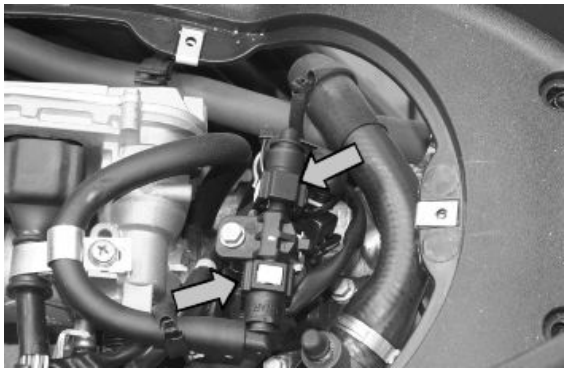


Removing the butterfly valve

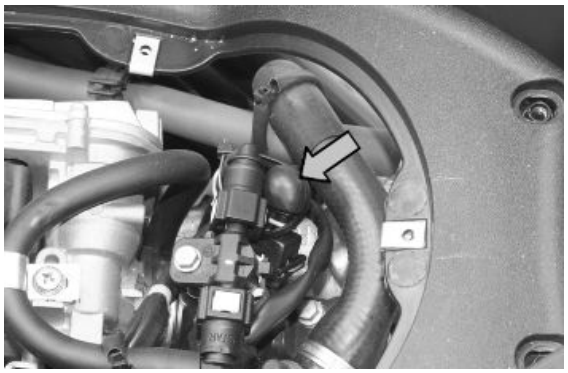
Remove the fuel piping clamping screw indicated in the figure.



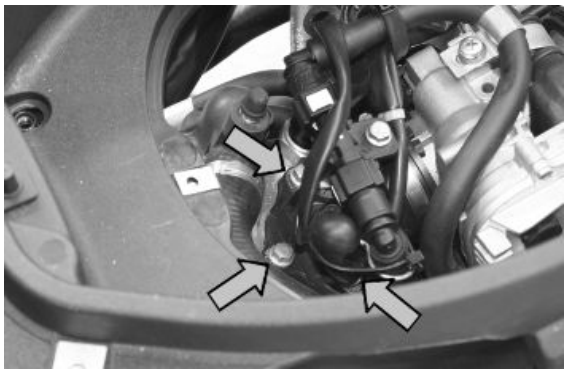
Remove the fast-release fittings from the injector support.



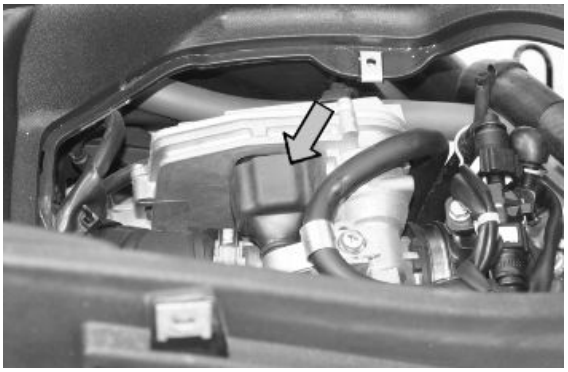
Remove the injector connector.



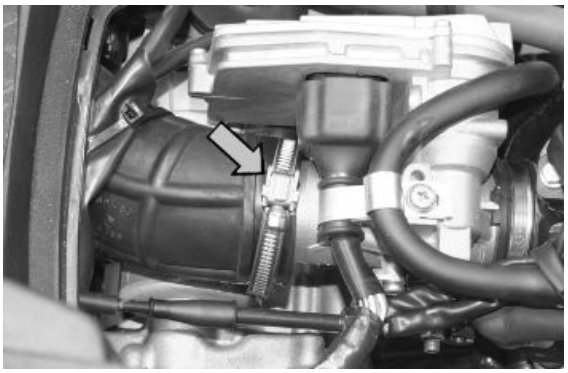
Remove the three screws fixing the manifold to the cylinder head and the clip fixing the throttle body to the manifold.



Remove the MIU ECU connector.



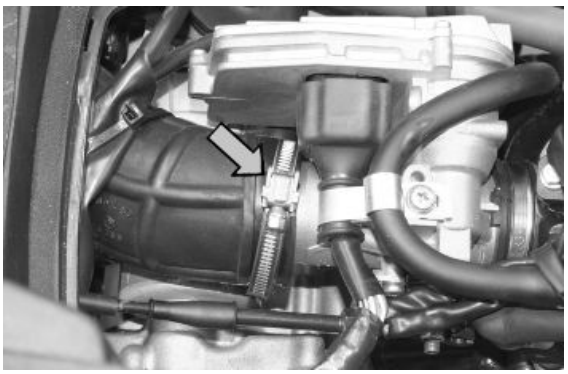
Remove the clip fixing the throttle body to the air cleaner bellows.



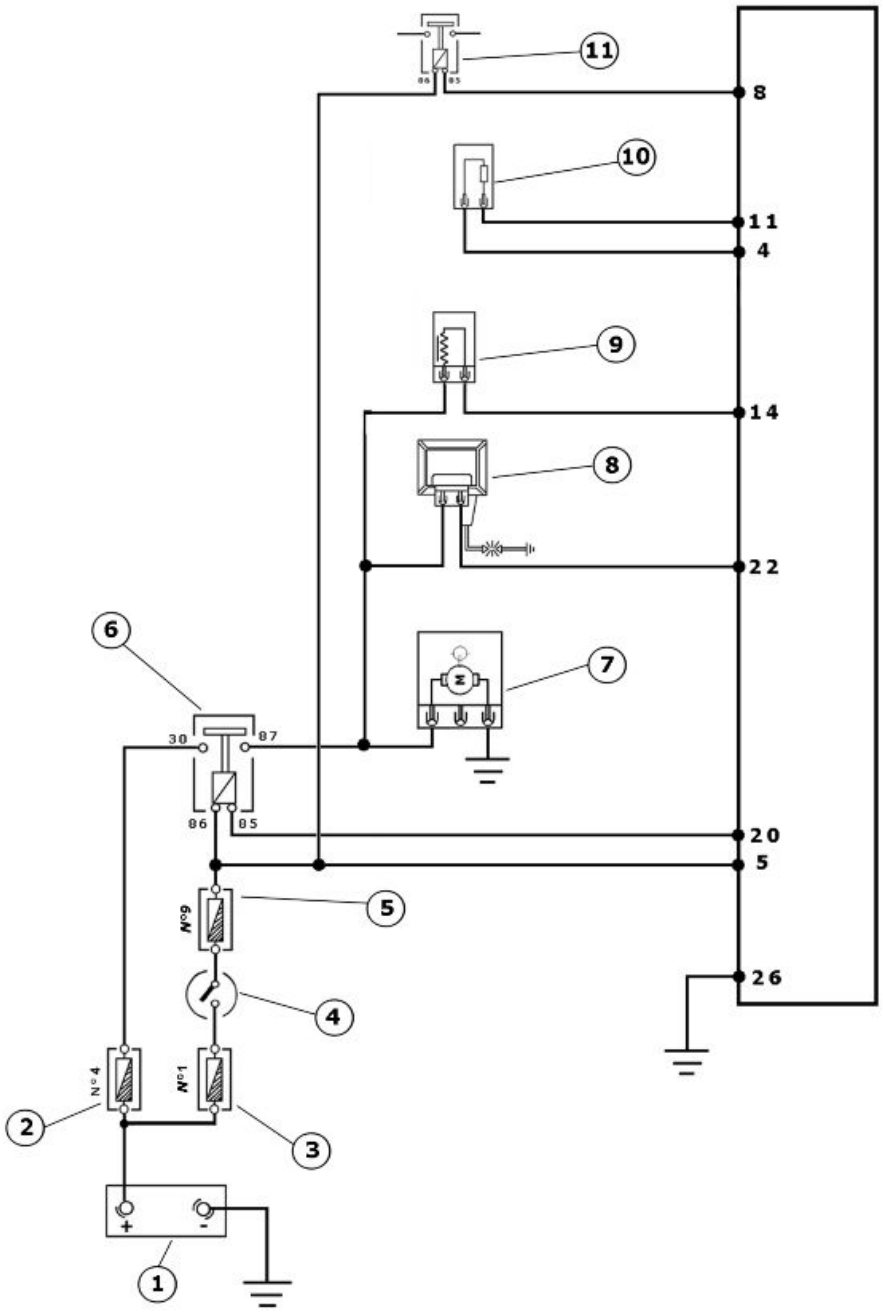
Remove the gas command fitting as indicated in the picture

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 photograph.



Pump supply circuit



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	10 A
3	Fuse	30 A
4	Ignition key contacts	
5	Fuse	7.5 A
6	Injection load solenoid	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda probe	

	Specification	Desc./Quantity
11	Electric fan solenoid	

When switched to «ON», the fuel pump starts to rotate for 2 seconds and then stops. When the engine starts, 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)

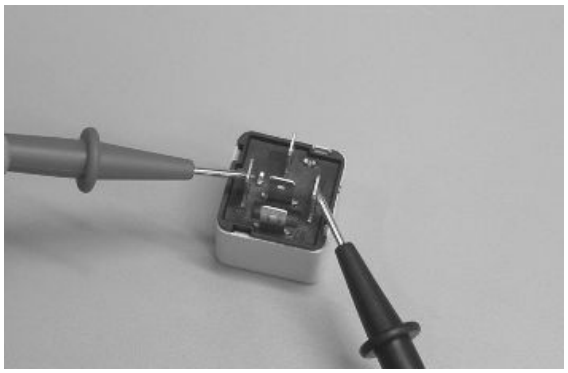
Check the efficiency of 10 A fuse N° 4 injection load.

Check the efficiency of 7.5 A fuse No. 9 key-controlled control unit power supply.

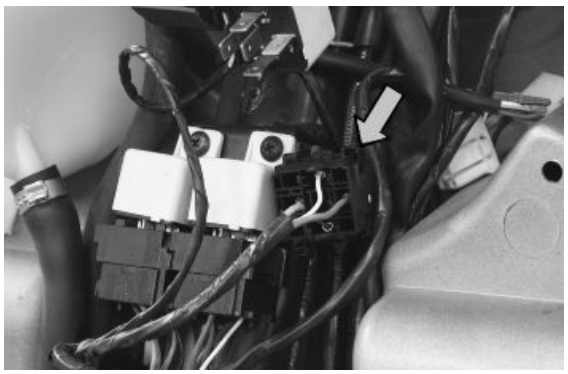
Check the efficiency of the injection load solenoid.

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 solenoid.

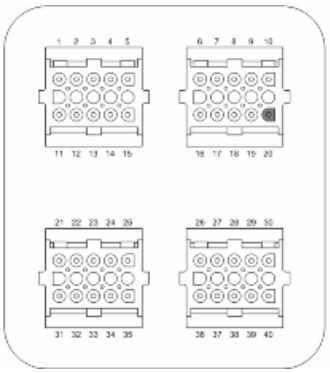


Check the power supply line of the injection load solenoid energising coil: after switching to «ON», make sure there is battery voltage, for 2 seconds, between the Red-White cable and the Black-Purple cable of the solenoid base. If there is not, check the continuity of the Red-White cable between the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

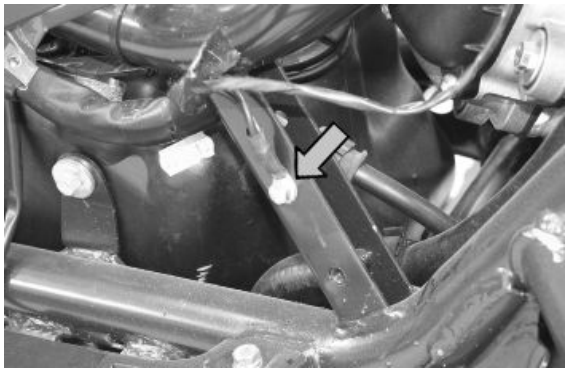


N.B.

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



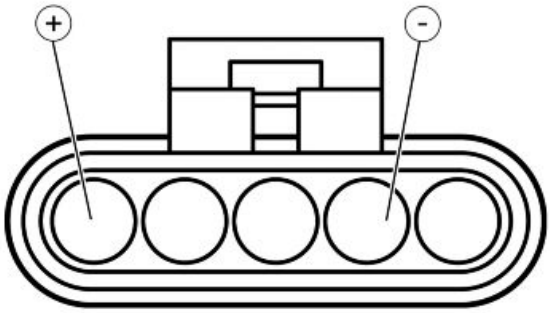
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.



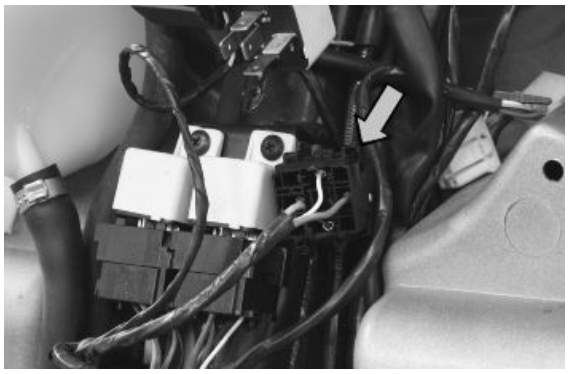
N.B.

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

After switching to «ON», check that there is battery voltage, for about 2 seconds, between the Black-Green cable of the pump connector and the ground lead with the pump connector disconnected. Otherwise, check the continuity of the Black-Green cable between the pump connector and the solenoid base.



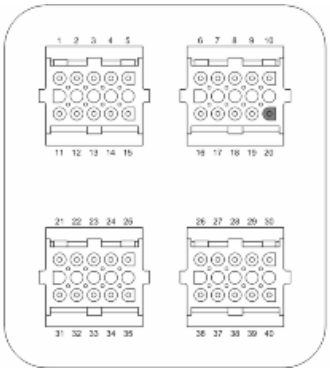
Check the efficiency of the ground line of the fuel pump by measuring the continuity between the pump connector black cable, system side, and the ground.



If, when switching to «ON», the pump continues to turn after 2 seconds of activation, check, with the control unit disconnected and the injection load solenoid 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

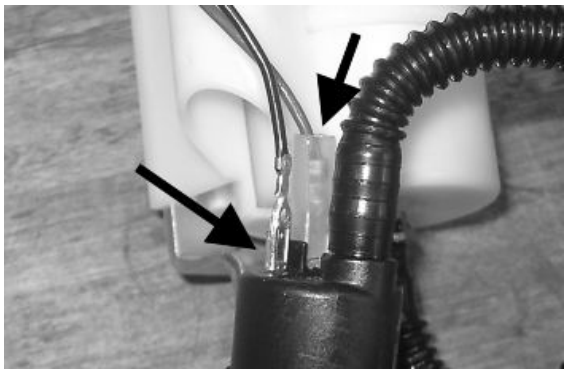
With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. Get a graded burette with a flow rate of approximately 1 L. Rotate the pump using the active diagnoses of the palm top computer. Using a pair 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^3.

Specific tooling

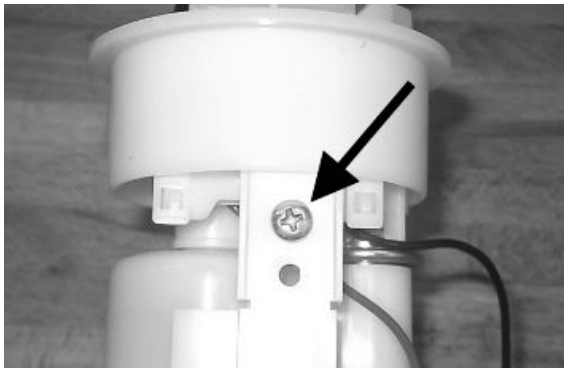
020480Y Petrol pressure check kit

Fuel filter check

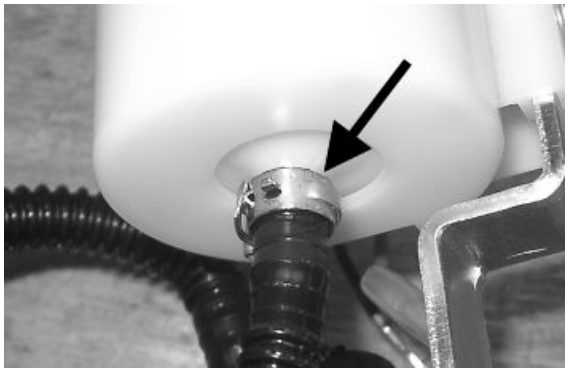
Disconnect the terminals from the electric pump



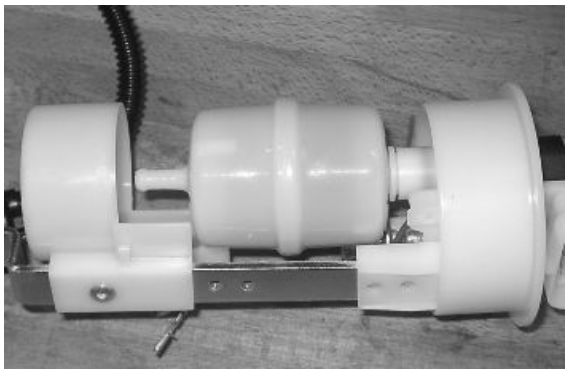
Remove the screw shown in the picture



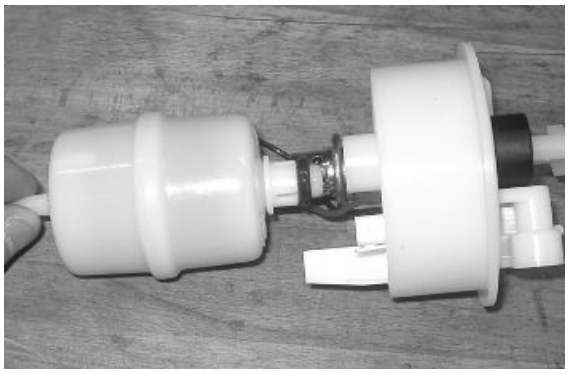
Remove the clip fixing the piping to the filter shown in the picture



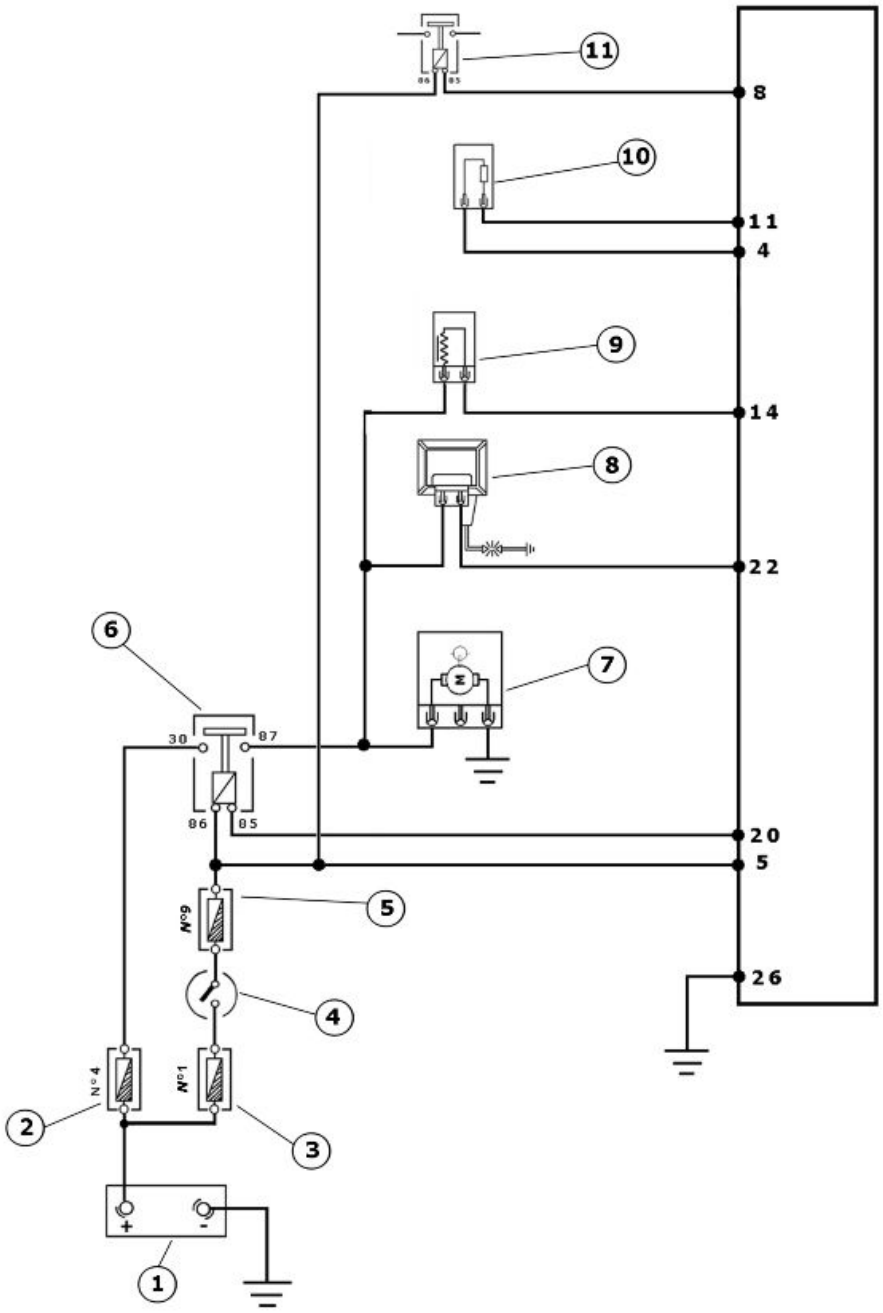
Separate the lower part of the pump mounting as shown in the picture.



Remove the filter from the pump mounting



Inspecting the injector circuit



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	10 A
3	Fuse	30 A
4	Ignition key contacts	
5	Fuse	7.5 A
6	Injection load solenoid	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda probe	

	Specification	Desc./Quantity
11	Electric fan solenoid	

Check the resistance at the injector ends: 14.5 ± 5% Ohm

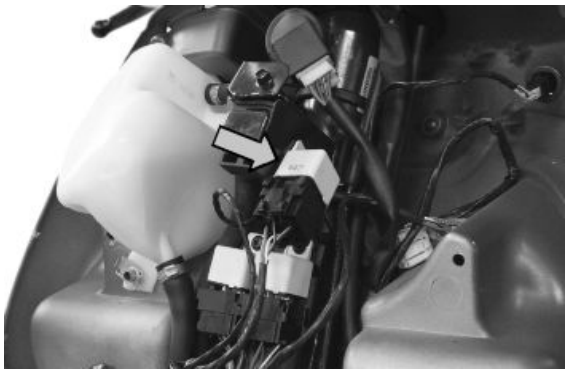
Check the efficiency of 10 A fuse N° 4 injection load.

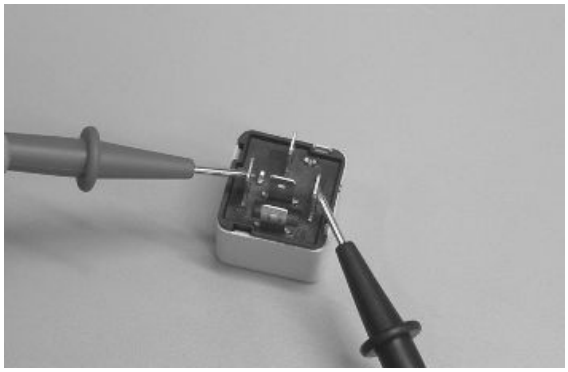
Check the efficiency of 7.5 A fuse No. 9 key-controlled control unit power supply.

Check the efficiency of the injection load solenoid.

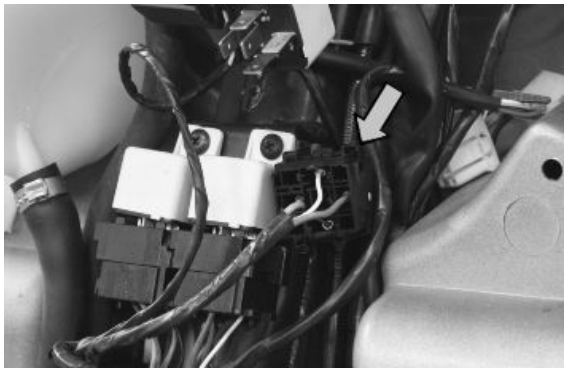
Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm

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



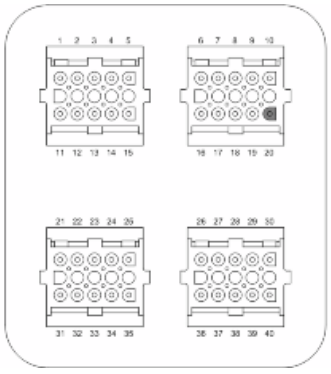


Check the power supply line of the injection load solenoid energising coil: after switching to «ON», make sure there is battery voltage, for 2 seconds, between the Red-White cable and the Black-Purple cable of the solenoid base. If there is not, check the continuity of the Red-White cable between the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

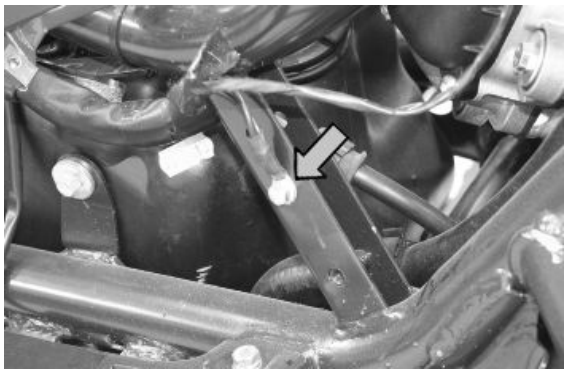


N.B.

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



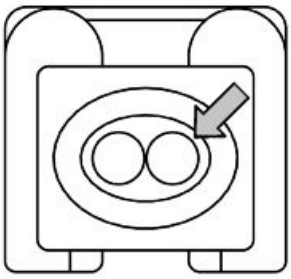
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.



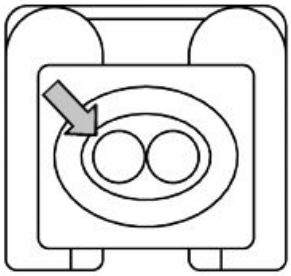
N.B.

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

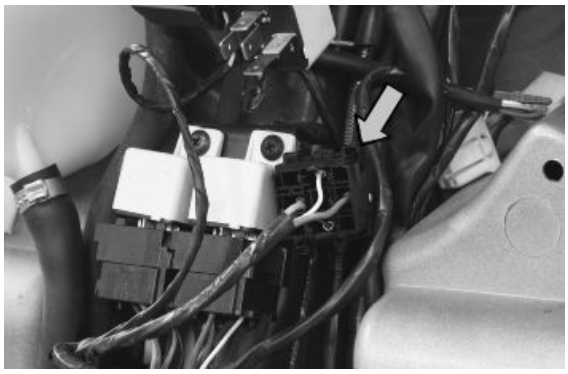
With the control unit and the injector disconnected, check the continuity of the Red-Yellow cable between pin 14 of the interface wiring and the injector connector



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

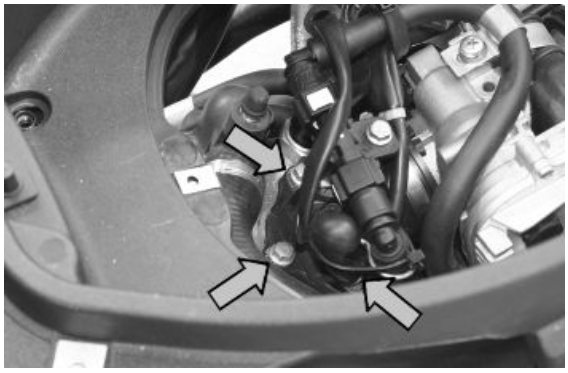


With injector disconnected and the injector load solenoid disconnected, check the continuity of the Black-Green cable between the injector connector and solenoid base.



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 cm³. 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 cm³ of fuel is dispensed with an adjustment pressure of approximately 2.5 BAR.

Specific tooling

020480Y Petrol pressure check kit

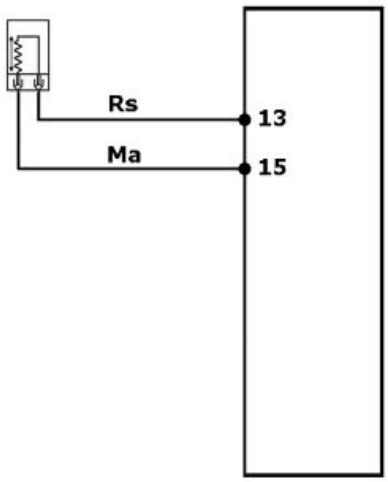
Proceed with the injector seal test.
Dry the injector outlet with a blast of compressed air. Activate the fuel pump. Wait for one minute, making sure there are no leaks coming from the injector. Slight oozing is normal.
Value limit = 1 drop per minute

Components location

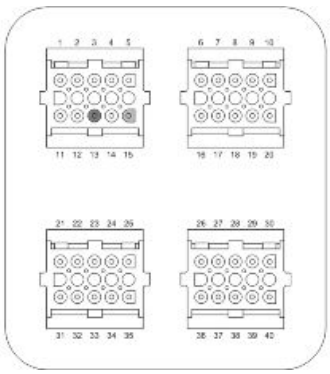
COMPONENT LAYOUT

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

Tachometer

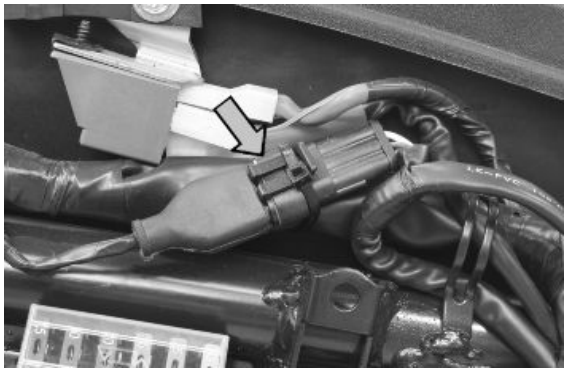


With wiring disconnected from the control unit and connected to the system, check that the sensor resistance between pins 13 - 15 is between 100 and 150 Ohm at an engine temperature of approximately 20°

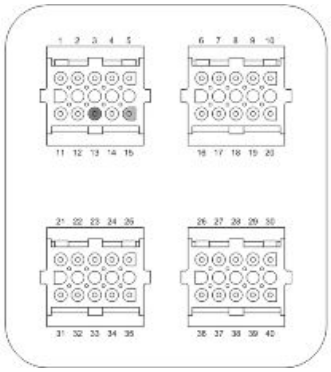


Disconnect the fuel pipe connector. Start up the engine and wait for it to stop. With the wiring connected to the control unit and system try to start up the engine and check that the voltage between pins 13 and 15 is around 2.8 V

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.

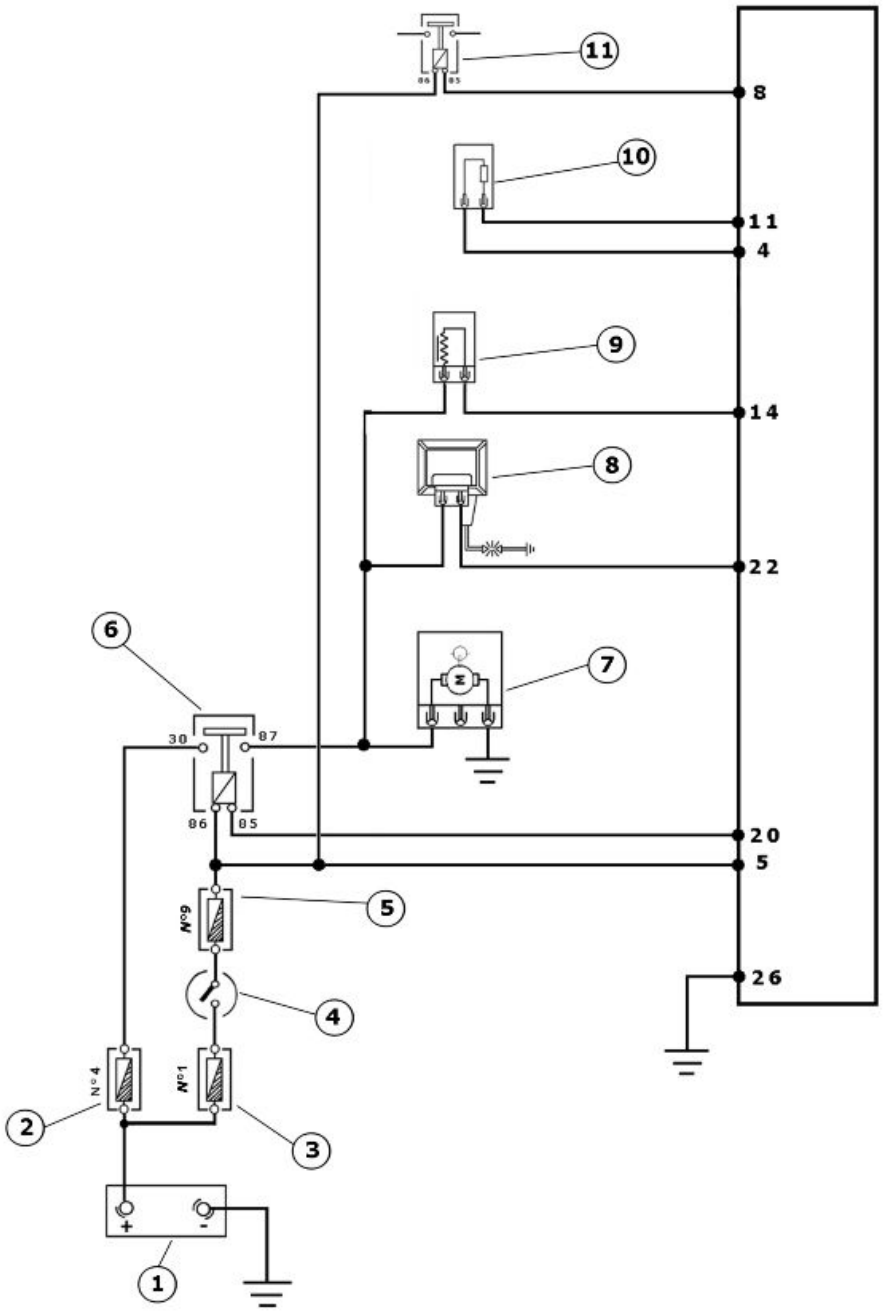


Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter

HT coil



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	10 A
3	Fuse	30 A
4	Ignition key contacts	
5	Fuse	7.5 A
6	Injection load solenoid	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda probe	

	Specification	Desc./Quantity
11	Electric fan solenoid	

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 ± 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

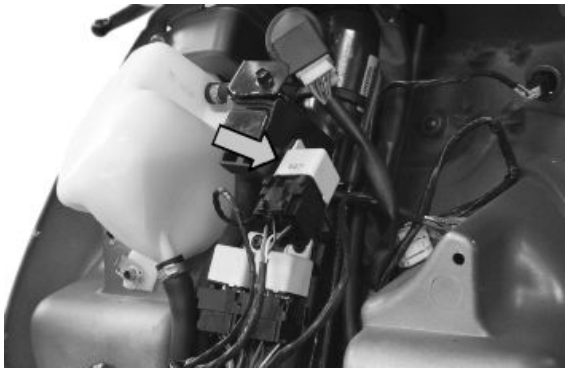
Check the efficiency of 10 A fuse N° 4 injection load.

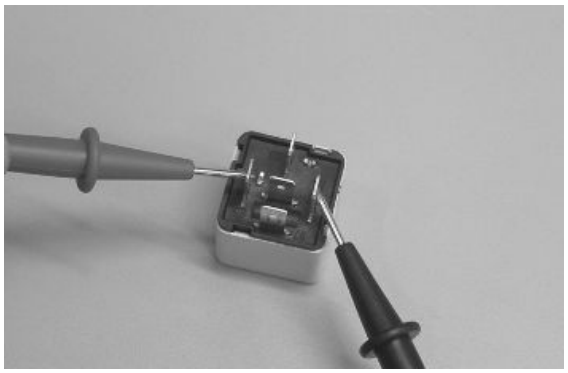
Check the efficiency of 7.5 A fuse No. 9 key-controlled control unit power supply.

Check the efficiency of the injection load solenoid.

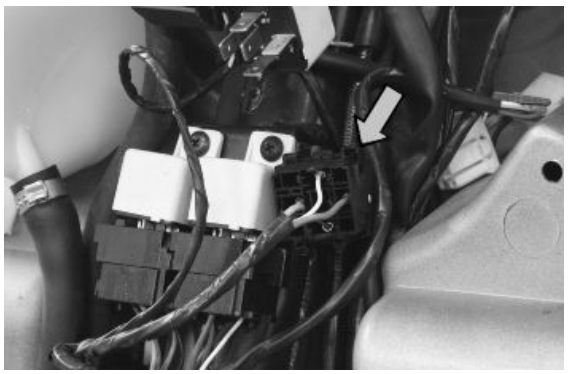
Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm

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



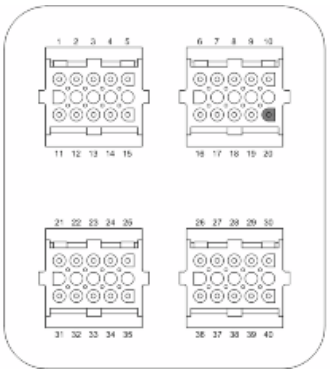


Check the power supply line of the injection load solenoid energising coil: after switching to «ON», make sure there is battery voltage, for 2 seconds, between the Red-White cable and the Black-Purple cable of the solenoid base. If there is not, check the continuity of the Red-White cable between the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



N.B.

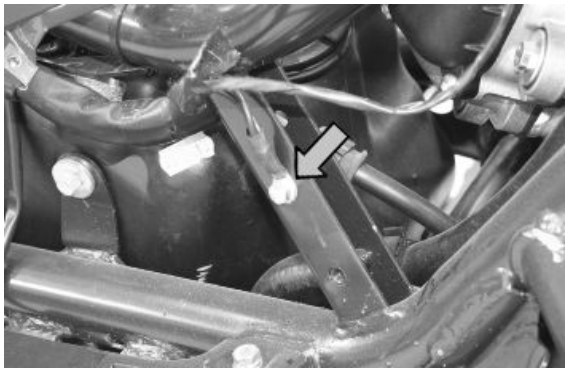
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (SOLENOIDS, CONTROL UNIT, FUSES ETC.).



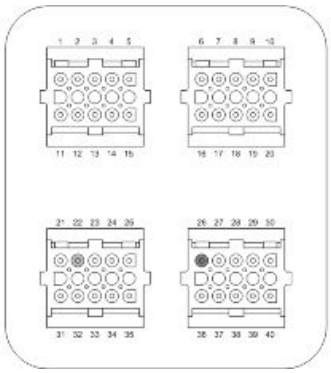
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.

N.B.

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

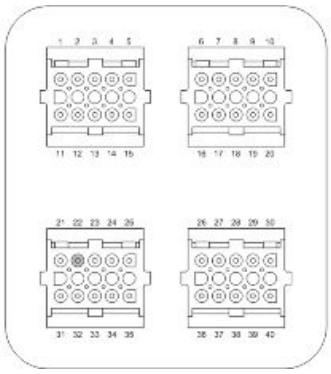


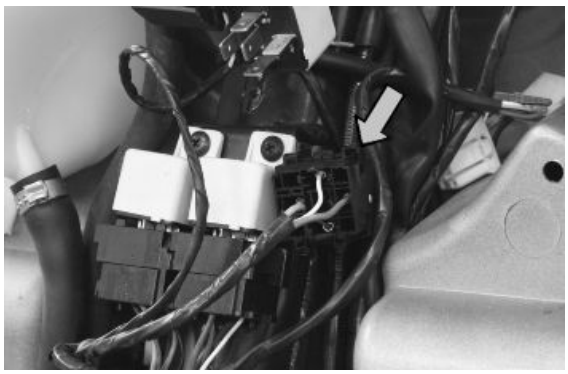
Check there is voltage between pins 22 and 26 of the interface wiring for around two seconds when switching to «**ON**».



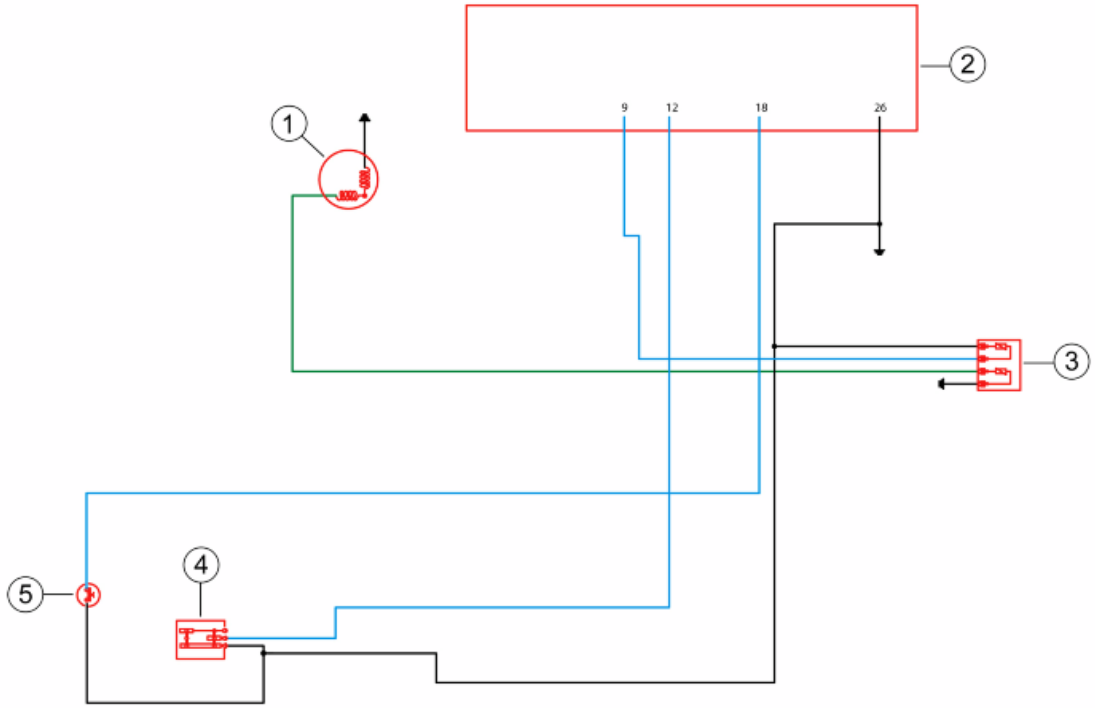
Check the resistance of the primary coil between pin 22 of the interface wiring and the green black cable of the injection load solenoid base with the control unit disconnected and the solenoid disconnected.

Resistance of the primary = 0.5 ± 8% Ohm





Coolant temperature sensor



TEMPERATURE SENSOR

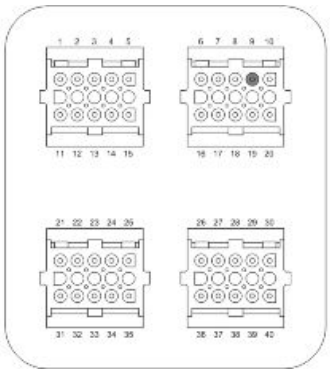
	Specification	Desc./Quantity
1	Instrument panel	
2	Electronic control unit	
3	Water temperature sensor	
4	Engine stop switch	
5	Side stand switch	

With the connector on the control unit side disconnected and the coolant temperature sensor connector connected, check that the resistance values between pin 9 and the ground lead correspond with the engine temperature.

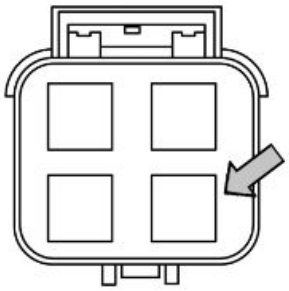
20° = 2500 ± 100 Ω

80° = 308 ± 6 Ω

With the connector on the control unit side disconnected and the coolant temperature connector disconnected, check the insulation between the light-blue/green cable and ground lead.



With the connector on the control unit side disconnected and the coolant temperature connector disconnected, check the continuity between pin 9 of the interface cable harness and the light-blue/ green cable of the connector.



Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter

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.

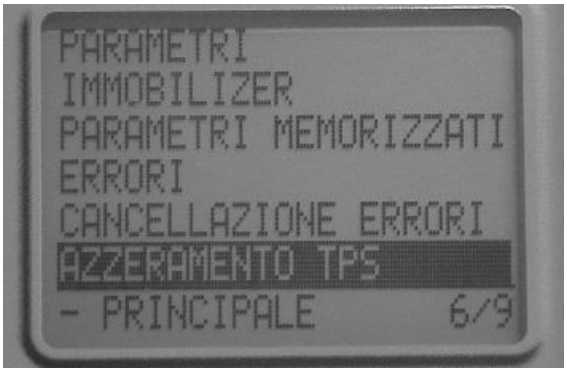
With this operation we inform the control unit, as the starting point, of the mV value corresponding to the pre-calibrated position.

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.

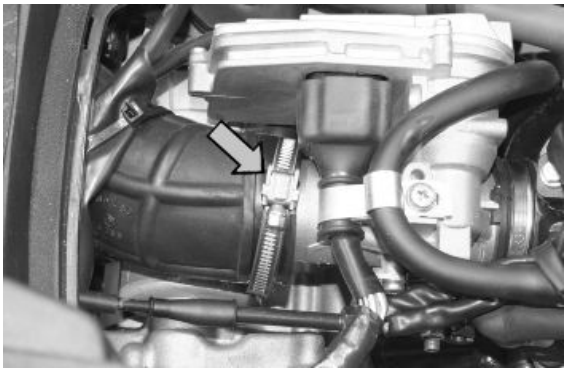
Reset should be performed in the following cases:

- on first fitting.
- if the injection control unit is replaced.

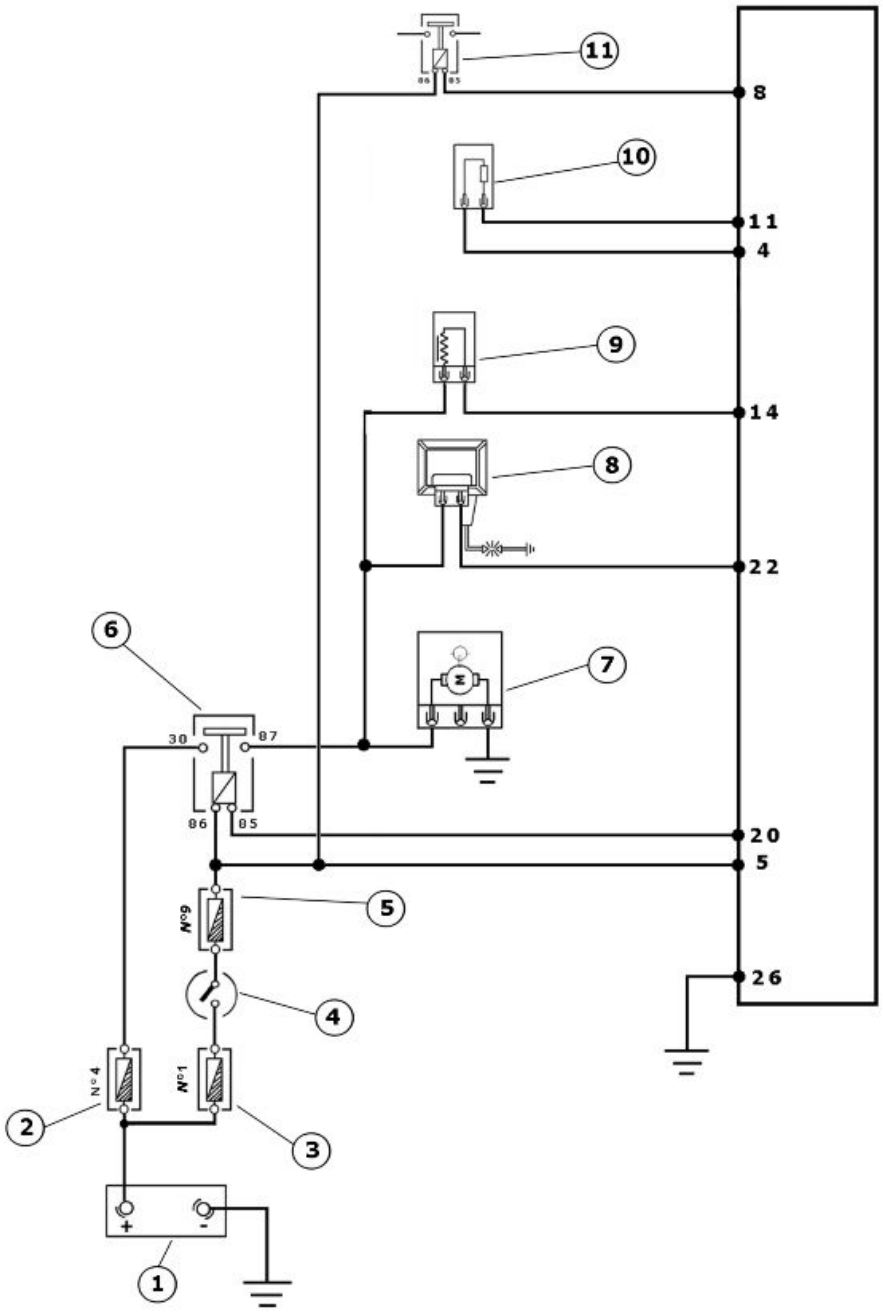
N.B.

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



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	10 A
3	Fuse	30 A
4	Ignition key contacts	
5	Fuse	7.5 A
6	Injection load solenoid	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda probe	

	Specification	Desc./Quantity
11	Electric fan solenoid	

The Lambda probe or oxygen sensor is a sensor which provides indications concerning the oxygen content in the exhaust gas. The signal generated is not of the proportional type but of the ON/OFF type, i.e. there is oxygen or there is not. The sensor is positioned on the exhaust manifold before the catalytic converter in an area where the gas temperature is always high. The temperature at which the sensor works is at least 350°C at 600°C and it has a reaction time of just 50 milliseconds. The signal generated passes from a high value to a low value with a mixture with lambda =1. Since the sensor only works at high temperatures, it has an electric preheating element inside it, controlled by the control unit, to take it quickly to the functioning state.

Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter

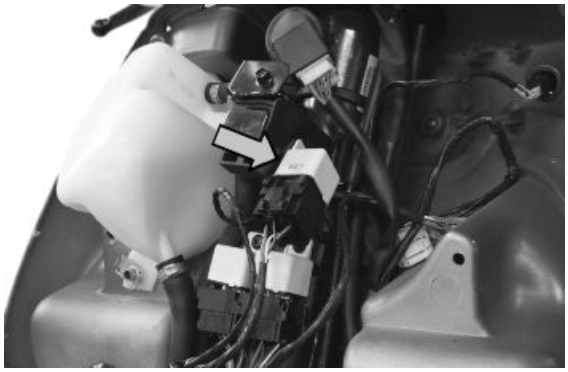
Check the efficiency of 10 A fuse N° 4 injection load.

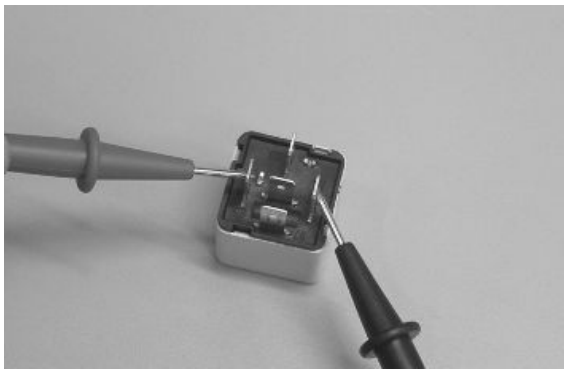
Check the efficiency of 7.5 A fuse No. 9 key-controlled control unit power supply.

Check the efficiency of the injection load solenoid.

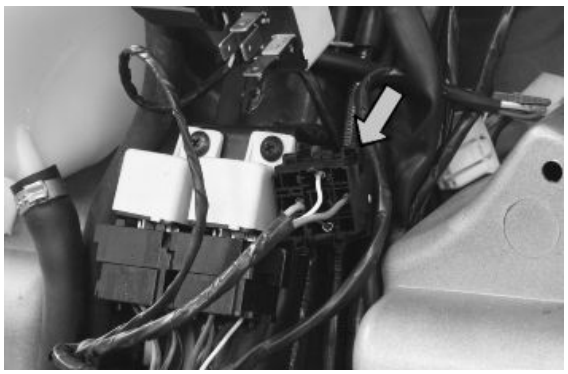
Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm

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



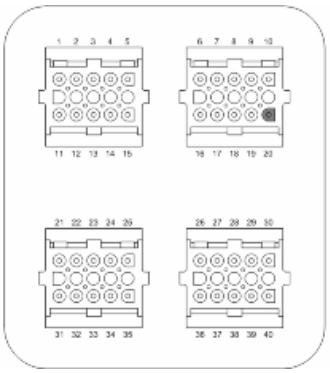


Check the power supply line of the injection load solenoid energising coil: after switching to «ON», make sure there is battery voltage, for 2 seconds, between the Red-White cable and the Black-Purple cable of the solenoid base. If there is not, check the continuity of the Red-White cable between the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

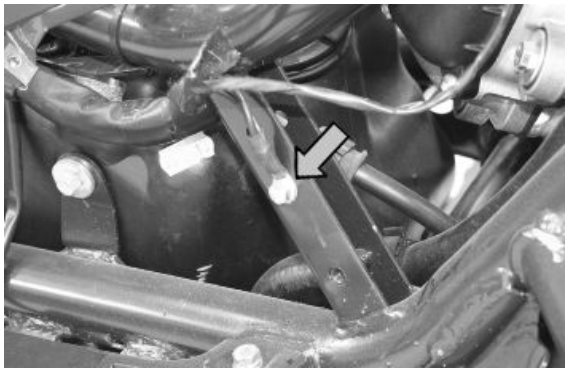


N.B.

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



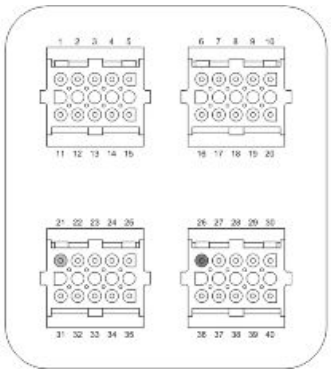
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.



N.B.

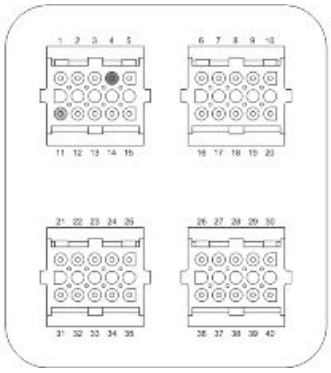
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (SOLENOIDS, CONTROL UNIT, FUSES ETC.).

Check there is voltage between pins 21 and 26 of the interface wiring, for around two seconds, when switching to «**ON**».

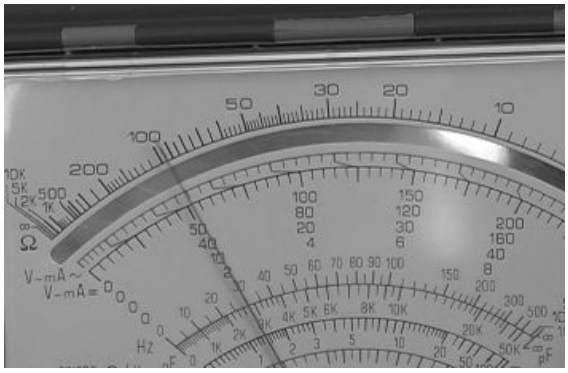


SIGNAL CONTROL

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..



INDEX OF TOPICS

Front

Removing the front wheel

- Remove the front brake calliper.

- Loosen the wheel axle lock-nut.

- Loosen the two wheel axle safety screws on the fork leg, on the brake calliper side.

- Pull out the wheel axle.

See also

Removal

Front wheel hub overhaul

Check that the wheel bearings do not show signs of wear.

If you have to replace the wheel bearings, proceed as follows:

- Remove the plastic cover on the tone wheel side to avoid damage by loosening the 5 fixing screws.
- Remove the two bearings on the odometer drive side using the pliers 14 or 34 and the bell detail 9.
- Remove the internal spacer.

*** Either tool can be used.**

- Support the front wheel with two wooden shims that make it possible to avoid scratching in the case of contact with the rim.
- Insert the punch (consisting of adaptor handle, 15 mm adaptor and guide) from the odometer drive side to permit the removal of the brake disc side bearing and the spacer bushing.

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020412Y 15-mm guide

- Heat the bearing seat on the side the brake disc with the heat gun.

- Insert the bearing using the punch consisting of adaptor handle, 42x47 mm adaptor and 15 mm guide, and drive it up to the stop.

- Reinsert the spacer bushing on the brake disc side using the appropriate tool and take it to the stop.

Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

020412Y 15-mm guide

020201Y Spacer bushing driving tube

- Turn over the wheel and insert the internal spacer with the part fitted with the Seeger ring facing the bearing on the brake disc side installed previously.

- Heat the bearing seat on the odometer drive side with the heat gun.

- Insert the two bearings using the punch consisting of adaptor handle, 32x35 mm adaptor and 15 mm guide, and drive it up to the stop.

Specific tooling

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

020412Y 15-mm guide

- Refit the cap and tighten the five fixing screws.

Refitting the front wheel

- Grease the wheel axle, then install it from the tone wheel side and install the tone wheel properly.
- Tighten the wheel axle nut to the prescribed torque.

N.B.

TAKE CARE NOT TO DAMAGE THE ODOMETER DRIVE. FOR THE SAKE OF SAFETY, OFFSET THE INTERNAL STOP FROM THE STOP OF THE TONE WHEEL BY 90°.

- Tighten the two safety screw on the fork leg to the prescribed torque.

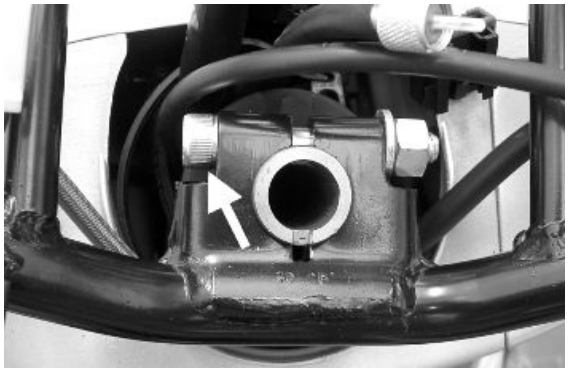
Locking torques (N*m)

Front wheel axle nut 45 - 50 **Safety screw on fork leg** 6 - 7

Handlebar

Removal

- Remove the rear handlebar cover.
- Remove the pin mounting the handlebar to the steering tube.
- Remove the handlebar and place it on the rear cover of the legshield.

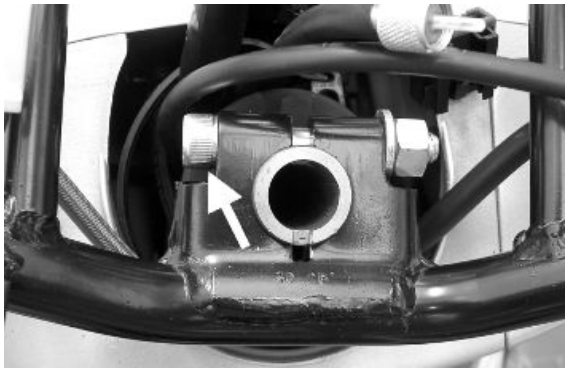


See also

Rear handlebar cover

Refitting

- Install the handlebars on the steering tube, paying attention to the centring, aligning the recess on the handlebar with that on the steering tube as shown in the figure.
- Tighten the handlebar fixing screw on the steering tube to the prescribed torque.



Locking torques (N*m)

Handlebar fixing screw (*) **45 to 50**

(*) Lubricate the nuts with engine oil before installation

Front fork

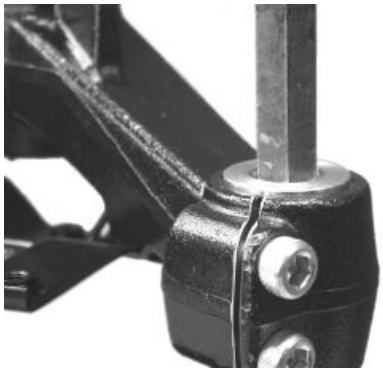
Removal

Overhaul

- Support the fork in a vice.
- Loosen the two tightening screws of the stem supporting clamp.
- Unscrew the stem closing cap and slide off the complete fork leg from the corresponding support.

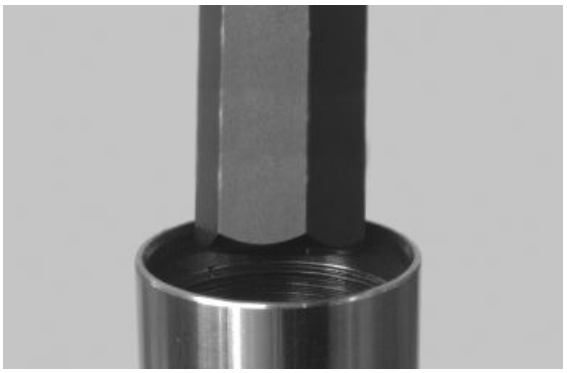
CAUTION

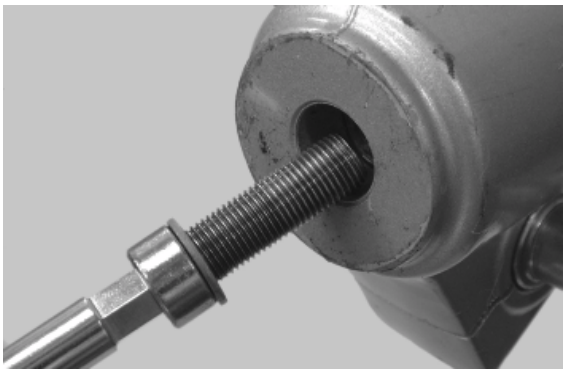
THE STEM CLOSING CAP KEEPS THE MAIN SPRING PRE-LOADED. KEEP THE CAP PROPERLY FITTED DURING THE REMOVAL FINAL STAGE TO AVOID ACCIDENTS.



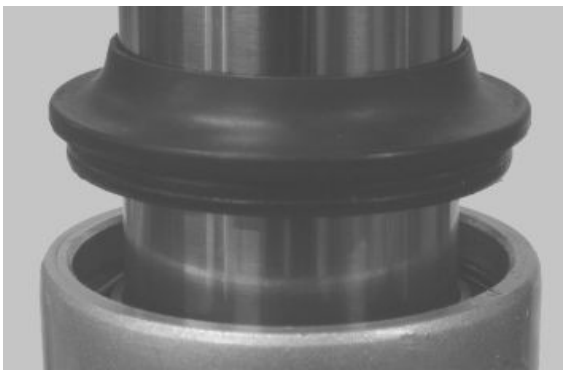
- Support the fork leg properly, remove the main spring and drain off the fork leg oil.

- Remove the hydraulic rod fixing screw with the corresponding sealing gasket:
- With a 19-mm hexagonal spanner, lock hydraulic rod rotation.
- Undo the fixing screw and collect the copper washer.

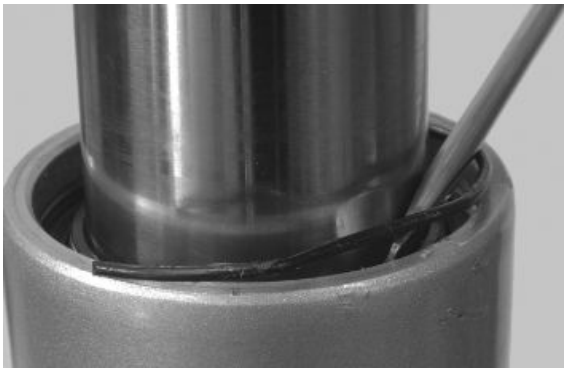




- Remove the stem dust guard with a screwdriver.



- Remove the circlip retaining the oil seal.



- Take out the stem.

- Check there are no signs of wear or seizing between the stem and the fork leg. Otherwise, replace the damaged parts.

Characteristic

Maximum fork leg diameter

35.10 mm

Minimum stem diameter

34.90 mm

- Take out the oil seal using the appropriate tools.
- Fit the tie rod into the oil seal.
- Insert in sequence the two half-rings per Ø 35-mm stems.

Specific tooling

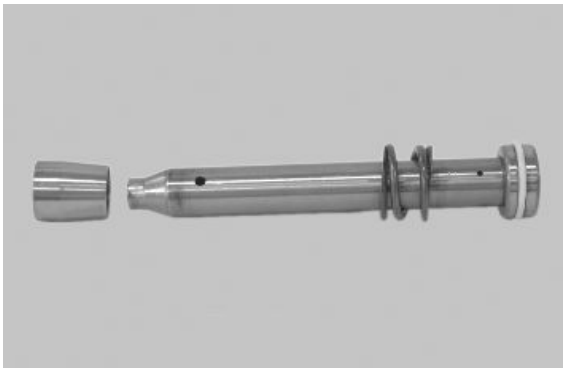
020487Y Fork oil seal extractor

- Hold the tie rod manually so that it does not fall into the fork leg and/or that both half-rings are not in their position.
- Fit the bell.
- Tighten the nut until it stops.
- Act on the tool until the oil seal is completely removed.

Specific tooling

020487Y Fork oil seal extractor

- Remove the hydraulic rod with the corresponding sealing gasket, the spring and the stop bushing.

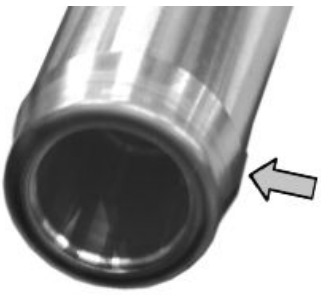


COMPONENT CHECK

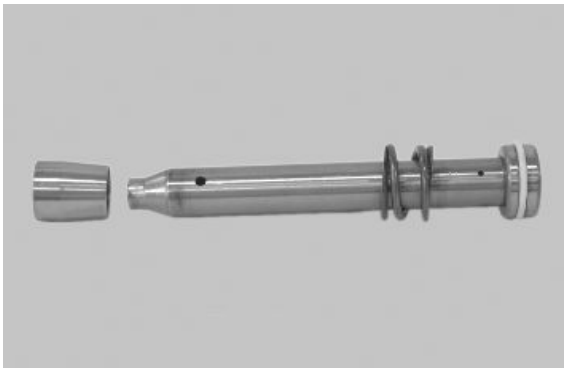
CAUTION

CLEAN ALL THE COMPONENTS THOROUGHLY.

- Check that the fork leg is not cracked or broken in the attachments.
- Check that the stem is not scored, dented or distorted.
- Check that the stop bushing for the hydraulic rod is correctly fixed through caulking.



- Check that hydraulic rod caulkings, the return spring to the unloaded the end of stroke and the hydraulic rod sealing ring are in good conditions.



- Check that the main spring exhibits no signs of yielding or abnormal wear.

- Check that the closing cap O-ring of the stem is in good conditions.

Refitting

- First grease the splitting chamber of the two sealing lips of a new oil seal.
- Fit the sealing ring on the stem and keep the identification words facing upwards.
- Drive the oil seal as far as it will go using the appropriate tool.

Specific tooling

020376Y Adaptor handle

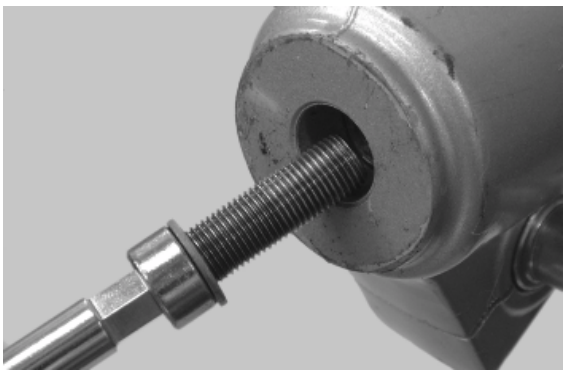
020359Y 42x47-mm Adaptor

- Pre-fit the stem with the hydraulic rod, the spring and the stop bushing.
- Fit the pre-assembled components inside the fork leg.

- Fit the hydraulic rod fixing screw with the copper sealing washer and tighten to the prescribed torque using the recommended product.

CAUTION

ALWAYS USE NEW COPPER WASHER.

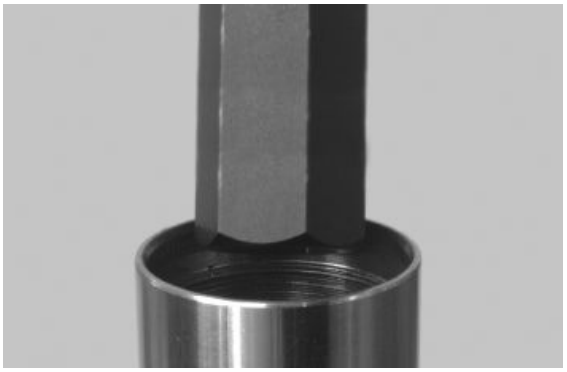


Locking torques (N*m)

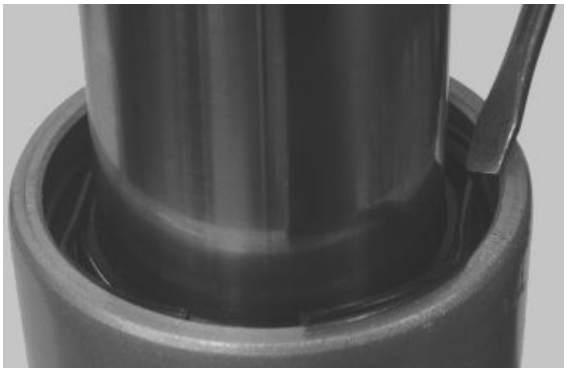
Hydraulic rod fixing screw 25 ÷ 35*

(°) Apply LOCTITE 243 threadlock

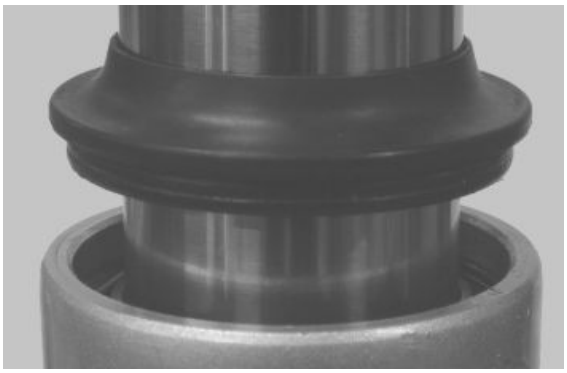
- Lock hydraulic rod rotation using a 19-mm hexagonal spanner.



- Fit the oil seal retaining circlip.



- Grease and fit a new dust guard.



- Fit the fork leg together with the stem on the fork supporting clamp until it stops.
- Tighten the two screws to the prescribed torque in the sequence indicated in the picture.

Locking torques (N*m)

Stem support clamp tightening screws **20 to 25**

- Refill the fork leg with the recommended product to the prescribed amount.

Recommended products

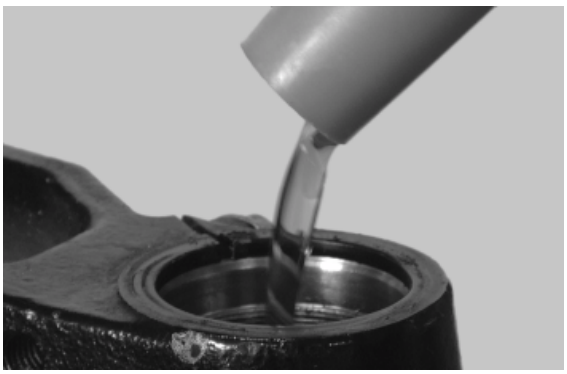
AGIP FORK 7.5 W Oil for front fork

Hydraulic fluid SAE 7.5 W

Characteristic

Oil quantity per stem

133 ± 3 cm^3



- Bleed the hydraulic rod by actuating the stem repeatedly.
- Fit the spring into the stem.

- Lubricate the closing cap O-ring of the stem.
- Preload the spring, fit the closing cap and tighten to the prescribed torque.

Locking torques (N*m)

Fork locking screws cap **15 ÷ 30**

- Repeat the procedure for the other fork leg.

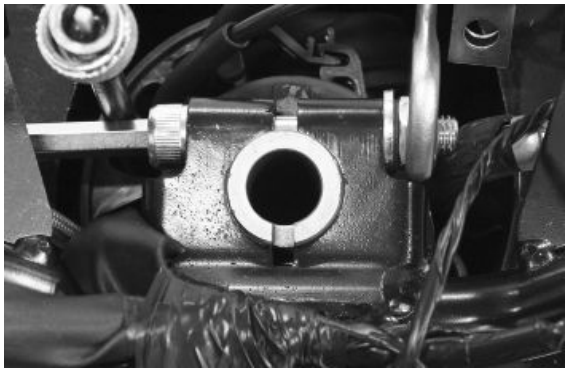
N.B.

IF BOTH FORK LEGS ARE SERVICED AT THE SAME TIME, BE CAREFUL NOT TO INVERT THE RIGHT FORK LEG WITH THE LEFT ONE.

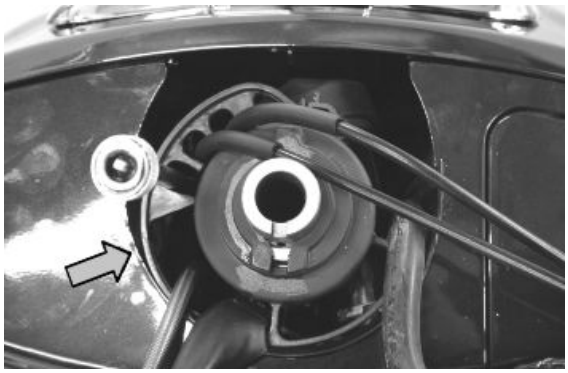
Steering column

Removal

- Remove the front wheel.
- Remove the front mudguard
- Remove the front brake calliper
- Remove the front and rear handlebar covers.
- Remove the pin mounting the handlebar to the steering tube.
- Remove the handlebar and rest it on the shield back plate.



- Remove by releasing the cable passages and sliding the protection collar upwards.



Using the special tool, loosen and remove the upper ring nut, the spacer washer and the counter-ring nut.

- Extract the fork.

N.B.

TAKE CARE TO SUPPORT THE FORK SO AS TO PREVENT IT FROM COMING OFF ABRUPTLY

Specific tooling

020055Y Wrench for steering tube ring nut

Refitting

- Fit the lower steering fifth wheel on the steering tube.
- Fit the fork together with the lower steering fifth wheel on the headstock and hold it so that it does not fall.

N.B.

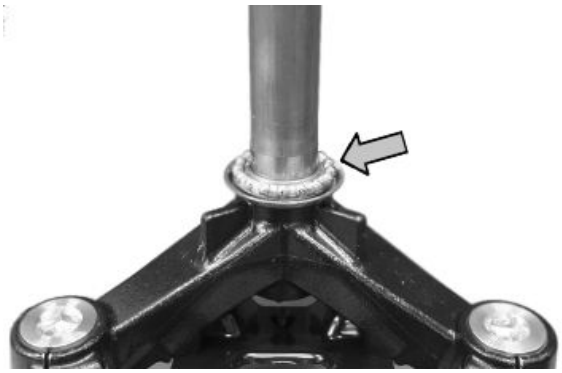
LUBRICATE THE STEERING FIFTH WHEEL TRACKS WITH RECOMMENDED GREASE BEFORE USE.

Recommended products

AGIP GREASE PV2 Grease for steering bearings, bolt seatings for swinging arms and fay-

ing surface of driven pulley spring (only pulley side)

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



- Fit the upper steering fifth wheel.

CAUTION

INSERT THE UPPER FIFTH WHEEL WITH THE CAGE FACING UPWARDS.

- Fit the steering fifth wheel upper seat.

- Fit the cover plate.

- Insert the lower tightening ring nut, screw until it stops and, with the specific tool, tighten to the prescribed torque.

Specific tooling

020055Y Wrench for steering tube ring nut

Locking torques (N*m)

Steering tube lower ring nut **14 ÷ 17**

- Fit the spacer between the two ring nuts on the steering tube in the position indicated.

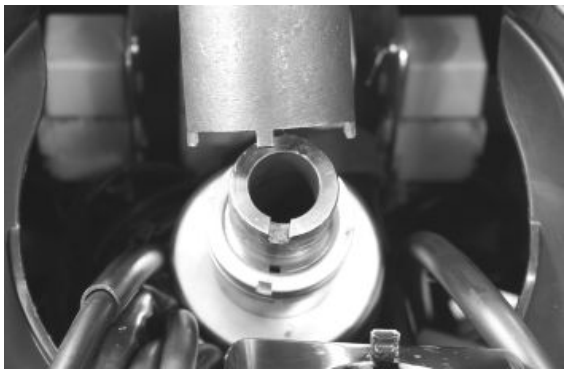
- Insert the upper tightening ring nut, screw until it stops and, with the specific tool, tighten to the indicated torque.

Specific tooling

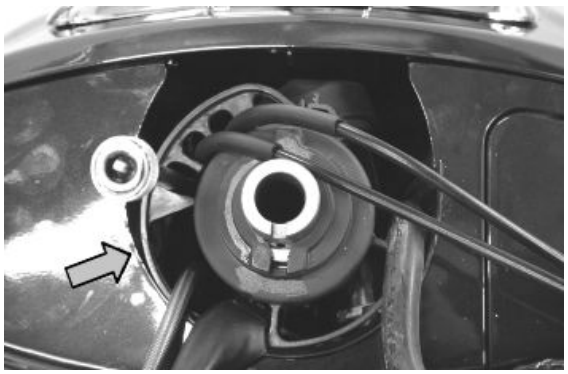
020055Y Wrench for steering tube ring nut

Locking torques (N*m)

Steering tube upper ring nut **40 ÷ 45**



Insert the collar shown in the figure and restore the cable passage as shown in the figure.



- Fit the front wheel.

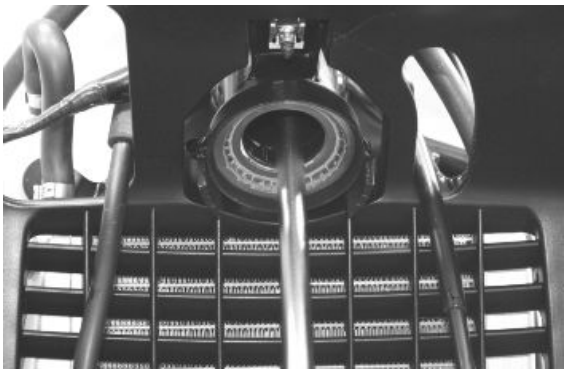
Steering bearing

Removal

- Clean thoroughly and visually inspect if the components are in good conditions.
- Check the upper steering fifth wheel for wear.

- Check the lower steering fifth wheel for wear.

- Visually inspect that the steering fifth wheel tracks, the headstock and the steering tube exhibit no scores or abnormal wear. Otherwise, replace them.

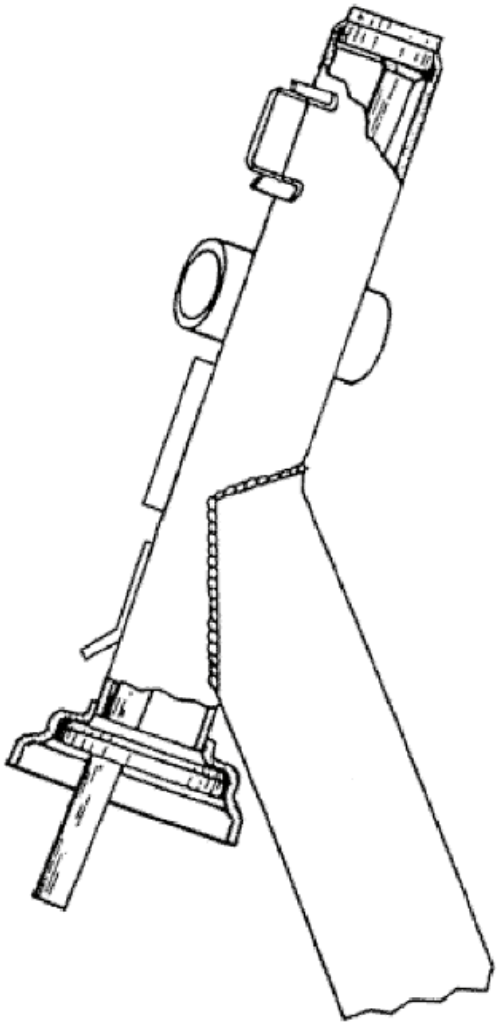


STEERING FIFTH WHEEL TRACK REMOVAL

- Remove the steering fifth wheel tracks on the chassis with the specific tool, following the indicated procedure.
- Fit the specific tool from the lower part of the headstock until it makes contact with the upper track.
- Hit with force the specific tool, placing it at different points diametrically opposed so as to remove the upper track.

Specific tooling

020004Y Punch for removing steering bearings from headstock



- Repeat the procedure for the lower steering fifth wheel track.

- Remove the lower fifth wheel seat on the steering tube using the specific tool.

Specific tooling

020004Y Punch for removing steering bearings from headstock

Refitting

STEERING FIFTH WHEEL TRACK FITTING

- Thoroughly clean the track seats on the headstock and the steering tube.
- Fit the new tracks of the headstock with the specific tool.
- Screw the nut until the tracks are fully inserted.

N.B.

LUBRICATE THE STEERING FIFTH WHEEL TRACKS WITH RECOMMENDED GREASE BEFORE USE.

Specific tooling

001330Y Tool for fitting steering seats

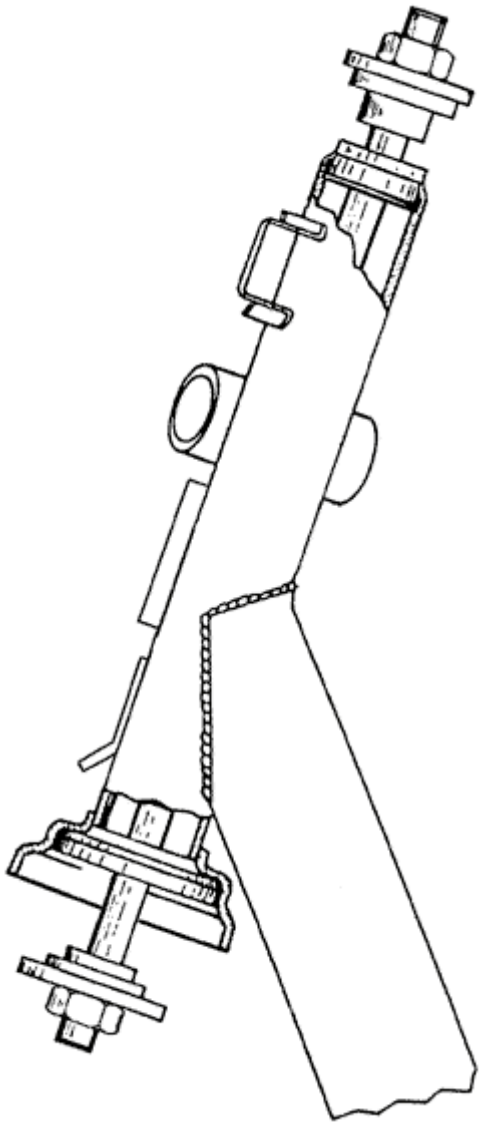
001330Y014 Tool for fitting steering seats

001330Y015 Tool for fitting steering seats

Recommended products

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

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



- Fit the lower fifth wheel seat on the steering tube.
- With a tube of the indicated sizes, fit the lower seat until it stops. Inside Ø: 35.5 mm; Outside Ø: 38 mm; Length: 350 mm.

N.B.

LUBRICATE THE STEERING FIFTH WHEEL TRACKS WITH RECOMMENDED GREASE BEFORE USE.

Recommended products

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

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

Rear

Removing the rear wheel

- Remove the muffler mounting bracket
- Remove the 5 screws shown in the picture

Refitting the rear wheel

- Carry out the removal operations but in reverse order, observing the prescribed tightening torques.

Locking torques (N*m)

Fixing screw for wheel rim to hub 33 - 37

Swing-arm

Removal

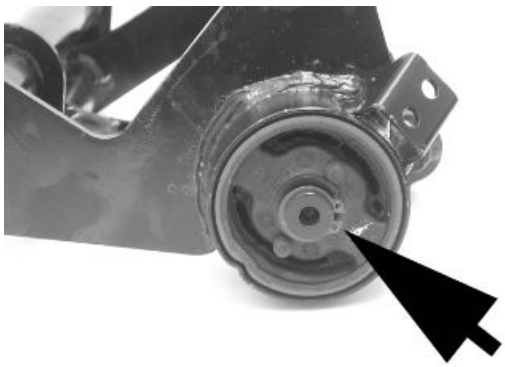
- Place the vehicle on its centre stand;
- Support the engine adequately;
- Loosen the nut shown in the figure and pull out the pin from the left-hand side.

- Loosen the nut and lock nut on the left-hand side of the scooter (see figure) and unscrew the pin from the opposite side.
- Remove the retaining screw of the rear brake pipe shown in the figure.

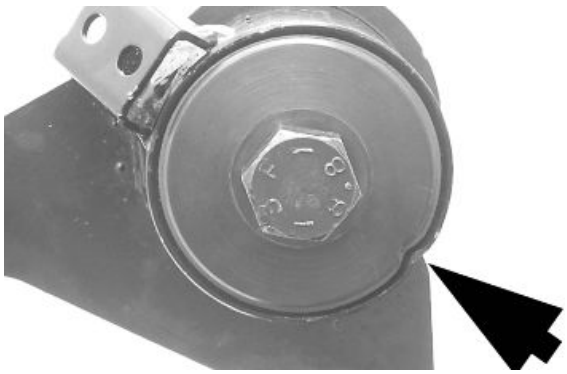
- Loosen the nut on the inside of the frame from the left-hand side (see figure) and remove the relevant pin;
- Remove the swinging arm.

Overhaul

- Check that the silent bloc is not damaged. If there is, replace it.
- Remove the Seeger ring shown in the picture



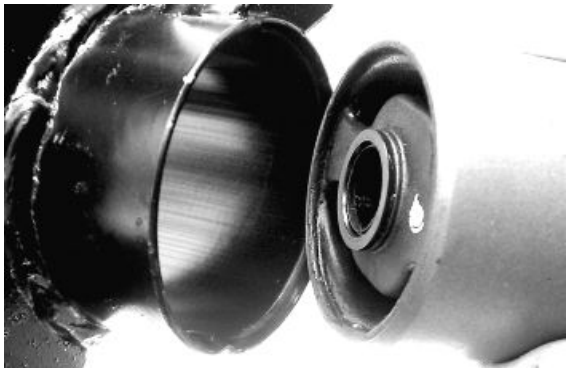
- Remove the full silent bloc bracket
- Hold the full silent bloc bracket in the clamp
- Using the appropriate tool, remove the silent bloc from the bracket from the side corresponding to the inside of the vehicle. This is to guarantee the tool is centred properly on the support



Specific tooling

020271Y Tool for removing-fitting silent bloc

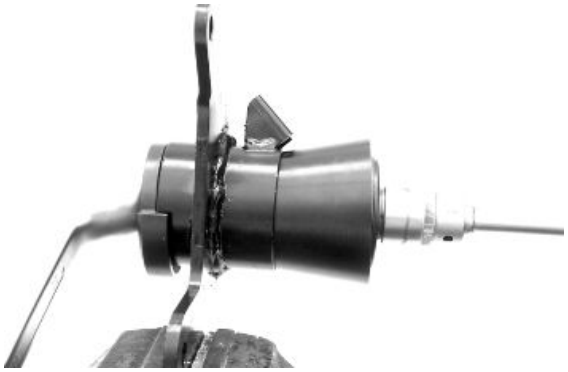
- Install a new silent bloc, making sure it aligns properly with the reference tooth.
- Fit the silent blocs, making sure the chamfered part of the silent bloc matches the chamfered part of the bracket



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

Specific tooling

020271Y Tool for removing-fitting silent bloc



- 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 frame side.
- Check the axial clearance between the two swinging arms using a feeler gauge

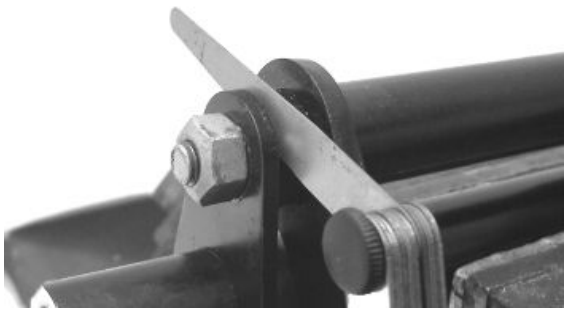
Characteristic

Allowable limit after use:

1 mm

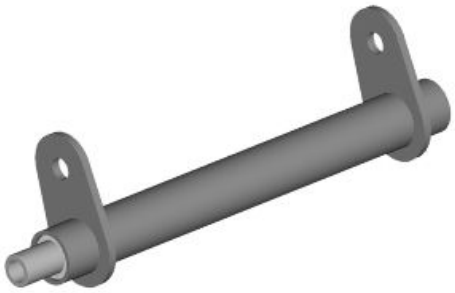
standard clearance

0.40 ÷ 0.70 mm



- In order to check the clearance of the swinging arm on the frame side, prepare a retainer using the fixing pin of the swinging arm on the frame and two rings from the special tool 020229Y.
Alternatively, use two washers with inside diameter of 12 mm for pins, outside diameter min. 30 mm and thickness min. 4 mm.

- Separate the swinging arm on the engine side from the vehicle side arm.
- Remove 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

020115Y Ø 18 punch

020244Y 15-mm diameter punch

SWINGING ARM SERVICE

Specification	Desc./Quantity
Length of the internal swinging arm spacer on the frame side	**228** -0.2/-0.4 mm
Length of the internal swinging arm spacer on the engine side	**183** 0/-0.2 mm
Length of the swinging arm tube on the engine side	**182.5** -0.1/-0.3 mm
Length of the swinging arm tube on the frame side	**227.1**+0.2/0 mm

- Lubricate the roller bearing housings 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 frame side swinging arm with the most protruding part pointing towards the silent block side as shown in the picture

Recommended products

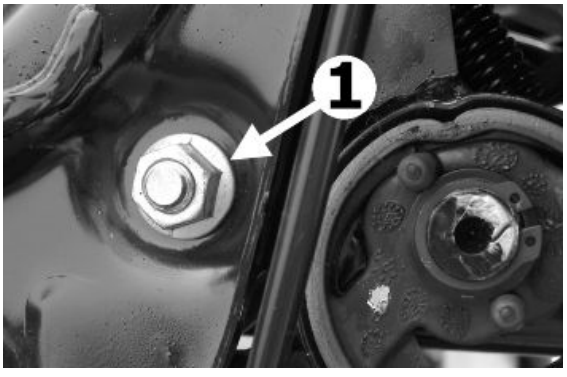
AGIP GREASE PV2 Grease for control levers on the engine

White anhydrous-calcium based grease to protect roller bearings; temperature range between -20 ° C and +120 °C; NLGI 2; ISO-L-XBCIB2

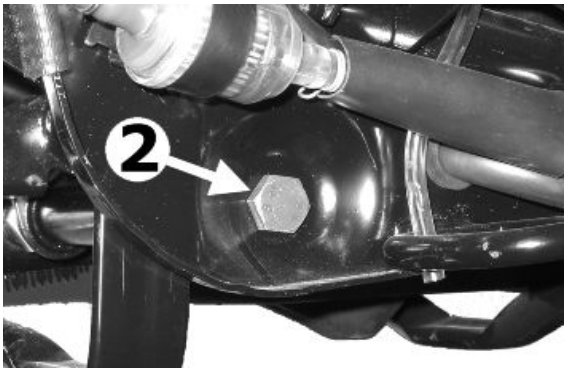
Refitting

In order to fit the swinging arm properly, follow these steps:

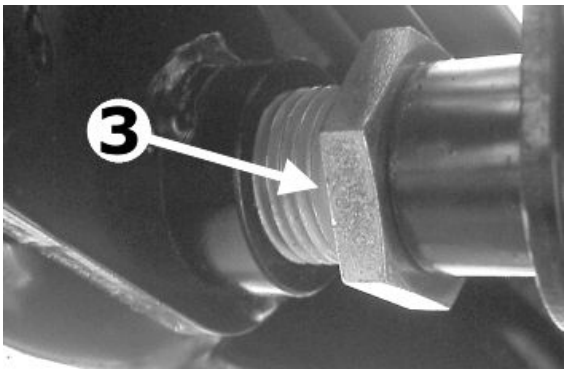
- Position the silent block support bracket with part «**3** » pre-fitted and screw in but do not tighten part «**1**».



- Position the swinging arm, inserting part « **2**».



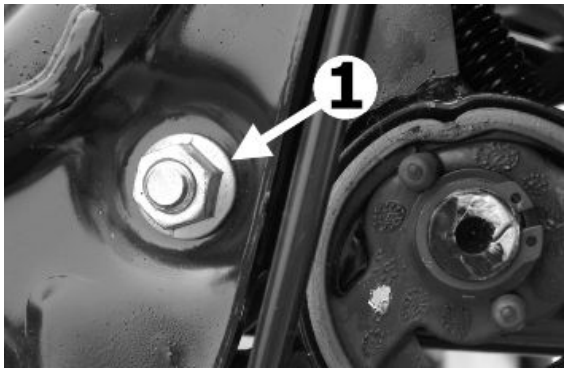
- Tighten part «**3**» to the prescribed torque.



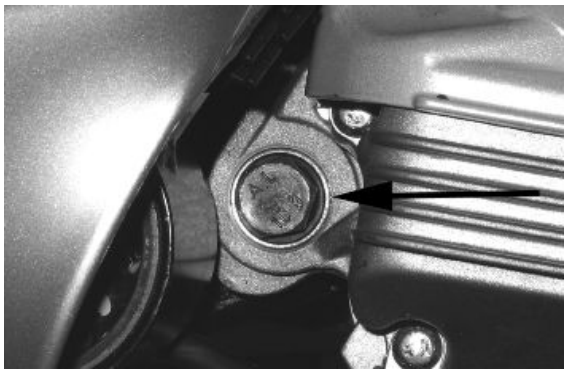
- Screw and tighten part «**4**» to the prescribed torque.

- Screw and tighten part «**5**» to the prescribed torque.

- Tighten part «**1**» to the prescribed torque.



- Insert the swinging arm - engine pin and tighten to the prescribed torque.



SWINGING ARM FITTING

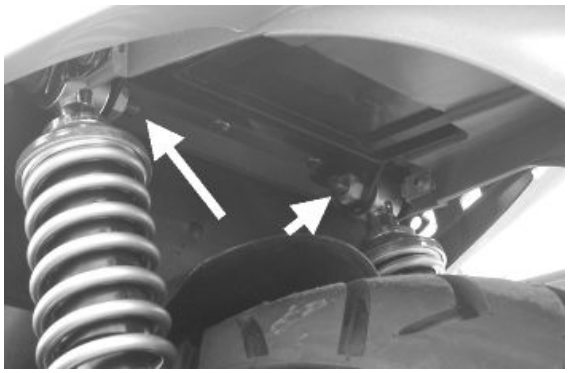
Name	Torque in Nm
Part 1	64 - 72
Part 3	5 - 7
Part 4	90 - 110
Part 5	50 ÷ 55
Engine-swinging arm pin	55 ÷ 61

Shock absorbers

Removal

Proceed as follows:

- place the vehicle on its centre stand;
- lift the engine a little with a jack so as to free the two shock absorbers;
- remove the silencer
- 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 silencer 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.



See also

Exhaust assy. Removal

Refitting

Carry out the previous operations but in reverse order.

Locking torques (N*m)

Left shock absorber lower retainer 33 ÷ 41 Right shock absorber lower retainer 40 ÷ 45 Upper shock absorber retainer 40 ÷ 45

Exhaust bracket

Removal

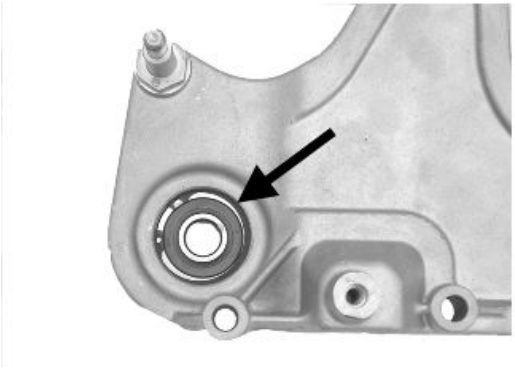
- Loosen and remove the lower retaining bolt of the right-hand shock absorber at the mounting arm.
- Loosen the 2 retaining screws between arm and engine.
- Remove the split pin and safety cover; unscrew the wheel axle nut; use the rear brake to prevent the wheel from turning.
- Remove the mounting arm.
- Remove the full muffler unit.

See also

Exhaust assy. Removal
Exhaust assy. Removal

Overhaul

- Remove the circlip shown in the picture

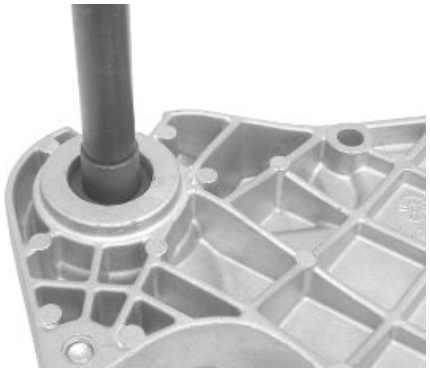


- Support the muffler support bracket sufficiently
- Using the special punch, remove the bearing from its seat as shown in the picture

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

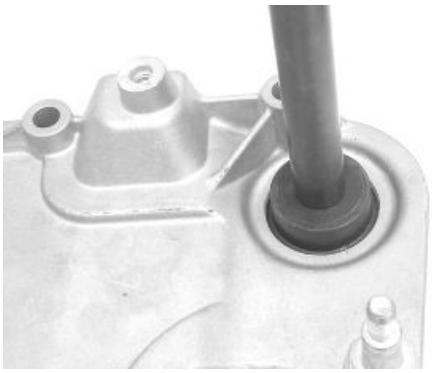


- Heat the bearing seat using the heat gun
- Using the special punch, install a new bearing in the seat as shown in the picture

Specific tooling

020376Y Adaptor handle

020151Y Air heater



Refitting

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

N.B.

THE TIGHTENING MUFFLER MOUNTING ARM MUST BE TIGHTENED AFTER TIGHTENING THE WHEEL.

Locking torques (N*m)

Rear wheel axle nut 104 to 126 Muffler mounting arm to engine screws (*) 20 ÷ 25 Right shock absorber lower retainer 40 ÷ 45

Centre-stand

- 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.
- On refitting tighten the nut to the specified torque.

Locking torques (N*m)

Centre stand bolt **40 ÷ 45**

Side stand

Removal of the side stand

- Unhook the springs;
- Loosen the nut;
- Pull out the screw;

Fitting

Carry out the previous operations but in reverse order.

Locking torques (N*m)

Side stand fixing bolt **40 ÷ 45**

INDEX OF TOPICS

This section è is dedicated to the description of the brake system components.

Interventions rules

WARNING

BRAKING SYSTEM FLUID IS CORROSIVE: ALWAYS WEAR PROTECTIVE GLOVES. IN THE EVENT OF ACCIDENTAL CONTACT WITH YOUR EYES, RINSE THE CONTACT AREA WELL WITH ABUNDANT WATER.
THE BRAKE FLUID DRAINED FROM THE SYSTEM IS HARMFUL TO THE ENVIRONMENT. COLLECTION AND DISPOSAL MUST BE CARRIED OUT IN COMPLIANCE WITH THE REGULATIONS IN FORCE. UNDER NORMAL DRIVING AND CLIMATIC CONDITIONS YOU SHOULD CHANGE THE FLUID EVERY TWO YEARS. IF BRAKES ARE USED INTENSELY AND/OR IN HARSH CONDITIONS, CHANGE THE FLUID MORE FREQUENTLY.
DURING INSTALLATION, THE PARTS TO BE REUSED MUST BE ABSOLUTELY CLEAN AND FREE FROM ANY TRACES OF OIL, FUEL AND GREASE: IT IS THEREFORE NECESSARY TO CLEAN THEM THOROUGH WITH DENATURED ALCOHOL.

N.B.

FOR TOPPING UP AND CHANGE, USE ONLY BRAKE FLUID DOT4 - NHTSA 116.
OBSERVE THE MAXIMUM DEGREE OF CLEANLINESS. HYDRAULIC FLUID IS EXTREMELY CORROSIVE FOR PAINTED SURFACES.
BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR.
IF THE MOISTURE CONTENT IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, IT WILL RESULT IN POOR BRAKING EFFICIENCY DUE TO A LOW BOILING POINT OF THE FLUID.

N.B.

ALWAYS USE FLUID FROM SEALED CONTAINERS.

N.B.

RUBBER PARTS SHOULD NEVER BE LEFT IN ALCOHOL LONGER THAN 20 SECONDS. AFTER WASHING, THE PIECES MUST BE DRIED WITH A BLAST OF COMPRESSED AIR AND A CLEAN CLOTH.
THE SEAL RINGS MUST BE IMMERSED IN THE OPERATING FLUID; THE USE OF PRF1 PROTECTIVE DEVICE IS ALLOWED.

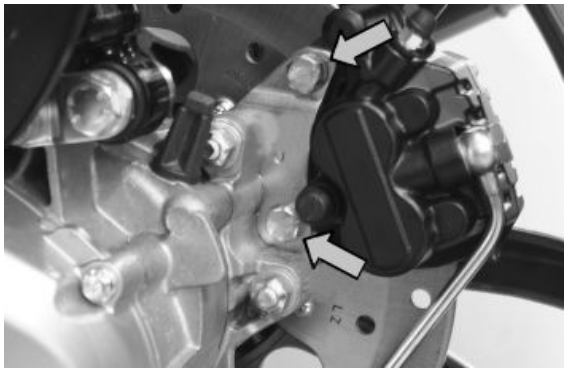
WARNING

THE PRESENCE OF BRAKE FLUID ON THE DISC OR BRAKE PADS REDUCES BRAKING EFFICIENCY. IN THIS CASE, REPLACE THE PADS AND CLEAN THE DISC WITH A HIGH-QUALITY SOLVENT.

Rear brake calliper

Removal

- Remove the rear wheel.
- Remove the two rear brake calliper devices fastening them to the support as shown in the picture.



N.B.

SHOULD THE BRAKE CALLIPER BE REPLACED, BEFORE REMOVING THE FITTINGS FIXING THE CALLIPER TO THE SUPPORTING BRACKET, FIRST LOOSEN THE OIL HOSE FITTING AFTER HAVING EMPTIED THE SYSTEM OF THE CIRCUIT BEING INSPECTED.

Refitting

- Follow the removal procedures but in reverse order and tighten to the prescribed torques with the recommended product.

Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

Screw tightening calliper to support 20 to 25

If the calliper is replaced:

CAUTION

ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.

CAUTION

ALWAYS USE NEW COPPER WASHERS.

Locking torques (N*m)

Rear brake calliper-pipe fitting 20 to 25

See also

Rear - combined

Front brake calliper

Removal

- Remove the two retainers fastening the front brake calliper to the support as shown in the picture.

N.B.

SHOULD IT BE NECESSARY TO REPLACE THE CALLIPER, FIRST LOOSEN THE FITTING CONNECTING THE PIPE TO THE BRAKE CALLIPER.

Refitting

- To fit the calliper, follow the above operations but in reverse order.

Locking torques (N*m)

Screw tightening calliper to support 24 ÷ 27

If the calliper is replaced:

CAUTION

ALWAYS USE NEW COPPER WASHERS.

CAUTION

ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.

Locking torques (N*m)

Brake fluid pipe-calliper fitting 20 to 25

See also

Front

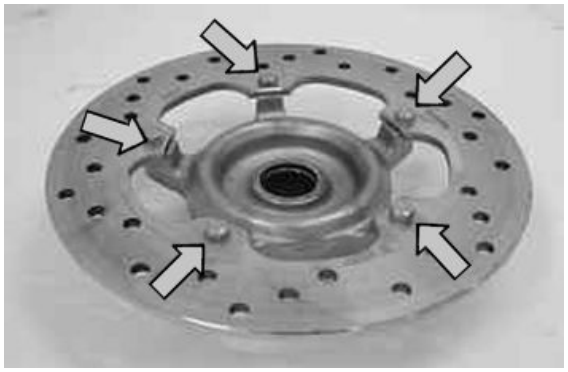
Rear brake disc

These vehicles may feature a rear wheel with integrated hub or with a hub independent from the wheel.

Removal

REAR WHEEL WITH INDEPENDENT HUB

- Remove the rear wheel.
- Act on the disc five fixing screws shown in the picture.



See also

Removing the rear wheel

REAR WHEEL WITH INTEGRATED HUB

- Remove the rear wheel.
- Act on the disc five fixing screws shown in the picture.

See also

Removing the rear wheel

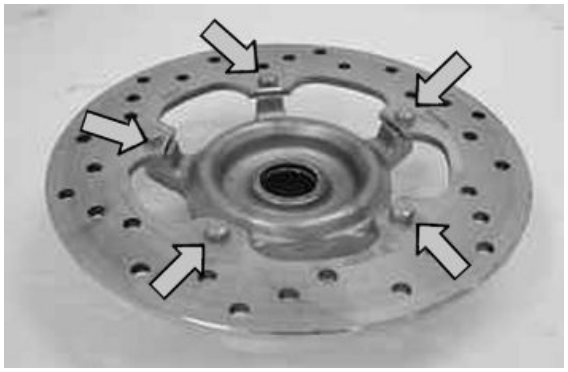
Refitting

REAR WHEEL WITH INDEPENDENT HUB

- For the installation, position the disc correctly using the arrow stamped on it as reference.
- Tighten the screws to the prescribed torque and apply the recommended product.

N.B.

THE SURFACE OF THE DISC WITH THE STAMPED ARROW FOR THE DIRECTION OF ROTATION MUST FACE TOWARDS THE OUTSIDE OF THE SCOOTER.



Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

Brake disc screws 8 to 10

REAR WHEEL WITH INTEGRATED HUB

For fitting, position the disc correctly using the arrow stamped on it as reference.

N.B.

THE ARROW STAMPED ON THE DISC INDICATING THE RUNNING DIRECTION MUST BE FITTED TOWARDS THE OUTSIDE OF THE VEHICLE.

- Tighten the screws to the prescribed torque and apply the recommended product.

Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

Brake disc screws **8 to 10**

Disc Inspection

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

Characteristic

New rear disc thickness

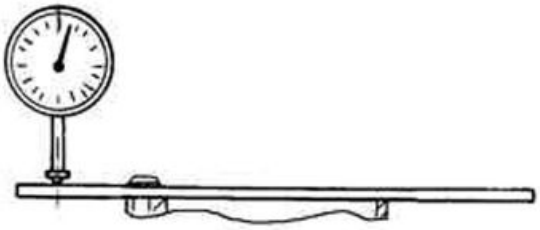
4.0 mm

Disc thickness at wear limit (rear)

3.5 mm

- Using the specific tool, check that the axial run-out of the brake surface is within the prescribed limits.
- If this is not the case, replace the disc and repeat the test.

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



Characteristic

Max. axial run-out

0.1 mm

Front brake disc

Removal

Proceed as follows:

- Remove the front wheel.
- Loosen the five disc fixing screws.
- Thoroughly clean the seats on the front wheel hub and on the disc.

See also

Removing the front wheel

Refitting

For fitting, position the disc correctly using the arrow stamped on it as reference.

- Do up the screws to the prescribed torque and apply the recommended product

N.B.

THE ARROW STAMPED ON THE DISC INDICATING THE RUNNING DIRECTION MUST BE FITTED TOWARDS THE OUTSIDE OF THE VEHICLE.

Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

Brake disc screws 8 to 10

Disc Inspection

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

Characteristic

Thickness of a new front disc

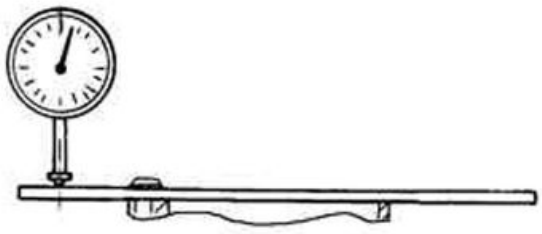
4.0 mm

Disc thickness at wear limit (front)

3.5 mm

- Remove the wheel and check using the appropriate tools that the axial run-out of the brake surface is within the prescribed limits.
- If this is not the case, replace the disc and repeat the test.

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



Characteristic

Max. axial run-out

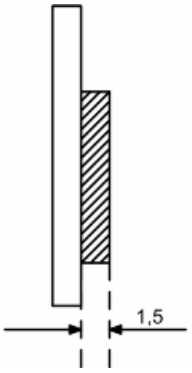
0.1 mm

Front brake pads

Removal

Proceed as follows:

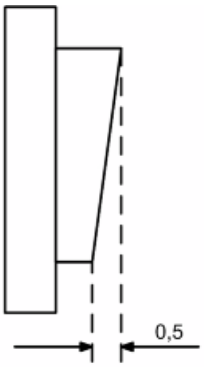
- Remove the front brake calliper.
- Loosen the two pins shown in the figure that lock the two pads.
- Remove the pads, being careful with the pad spring clamp.
- Check the thickness of the friction material of the pads.
- Replace the pads if the thickness is below the minimum value.
- The replacement must be made with greater residual thickness if the pad has not worn evenly. A 0.5 mm thickness difference in the residual friction material is permitted.



Characteristic

Minimum value

1.5 mm



See also

Front
brake calliper

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)

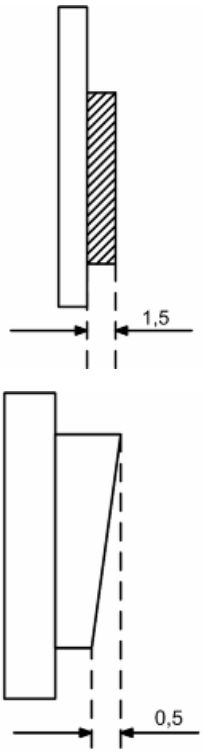
Pad fixing pin 19.6 ÷ 24.5

Rear brake pads

Removal

- Remove the rear brake calliper
- Loosen the two pins shown in the figure that lock the two pads; be careful with the pad spring clamp.
- Remove the brake pad and check there are no faults or warping. Replace it if such anomalies are present.
- 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.



See also

Removal

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

Fill

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 brake lever, load the system and bring it up to the required pressure.
- Keeping the brake lever pulled, loosen the bleed screw to purge the air in the system. 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

Front

- 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 brake lever, load the system and bring it up to the required pressure.
- Keeping the brake lever pulled, loosen the bleed screw to purge the air in the system. 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

The front and rear brake fluid reservoirs are both positioned on the handlebar. Proceed as follows:

- Rest the vehicle onto the centre stand, with the handlebar centred.
- Check the fluid level through the sight glass «**A**».

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

Front brake pump

Removal

- Remove the rear handlebar cover.
- Drain the braking system.
- Disconnect the brake fluid line from the pump, paying attention to a possible escape of remaining brake fluid.
- Remove the brake stop button from the lever.
- Undo the two U-bolt fixing screws.
- Remove the brake pump with the lever.

Refitting

- Upon refitting, perform the operation but in reverse order.
- Tighten the hydraulic line to the prescribed torque and purge the system.
- When the operation is over, tighten the brake fluid bleed screw to the prescribed torque.

N.B.

WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.

WARNING

BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR. IF THE LEVEL OF MOISTURE IN THE FLUID EXCEEDS A GIVEN VALUE, BRAKING WILL BE INEFFICIENT. THEREFORE, ALWAYS USE FLUID FROM SEALED CONTAINERS. UNDER NORMAL DRIVING AND CLIMATIC CONDITIONS YOU SHOULD CHANGE THIS FLUID EVERY TWO YEARS. IF BRAKES ARE USED INTENSELY AND/OR IN HARSH CONDITIONS, CHANGE THE FLUID MORE FREQUENTLY.

CAUTION

WHEN CARRYING OUT THE OPERATION, BRAKE FLUID MAY LEAK FROM BETWEEN THE BLEED SCREW AND ITS SEAT ON THE CALLIPER. CAREFULLY DRY THE CALLIPER AND DEGREASE THE DISC SHOULD THERE BE BRAKE FLUID ON IT.

Locking torques (N*m)

Oil bleed screw 12 - 16 Hydraulic line fixing screw: 16 ÷ 20 Fixing screws for the handlebar control unit U-bolts 7 to 10

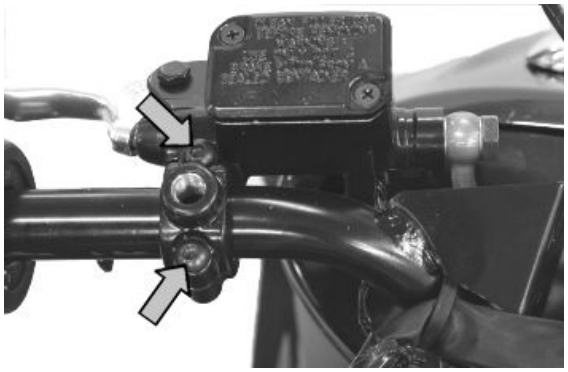
See also

Front

Rear brake pump - combined

Removal

- Remove the rear handlebar cover.
- Drain the braking system.
- Disconnect the brake fluid line from the pump, paying attention to a possible escape of remaining brake fluid.
- Remove the brake stop button from the lever.
- Undo the two U-bolt fixing screws.
- Remove the brake pump with the lever.



Refitting

- Upon refitting, perform the operation but in reverse order.
- Tighten the hydraulic line to the prescribed torque and purge the system.
- When the operation is over, tighten the brake fluid bleed screw to the prescribed torque.

N.B.

WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.

WARNING

BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR. IF THE LEVEL OF MOISTURE IN THE FLUID EXCEEDS A GIVEN VALUE, BRAKING WILL BE INEFFICIENT. THEREFORE, ALWAYS USE FLUID FROM SEALED CONTAINERS. UNDER NORMAL DRIVING AND CLIMATIC CONDITIONS YOU SHOULD CHANGE THIS FLUID EVERY TWO YEARS. IF BRAKES ARE USED INTENSELY AND/OR IN HARSH CONDITIONS, CHANGE THE FLUID MORE FREQUENTLY.

CAUTION

WHEN CARRYING OUT THE OPERATION, BRAKE FLUID MAY LEAK FROM BETWEEN THE BLEED SCREW AND ITS SEAT ON THE CALLIPER. CAREFULLY DRY THE CALLIPER AND DE-GREASE THE DISC SHOULD THERE BE BRAKE FLUID ON IT.

Locking torques (N*m)

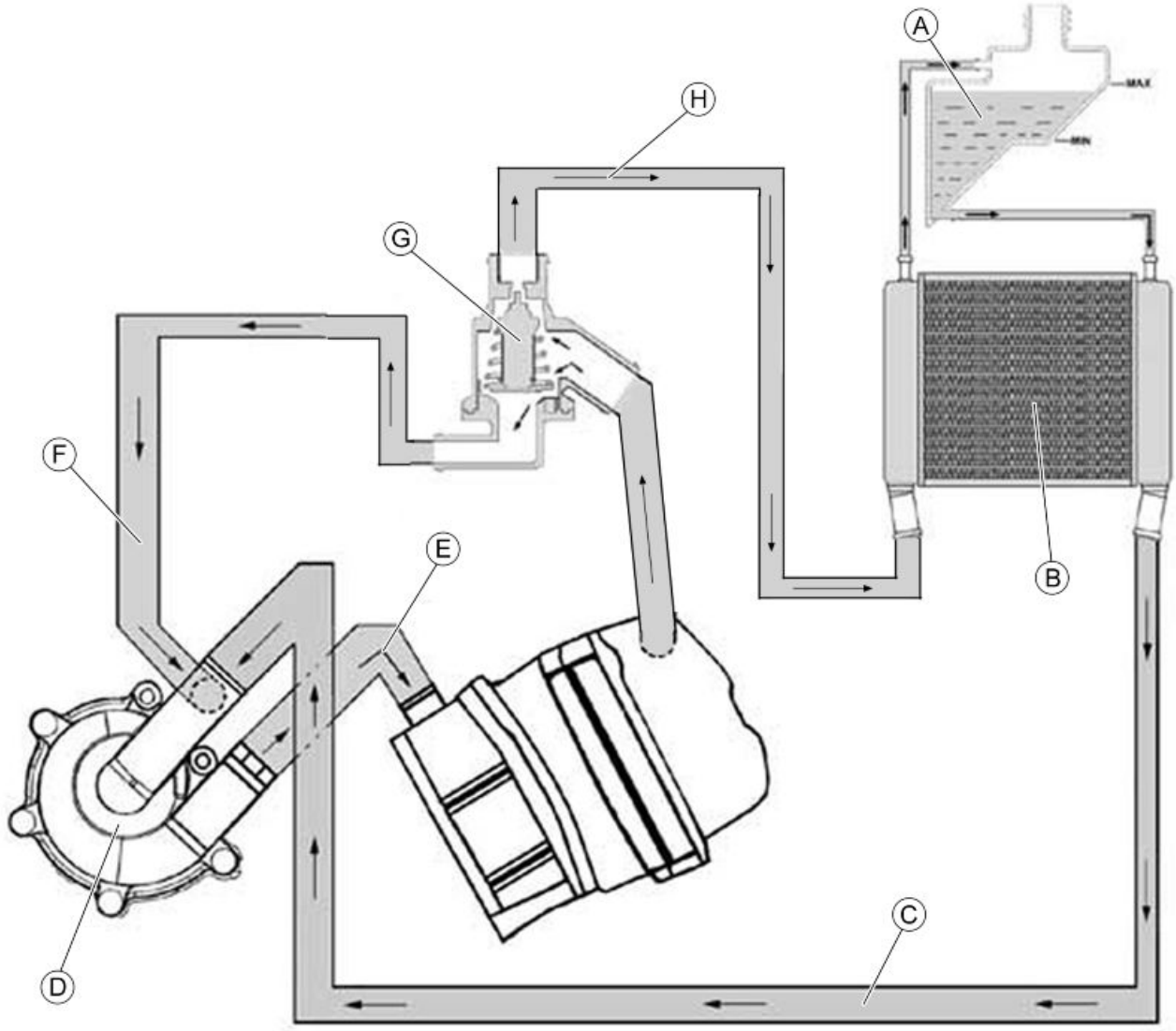
Oil bleed screw 12 - 16 Hydraulic line fixing screw: 16 ÷ 20 Fixing screws for the handlebar control unit U-bolts 7 to 10

See also

Rear - combined

INDEX OF TOPICS

Circuit diagram



KEY

A = Expansion tank

B = Radiator

C = Radiator intake pipe

D = Water pump

E = Delivery pipe to cylinder

F = By-Pass pipe

G = Thermostat

H = Radiator delivery pipe

TECHNICAL SPECIFICATIONS

Specification	Desc./Quantity
Cooling system capacity	1.75 l
Recommended fluid	AGIP PERMANENT SPEZIAL (ready for use)
Sealing pressure	Cap calibrated at 0.9 bar

THERMOSTAT

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

ELECTRIC VENTILATION

Specification	Desc./Quantity
Electric ventilation starts at	100° C
Electric ventilation stops at	90° C

WATER PUMP

Specification	Desc./Quantity
Type	Centrifugal
Control	Coaxial to crankshaft

RADIATOR

Specification	Desc./Quantity
Type	Aluminium, with horizontal circulation

EXPANSION TANK

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

Electric fan check

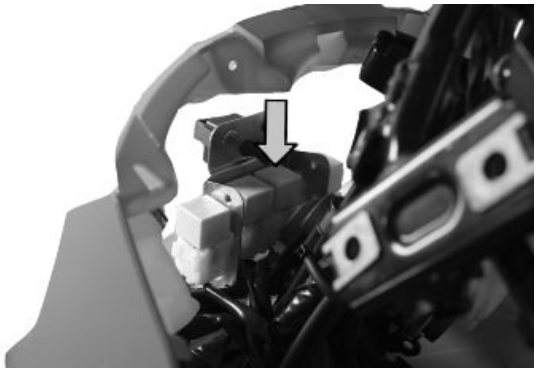
- Check and, if necessary, restore the correct battery voltage.

Characteristic

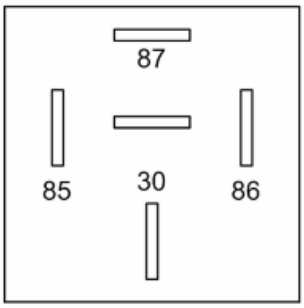
Battery voltage

12V

- Check that the electric ventilation relay is working properly.



- If the relay is not working, replace it.
- If the relay is working, remove it and jump the red
- red black (85 - 86) wires. The electric ventilation starts if the key switch is set to «**ON**» and all components are working.



- In order to check the coolant temperature sensor, see the «Injection» chapter.

See also

Remote controls check

System bleed

- Start up the engine until the operating temperature is reached.
- Remove the rubber hood over the bleed valve
- Obtain a rubber tube that is of the right length to connect the valve to the expansion tank
- Place one end of the pipe on the bleed valve and the other in the expansion tank
- Loosen the screw by **two** turns until the communication hole is revealed with the head as shown in the picture
- Wait until only coolant comes out of the rubber pipe so as to eliminate any air bubbles inside the circuit.
- Tighten the bleed valve respecting the maximum torque.
- Bring the coolant up to the correct level inside the expansion tank

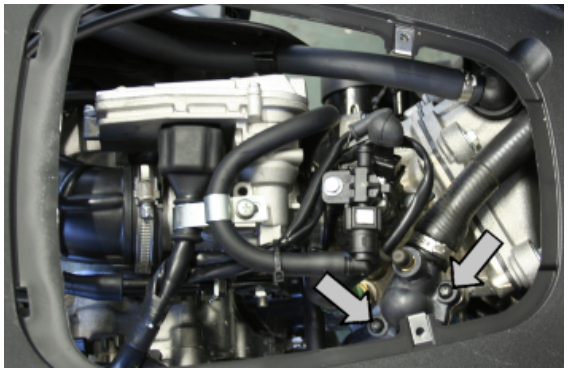
Locking torques (N*m)

Bleed screw 3

Thermostat

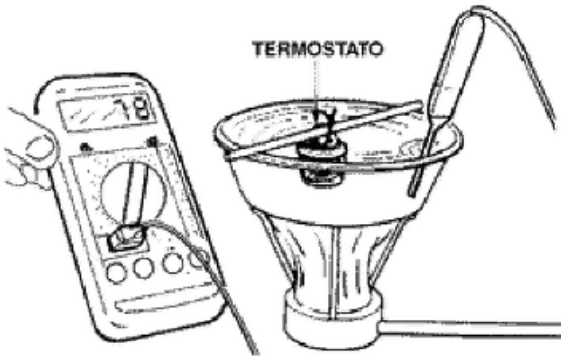
Removal

- Remove the helmet compartment inspection cover.
- Place a + 2.0 l container under the vehicle to collect the coolant.
- Undo the two screws indicated, lift the cover and remove the thermostat.



Check

1) Visually inspect that the thermostat is not damaged.
2) Fill a metal container with approx. 1 litre of water.
Immerse the thermostat, and keep it in the centre of the container.
Immerse the multimeter temperature probe, and keep it close to the thermostat.
Heat up the container using the thermal gun.
Check the temperature at which the thermostat starts to open:
Heat up until the thermostat is completely open.
3) Replace the thermostat if it is not working properly.



CAUTION

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

Specific tooling

020331Y Digital multimeter

020151Y Air heater

THERMOSTAT

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

Refitting

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

Locking torques (N*m)

Thermostat cover screws 3 to 4

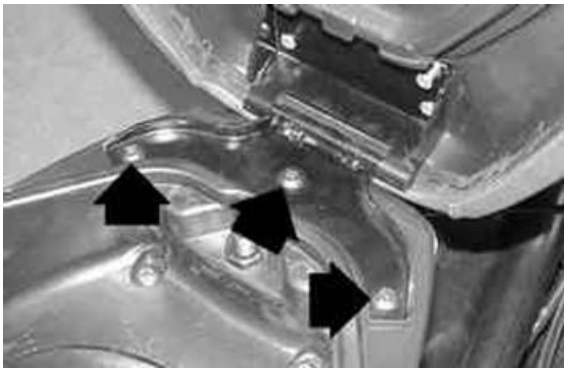
- Once the cooling circuit is restored, refill using the recommended product and purge the circuit as expressly indicated in the «Cooling System» chapter.

INDEX OF TOPICS

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

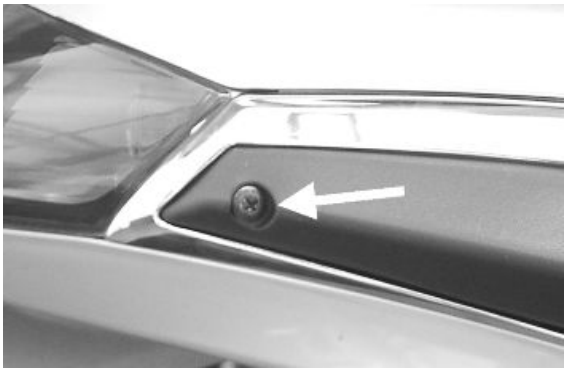
Seat

- Remove the saddle by loosening the three retaining screws indicated in the figure;



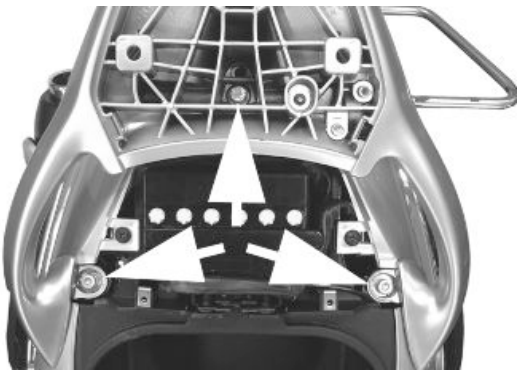
Side fairings

- Remove the side bumper, loosening the retaining screw shown in the figure.



Rear rack

- Remove snapped-in plastic cover from the rear luggage rack.
- Loosen the 3 hexagonal retaining screws indicated in the figure and remove luggage rack.

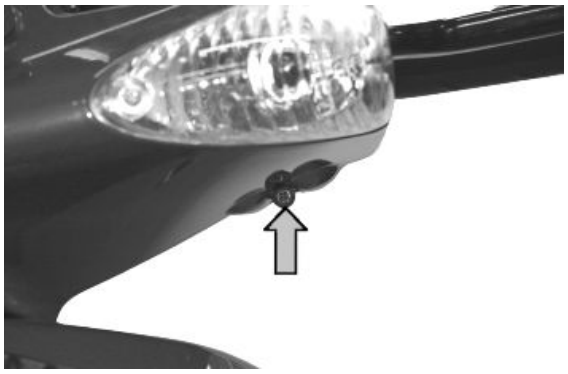


Rear handlebar cover

- Remove the windshield.
- Remove the rear-view mirrors.
- On both sides of the handlebar undo the screw indicated and remove the brake pump compartment inspection cover.

- Undo the screw indicated.

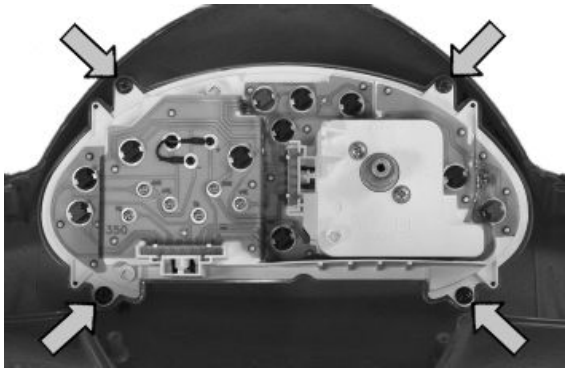
- From below undo the screw fixing it to the front handlebar cover.



- Undo the two screws fixing it to the frame.
- Remove the rear handlebar cover after disconnecting the electrical connectors and the odometer cable.

Instrument panel

- Remove the rear handlebar cover.
- Undo the four screws shown in the picture.
- Remove the instrument panel.

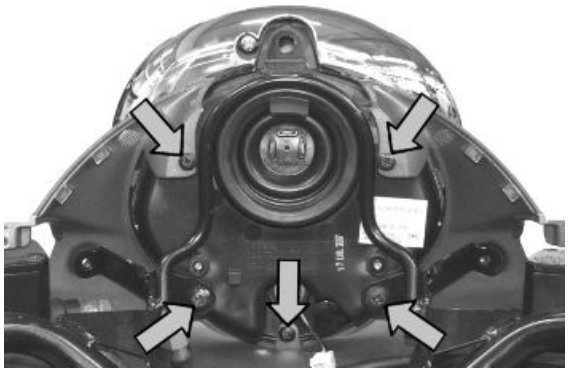


See also

Rear handlebar cover

Front handlebar cover

- Remove the rear handlebar cover.
- Disconnect the electrical connectors of the headlamp and turn indicators.
- Undo the five screws indicated and remove the headlight assembly and the front handlebar cover.

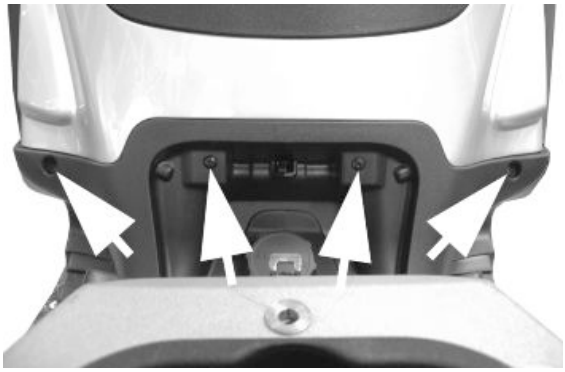


- During the fitting stage, make sure that the retainer clamp indicated is placed correctly.

Headlight assy.

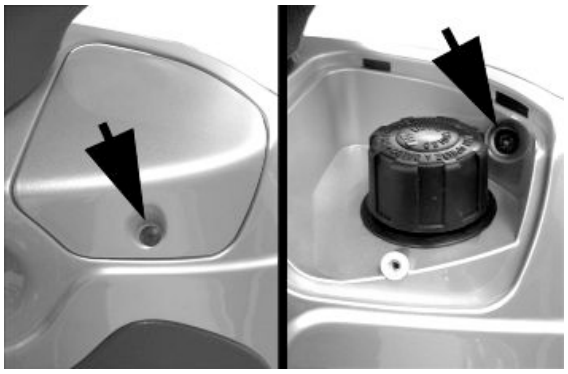
Frame central cover

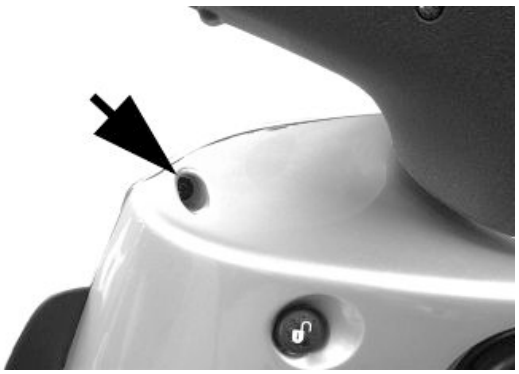
- Open the fuel tank access port.
- Loosen the 4 screws shown in the figure.
- Remove temporarily the fuel tank cap and pull out the rubber protector.
- Remove the central frame cover, separating it from the rear section of the scooter, then separating it from the transmission for the opening of the access cover.



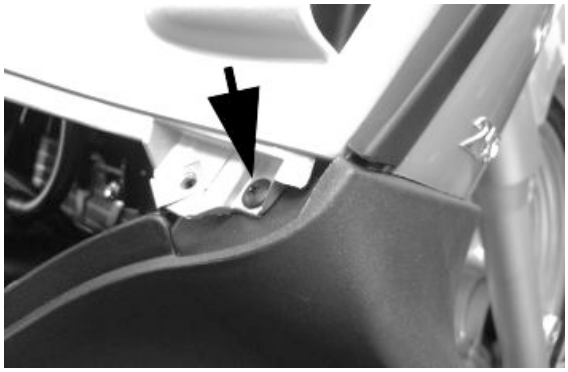
Legshield

- Remove the headlight assembly.
- Remove the fixing screw of the expansion tank access cover.
- Unscrew the 2 fixing screws on the upper part of the shield back plate indicated in the figure.
- Unscrew the 2 fixing screws with the wheel housing.

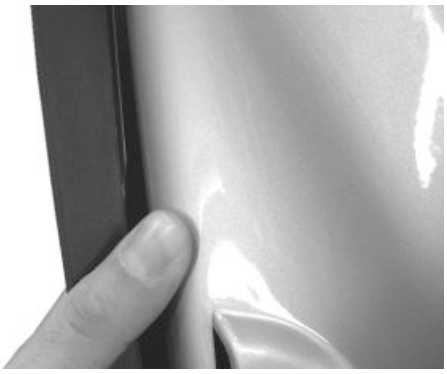




- Remove the central frame cover, then unscrew the 2 screws indicated in the figure.
- Remove the Piaggio symbol from the shield, then remove the screw.
- Remove the legshield to the front.



- To reassemble, follows the steps in reverse order, paying attention to the correct seating of the shield on the shield back plate.

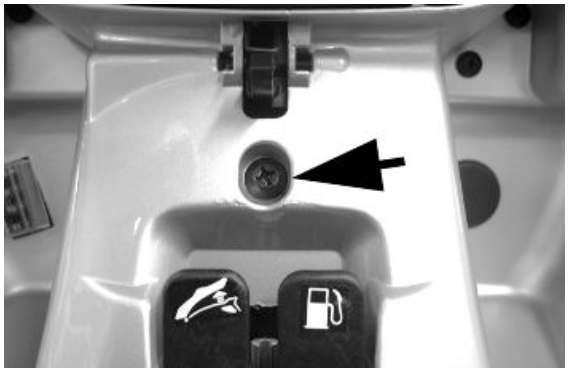


See also

Headlight assy.
Frame central cover

Knee-guard

- Remove the legshield; - Remove the 2 fixing screws of the fuse box in the front glove box; - Separate the electrical connections; - Remove the expansion tank; - Remove the retaining screw inside the glove box; - Disconnect the saddle closing mechanism; - Remove the rear shield with the glove box.



See also

Legshield

Removing the ignition key-switch when on *off*

- Remove the shield back plate.
- Remove the immobilizer aerial as shown in the figure.

- Detach the electrical wiring.
- Remove the ignition key-switch, by removing the spring retainer shown in the figure.

- Lightly push the master-cylinder and extract the lock from the notch shown in the figure.
- Hence extract the master-cylinder complete with the key-switch.
- To refit, proceed in the reverse order.

See also

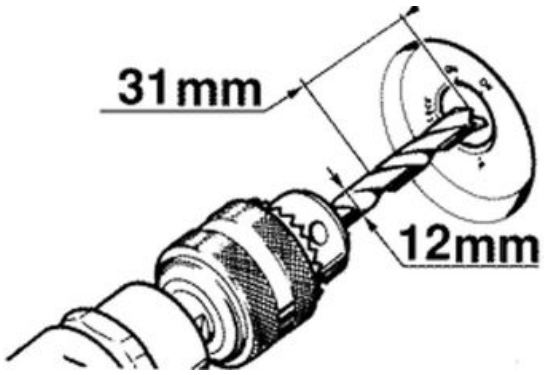
Knee-guard

Removing the ignition key-switch when on *lock*

In position "Lock", it is not possible to access the cylinder retaining spring. The spring must then be removed as shown in the figure, allowing the lock cylinder to be pressed out.

N.B.

TO REFIT THIS ITEM, THE VEHICLE STEERING LOCK MUST BE RELEASED WITH THE LOCK BODY (INTERNAL AND EXTERNAL PART) IN POSITION "OFF". PROCEED AS DESCRIBED IN THE PREVIOUS PARAGRAPH.

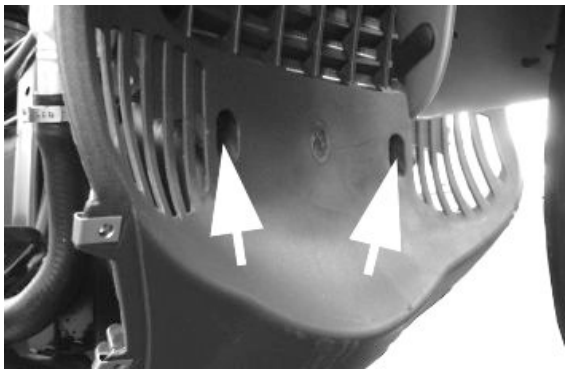


See also

Removing the ignition key-switch when on *off*

Front wheel housing

- Remove the shield back plate.
- Remove the footrests.
- Remove the front suspension.
- Loosen the remaining retaining screws holding the central chassis cover.
- Remove the radiator cover.



See also

Footrest
Removing the front wheel
Knee-guard

Taillight assy.

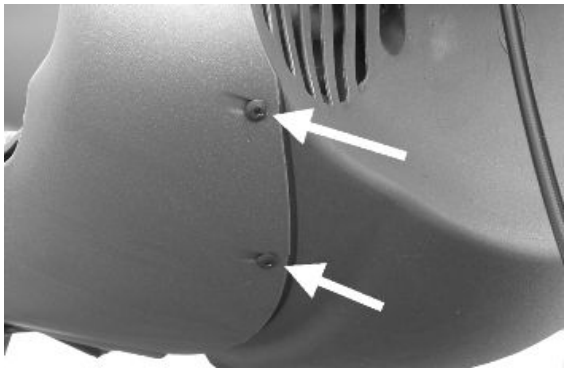
- Remove the cover of the luggage rack.
- Remove the side bumpers.
- Unscrew the 3 screws holding the rear light.
- Remove the rear light assembly after disconnecting the electrical cable harness.

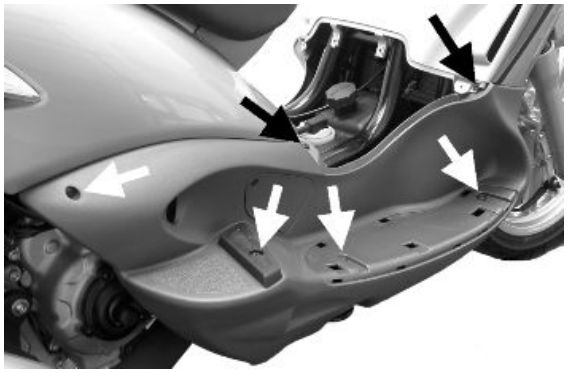
See also

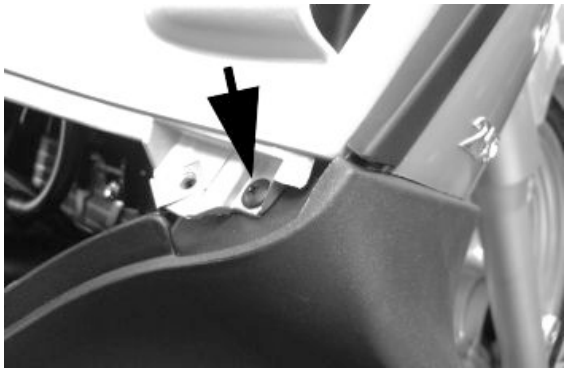
Rear rack
Side fairings

Footrest

- Remove the central cover.
- Remove the mat of the footrest.
- Loosen the eight footrest mounting screws.
- Remove the footrest.





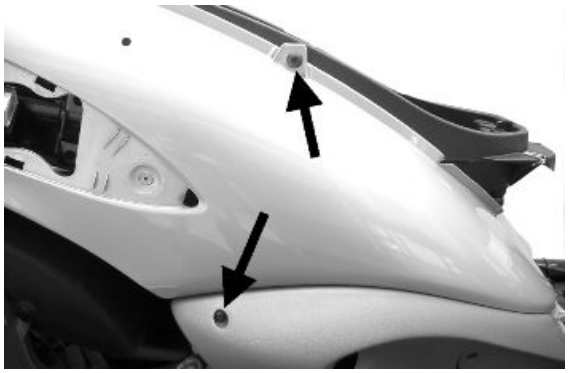


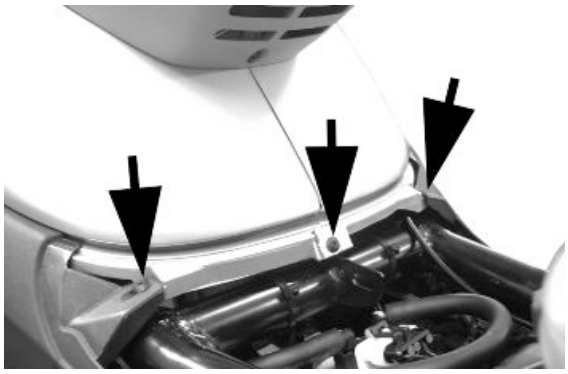
See also

Frame central cover

Side fairings

- Remove the saddle.
- Remove the luggage rack.
- Remove the central cover.
- Remove the rear light assembly.
- Remove the cover under the saddle by loosening the retaining screw located under the saddle mounting plate.
- Loosen the 6 side-fairing fixing screws indicated in the 3 pictures.
- Remove the fairings.



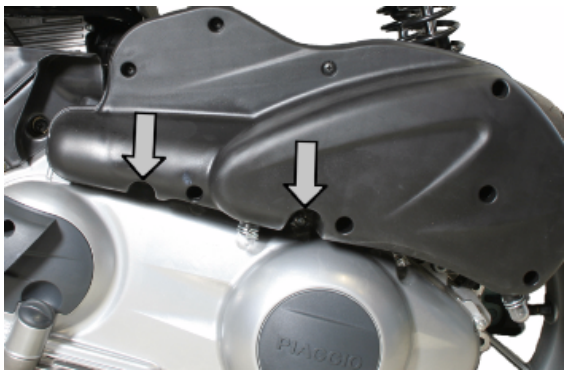


See also

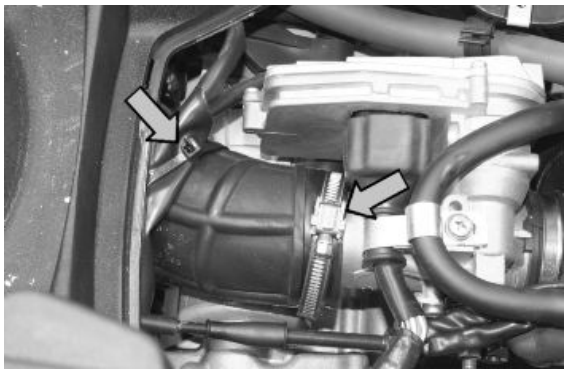
Taillight assy.
Rear rack
Frame central cover
Seat

Air filter

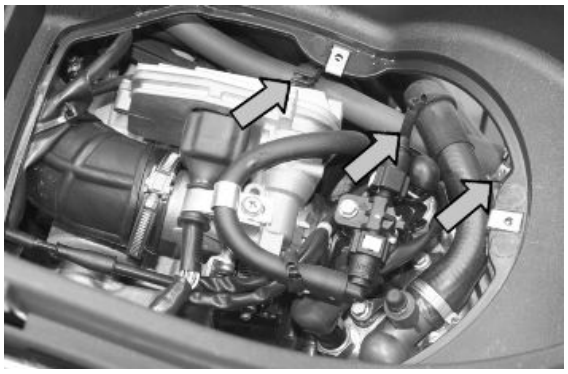
- Undo the two screws indicated.



- Reach the inspection compartment inside the helmet compartment.
- Disconnect the two manifold clamps.



- Disconnect the three clamps connecting the Blow-By pipe.

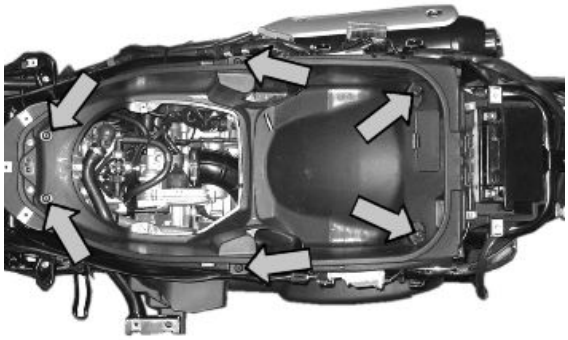


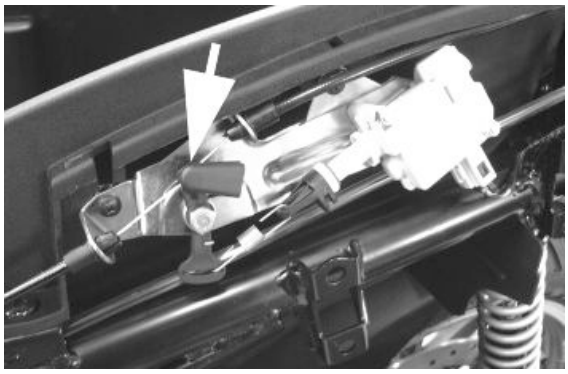
Rear mudguard

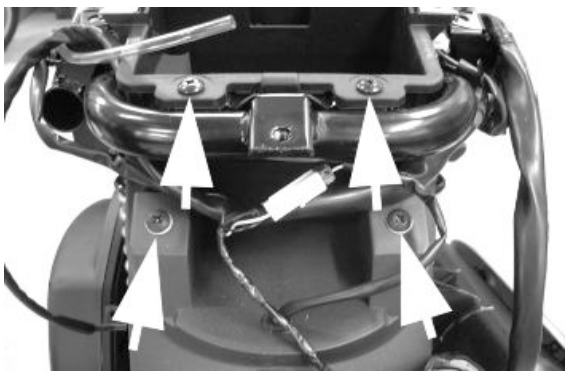
- Loosen the 4 fixing screws, 2 of which are indicated in the figure and the other 2 located on the opposite side under the air filter;
- Remove the rear mudguard.

Helmet bay

- Remove the side fairings.
- Disconnect the battery and the electrical cable harness.
- Disconnect the cable from the electric saddle opening device.
- Remove the 10 screws indicated in the figure.
- Remove the helmet compartment in advance.





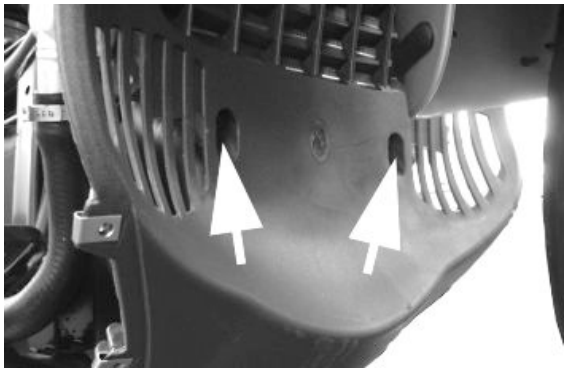


Fuel tank

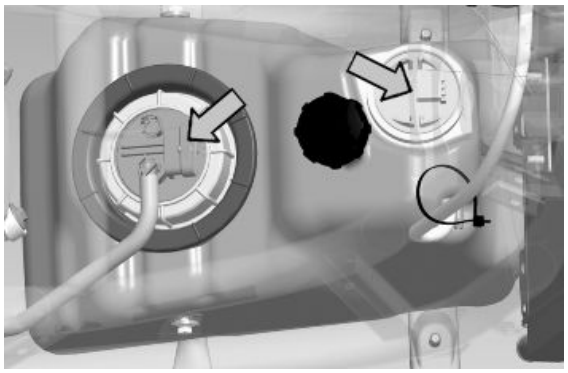
- Remove the shield back plate.
- Remove the two lower screws of the front wheel housing.
- Remove the footrest.

N.B.

THIS OPERATION SHOULD PREFERABLY BE PERFORMED WITH THE TANK EMPTY.



- Separate the electrical connections of the fuel gauge and disconnect the fuel supply line and tank breather;
- Remove the toggle handles by loosening the 4 retaining screws;
- Remove the support bracket by loosening the 2 retaining screws of the bracket at the frame;
- Remove the three tank retaining screws at the frame;
- Remove the tank by tilting it downwards and pulling out from below.



N.B.

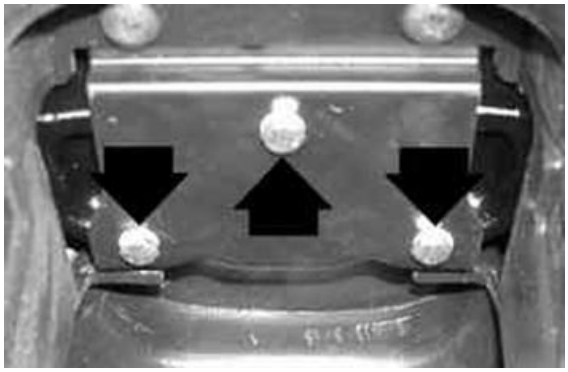
BE VERY CAREFUL WHEN PULLING OUT THE CARBURETTOR PIPING SINCE AN EXCESSIVE FORCE MAY DAMAGE THE PLASTIC INSERTS ON THE PUMP BODY. UPON REASSEMBLY, IT IS THEREFORE NECESSARY TO SLIGHTLY PRESS THE PIPING AND THE RETAIN RIM TOWARDS THE PUMP, THEN KEEP THE RIM PRESSED AND PULL THE COUPLING UPWARDS.

See also

Knee-guard
Front wheel housing
Footrest

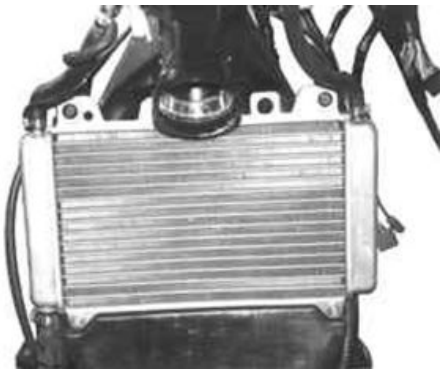
Front mudguard

- Remove the retaining screw of the cable lead through support on the right-hand side of the mudguard. - Loosen the 3 fixing retaining screws indicated in the figure and remove the mudguard.



Radiator fan

- Remove the front wheel housing.
- Prepare a container for the coolant.
- Remove the expansion tank outlet and return pipes.
- Remove the coolant supply and return pipes from the radiator.
- Loosen the screw mounting the radiator to the frame.
- Disengage the radiator and the electric fan.



See also

Front wheel housing

Flyscreen

- Undo the screw indicated.

- Undo the four screws indicated and remove the windshield.

INDEX OF TOPICS

Carry out the listed tests before delivering the vehicle.

Warning - Handle fuel with care.

Aesthetic inspection

Appearance check:

- Paintwork
- Fitting of plastics
- Scratches
- Dirt

Tightening torques inspection

- Visually check that there is a yellow mark on the following clamps:

FRONT SUSPENSION

- Front wheel pin nut.
- Screws fixing wheel pin on right fork leg.

FRONT BRAKE

- Screws fixing front brake callipers to fork.
- Brake pipes / front brake calliper coupling.

REAR SUSPENSION

- Rear wheel tightening screws.
- Lower shock absorber retainer.
- Nuts fixing muffler supporting arm - engine.
- Screws fixing muffler to supporting arm.
- Rear wheel pin nut.

REAR BRAKE

- Screws fixing rear brake calliper to supporting plate.
- Brake pipe to rear brake calliper coupling.
- Screws fixing supporting plate to engine.

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 THE RECOMMENDED CAPACITY. USING A FUSE OF UNSUITABLE RATING MAY SERIOUSLY DAMAGE THE VEHICLE OR EVEN CAUSE A FIRE.

Levels check

Level check:

- Hydraulic brake system liquid level.
- 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

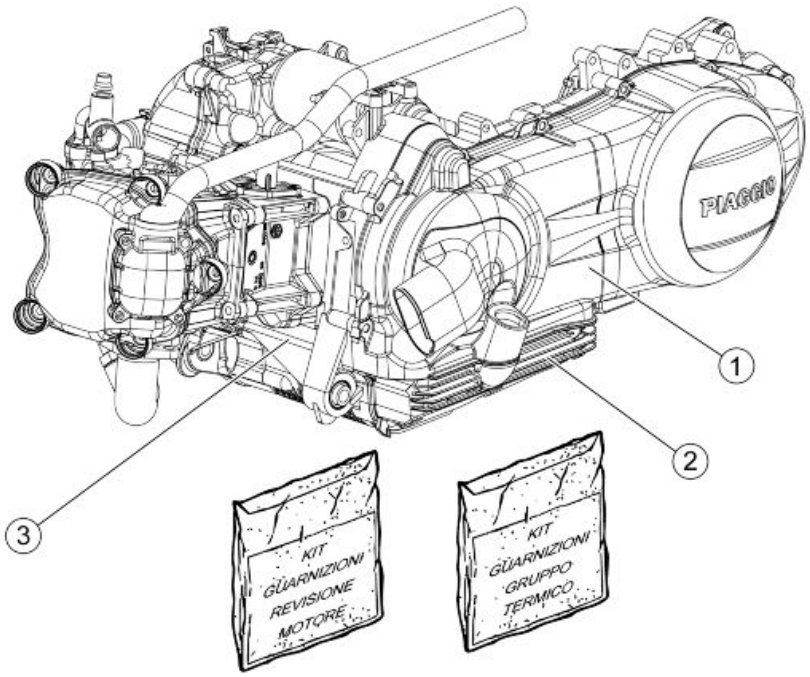
• Other: papers check, chassis and engine number check, tools and equipment, licence plate fitting, lock check, tyre pressure check, rear-view mirror and any accessory fitting

INDEX OF TOPICS

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

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

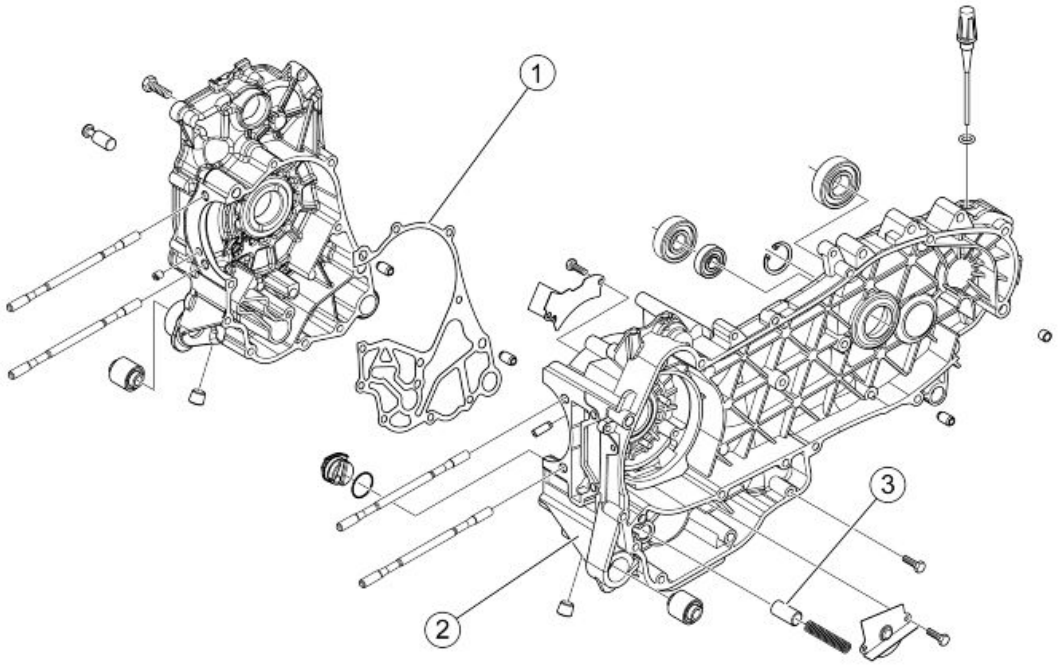
Engine



ENGINE

	Code	Action	Duration
1	001001	Engine from chassis - Removal and refit.	
2	003064	Engine oil - change	
3	001127	Engine - Complete service	

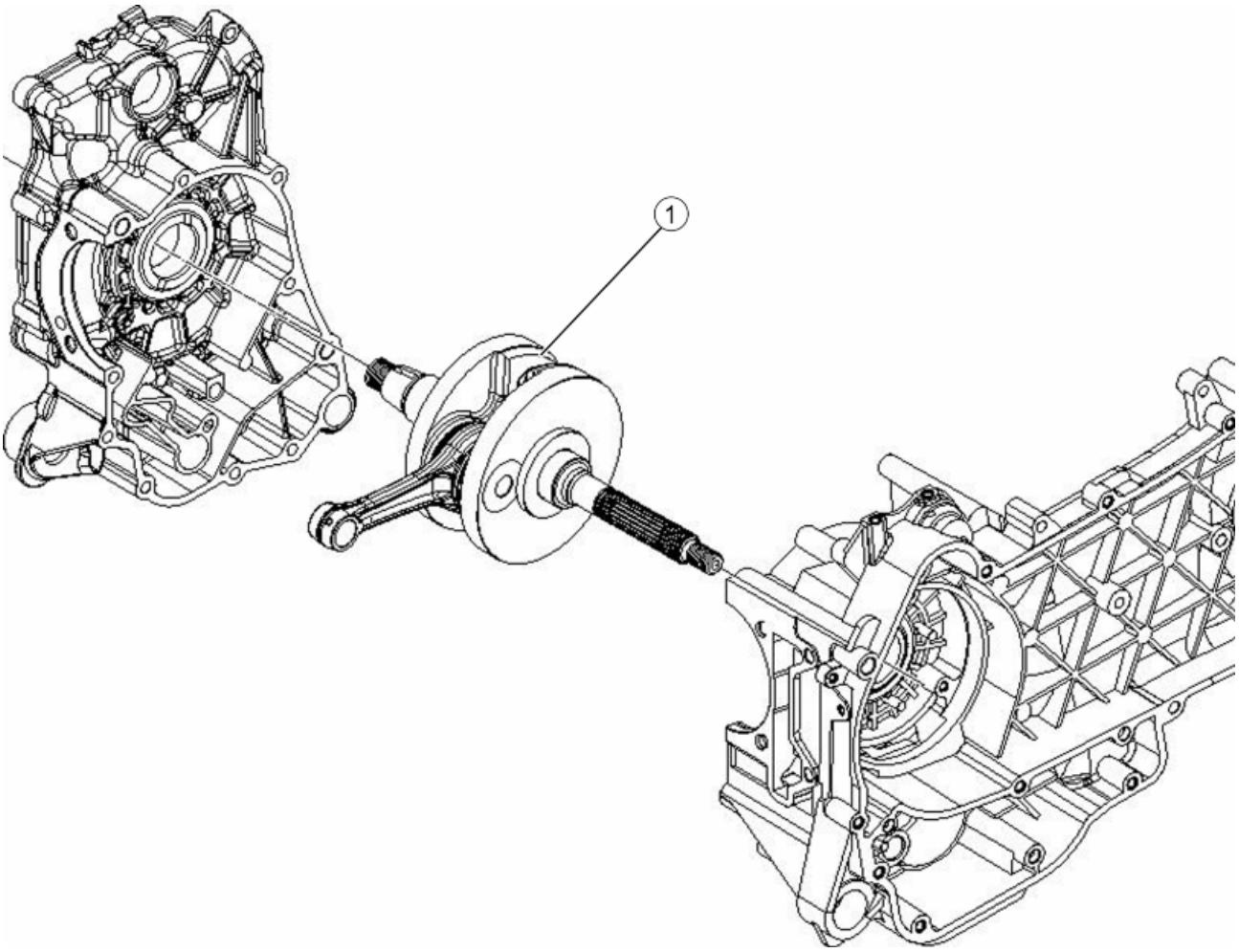
Crankcase



CRANKCASE

	Code	Action	Duration
1	001153	Crankcase halves gasket - Replacement	
2	001133	Engine crankcase - Replacement	
3	001124	Lubrication by pass - Replacement	

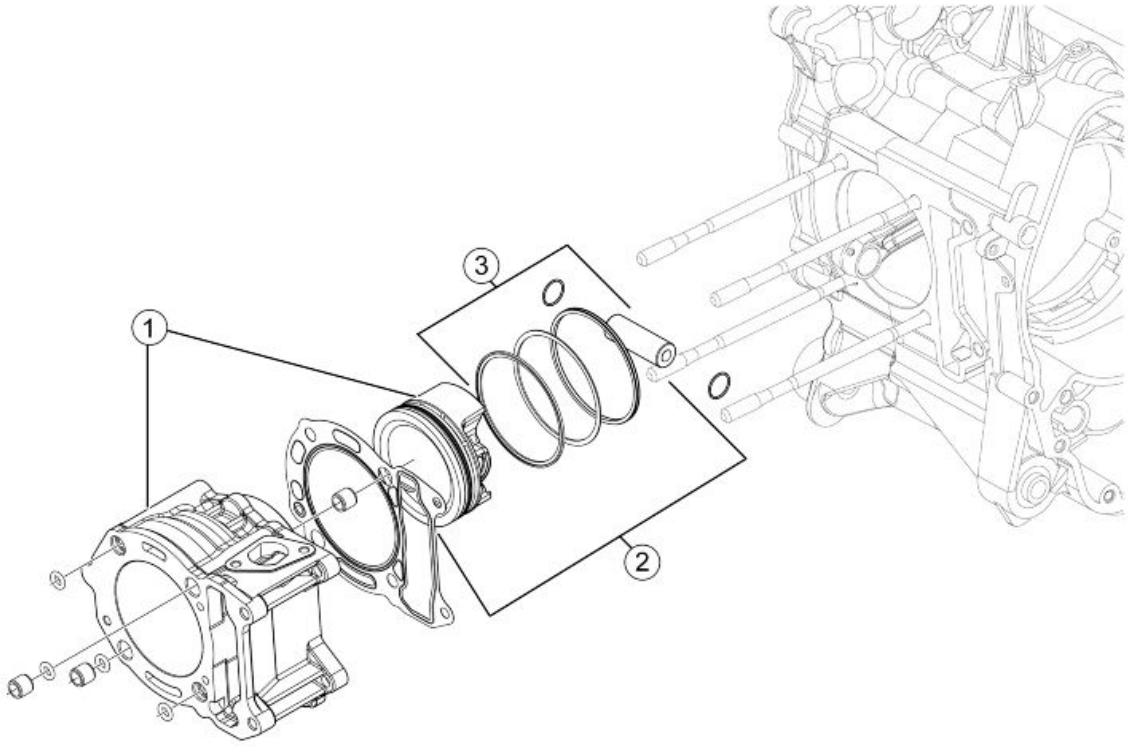
Crankshaft



CRANKSHAFT

	Code	Action	Duration
1	001117	Crankshaft - Replacement	

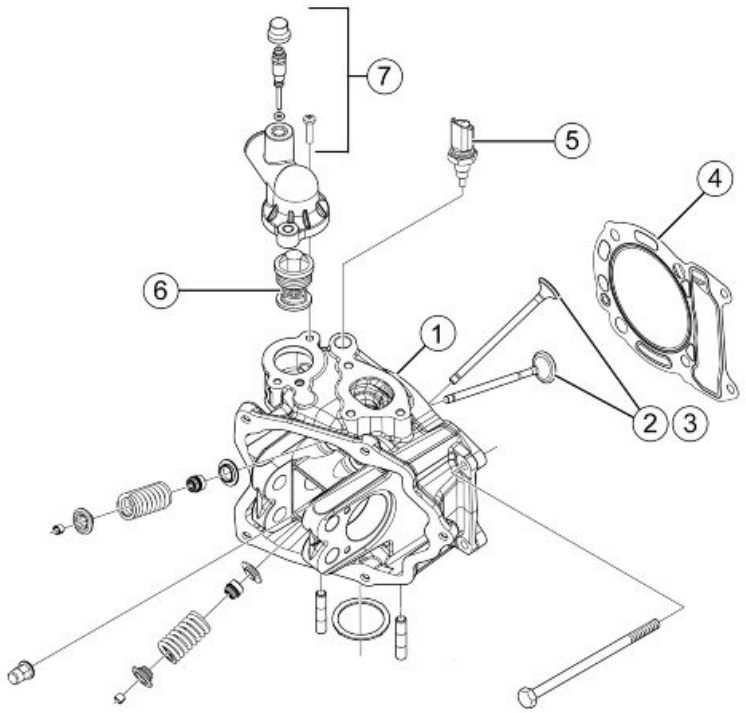
Cylinder assy.



CYLINDER - PISTON

	Code	Action	Duration
1	001002	Cylinder / Piston - Replacement	
2	001154	Pistonsrings-pin assembly - Service	
3	001176	Rings / Pin - Replacement	

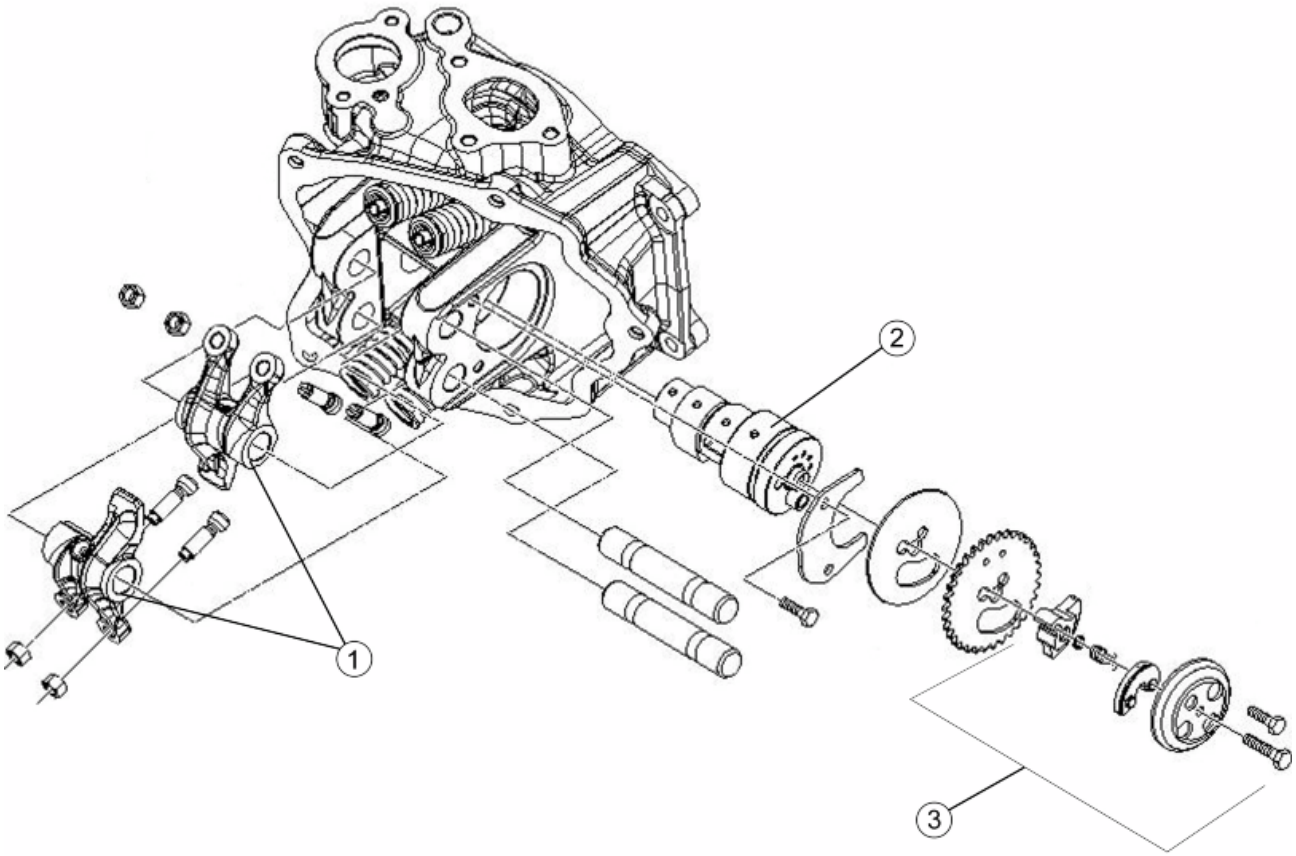
Cylinder head assy.



VALVE HEAD

	Code	Action	Duration
1	001126	Head - Replacement	
2	001045	Valves - Replacement	
3	001049	Valves - adjust	
4	001056	Head gasket - change	
5	000235	Coolant temperature sensor - Repl.	
6	001057	Thermostat - Replacement	
7	007012	Coolant bleed valve - Replacement	

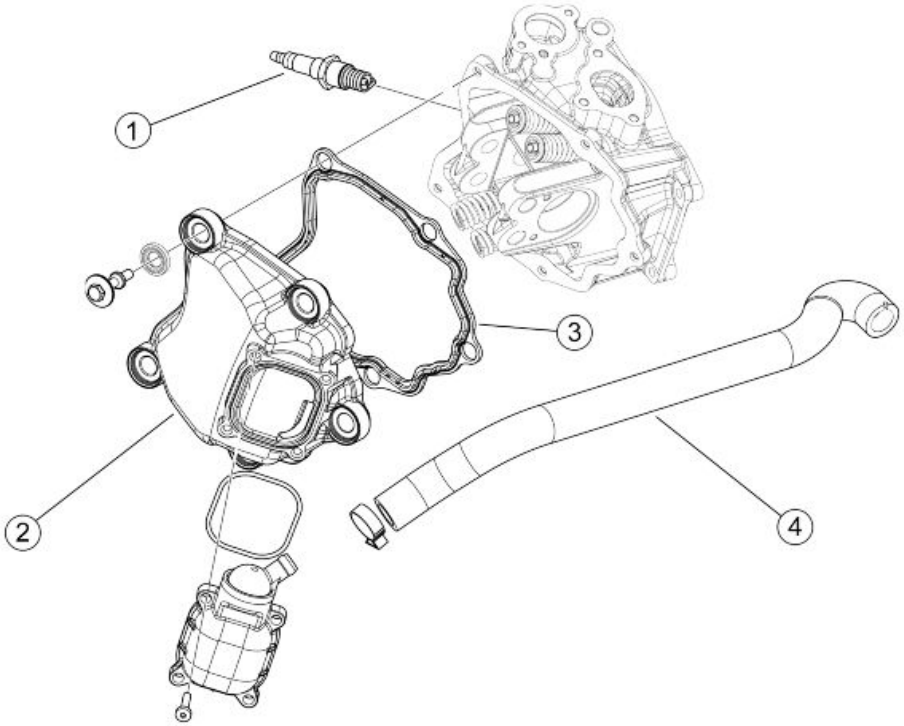
Rocker arms support assy.



CAMSHAFT

	Code	Action	Duration
1	001148	Rockers valves - Replacement	
2	001044	Camshaft - Replacement	
3	001169	Pressure reducer - Replacement	

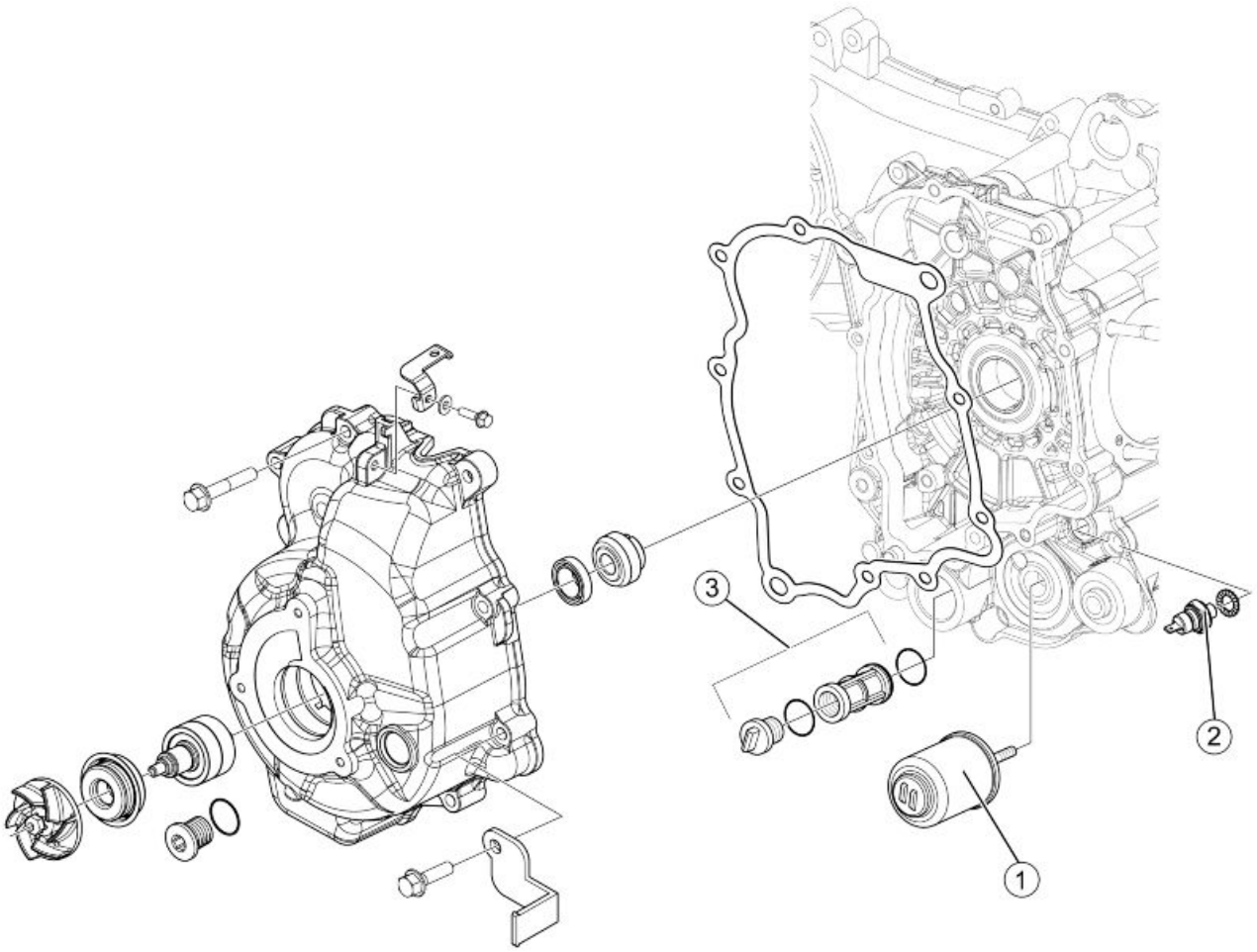
Cylinder head cover



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	

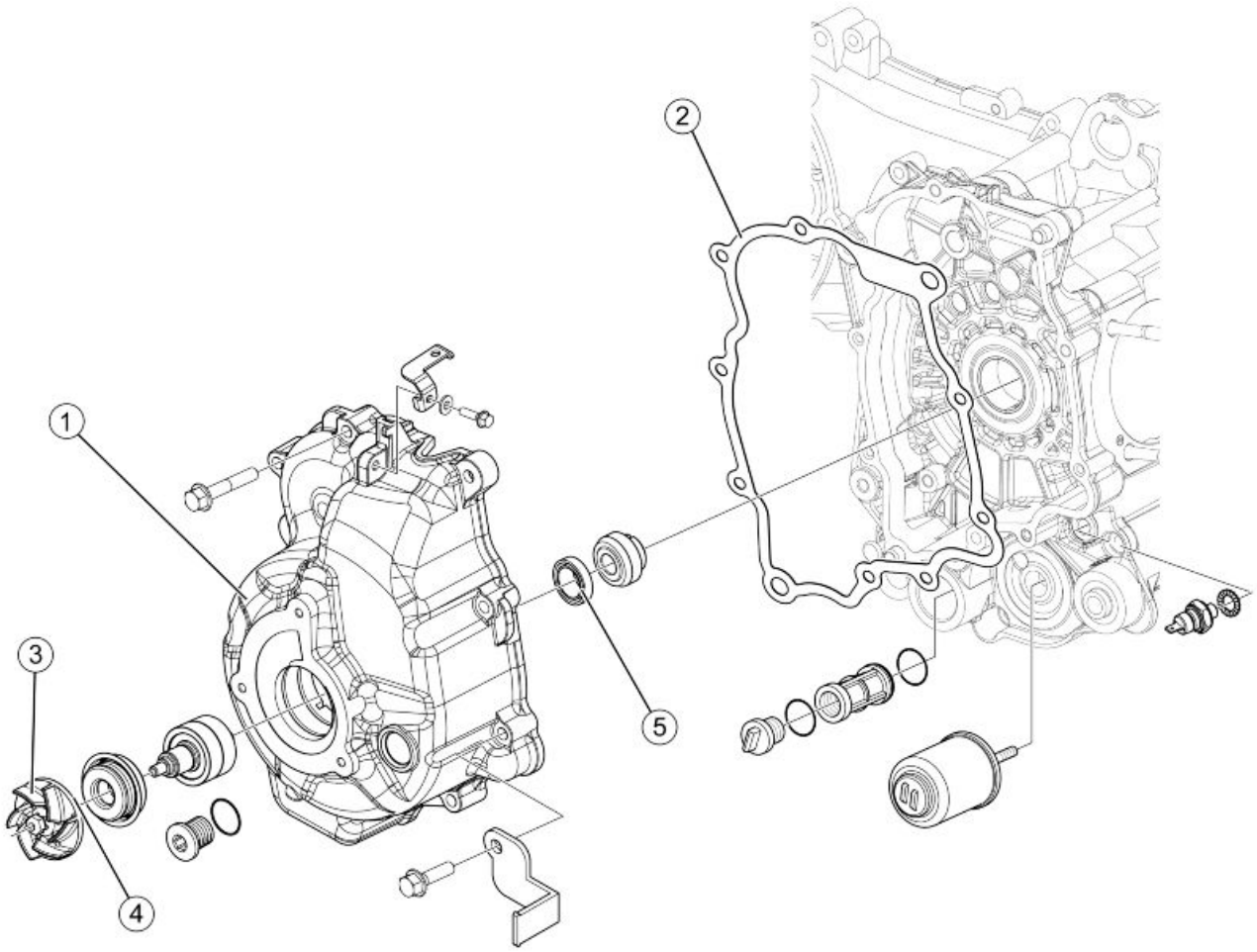
Oil filter



OIL FILTER

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

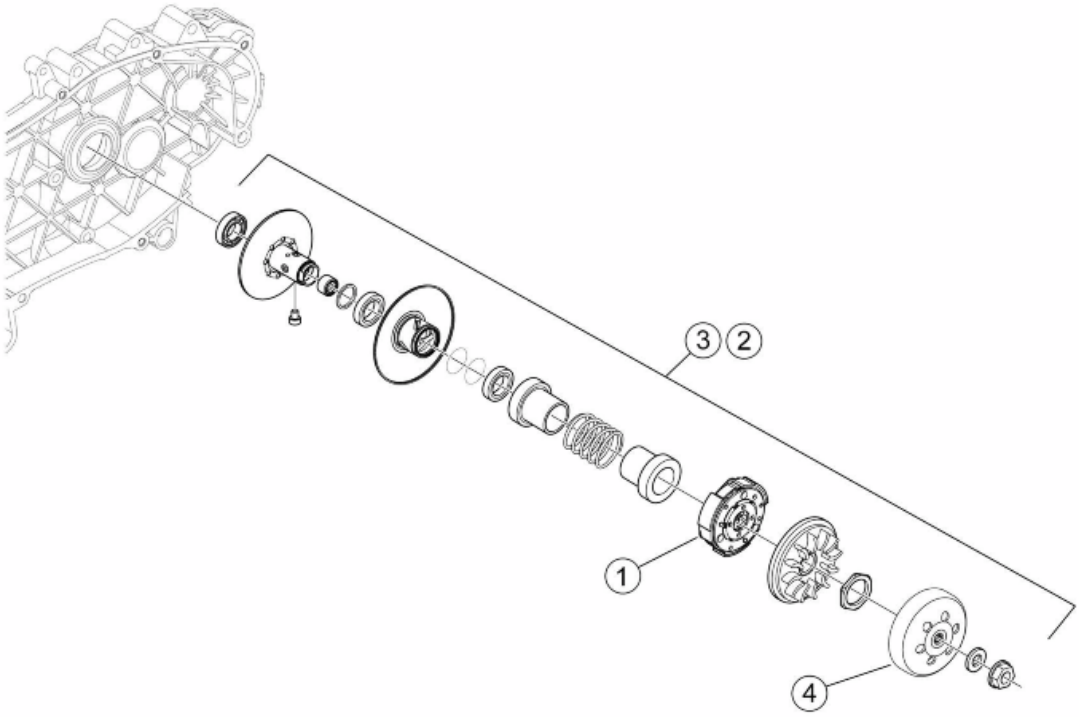
Flywheel cover



FLYWHEEL COVER

	Code	Action	Duration
1	001087	Flywheel cover - Replacement	
2	001150	Flywheel cover gasket - change	
3	007007	Water pump rotor - Replacement	
4	001113	Water pump / Pump rotor - Replacement	
5	001099	Flywheel-side oil seal - Replacement	

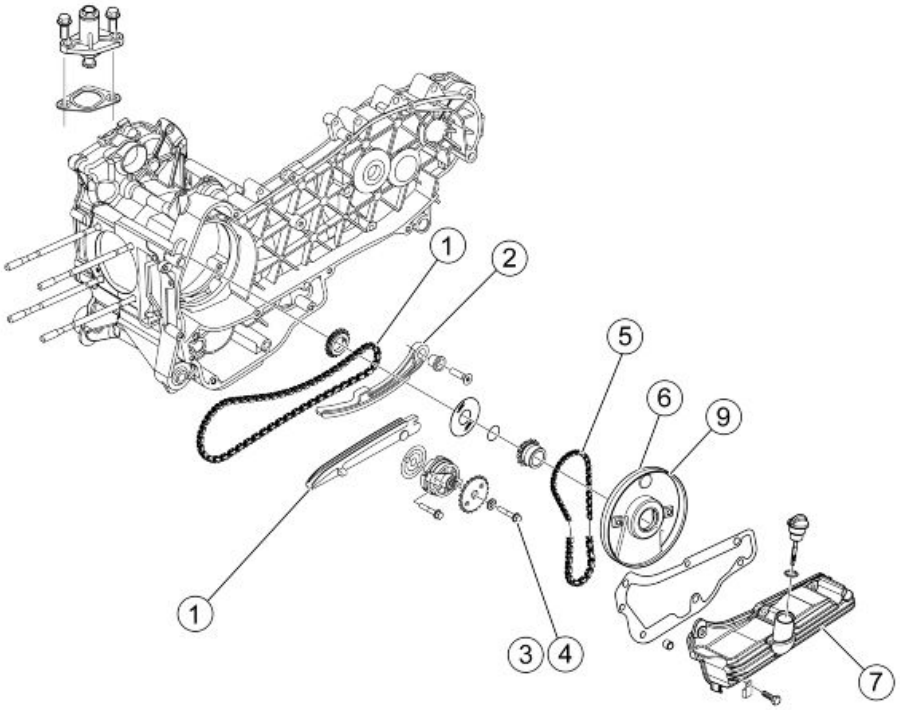
Driven pulley



DRIVEN PULLEY

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

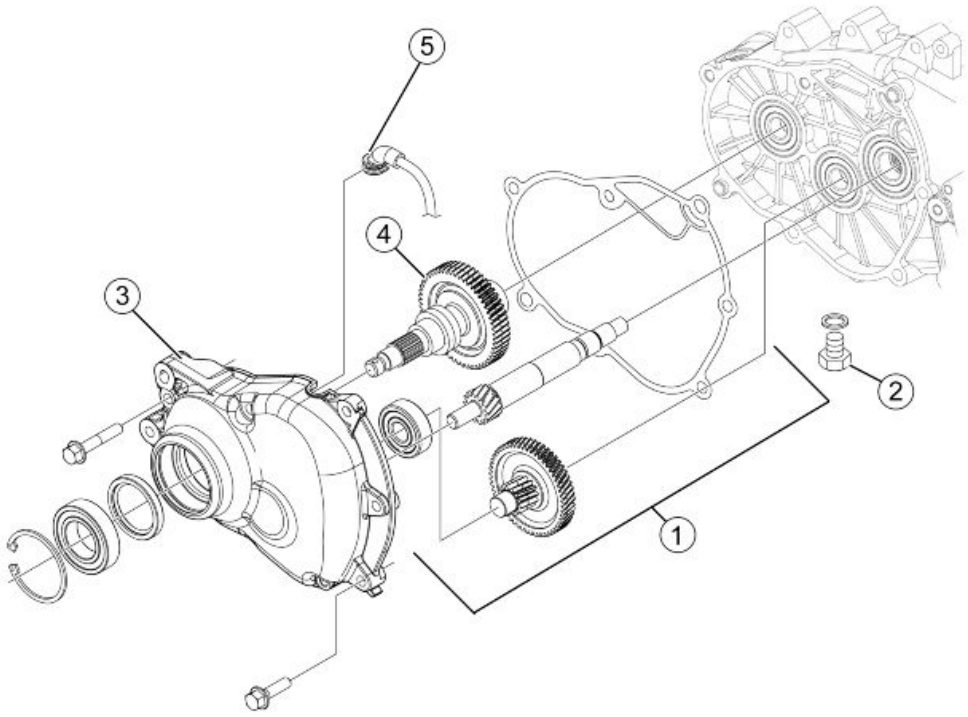
Oil pump



OIL PUMP

	Code	Action	Duration
1	001125	Chain guide pads - Replacement	
2	001051	Distribution belt - chain - Replacement	
3	001042	Oil pump - overhaul	
4	001112	Oil pump - change	
5	001122	Oil pump chain - Replacement	
6	001172	Chain cover flap - change	
7	001130	Oil sump - change	
8	001129	Chain tensioner - Service and Replacement	
9	888133	Chain cover flap - Check / replacement	

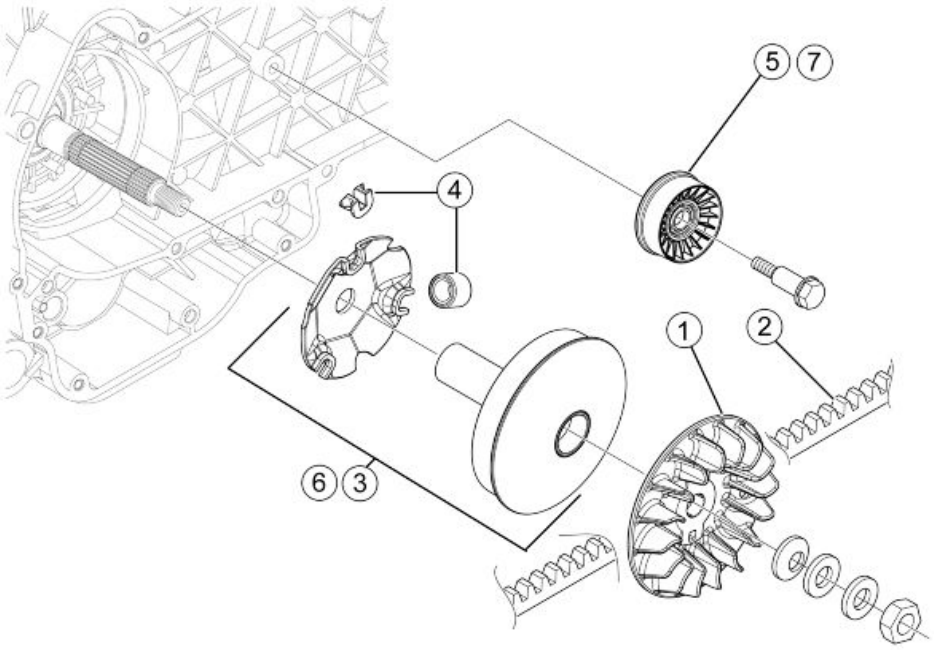
Final gear assy.



FINAL REDUCTION GEAR

	Code	Action	Duration
1	001010	Reduction gear - Replacement	
2	003065	Gear box oil - Replacement	
3	001156	Reduction gear cover - Replacement	
4	004125	Rear wheel axle - Replacement	
5	004180	Reduction gear pipe - replace	

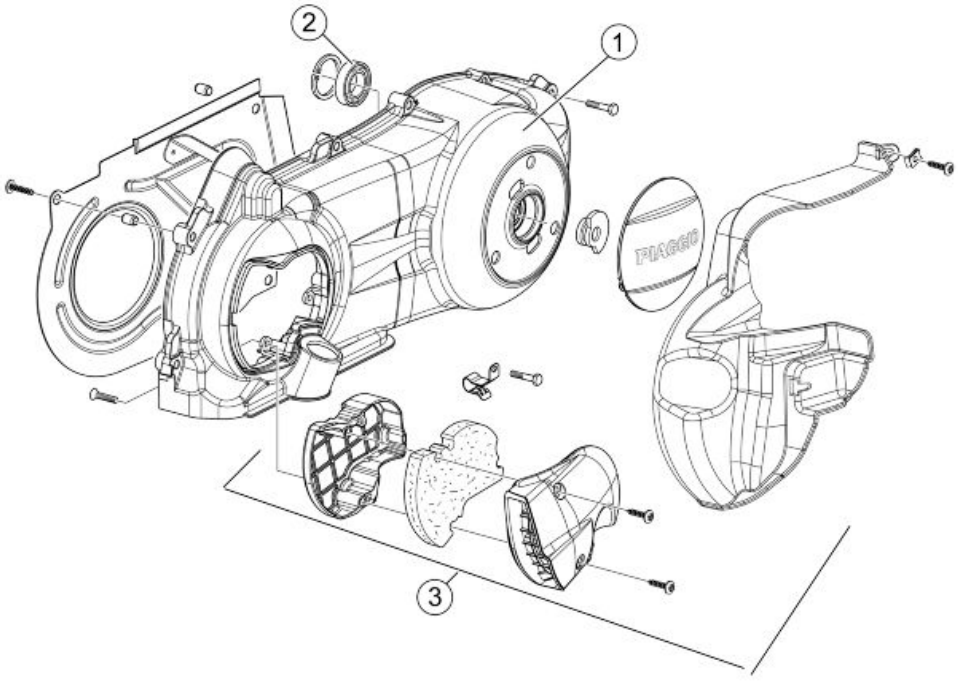
Driving pulley



DRIVING PULLEY

	Code	Action	Duration
1	001086	Driving half-pulley - Replacement	
2	001011	Drive belt - Replacement	
3	001066	Driving pulley - Removal and refitting	
4	001177	CVT rollers / sliders - Replacement	
5	001141	Belt anti-flapping roller - Replacement	
6	001006	Driving pulley - Service	
7	001175	Anti-flapping roller/ Belt - Service	

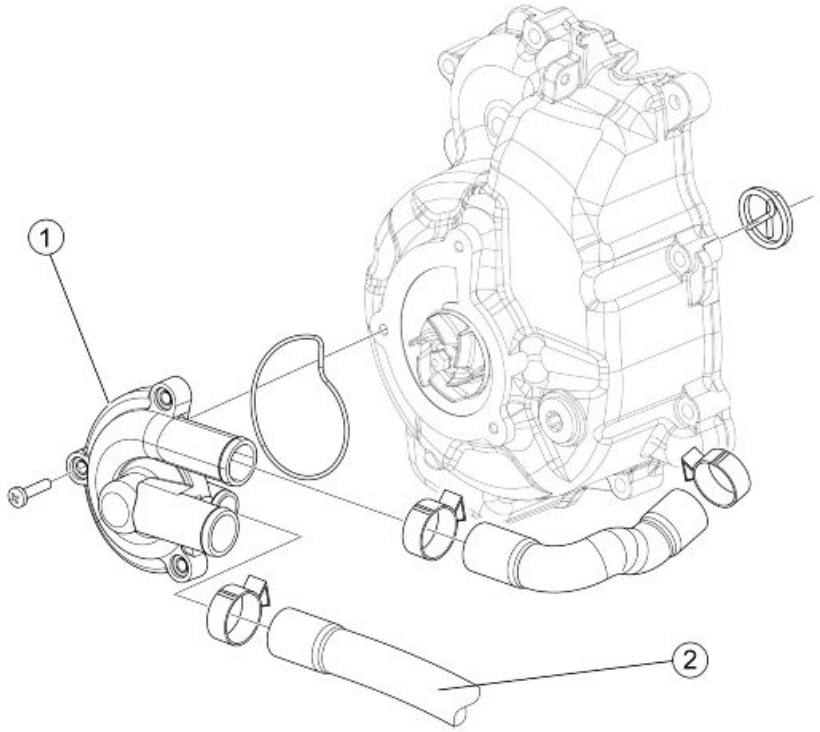
Transmission cover



TRANSMISSION COVER

	Code	Action	Duration
1	001096	Transmission crankcase cover - Replacement	
2	001135	Transmission cover bearing - Replacement	
3	001170	Air deflector - Replacement	

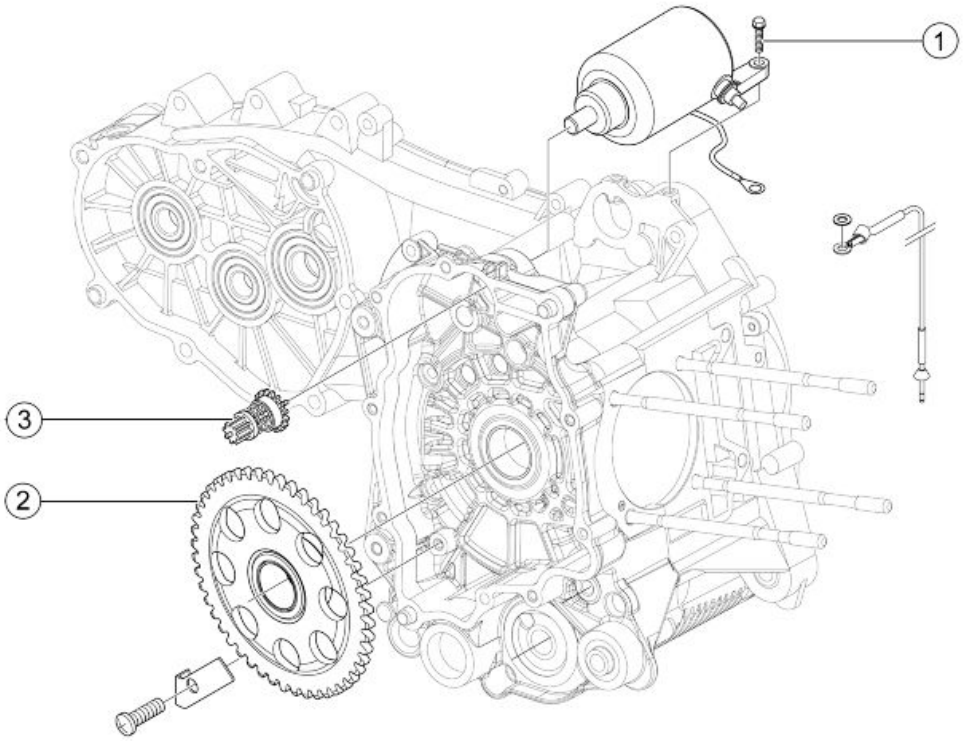
Water pump



WATER PUMP

	Code	Action	Duration
1	007017	Water pump cover - Replacement	
2	007009	Head-pump by-pass rubber sleeve - Replacement	

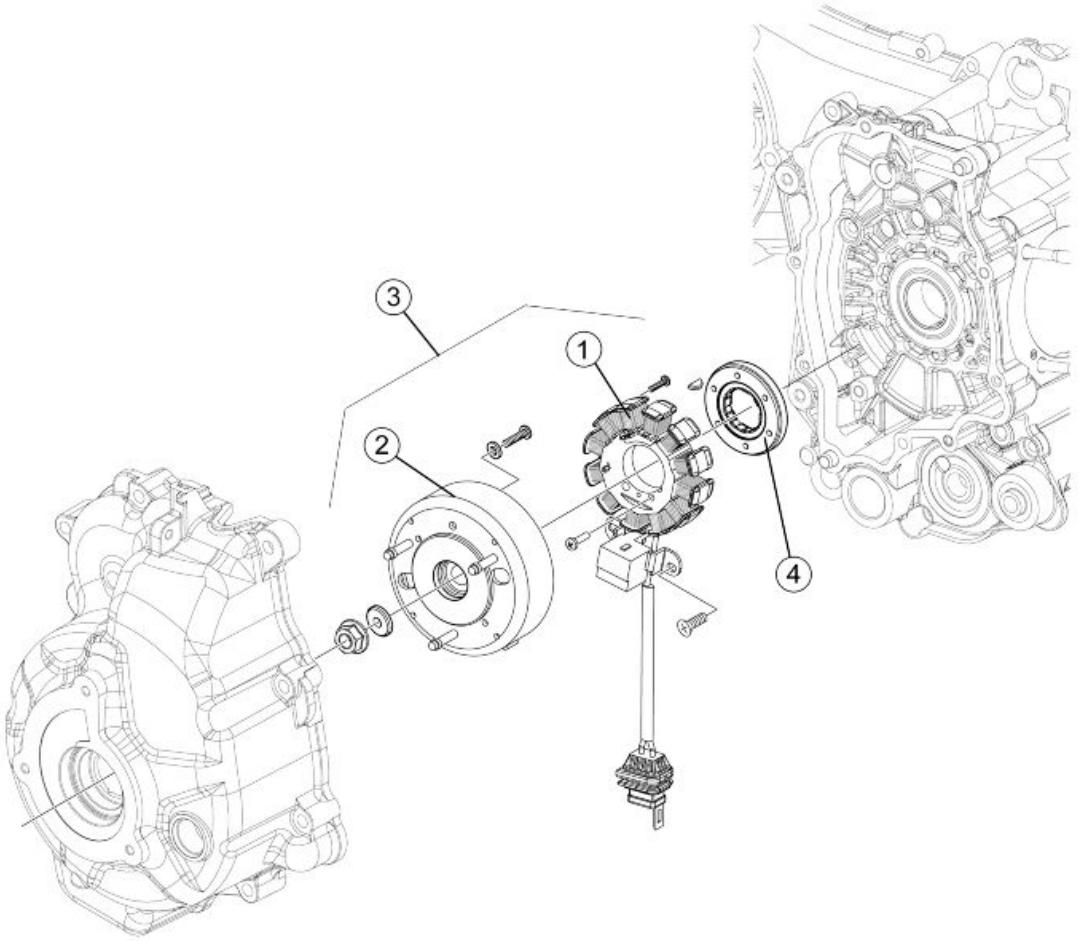
Starter motor



ELECTRICAL START-UP

	Code	Action	Duration
1	001020	Starter motor - Replacement	
2	001151	Starter driven gearing - Replacement	
3	001017	Start-up pinion - Replacement	

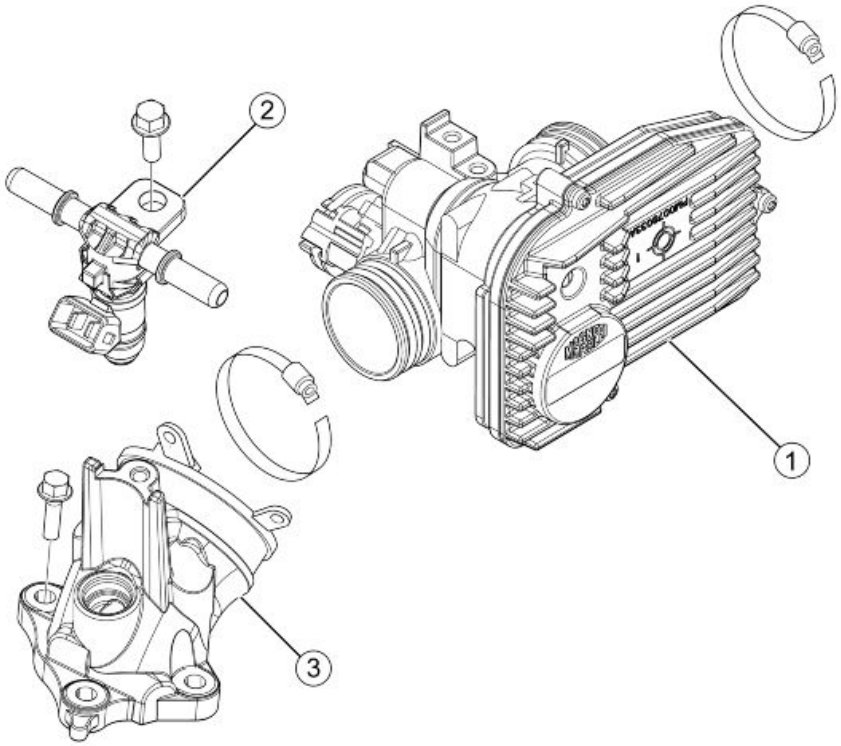
Flywheel magneto



MAGNETO FLYWHEEL

	Code	Action	Duration
1	001067	Stator - Removal and Refitting	
2	001173	Rotor - Replacement	
3	001058	Complete flywheel - change	
4	001104	Start-up freewheel - Replacement	

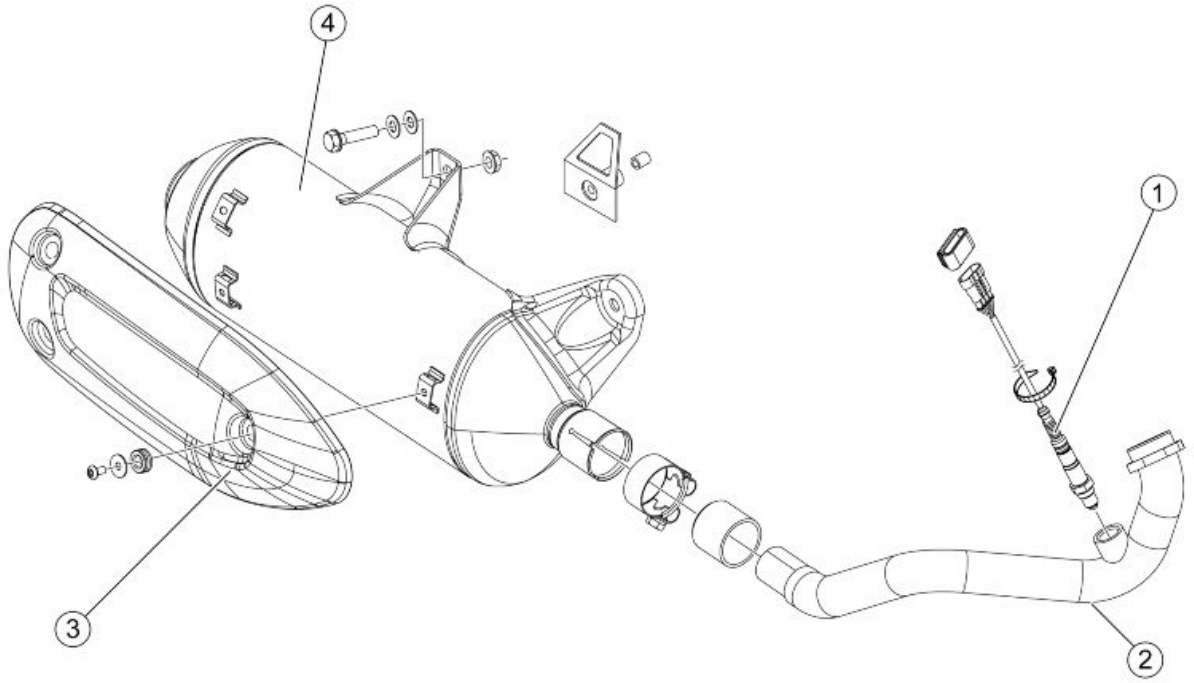
Butterfly valve



THROTTLE BODY

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

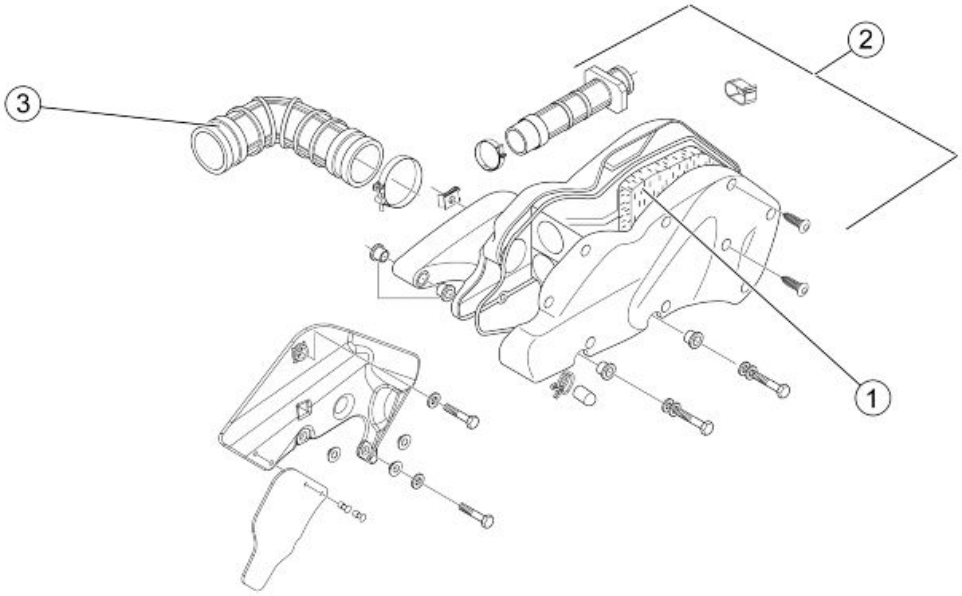
Exhaust pipe



MUFFLER

	Code	Action	Duration
1	005138	Lambda probe - Replacement	
2	001092	Exhaust manifold - Replacement	
3	001095	Silencer heatshield - Replacement	
4	001009	Silencer - Replacement	

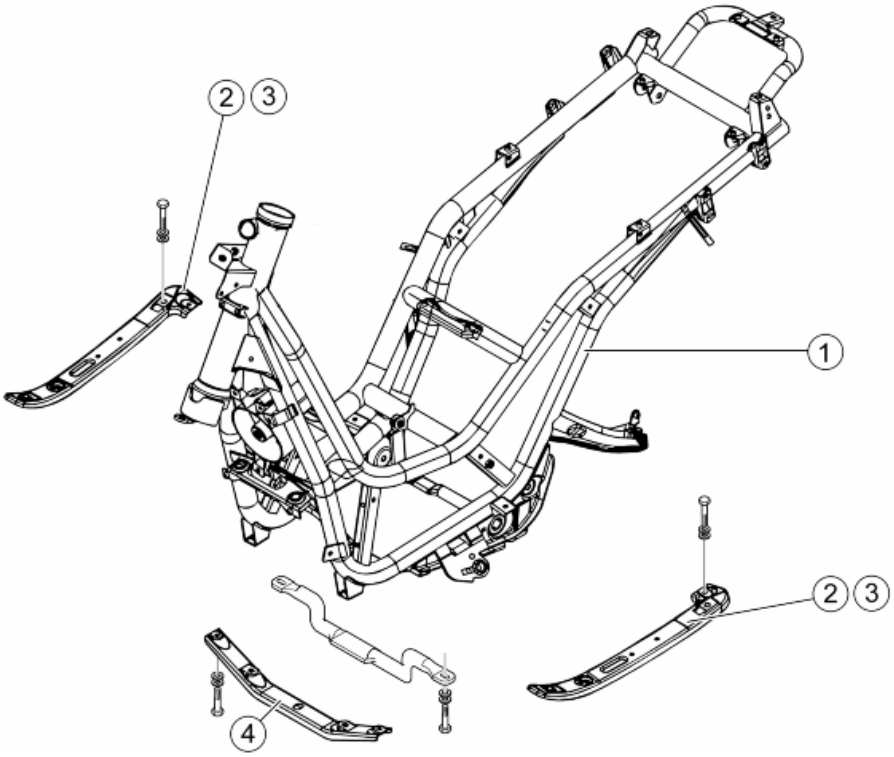
Air cleaner



AIR CLEANER

	Code	Action	Duration
1	001015	Air filter box - Replacement	
2	001014	Air filter - Replacement / cleaning	
3	004122	Air cleaner/ carburettor union - Replacement	

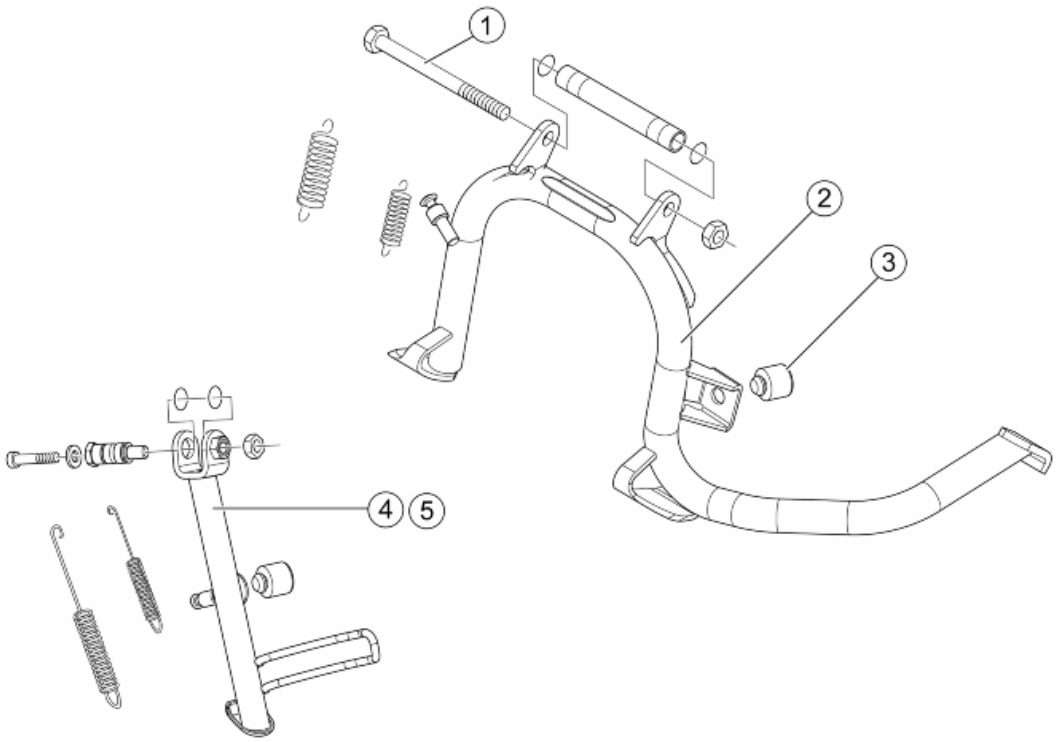
Frame



CHASSIS

	Code	Action	Duration
1	004001	Chassis - Replacement	
2	004147	footboard support bracket one side - Replacement	
3	004148	Footrest support bracket, both sides - Replacement	
4	004146	Front chassis - Replacement	

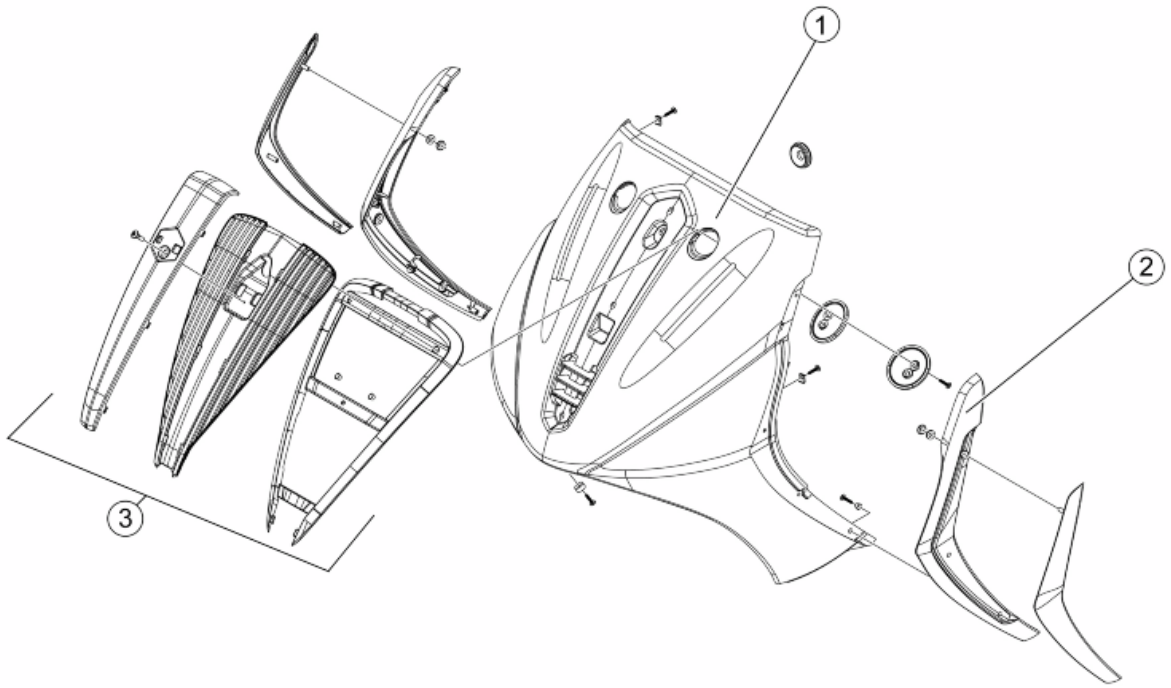
Centre-stand



STAND

	Code	Action	Duration
1	001053	Stand pin - Replacement	
2	004004	Stand - Replacement	
3	004179	Stand bumper - Replacement	
4	004102	Side stand - Replacement	
5	005079	Stand switch - Replacement	

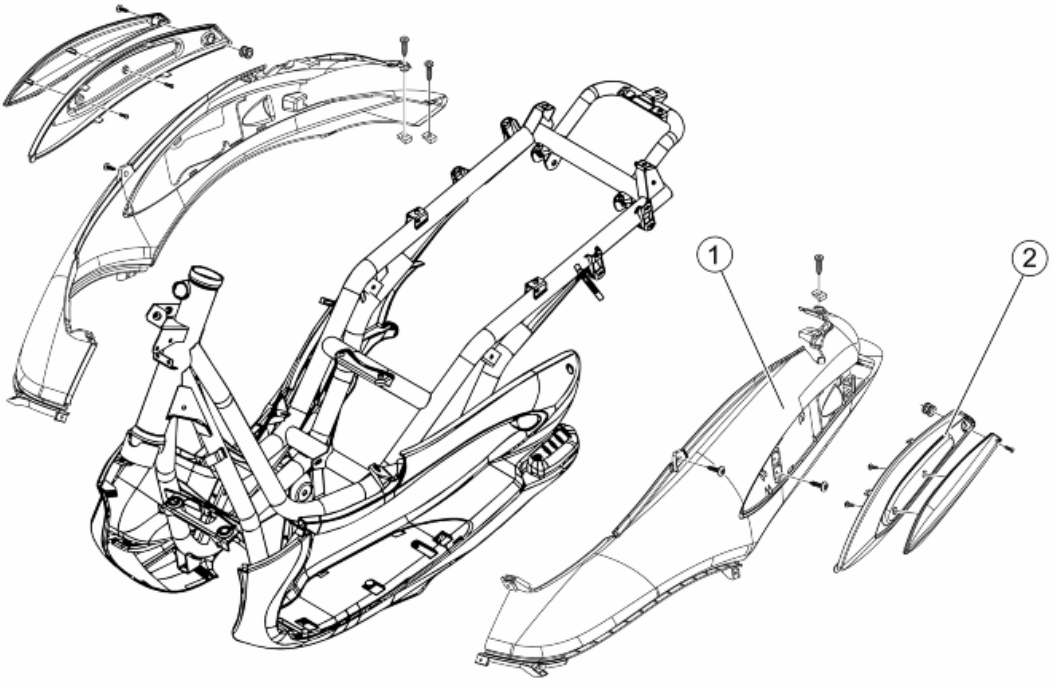
Legshield spoiler



LEGSHIELD - SPOILER

	Code	Action	Duration
1	004064	Legshield, front section - Replacement	
2	004023	Shield rim - Replacement	
3	004149	shield central cover - Replacement	

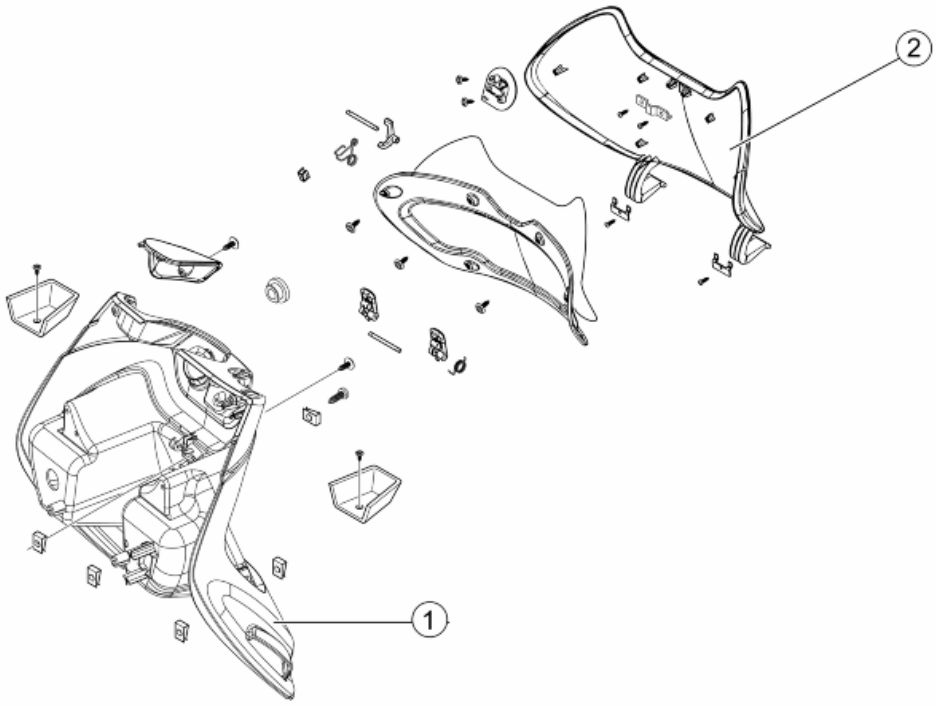
Side fairings



SIDE COVERS

	Code	Action	Duration
1	004012	Rear side panels - Replacement	
2	004129	Rear fairing - Replacement	

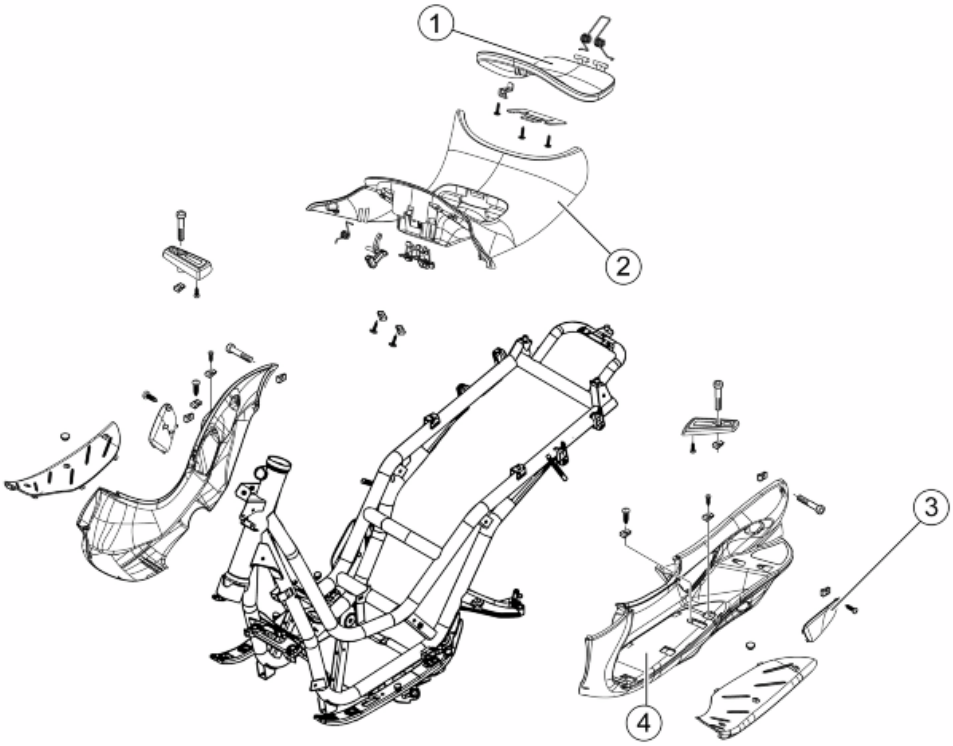
Rear cover



REAR SHIELD

	Code	Action	Duration
1	004065	Shield back plate - Replacement	
2	004081	Top box lid - Replacement	

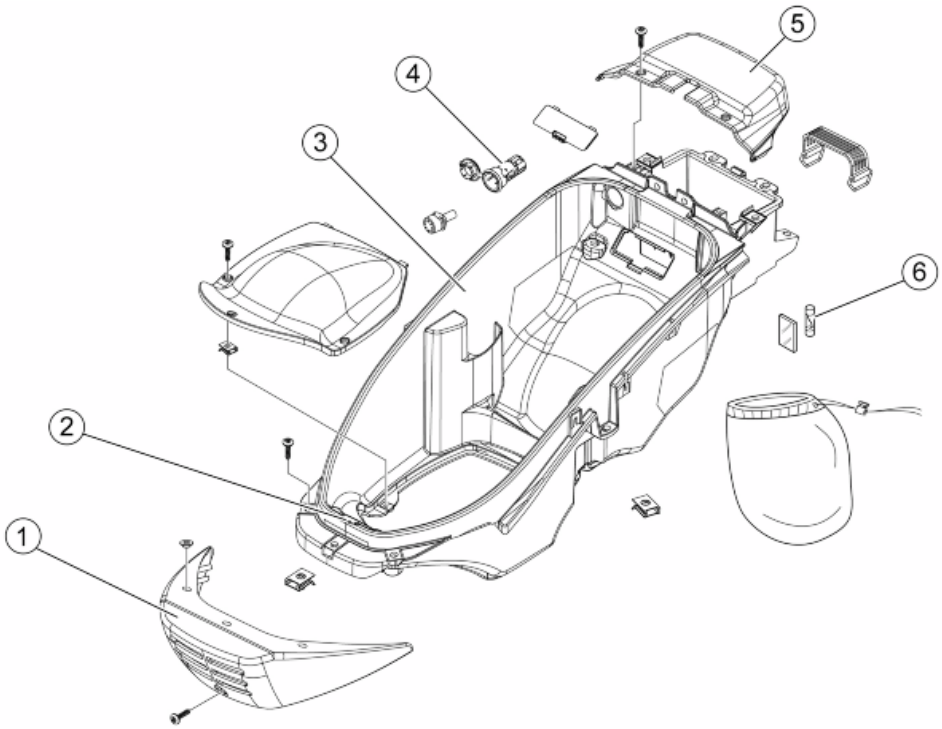
Central cover



CENTRAL COVER

	Code	Action	Duration
1	004135	Fuel tank port - Replacement	
2	004011	Central chassis cover - Replacement	
3	004059	Spark plug inspection flap - Replacement	
4	004015	Footrest - Replacement	

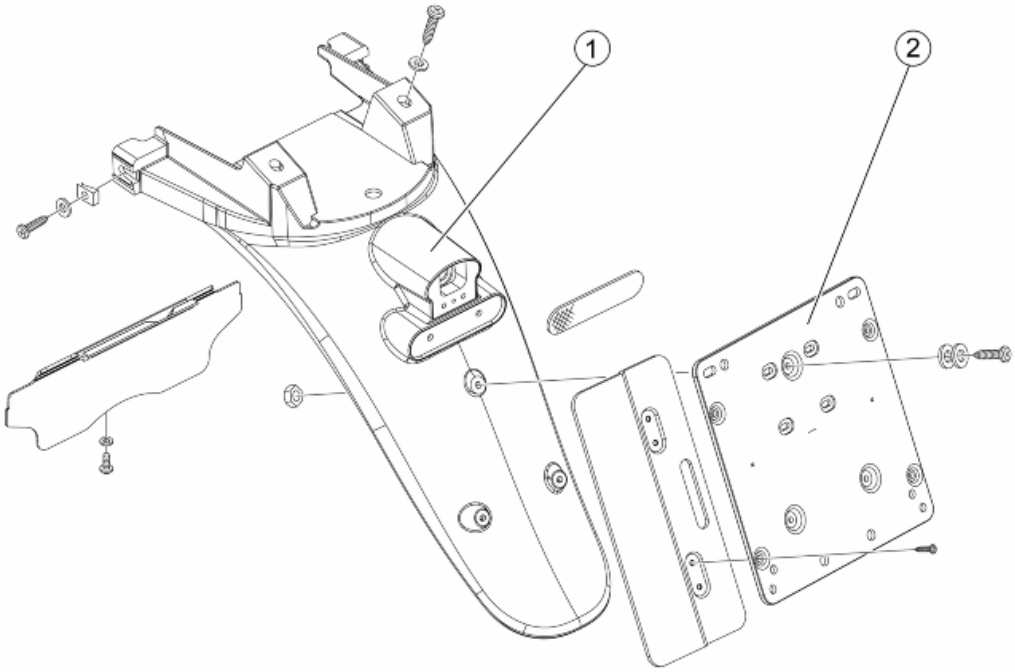
Underseat compartment



HELMET COMPARTMENT

	Code	Action	Duration
1	004106	Helmet compartment band - Replacement	
2	005033	Glove-box light switch - Replacement	
3	004016	Helmet compartment - Replacement	
4	004112	Cock / carburettor hose - Replacement	
5	005046	Battery cover - change	
6	005026	Helmet compartment bulb - Replacement	

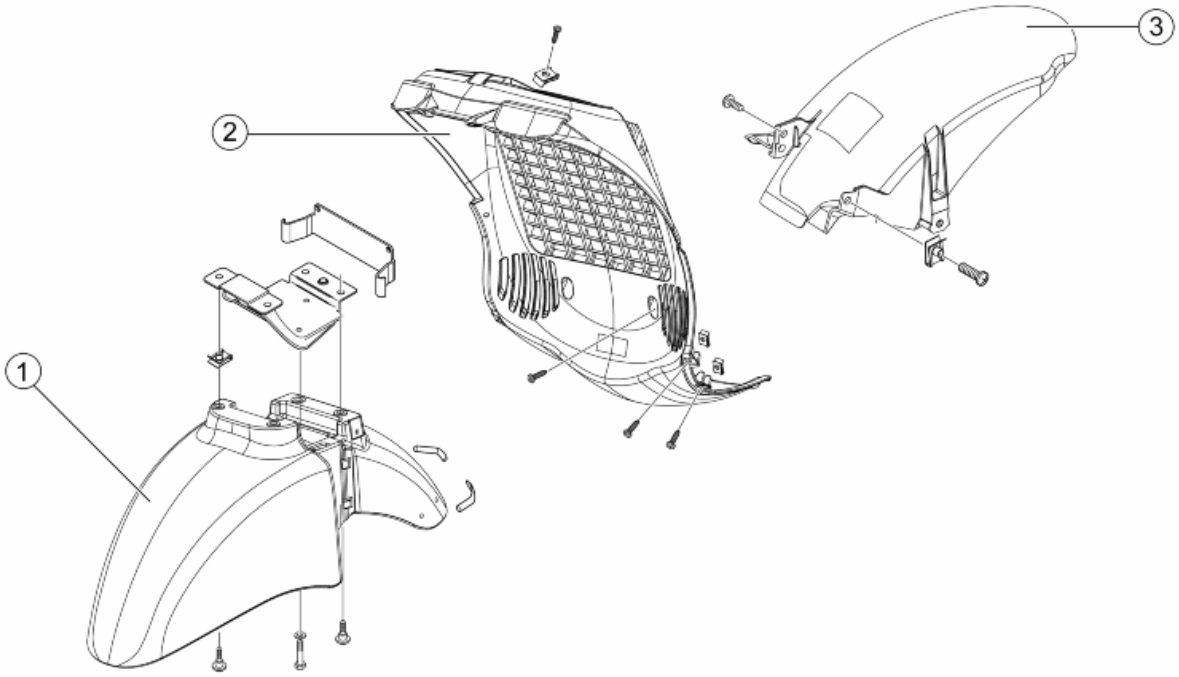
Plate holder



LICENSE PLATE HOLDER

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

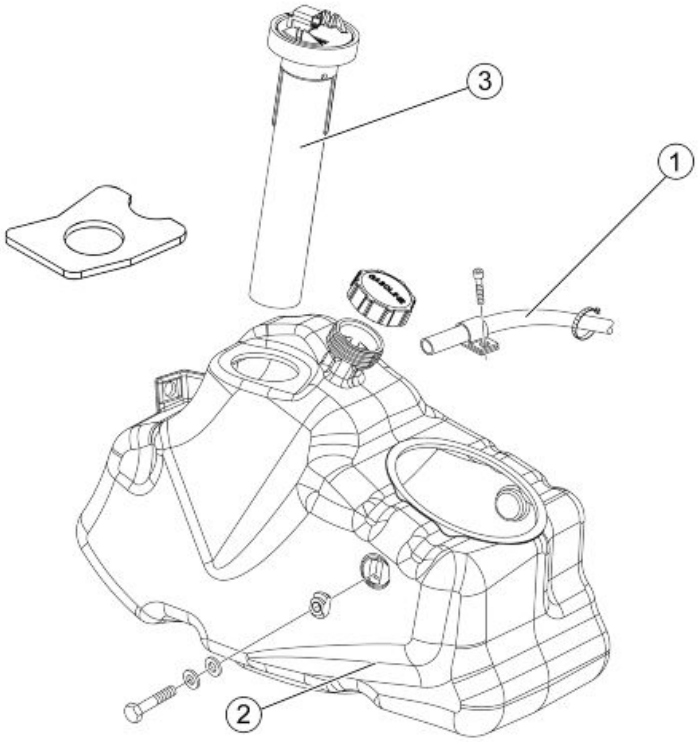
Mudguard



MUDGUARDS

	Code	Action	Duration
1	004002	Front mudguard - change	
2	004053	Spoiler - Replacement	
3	004009	Rear mudguard - Replacement	

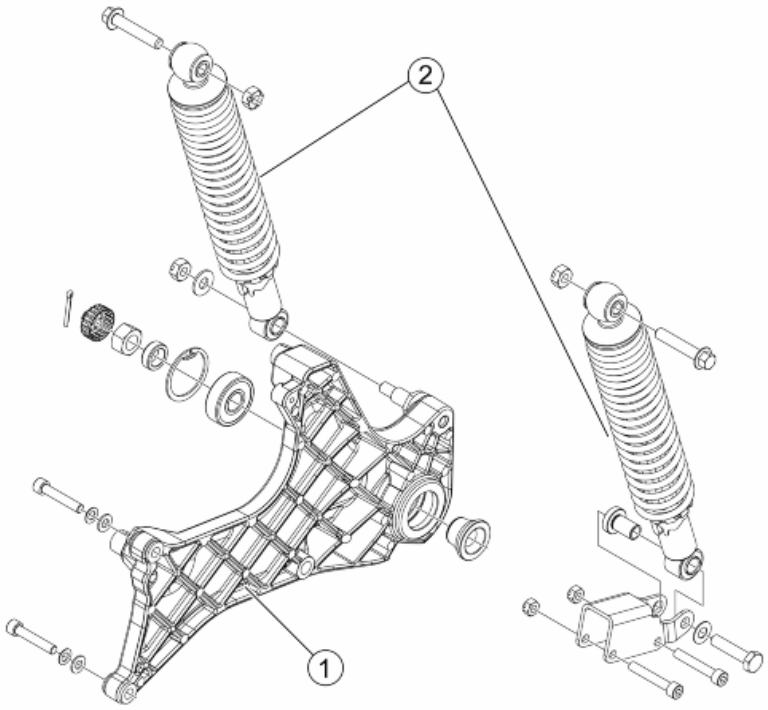
Fuel tank



FUEL TANK

	Code	Action	Duration
1	004109	Fuel tank breather - change	
2	004005	Fuel tank - Replacement	
3	005010	Tank float - Replacement	

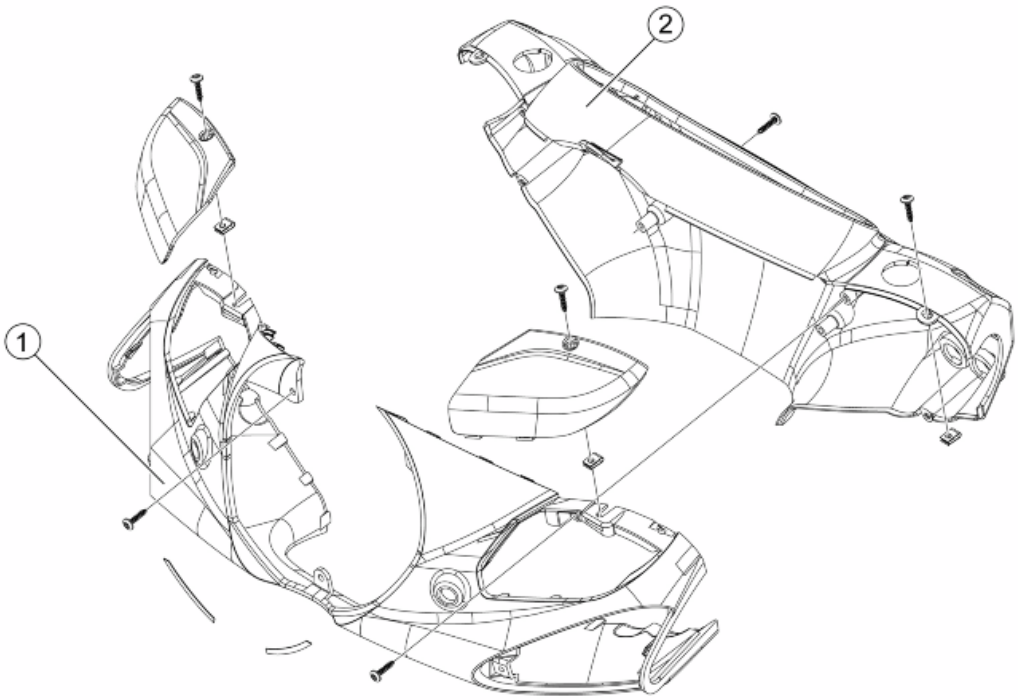
Rear shock-absorber



REAR SHOCK ABSORBER

	Code	Action	Duration
1	003077	Muffler supporting arm/ rear shock absorber - Replacement	
2	003007	Rear shock absorber - Replacement	

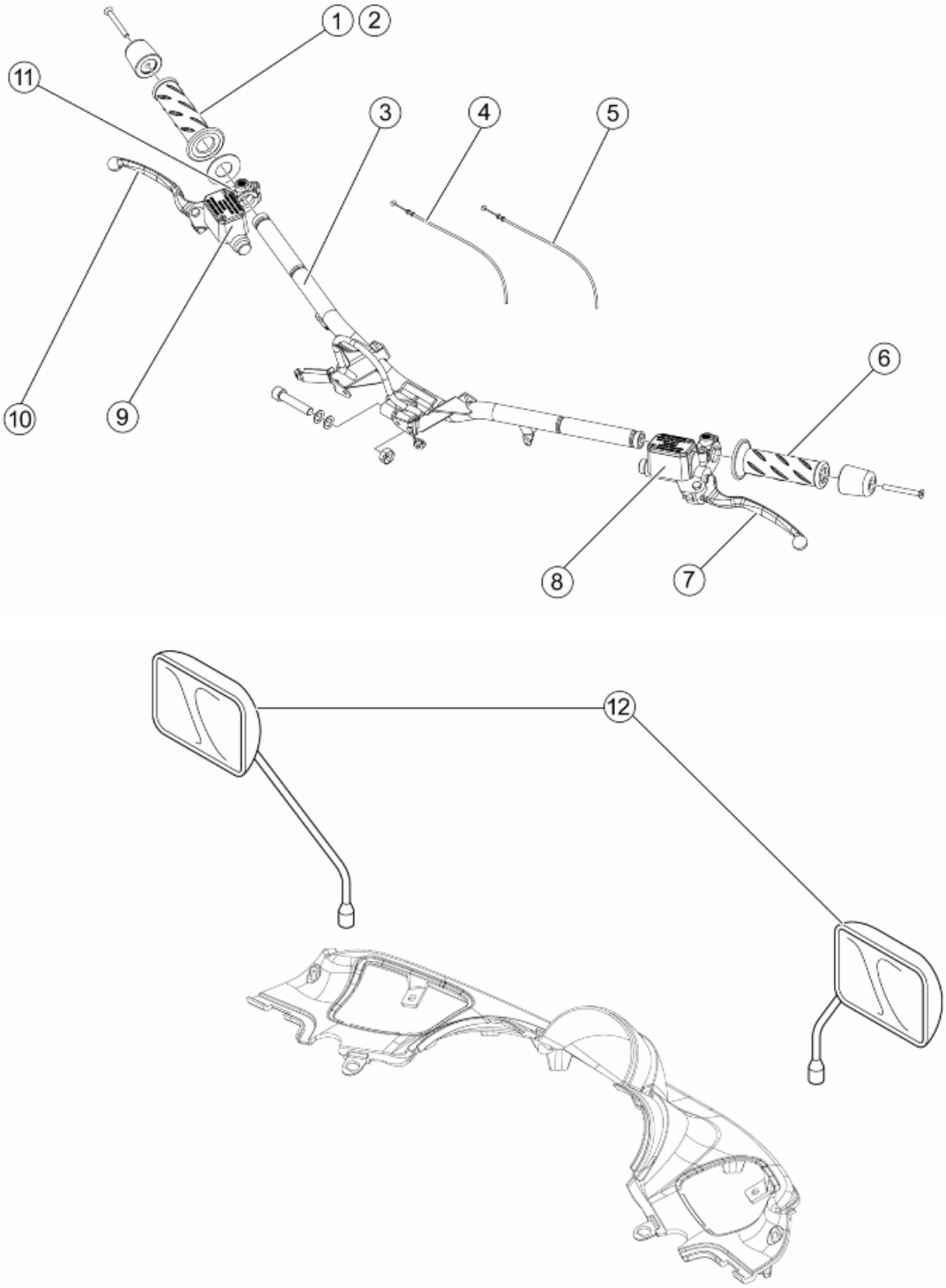
Handlebar covers



HANDLEBAR COVERS

	Code	Action	Duration
1	004018	Front handlebar covers - Replacement	
2	004019	Rear handlebar covers - Replacement	

Handlebar components

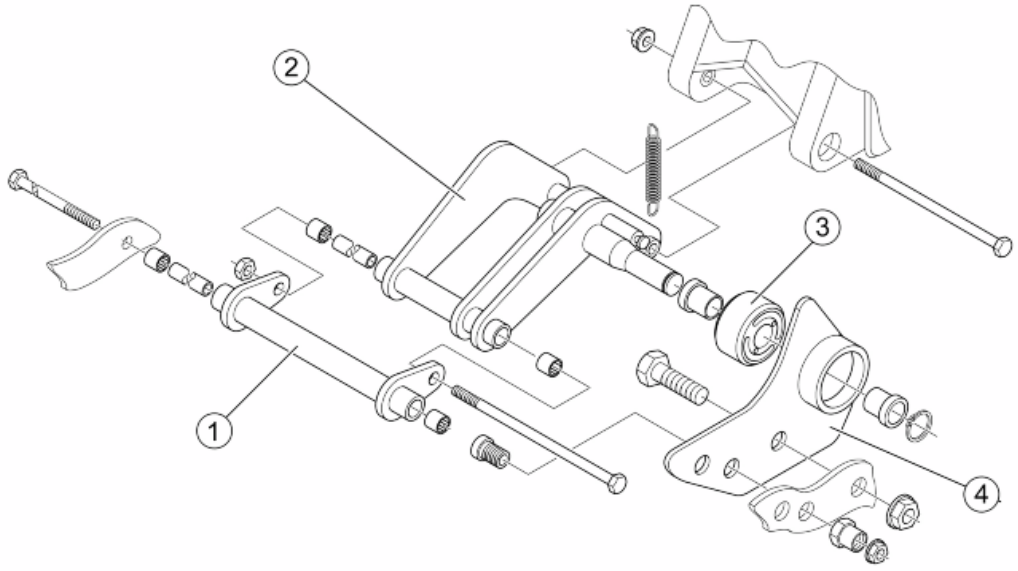


HANDLEBAR COMPONENTS

	Code	Action	Duration
1	002060	Complete throttle control - Replacement	
2	002059	Right-hand knob - Replacement	

	Code	Action	Duration
3	003001	Handlebar - Replacement	
4	003061	Accelerator transmission - adjust	
5	002063	Complete throttle transmission - Replacement	
6	002071	Left knob - Replacement	
7	002037	Brake lever - Replacement	
8	002067	Rear brake pump - Replacement	
9	002024	Front brake pump - Replacement	
10	004162	Mirror mounting and/or brake pump fitting U-bolt - Replacement	
11	004066	Driving mirror - Replacement	

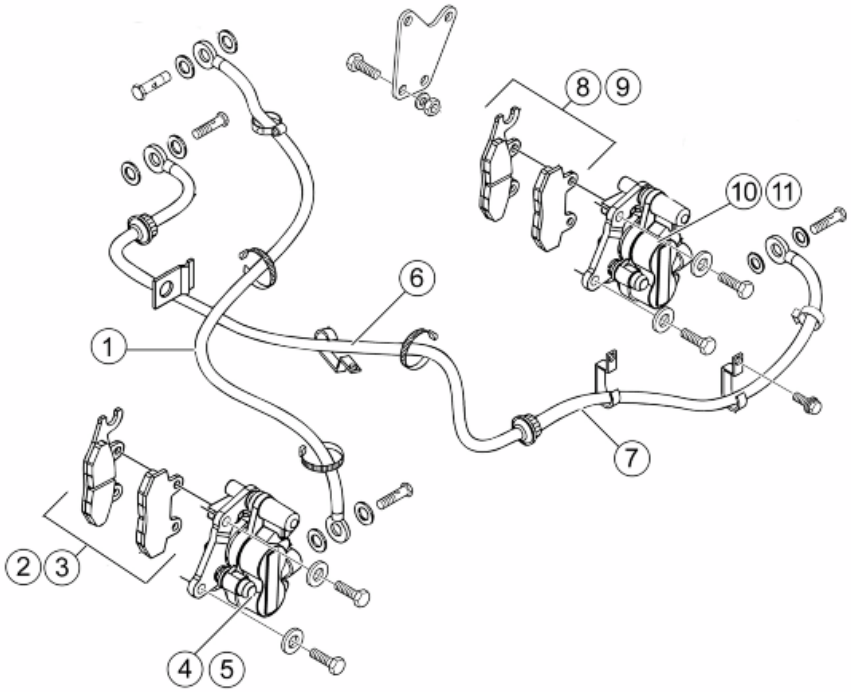
Swing-arm



SWINGING ARM

	Code	Action	Duration
1	003080	Swinging arm on chassis - Replacement	
2	001072	Engine/chassis swinging arm attachment - Replacement	
3	004058	Silent block - Replacement	
4	003081	Swinging arm support flange - Replacement	

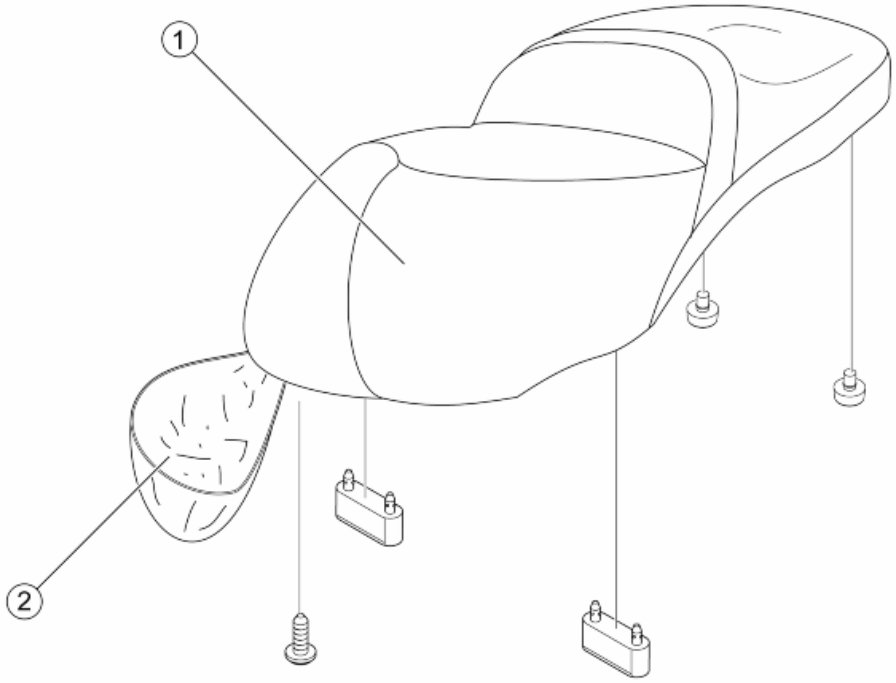
Brake hoses



BRAKE PIPING

	Code	Action	Duration
1	002021	Front brake piping - Replacement	
2	003070	Front brake pads/shoes - Check for wear	
3	002007	Front brake pads - Replacement	
4	002039	Front brake calliper - Replacement	
5	002047	Front brake fluid and air bleed system - Replacement	
6	002020	Rear brake disc piping - Replacement	
7	002081	Rear brake rigid pipes - Replacement	
8	003071	Rear brake pads/shoes - Check for wear	
9	002002	Rear brake pads - Replacement	
10	002080	Rear brake oil bleed system - Change	
11	002048	Rear brake calliper - Replacement	

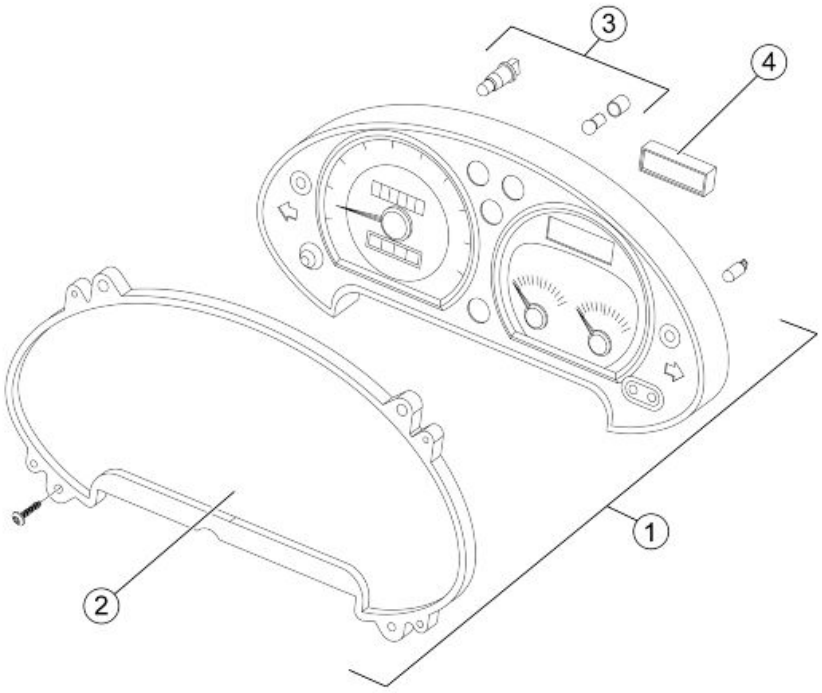
Seat



SADDLE

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

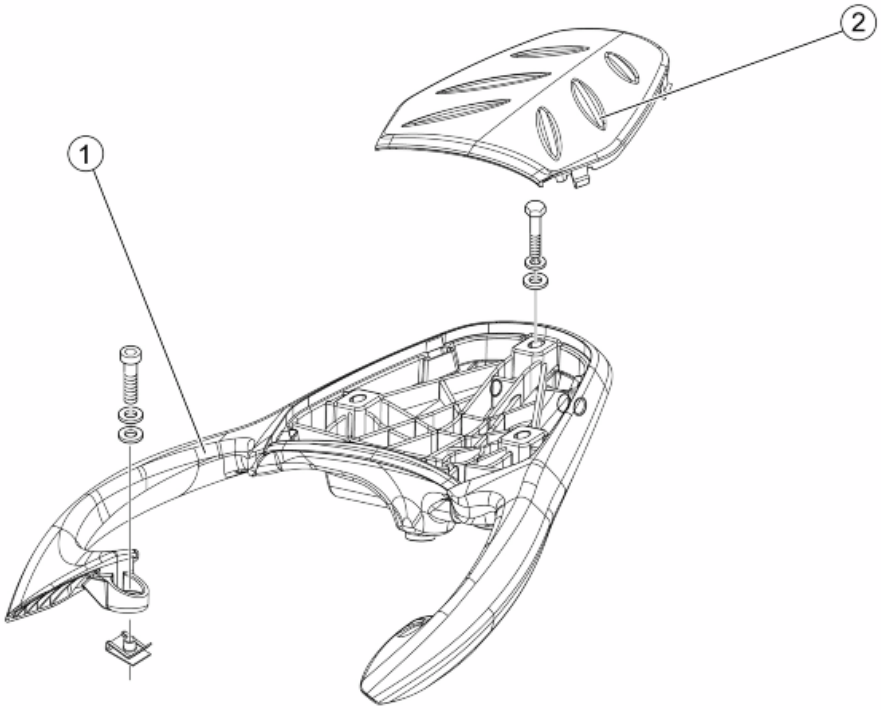
Instrument panel



INSTRUMENT PANEL

	Code	Action	Duration
1	005014	Odometer - Replacement	
2	005078	Odometer glass - Replacement	
3	005038	Dashboard warning/telltale lights - Replacement	
4	005076	Clock / Cell - Replacement	

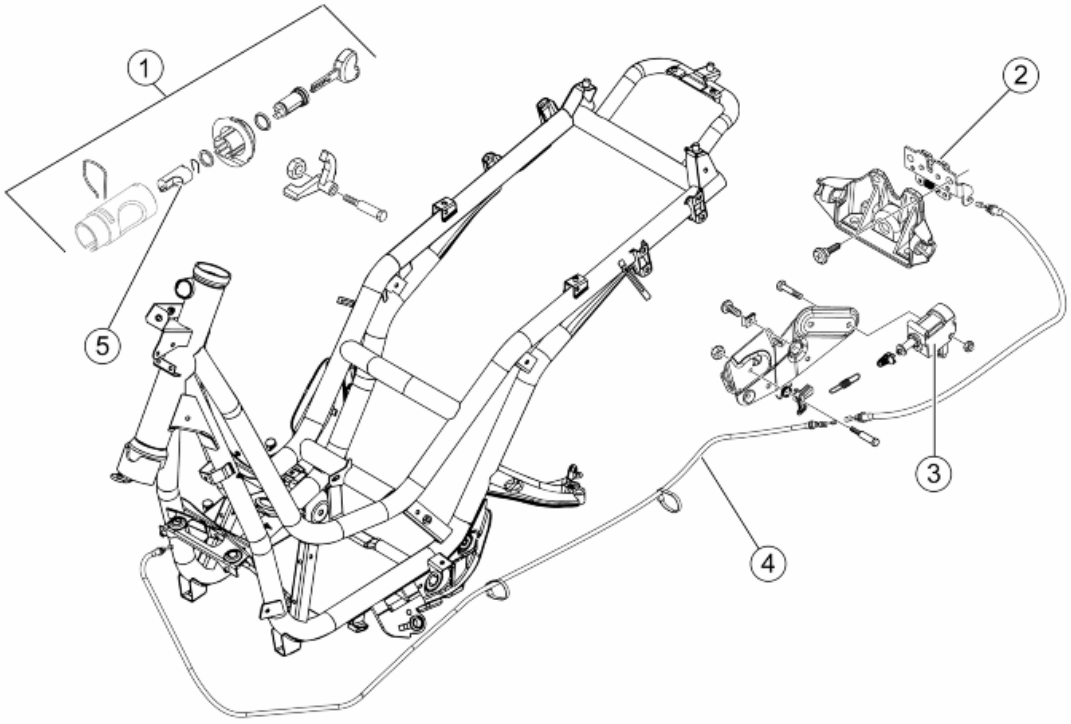
Rear rack



LUGGAGE RACK

	Code	Action	Duration
1	004008	Luggage rack - Replacement	
2	004062	Luggage rack cover - Replacement	

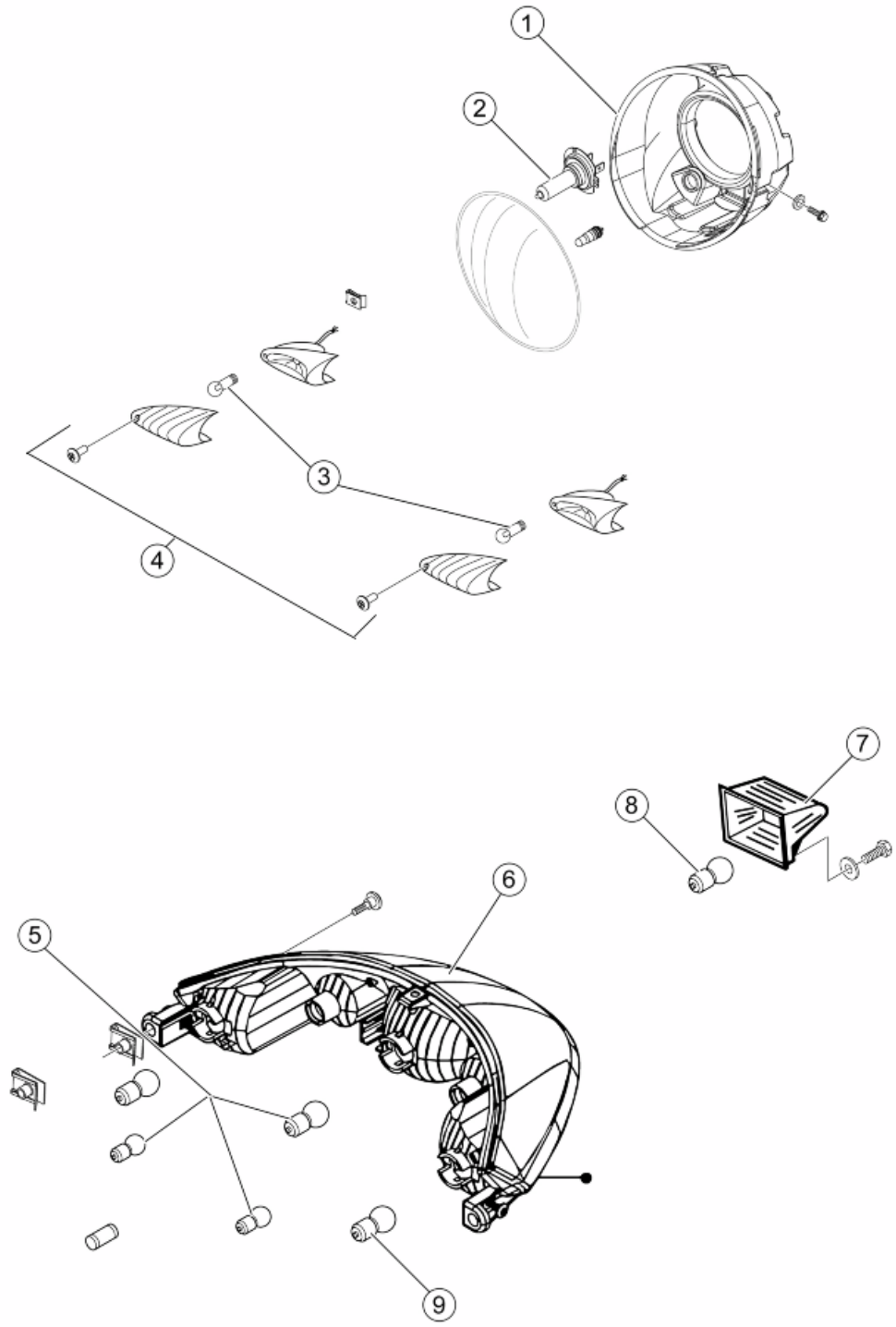
Locks



LOCKS

	Code	Action	Duration
1	004010	Anti-theft lock - Replacement	
2	004054	Saddle lock catch - Replacement	
3	005099	Electric saddle opening device - Replacement	
4	002083	Saddle opening transmission - Replacement	
5	005072	Immobilizer aerial - Replacement	

Turn signal lights

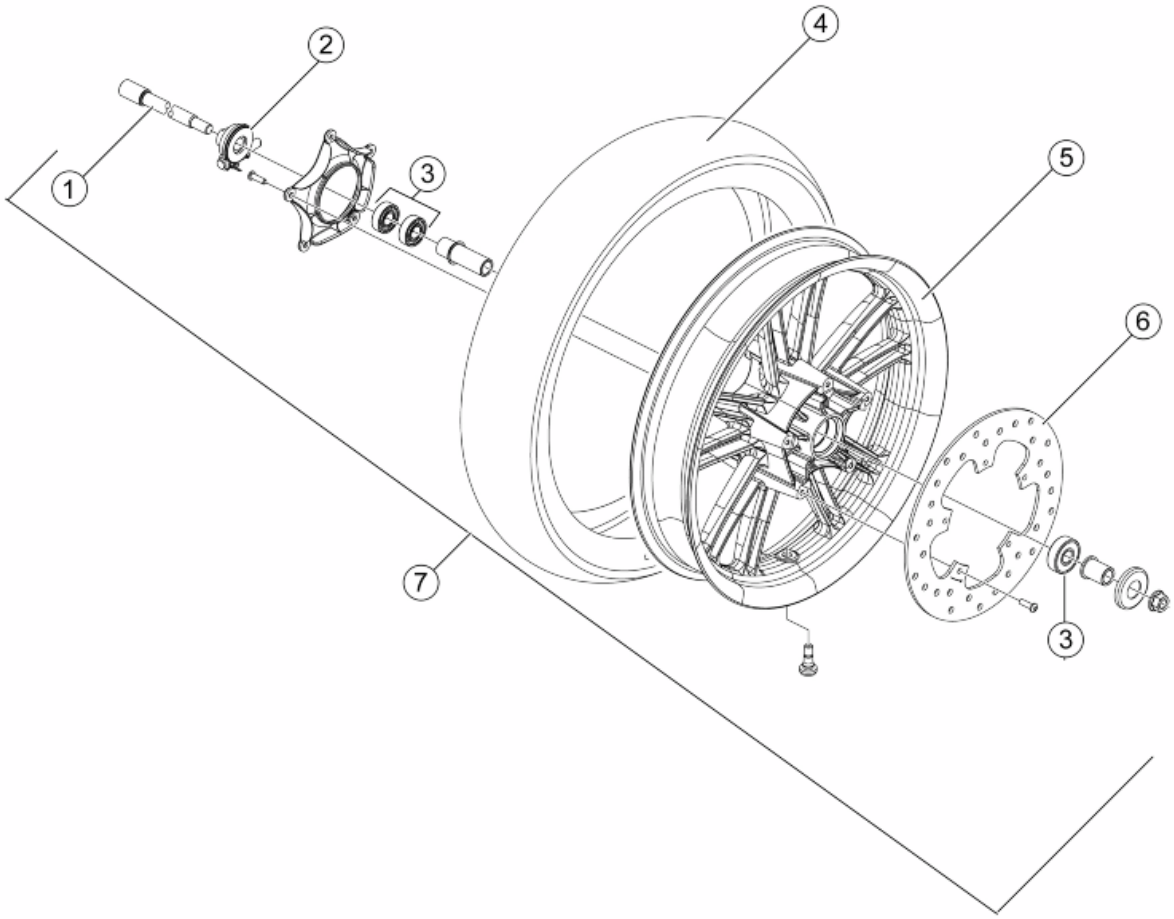


INDICATOR LIGHTS

	Code	Action	Duration
1	005002	Front light - replacement	
2	005008	Headlight bulbs - Replacement	

	Code	Action	Duration
3	005067	Front turning indicator bulb - replacement	
4	005012	Front turning indicators - Replacement	
5	005066	Rear light bulbs - Replacement	
6	005005	Taillight - change	
7	005032	number plate light glass - Replacement	
8	005031	number plate light bulb - Replacement	
9	005068	Rear turning indicator bulb - Replacement	

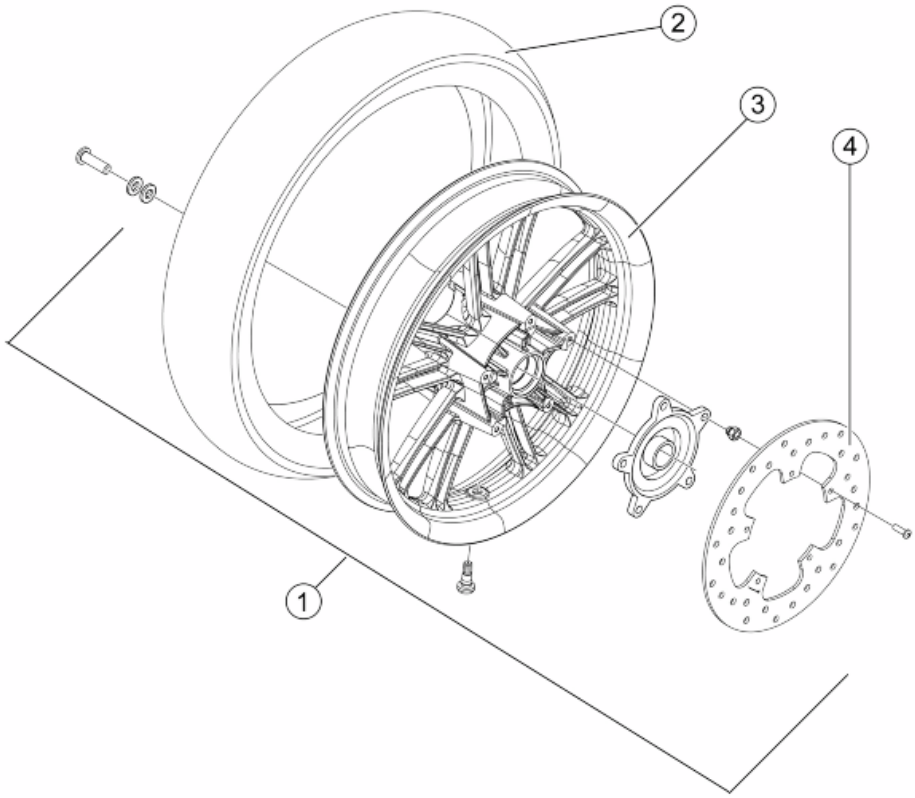
Front wheel



FRONT WHEEL

	Code	Action	Duration
1	003038	Front wheel axle - Replacement	
2	002011	Odometer drive - Replacement	
3	003040	Front wheel bearings - Replacement	
4	003047	Front tyre - Replacement	
5	003037	Front wheel rim - Replacement	
6	002041	Front brake disc - Replacement	
7	004123	Front wheel - Replacement	

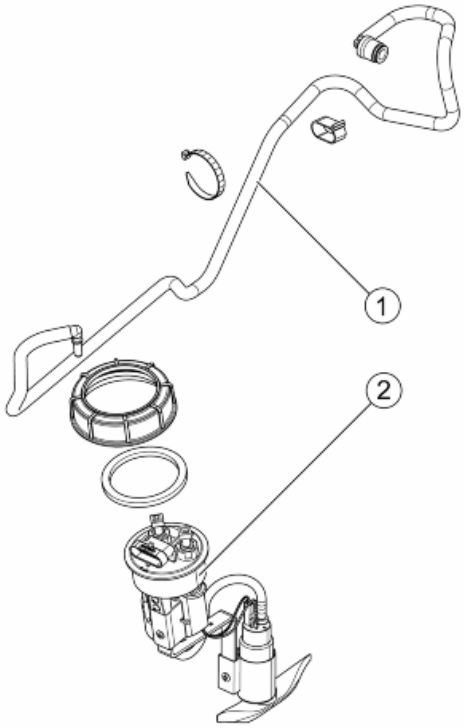
Rear wheel



REAR WHEEL

	Code	Action	Duration
1	001016	Rear wheel - Replacement	
2	004126	Rear wheel tyre - Replacement	
3	001071	Rear wheel rim - Replacement	
4	002070	Rear brake disc - Replacement	

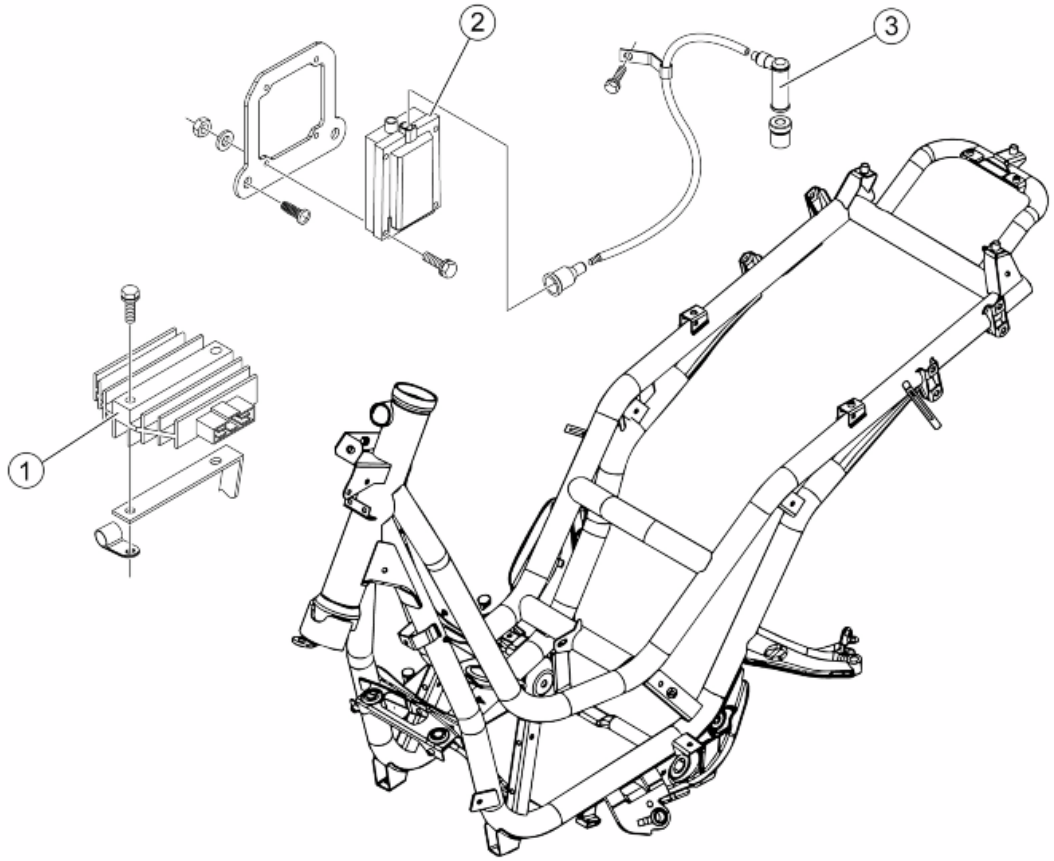
Fuel pump



FUEL PUMP

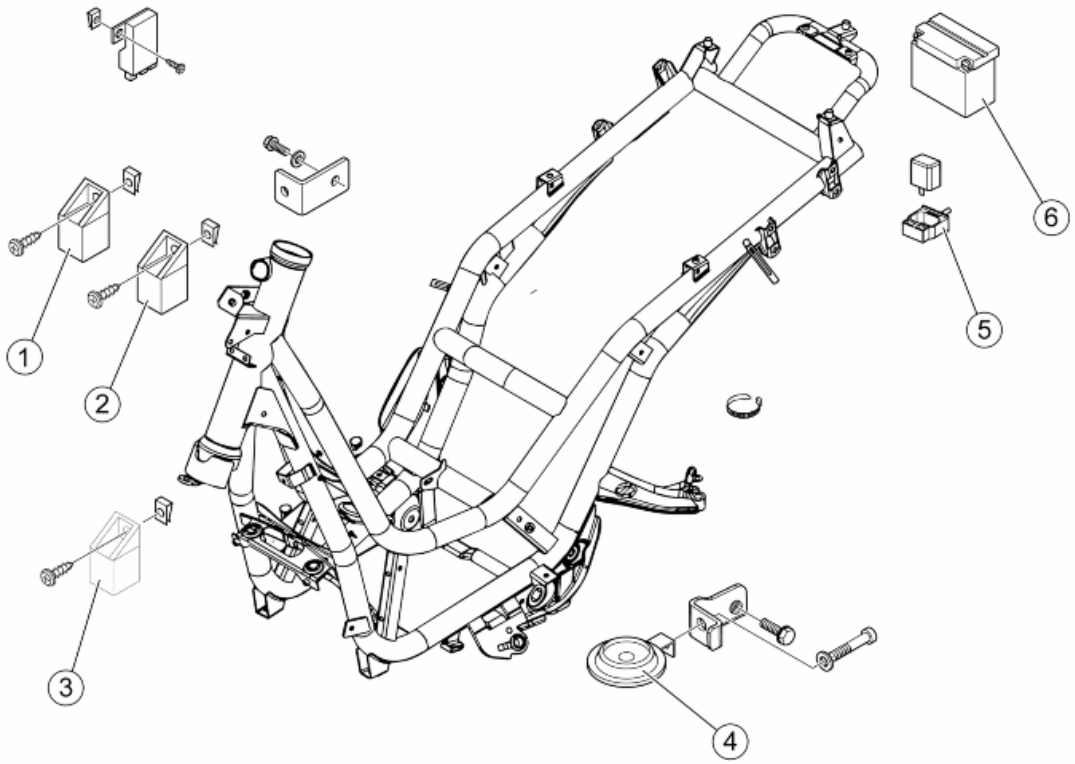
	Code	Action	Duration
1	004073	Fuel pump - Replacement	
2	004137	Injector pump pipe - Replacement	

Electric devices



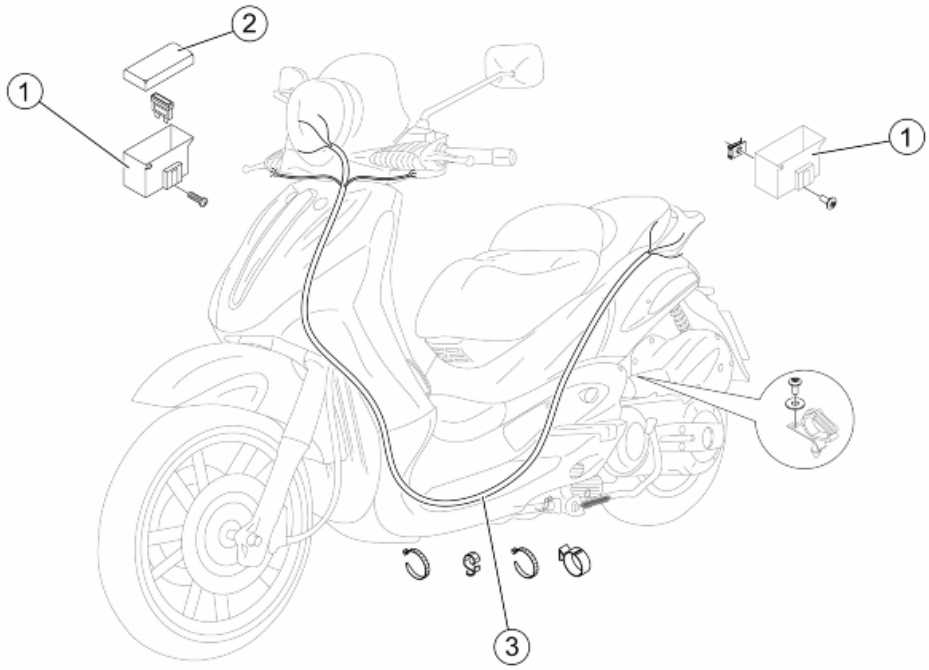
VOLTAGE REGULATOR

	Code	Action	Duration
1	005009	Voltage regulator - Replacement	
2	001069	HV coil - Replacement	
3	001094	Spark plug cap - Replacement	



CONTACTORS

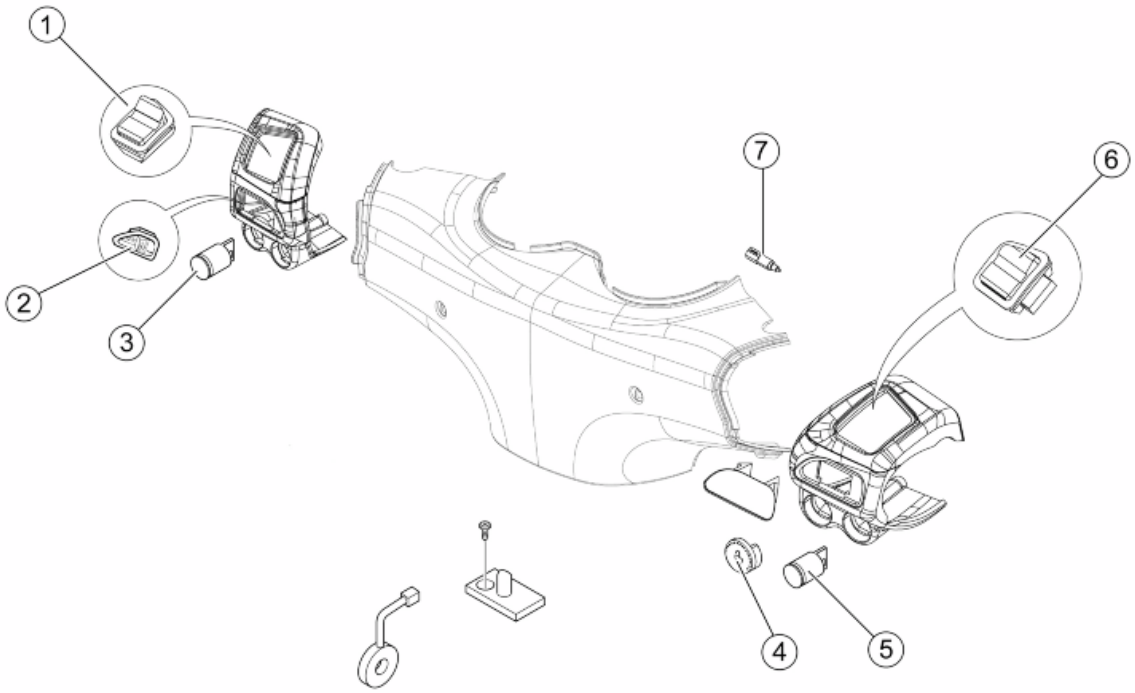
	Code	Action	Duration
1	005035	Headlight solenoid - Replacement	
2	005096	Injection Component contactor - Replacement	
3	005117	Electric fan contactor - Replacement	
4	005003	Horn - Replacement	
5	005011	Starter relay - Replacement	
6	005007	Battery - change	



WIRE UNIT

	Code	Action	Duration
1	005054	Fuse holder - Replacement	
2	005052	Fuse - Replacement	
3	005001	Electrical system - Replacement	

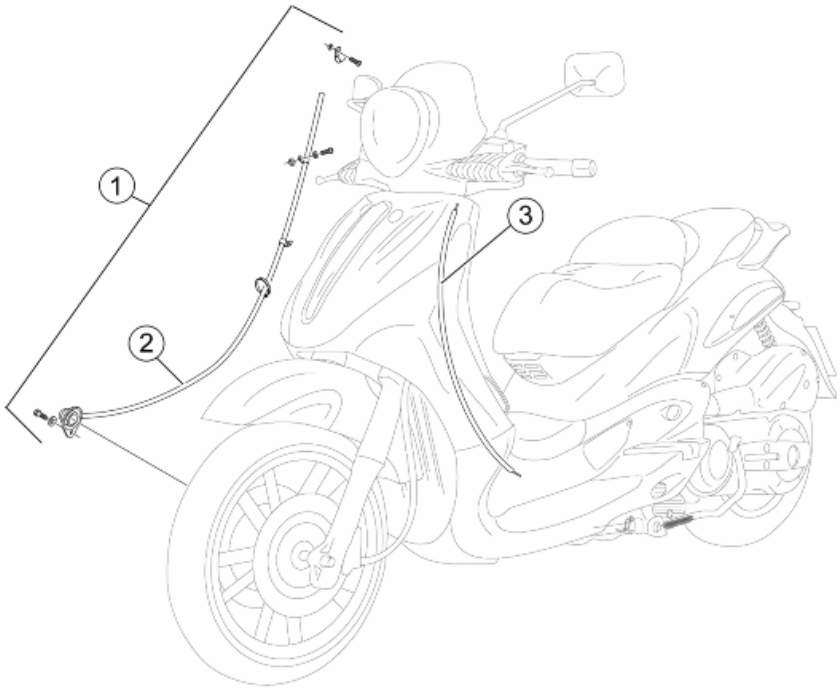
Electronic controls



ELECTRIC CONTROLS

	Code	Action	Duration
1	005039	Lights switch - Replacement	
2	005006	Light or turning indicator switch - Replacement	
3	005040	Horn button - Replacement	
4	005121	Saddle opening button - Replacement	
5	005041	Starter button - Replacement	
6	005077	Emergency stop switch - Replacement	
7	005017	Stop switch - Replacement	

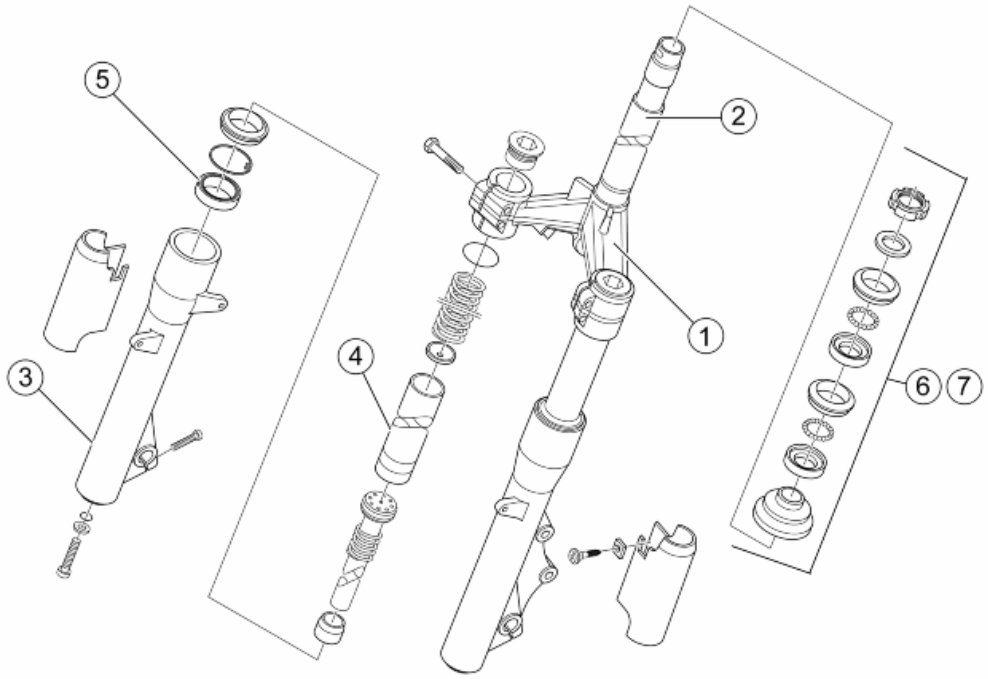
Transmissions



TRANSMISSIONS

	Code	Action	Duration
1	002051	Odometer transmission assembly - Replacement	
2	002049	Odometer cable - Replacement	
3	002082	Fuel tank door opening drive - Replacement	

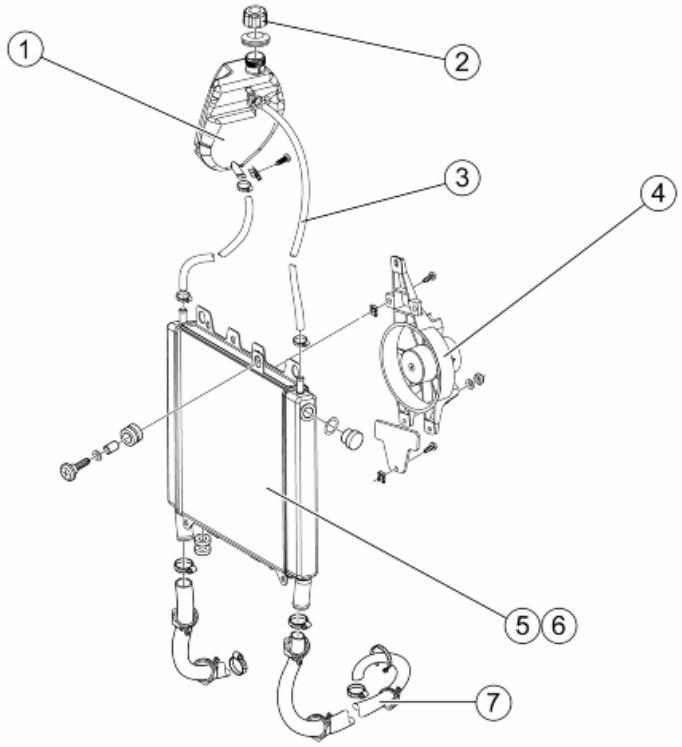
Front suspension



FRONT SUSPENSION

	Code	Action	Duration
1	003051	Complete fork - Replacement	
2	003010	Front suspension - Service	
3	003076	Fork sheath - Replacement	
4	003079	Fork stem - Replacement	
5	003048	Fork oil seal - Replacement	
6	003002	Steering fifth wheels - Replacement	
7	003073	Steering clearance - Adjustment	

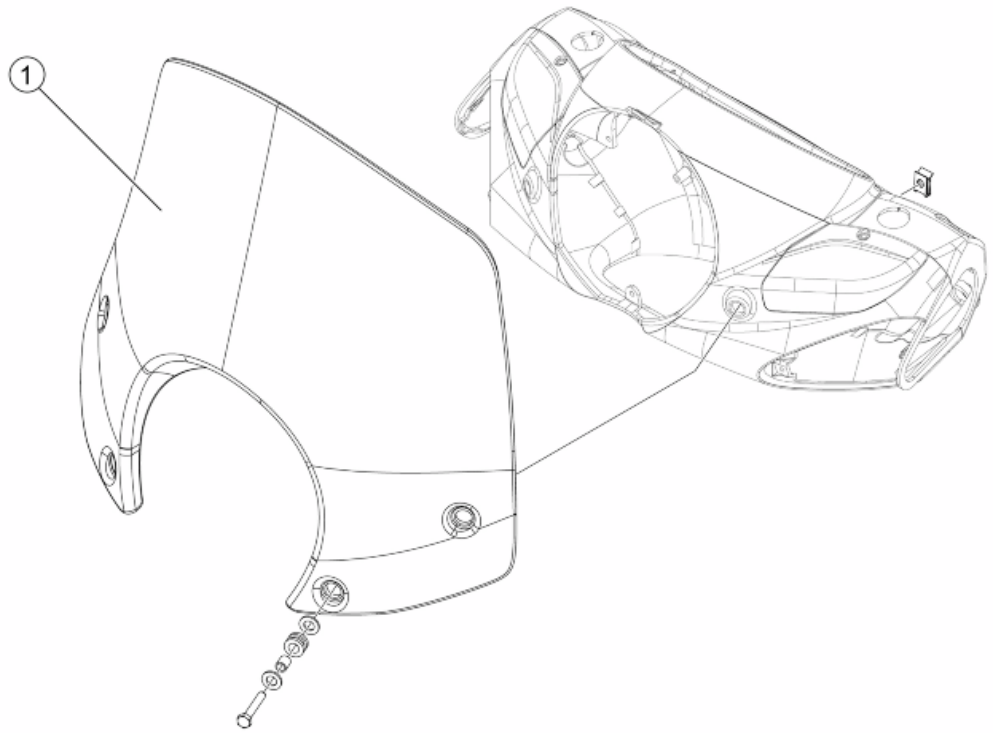
Cooling system



RADIATOR

	Code	Action	Duration
1	007001	Expansion tank - Replacement	
2	007024	Expansion tank cap - Replacement	
3	007013	Radiator expansion tank connection pipe - change	
4	007016	Fan with support - Replacement	
5	001052	Coolant and air bleed - Replacement	
6	007003	Coolant delivery and return pipe - change	

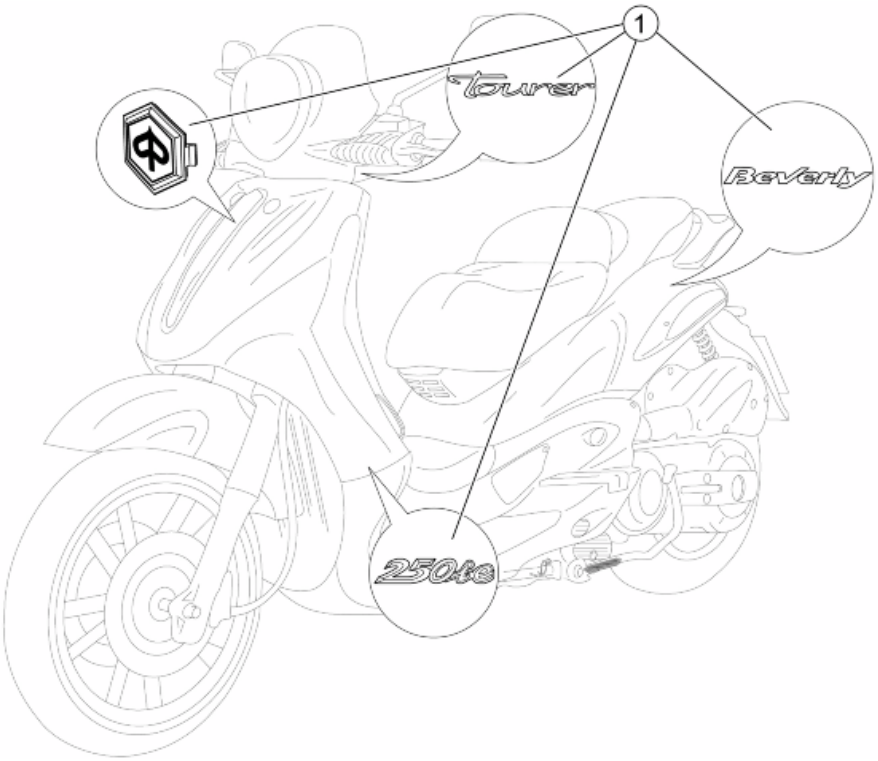
Windscreen



WINDSCREEN

	Code	Action	Duration
1	004028	Windshield glass - Replacement	

Stickers



TRANSFERS

	Code	Action	Duration
1	004159	Plates / Stickers - Replacement	

T

V