



SERVICE STATION MANUAL

677662 EN



Vespa LX - S 125 3V ie 150 3V ie (2012)



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SERVICE STATION MANUAL

Vespa LX - S 125 3V ie 150 3V ie

(2012)

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

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

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

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



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



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



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



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INDEX OF TOPICS

CHARACTERISTICS

CHAR

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



THE FOLLOWING INDICATIONS REFER TO THE LX VERSION.

VEHICLE IDENTIFICATION VESPA LX

Specification	Desc./Quantity
Chassis prefix (125)	ZAPM68300 - 10000001
Engine prefix (125)	M669M 1001
Chassis prefix (150)	ZAPM68400 - 10000001
Engine prefix (150)	M66AM - 1001



THE FOLLOWING INDICATIONS REFER TO THE S VERSION.

VEHICLE IDENTIFICATION VESPA S

Specification	Desc./Quantity
Chassis prefix (125)	ZAPM68301 - 10000001
Engine prefix (125)	M669M 1001
Chassis prefix (150)	ZAPM68401 - 10000001
Engine prefix (150)	M66AM - 1001

Chassis number

The chassis number «A» is stamped near the battery compartment.

To read it proceed as follows:

- lift the saddle;
- lift the helmet compartment by removing it.



Engine number

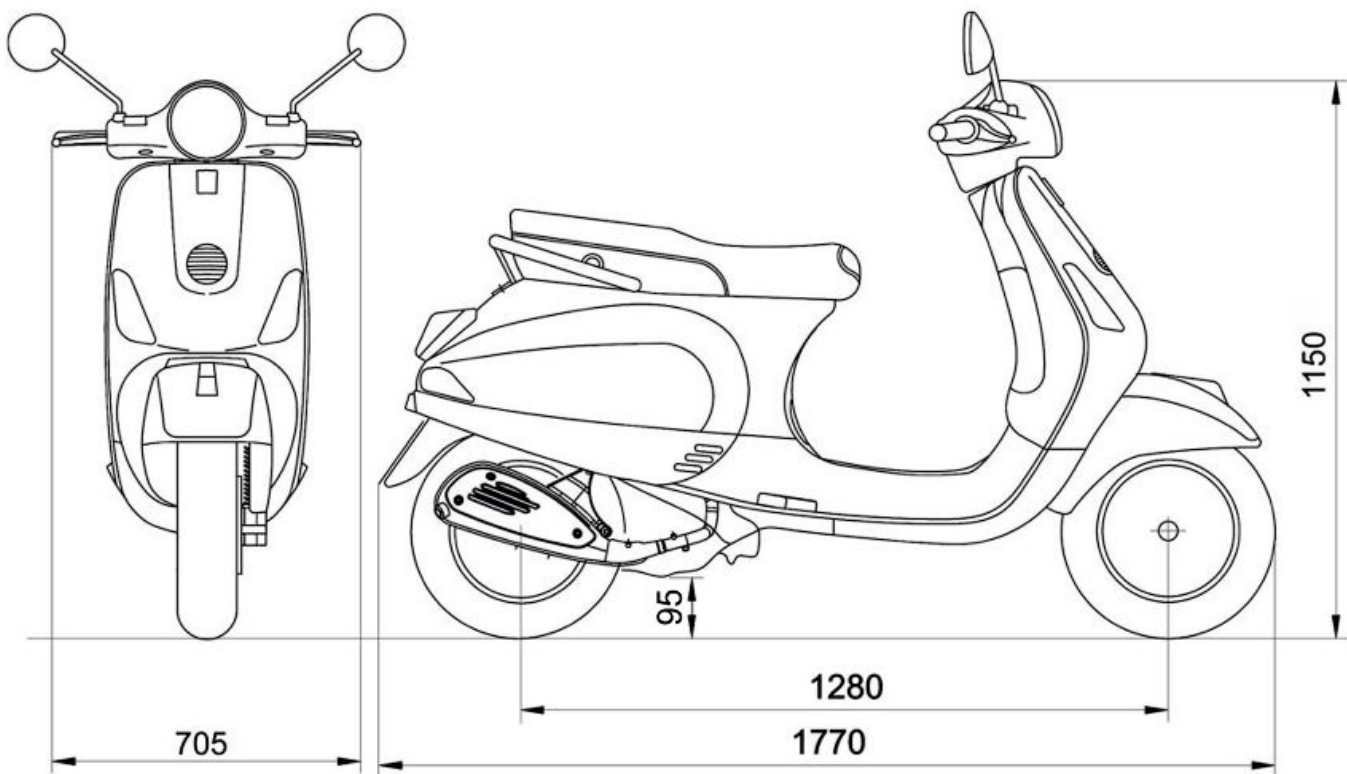
The engine number «B» is stamped near the rear left shock absorber lower support.



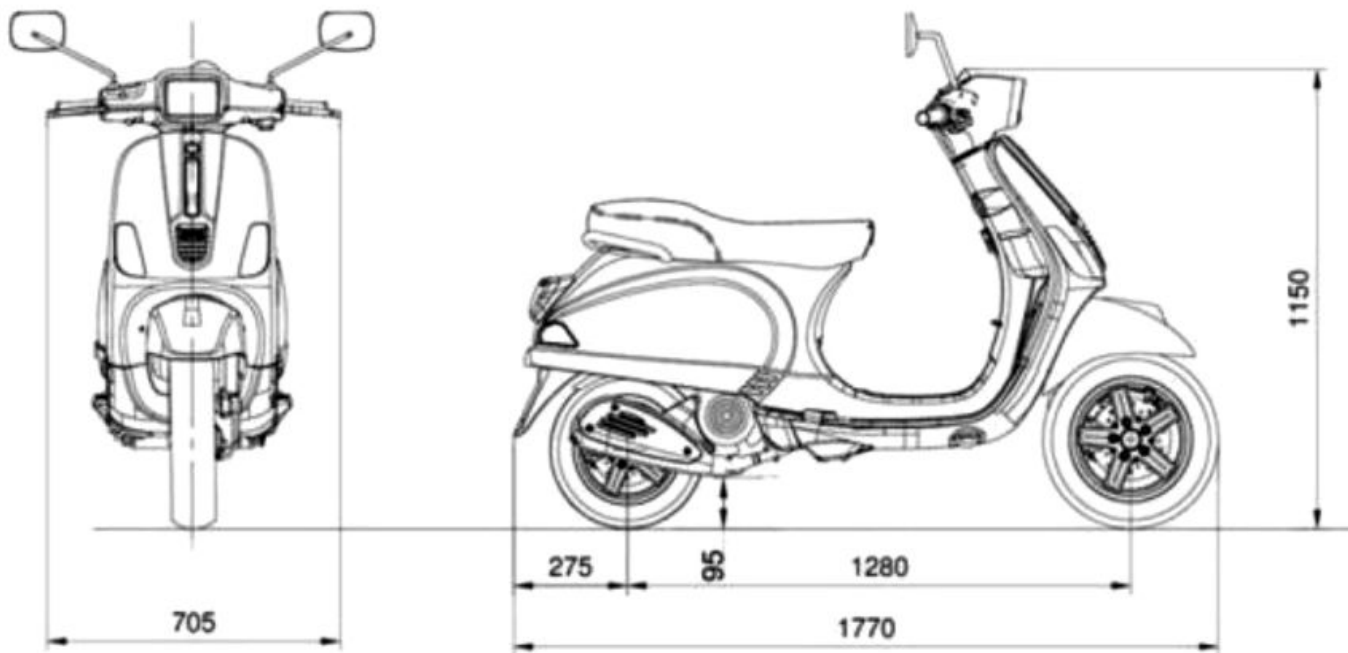
Dimensions and mass



THE FOLLOWING INDICATIONS REFER TO THE LX VERSION.



THE FOLLOWING INDICATIONS REFER TO THE S VERSION.



WEIGHTS AND DIMENSIONS

Specification	Desc./Quantity
Length	1770 mm
Width	705 mm
Maximum height	1150 mm
Wheelbase	1280 mm
Kerb weight	114 kg ± 5 kg
Maximum weight allowed	264 kg

Engine**125 cm³ ENGINE SPECIFICATIONS**

Specification	Desc./Quantity
Type	Single-cylinder, 4-stroke
Engine capacity	124.5 cm ³
Bore x stroke	52.0 x 58.6 mm
Max. power	7.2 kW at 7750 rpm
MAX. torque	9.5 Nm at 6000 rpm
Compression ratio	10:1
Idle speed	1750±50 rpm
Valve clearance (cold engine)	intake: 0.08 mm exhaust: 0.08 mm
Timing system	3 valves (2 intake, 1 drainage). single overhead camshaft chain-driven.
Lubrication	Engine lubrication with lobe pump (inside crankcase), chain-driven, with double filter: mesh and paper.
Cooling	Forced-air circulation cooling.
Fuel system	Electronic injection with Ø 26 mm throttle body, single injector.
Fuel	Unleaded petrol (95 RON)
Exhaust silencer	Absorption-type exhaust muffler with catalytic converter.
Emissions compliance	EURO 3

150 cm³ ENGINE SPECIFICATIONS

Specification	Desc./Quantity
Type	Single-cylinder, 4-stroke
Engine capacity	154.8 cm ³
Bore x stroke	58.0 x 58.6 mm
Max. power	8.7 kW at 7500 rpm
MAX. torque	12 Nm at 5000 rpm
Compression ratio	10.5: 1
Idle speed	1750±50 rpm
Valve clearance (cold engine)	intake: 0.08 mm exhaust: 0.08 mm
Timing system	3 valves (2 intake, 1 drainage). single overhead camshaft chain-driven.
Lubrication	Engine lubrication with lobe pump (inside crankcase), chain-driven, with double filter: mesh and paper.
Cooling	Forced-air circulation cooling.
Fuel system	Electronic injection with Ø 26 mm throttle body, single injector.
Fuel	Unleaded petrol (95 RON)
Exhaust silencer	Absorption-type exhaust muffler with catalytic converter.
Emissions compliance	EURO 3

Transmission**TRANSMISSION**

Specification	Desc./Quantity
Transmission	CVT 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

CAPACITIES

Specification	Desc./Quantity
Engine oil	1220 cm ³ (of which 120 cm ³ in the filtering cartridge)
Hub oil	200 cm ³
Fuel tank capacity	~ 7 litres ± 0.5 litres

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Electric	Electric starter
Ignition	Electronic inductive discharge ignition, with variable advance and separate HV coil.
Ignition advance	Three-dimensional map managed by control unit
Spark plug	NGK CR8EB
Electrode gap	0.7 to 0.8 mm

Frame and suspensions

FRAME AND SUSPENSION

Specification	Desc./Quantity
Chassis	Stamped plate body with welded structural reinforcements.
Front suspension	Single arm with helical spring and single double-acting hydraulic shock absorber.
Rear suspension	Double-acting shock absorber, adjustable to four positions at preloading.

Brakes

BRAKES

Specification	Desc./Quantity
Front brake	Ø 200-mm disc brake with hydraulic control activated by handlebar right-side lever.
Rear brake	Ø 110-mm drum brake with mechanical 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	11" x 2.50
Rear wheel rim	10" x 3.00
Front tyre	Tubeless, 110/70 - 11" 45L
Rear tyre	Tubeless, 120/70 - 10" 54L
Front tyre pressure	1.6 bar
Rear tyre pressure (with passenger)	2.0 bar (2.3 bar)

Tightening Torques

CHASSIS ASSEMBLY

Name	Torque in Nm
Swinging arm - chassis pin	44 to 52
Engine-swinging arm bolt	40 to 45
Silent block-swinging arm retaining bolts	40 to 45
Centre stand pin	40 to 45

STEERING ASSEMBLY

Name	Torque in Nm
Steering upper ring nut	35 to 40
Steering lower ring nut	12 to 14
Handlebar fixing screw	50 to 55

FRONT BRAKE

Name	Torque in Nm
Brake fluid pump-hose fitting	8 to 12
Brake fluid pipe-calliper fitting	20 ÷ 25
Screw tightening calliper to support	20 - 25
Brake disc screw (°)	5 to 6.5
Oil bleed valve (on the calliper)	10 to 12
Handlebar pump	7 ÷ 10
Brake pump reservoir screw	15 to 20

(°) Apply LOCTITE 242 threadlock

MUFFLER

Name	Torque in Nm
Silencer heat guard fixing screw	4 to 5
Screws fixing silencer to the crankcase	24 ÷ 27
Lambda probe tightening on exhaust manifold	40 to 50

FRONT SUSPENSION

Name	Torque in Nm
Shock absorber upper nut	20 to 30
Front wheel axle nut	75 to 90
Shock absorber upper bracket bolts	20 to 25
Wheel screw	20 to 25
Shock absorber lower bolts (°)	20 to 27

(°) Apply LOCTITE 242 threadlock

REAR SUSPENSION

Name	Torque in Nm
Rear wheel axle	104 ÷ 126
Shock-absorber/chassis nut	20 to 25
Lower shock absorber clamp	40 to 45

FLYWHEEL

Name	Torque in Nm
Flywheel cover screw	11 ÷ 13
Starter sprocket check fixing screw	5 to 6
Starter motor fixing screws	11 to 13
Flywheel fixing nut	100 to 110
Freewheel fixing screws	10 to 11

FLYWHEEL COVER

Name	Torque in Nm
Pick-up screws	3 - 4

Name	Torque in Nm
Stator fixing screws	5 to 6 (Loctite 242)
Stator cable plates clamping screws	3 - 4
Fixing clamps of head pump cover by-pass pipe	1.3 to 1.7
Coil fixing screw	11 to 13

CRANKCASE

Name	Torque in Nm
Calibrated fixing dowel	5 - 7
Oil filter cover	24 to 30
Engine oil level shaft	1.3 to 1.7
Engine-crankcase coupling screws	11 ÷ 13
Rear brake screw	15 to 17
Oil sensor	12 to 14
Oil filter	5 to 6
Oil drain screw	14.7 to 16.7
Oil pump bulkhead screw	4 to 6
Freewheel fixing screws	10 to 11
Oil pump fixing screw	5 to 6
Oil pump command crown screw	10 to 14
Rotor cover	1 to 1.50
Rotor clamp	3 to 4

HEAD AND CYLINDER

Name	Torque in Nm
Head cover screws	10.8 to 12.7
Cylinder head nut (PRE-TIGHTENING)	6 - 8
Cylinder head nut (TIGHTENING)	9 to 11 (Tighten to the prescribed torque and then proceed with 270.0°±5.0° rotation)
Cylinder stud bolt fitting	See section ENGINE/LUBRICATION/STUD BOLT
Throttle body clamp screws	1.3 to 1.7
Tensioner spring retaining screw	5 to 6
Fastener chain tensioner	11 to 13
Thermostat cover screws	3 - 4
Pressure reducer counterweight retainer screw	7 to 8.5
Injection manifold fixing screws	11 to 13
Valve clearance adjustment screw	6 to 9
Spark plug tightening	10 to 12
Timing system sprocket fixing screw	4 to 6
Screws fixing cylinder to crankcase	10.8 to 12.7
Head blow by	3 to 4

TRANSMISSION AND FINAL REDUCTION

Name	Torque in Nm
Transmission cover screws	11 to 13
Final reduction cover screws	24 to 27
Driven pulley fixing nut	53 to 59
Oil drain screw	14.7 to 16.7
Freewheel fixing screws	10 to 11
Driving pulley retainer nut	75 to 83

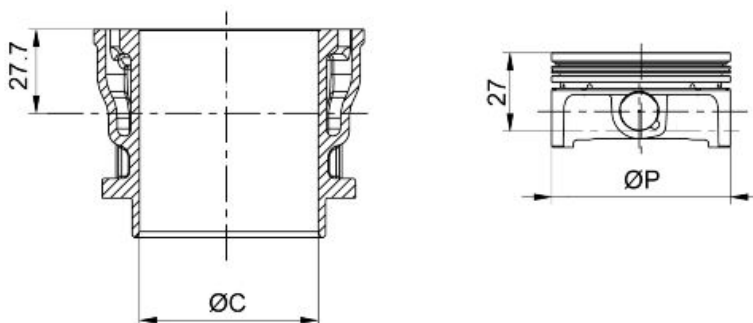
LUBRICATION

Name	Torque in Nm
Crankcase timing cover screws	11 to 13
Screws fixing oil pump to the crankcase	4 to 6
Pump rod screw	13 - 15
Minimum oil pressure sensor locking	12 to 14 (LOCTITE 5091 Edge closure between metal body and plastic block)

Overhaul data

Assembly clearances

Cylinder - piston assy.



CYLINDER - PISTON (125)

Specification	Desc./Quantity
Piston diameter	51.961 (± 0.014) mm
Cylinder diameter	52 (+0.008 -0.020) mm

CYLINDER - PISTON (150)

Specification	Desc./Quantity
Piston diameter	57.947 (± 0.014) mm
Cylinder diameter	58 (+0.008 -0.020) mm

COUPLING CATEGORIES (125)

Name	Initials	Cylinder	Piston	Play on fitting
cylinder-piston	A	51.980 to 51.987	51.947 to 51.954	0.026 ÷ 0.040
cylinder-piston	B	51.987 to 51.994	51.954 to 51.961	0.026 ÷ 0.040
cylinder-piston	C	51.994 to 52.001	51.961 to 51.968	0.026 ÷ 0.040
cylinder-piston	D	52.001 to 52.008	51.968 ÷ 51.975	0.026 ÷ 0.040

COUPLING CATEGORIES (150)

Name	Initials	Cylinder	Piston	Play on fitting
cylinder-piston	A	57.980 to 57.987	57.933 to 57.940	0.040 to 0.054
cylinder-piston	B	57.987 to 57.994	57.940 to 57.947	0.040 to 0.054
cylinder-piston	C	57.994 to 58.001	57.947 to 57.954	0.040 to 0.054
cylinder-piston	D	58.001 to 58.008	58.954 to 58.961	0.040 to 0.054

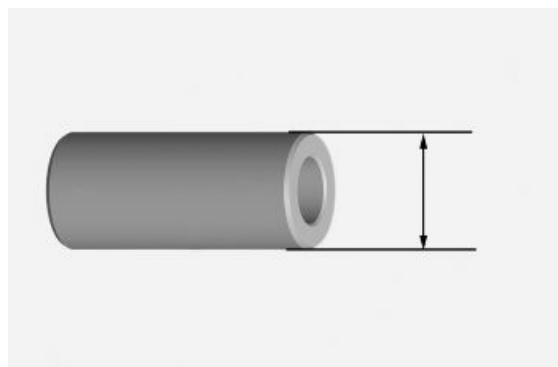
N.B.

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**

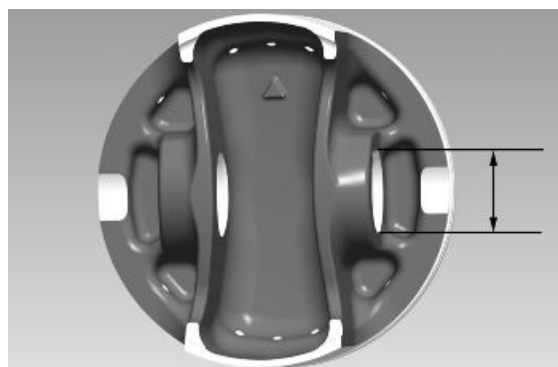
14 (+0 -0.004) mm



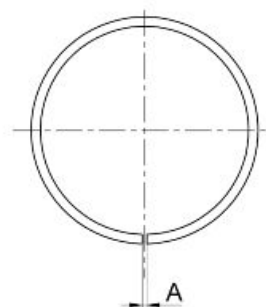
- Measure the diameter of the housings on the piston.

Characteristic**Standard diameter**

14 (+0.006 +0.001) mm



- Carefully clean the seal 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.
- Check the clearance upon mounting (A) of the bands:

**N.B.**

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

ASSEMBLY CLEARANCE OF BANDS - SEAL RINGS (125)

DESIGNATION	SIZES	ASSEMBLY CLEARANCES (A)
1° compression ring (mm)	52x0.8	0.20 to 0.35
2° compression ring (mm)	52x1.0	0.20 to 0.45
Oil ring segments (mm)	52x2.0	0.25 to 0.55

ASSEMBLY CLEARANCE OF BANDS - SEAL RINGS (150)

DESIGNATION	SIZES	ASSEMBLY CLEARANCES (A)
1° compression ring (mm)	58x0.8	0.20 to 0.35
2° compression ring (mm)	58x1.0	0.20 to 0.45
Oil ring segments (mm)	58x2.0	0.25 to 0.55

- Check that the head coupling surface is not worn or misshapen.

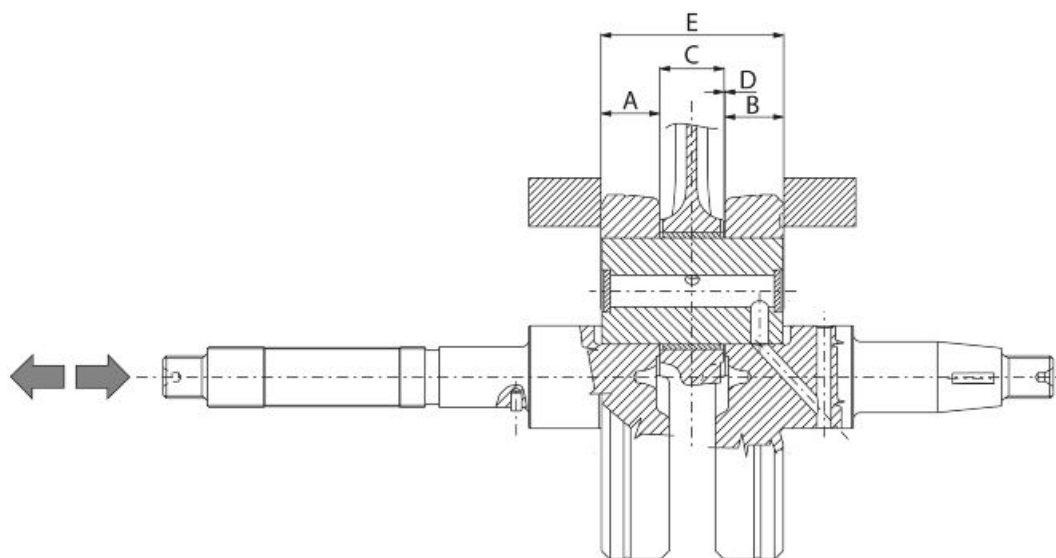
- Pistons and cylinders are classified according to diameter. The coupling is carried out in pairs (A-A, B-B, C-C, D-D).

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

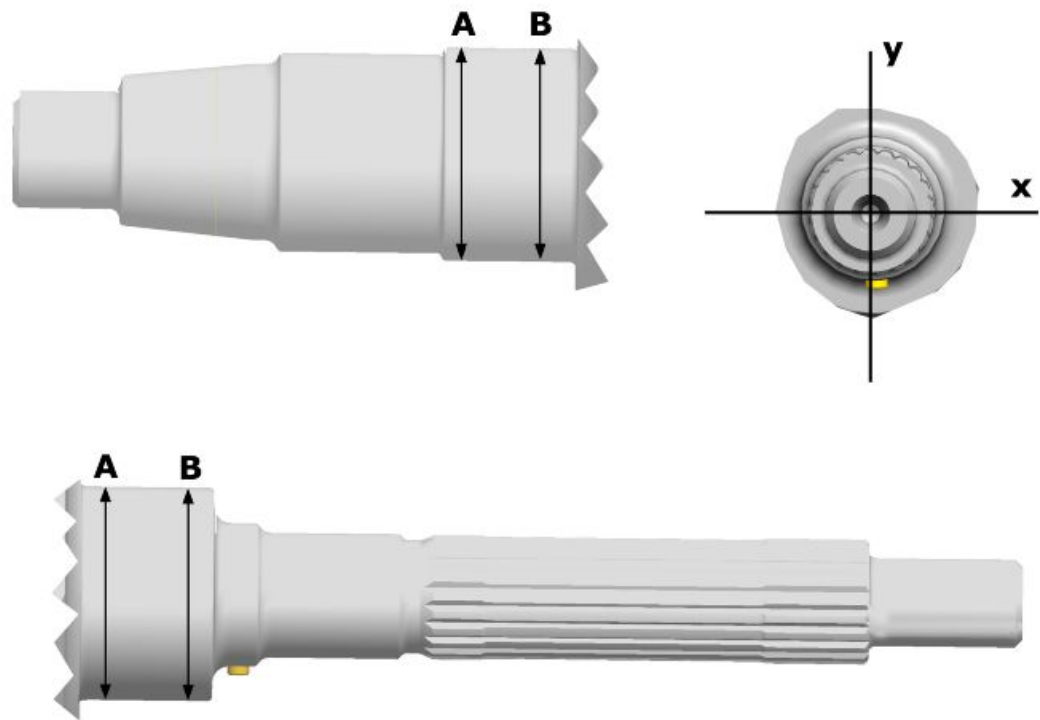


AXIAL CLEARANCE BETWEEN CRANKSHAFT AND CONNECTING ROD

Name	Code	Sizes	Assembly clearance
Half-shaft, transmission side	A	18.1 (+0; -0.05) mm	D = 0.20 - 0.50
Flywheel-side half shaft	B	18.1 (+0; -0.05) mm	D = 0.20 - 0.50
Connecting rod	C	15 (-0.10; -0.15) mm	D = 0.20 - 0.50
Spacer tool	E	51.4 (+0; +0.05) mm	D = 0.20 - 0.50

Diameter of crankshaft bearings.

Measure the bearings on both axes x-y.



CRANKSHAFT

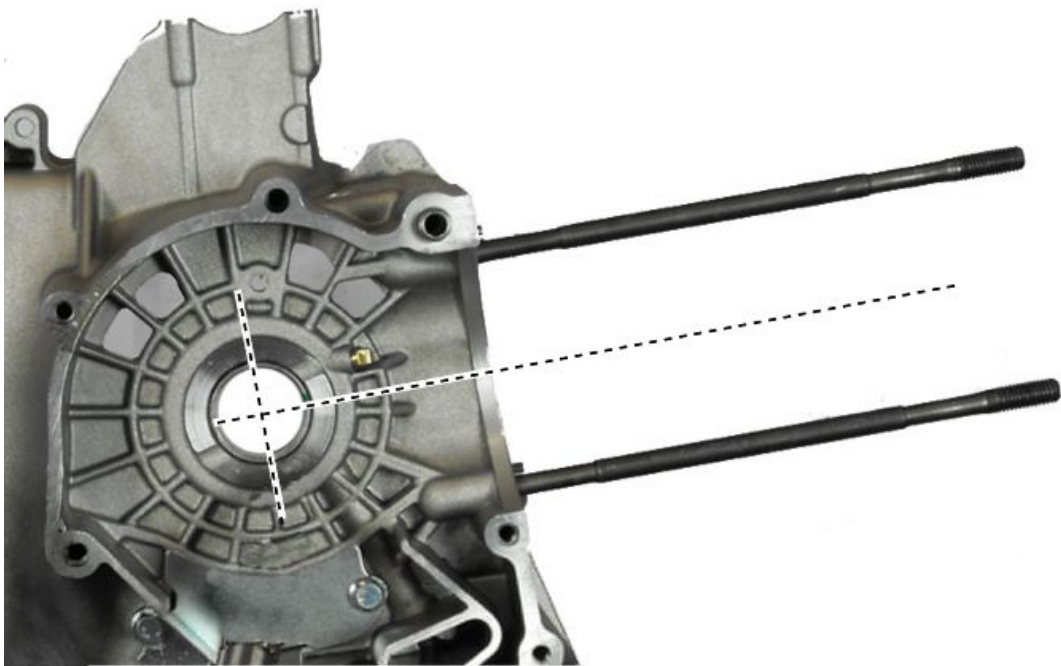
Specification	Desc./Quantity
Crankshaft bearings: Standard diameter: Cat. 1	26.998 to 27.004 mm
Crankshaft bearings: Standard diameter: Cat. 2	27.004 to 27.010 mm

- 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.

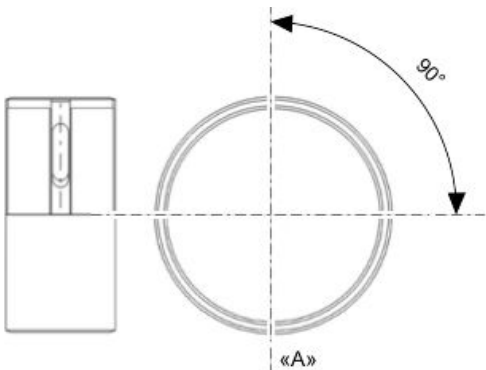
Characteristic

«A»

AXIS CYLINDER



- The main bushings have 2 half-bearings, 1 with and 1 without the lubrication channel.
- 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 photo.



Characteristic

«A»

AXIS CYLINDER

BUSHINGS

TYPE	IDENTIFICATION	CRANKSHAFT HALF-BEARING
B	BLUE	1.971 to 1.976
C	YELLOW	1.974 to 1.979
E	GREEN	1.977 to 1.982

- The section of the oil feeding channels is also influenced by the driving depth of the bushings.
- Visually check the wear of the bushings: in the coupling ends shown in the photo the bushing usually keeps the original look, check in the rest of the bushing if there is evident removal of material. If this occurs as stated, proceed to replace the crankcase halves.

**N.B.**

SMALL MARKS AND SCRATCHES OF THE SHAFT ROTATION ARE NORMAL SIGNS OF ENGINE USAGE, AND DO NOT AFFECT THE CORRECT FUNCTIONING.

Measurement of crankcase halves - crankshaft coupling clearance.

- The nominal diameters of the bushings, even if of the same coupling category, may differ by hundredths due to the plastic slackening of the material of the crankcase due to the driving load.
- Measure along the axis of the « **A** » cylinder, using a bore meter at two depths indicated in the figure, the diameter of the bushings.
- After measuring the two diameters, take the average.

Characteristic**«A»****AXIS CYLINDER**

- The bushings housing hole in the crankcase half is divided into two categories depending on the size, Category 1 and Category 2.

DIAMETER OF CRANKCASE WITHOUT BUSHING

Specification	Desc./Quantity
CAT 1	30.959 to 30.965 mm
CAT 2	30.953 to 30.959 mm

- 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.
- According to the classification of the shaft CAT.1 - CAT.2 combine a complete crankcase pre-fitted with suitable bushings according to the starting shaft.

CATEGORIES

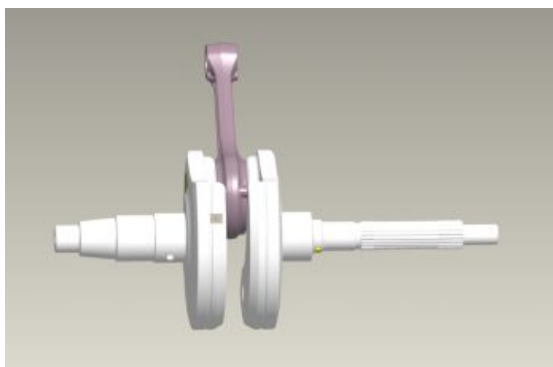
CRANKCASE HALVES	ENGINE HALF-SHAFT	BUSHING
Cat. 1	Cat. 1	E
Cat. 2	Cat. 2	B
Cat. 1	Cat. 2	C
Cat. 2	Cat. 1	C

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:

0.03 mm

- In case of faults, replace the head.
- Check the sealing surfaces for the exhaust manifold.
- Check that the camshaft and the rocking lever pin capacities exhibit no wear.
- Check that the head cover show no signs of wear.
- Check that there is no cooling liquid leakage from the seals.

- 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.





HEAD BEARINGS

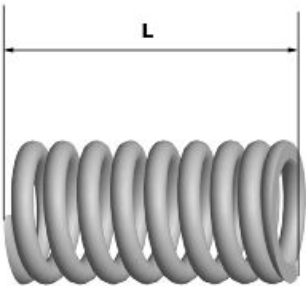
Specification	Desc./Quantity
bearing «A»	Ø 10.000 (+0.015) mm
bearing «B»	Ø 28.000 (+0.007 +0.028) mm
bearing «C»	Ø 42.000 (+0.009 +0.034) mm

Measure the unloaded spring length

Characteristic

Standard length

35.8 mm

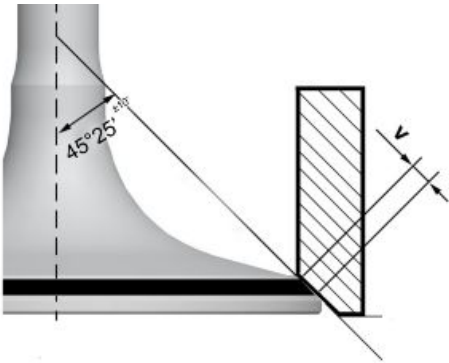


- Remove any carbon deposits from the valve seats.
- Check the width of the mark on the valve seat «V» with Prussian blue.

Characteristic

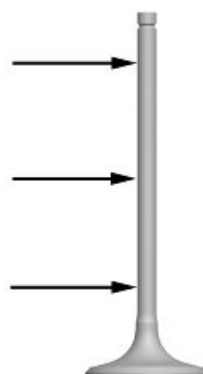
Standard value:

1 - 1.3 mm



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

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



STANDARD DIAMETER

Specification	Desc./Quantity
Intake:	4.030 to 4.015 mm
Exhaust:	4.975 to 4.960 mm

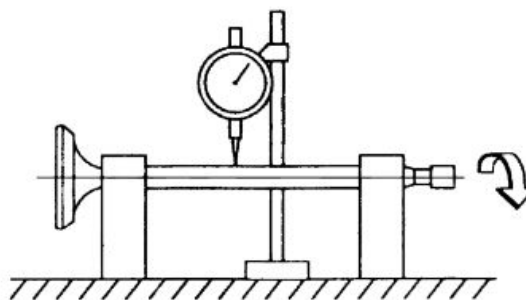
- Calculate the clearance between valve and valve guide.

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

Characteristic

Limit values admitted:

0.02 mm

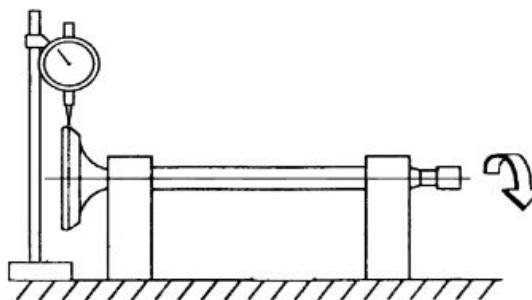


- Check the oscillation of the valve head by arranging a dial gauge at right angle relative to the valve head and rotate it on a "V" shaped abutment.

Characteristic

Admissible limit:

0.3 mm

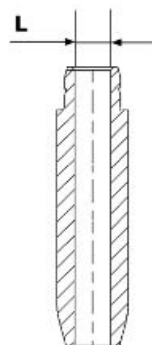


Measure the valve guide.

Characteristic

Valve guide:

4.3 ± 0.1 mm



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



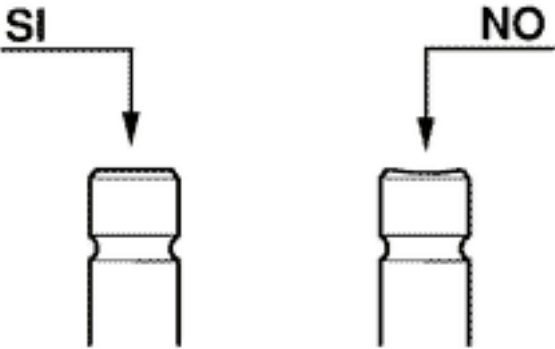
INTAKE

Specification	Desc./Quantity
Standard clearance:	0.10 mm
Admissible limit:	0.08 mm

EXHAUST

Specification	Desc./Quantity
Standard clearance:	0.15 mm
Admissible limit:	0.1 mm

- Check that there are no signs of wear on the mating surface with the set screw articulated 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.

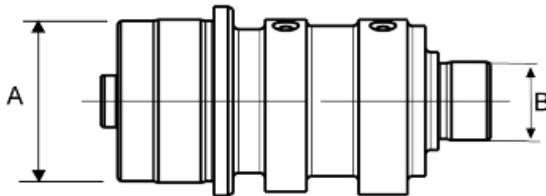
CAUTION

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: 25.002 to 25.015 mm
Camshaft check: Standard diameter	Bearing B diameter: 12.002 to 12.013 mm

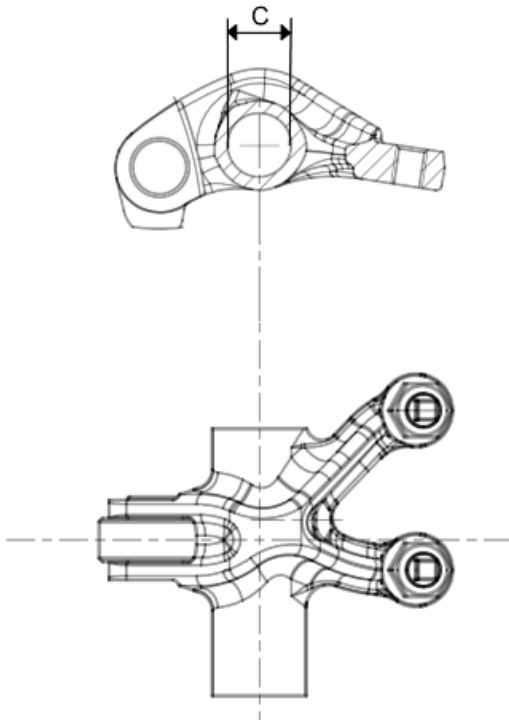


- Measure the outside diameter of the rocking lever pins
- Check the rocking lever pins do not show signs of wear or scoring.
- Measure the internal diameter of each rocker.

Check there are no signs of wear on the slider 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 (C)	Ø 10.015 to 10.035 mm
Rocking lever pin diameter: Standard diameter (D)	Ø 10.015 to 10.023 mm



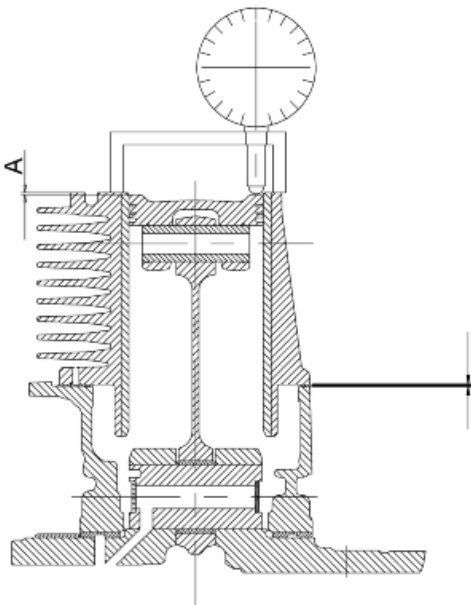


Slot packing system

Characteristic

Compression ratio

(10.5±0.5):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 RESETTNG THE DIAL GAUGE, EQUIPPED WITH A SUPPORT, ON A GROUND PLANE

ENGINE 125/150 SHIMMING

Name	Measure A	Thickness
Shimming	0 to -0.1	0.8 ± 0.05
Shimming	-0.1 to -0.3	0.6 ± 0.05
Shimming	-0.3 to -0.4	0.4 ± 0.05

Products

RECOMMENDED PRODUCTS TABLE

Product	Description	Specifications
AGIP GEAR SAE 80W-90	Lubricant for gearboxes and transmissions.	API GL-4
AGIP BRAKE 4	Brake fluid.	Synthetic fluid SAE J 1703 -FMVSS 116 - DOT 3/4 - ISO 4925 - CUNA NC 956 DOT 4
eni i-Ride PG 10W-40	Synthetic-based lubricant for four stroke engines.	JASO MA, MA2 - API SL - ACEA A3
AGIP FILTER OIL	Special product for the treatment of foam filters.	-
AGIP GREASE MU3	Yellow-brown, lithium-base, medium-fibre multipurpose grease.	ISO L-X-BCHA 3 - DIN 51 825 K3K -20
AGIP GP 330	Water repellent stringy calcium spray grease.	R.I.D./A.D.R. 2 10°b) 2 R.I.Na. 2.42 - I.A.T.A. 2 - I.M.D.G. class 2 UN 1950 Page 9022 EM 25-89

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

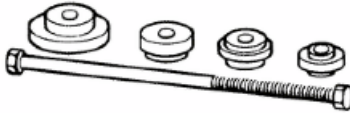
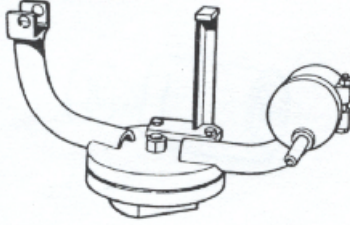
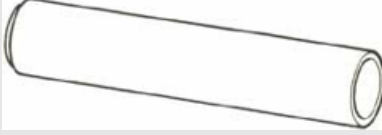
Specification	Desc./Quantity
1 Inch (in)	25.4 Millimetres (mm)
1 Foot (ft)	0.305 Meter (m)
1 Mile (mi)	1.609 Kilometre (km)
1 US Gallon (USgal)	3.785 Litre (l)
1 Pound (lb)	0.454 Kilogram (kg)
1 Cubic inch (in ³)	16.4 Cubic centimetres (cm ³)
1 Foot pound (lb ft)	1,356 Newton meter (Nm)
1 Miles per hour (mi/h)	1.602 Kilometres per hour (km/h)
1 Pound per square inch (PSI)	0.069 (bar)
1 Fahrenheit (°F)	32+(9/5) Celsius (°C)

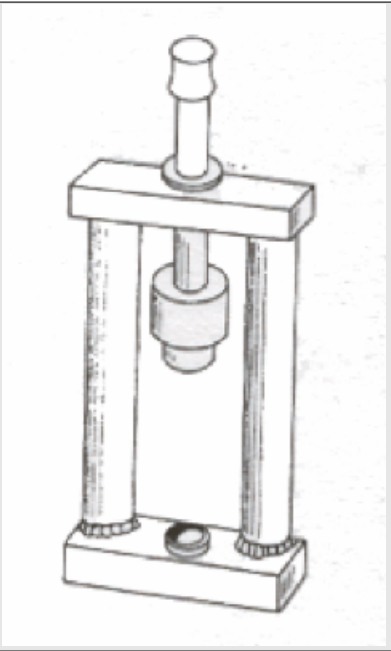
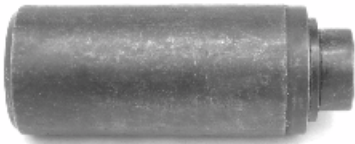
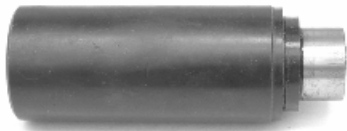
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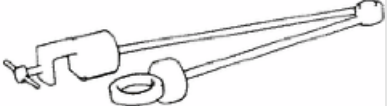
TOOLING

TOOL

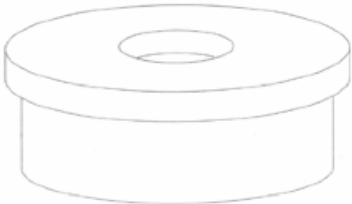
ATTREZZATURA SPECIFICA

Stores code	Description	
001330Y	Tool for fitting steering seats	
001467Y008	Pliers to extract 17 mm ø bearings	
001467Y009	Bell for OD 42-mm bearings	
001467Y013	Calliper to extract ø 15-mm bearings	
002465Y	Calliper for circlips	
005095Y	Engine support	
006029Y	Punch for fitting steering bearing seat on steering tube	

Stores code	Description	
020004Y	Punch for removing steering bearings from headstock	
020021Y	Front suspension service tool	
020036Y	Punch	
020037Y	Punch	
020038Y	Punch	

Stores code	Description	
020055Y	Wrench for steering tube ring nut	
020074Y	Support base for checking crankshaft alignment	
020150Y	Air heater mounting	
020151Y	Air heater	
020193Y	Oil pressure check gauge	
020263Y	Driven pulley assembly sheath	

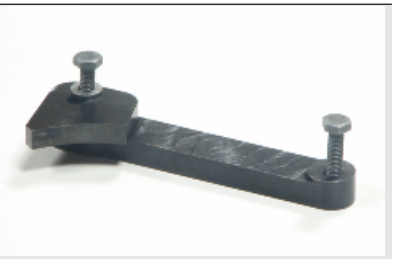
Stores code	Description	
020325Y	Pliers for brake-shoe springs	
020329Y	Mity-Vac vacuum-operated pump	
020330Y	Stroboscopic light to check timing	
020331Y	Digital multimeter	
020332Y	Digital rpm indicator	

Stores code	Description	
020334Y	Multiple battery charger	
020335Y	Magnetic mounting for dial gauge	
020357Y	32 x 35-mm Adaptor	
020358Y	37x40-mm Adaptor	
020359Y	42 x 47-mm Adaptor	
020360Y	52 x 55-mm Adaptor	
020363Y	20-mm guide	

Stores code	Description	
020364Y	25-mm guide	
020375Y	28 x 30 mm adaptor	
020376Y	Adaptor handle	
020382Y	Tool to extract valve cotters	
020412Y	15-mm guide	
020424Y	Driven pulley roller casing fitting punch	
020426Y	Piston fitting fork	

Stores code	Description	
020427Y	Piston assembly band	
020431Y	Valve oil seal extractor	
020434Y	Oil pressure check fitting	
020441Y	26 x 28 mm adaptor	
020444Y011	adapter ring	
020444Y009	wrench 46 x 55	

Stores code	Description	
020439Y	17-mm guide	
020442Y	Pulley lock wrench	
020444Y	Tool for fitting/ removing the driven pulley clutch	
020480Y	Petrol pressure check kit	
020922Y	Diagnosis Tool	
020933Y	Flywheel extractor	
020937Y	Driven pulley lock	

Stores code	Description	
020938Y	Driving pulley lock	
020939Y	Flywheel retainer	
020941Y	Crankshaft timing adjustment tool	
020942Y	Piston protrusion check tool	

INDEX OF TOPICS

MAINTENANCE

MAIN

Maintenance chart

SCHEDULED MAINTENANCE TABLE

I: CHECK AND CLEAN, ADJUST, LUBRICATE OR REPLACE, IF NECESSARY C: CLEAN; R: REPLACE; A: ADJUST; L: LUBRICATE

* Check level every 2,500 km

** Replace every 2 years

km x 1.000 or (months) maximum	1 (1)	5 (5)	10 (10)	15 (15)	20 (20)	25 (25)
Safety fasteners	I		I		I	
Spark plug		I	R	I	R	I
Cartridge air filter			C		C	
Centre stand bracket		L	L	L	L	L
Driving belt (125 cm ³)			I		R	
Driving belt (150 cm ³)			R		R	
Throttle control	A		A		A	
Roller housing			I		I	
Air filter			I		I	
Engine oil filter	R		R		R	
Valve clearance	A		A		A	
Electrical system and battery	I	I	I	I	I	I
Cylinder ventilation system						
Brake levers	L		L		L	
Brake fluid **	I	I	I	I	I	I
Engine oil*	R	I	R	I	R	I
Hub oil			I		I	
Headlight direction adjustment			A		A	
Brake pads	I	I	I	I	I	I
Tyre pressure and wear	I	I	I	I	I	I
Vehicle road test	I	I	I	I	I	I
Odometer gear			L		L	
Suspension			I		I	
Steering	A		A		A	
Transmission			L		L	
Labour time (minutes)	80	30	170	30	170	30

Spark plug

- Position the vehicle on the stand
- Remove the spark plug external inspection door by undoing the indicated screw



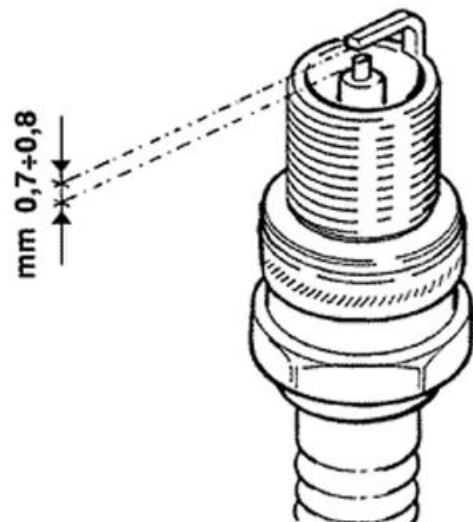
- Disconnect the spark plug H.V. cable cap.



- Unscrew the spark plug using the wrench supplied.



- Check the conditions of the spark plug, make sure the insulation is intact, that the electrodes are not excessively worn or sooty, the conditions of the washer, and measure the distance between the electrodes using the appropriate feeler gauge.
- Adjust the distance, if necessary, by bending the side electrode very carefully. In case of anomaly (as described before), replace the spark plug with another of the recommended type.



- Fit the spark plug with the correct inclination and manually screw it all the way down, then use the special spanner to tighten it.
- Fit the cap on the spark plug as far as it will go.
- Carry out refit operations.

CAUTION

THE SPARK PLUG MUST BE REMOVED WHEN THE ENGINE IS COLD. CHECK AND 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

Electrode gap

0.7 to 0.8 mm

Spark plug

NGK CR8EB

Locking torques (N*m)

Spark plug tightening 10 to 12

Hub oil

Check

- Park the vehicle on level ground and centre stand.
- Undo the screw indicated:
 - oil comes out of the screw hole: the oil quantity in the hub is adequate; place it and tighten the screw.
 - oil does NOT come out of the screw hole: the oil quantity in the hub, IS NOT adequate and it is necessary to carry out the top-up.
- With a cloth carefully clean the transmission crankcase.

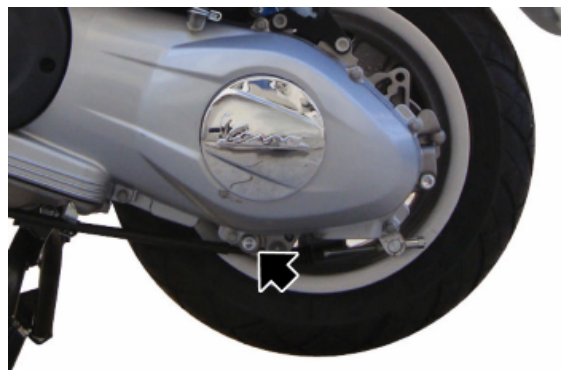


Replacement

- Remove the oil level check and filler screw.



- Prepare an adequately sized container.
- Unscrew the oil drainage plug and drain out all the oil.



- Screw in the drainage cap again and fill the hub with the prescribed oil.

Recommended products

AGIP GEAR SAE 80W-90 Lubricant for gearboxes and transmissions.

API GL-4

Characteristic

Rear hub oil

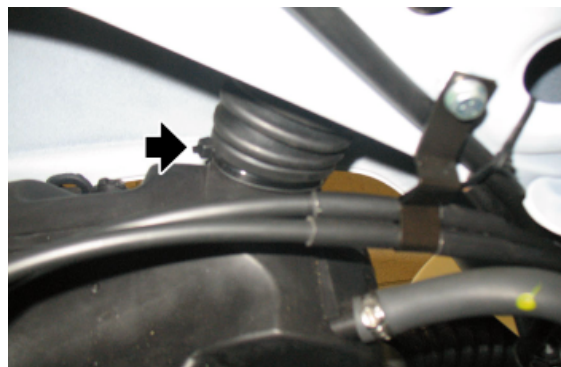
~ 200 cm³

Locking torques (N*m)

Hub oil drainage screw 15 to 17

Air filter

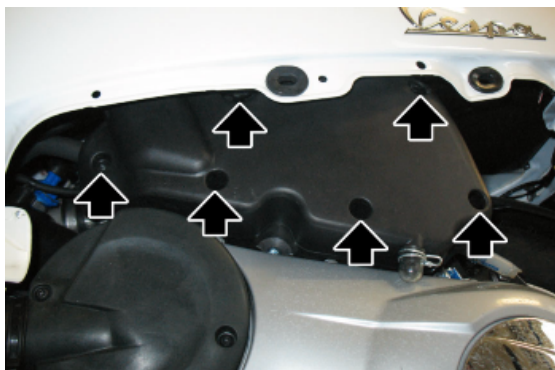
- Remove the helmet compartment.
- Disconnect the air intake pipe from the filter box.



- Undo the indicated fixing screws.
- Remove the left side fairing.



- Undo the six screws and remove the air-box cover.



- To clean the filtering element proceed as follows: remove the paper filtering element, blast with compressed air and then refit it.
- Make sure the filtering element is in the correct position.
- Check that the air passage sections are not damaged or deformed.
- Check the correct sealing of the coupling between the filter housing and the cover.

N.B.

FAILURE TO OBSERVE THESE INSTRUCTIONS MAY RESULT IN WRONG VACUUM INSIDE THE FILTER HOUSING, WHICH IN TURN MAY PRODUCE VARIATIONS IN CARBURETION.

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.

Engine oil

In four stroke engines, the engine oil is used to lubricate the timing elements, the bench bearings and the thermal group. **An insufficient quantity of oil can cause serious damage to the engine.**

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

Replacement

Change oil and replace filter as indicated in the scheduled maintenance table. The engine must be emptied by draining off the oil through the drainage plug of the mesh pre-filter, flywheel side; furthermore to facilitate oil drainage, loosen or remove the cap/dipstick. Once all the oil has drained through the drainage hole, unscrew the oil cartridge filter and remove it.



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

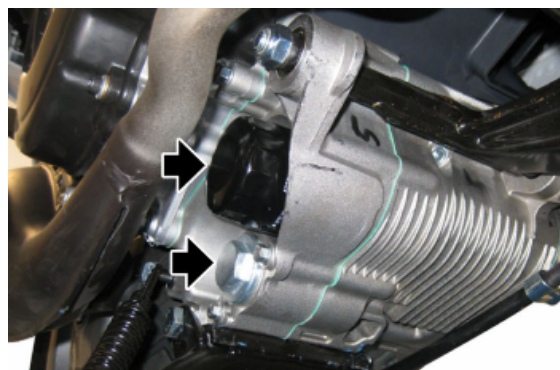
Lubricate them and refit the mesh filter and the oil drainage plug, screwing them up to the prescribed torque.

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

Change the engine oil.

Since a certain quantity of oil still remains in the circuit, oil must be filled from oil dipstick/cover.

Then start up the vehicle, leave it running for a few minutes and switch it off: After about five minutes, check the level and, if necessary, top-up but never exceeding the **MAX** level reference mark. The cartridge filter must be replaced every time the oil is changed. Use new oil of the recommended type for topping up and changing purposes.



N.B.

THE ENGINE MUST BE HOT WHEN THE OIL IS CHANGED.

Recommended products

eni i-Ride PG 10W-40 Synthetic-based lubricant for four stroke engines.

JASO MA, MA2 - API SL - ACEA A3

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.
- Undo cap/dipstick, dry it off with a clean cloth and reinsert it, **screwing down completely**.
- Remove the cap/dipstick again and check that the level is between the MIN and MAX reference marks; top up if necessary.

The MAX level mark indicates a quantity of around 1220 cc of engine oil. If the check is carried out after the vehicle has been used, and therefore with a hot engine, the level 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.

Engine oil top-up

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



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 specified torque. Refit the new cartridge filter being careful to lubricate the O-ring before fitting it. Change the engine oil.

Recommended products

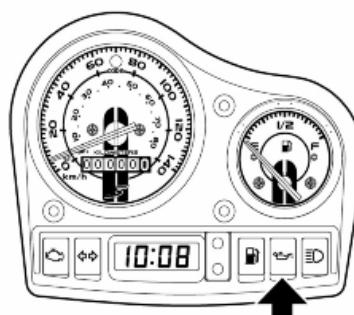
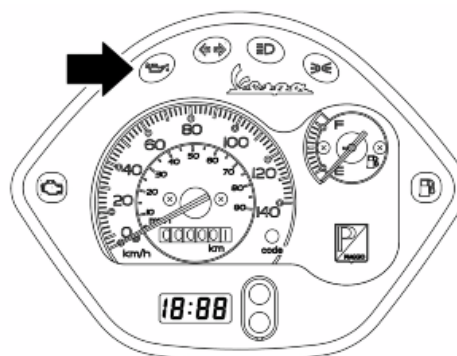
eni i-Ride PG 10W-40 Synthetic-based lubricant for four stroke engines.

JASO MA, MA2 - API SL - ACEA A3

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

Position the engine at top dead centre (TDC) in compression. To do this, use the appropriate tools. Use the holes on the engine crankcase to secure the tool.

Position the specific tool in the window between the flywheel pick-up references as illustrated in the figure.

The arrows stamped respectively on the valve frame and sprocket must coincide.

N.B.

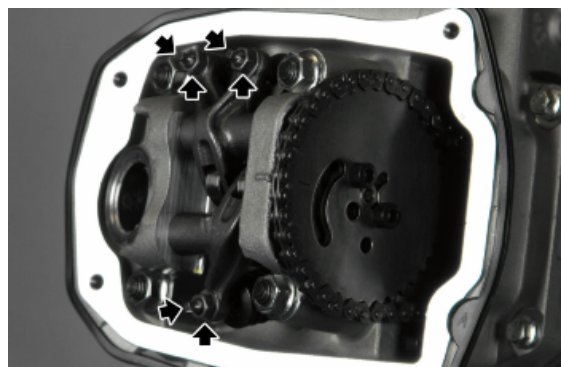
IF THE TIMING UNIT IS NOT IN PHASE CHECK THE CORRECT FITTING OF COMPONENTS.



Checking the valve clearance

-To check valve clearance, centre the reference marks of the timing system.

- Use a feeler gauge to check that the clearance between the valve and the register corresponds with the indicated values. When the valve clearance values, intake and exhaust respectively, are different from the ones indicated below, adjust them by loosening the lock nut and operating on the corresponding set screw, as shown in the figure.



Characteristic

Valve clearance (cold engine)

intake: 0.08 mm exhaust: 0.08 mm

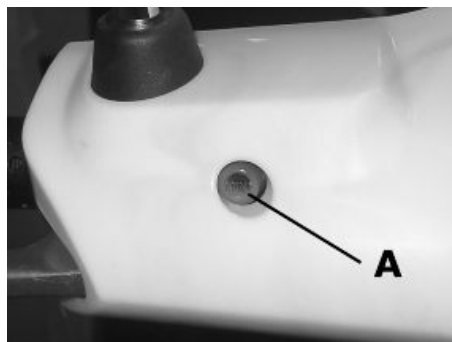
Braking system

Level check

Proceed as follows:

- Rest the vehicle on its centre stand with the handlebars perfectly horizontal;
- Check the level of liquid with the related warning light «A».

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



Top-up

Proceed as follows:

- Remove the front handlebar cover.
- Remove the reservoir cap by loosening the two screws, remove the gasket and top-up using only the fluid specified without exceeding the maximum level.

CAUTION

ONLY USE DOT 4-CLASSIFIED BRAKE FLUID.

CAUTION



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

CAUTION

BRAKING CIRCUIT FLUID IS HIGHLY CORROSIVE; DO NOT LET IT COME INTO CONTACT WITH PAINTED PARTS.

CAUTION

BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR. IF THE CONTENT OF MOISTURE IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, BRAKING WILL BE INEFFICIENT. NEVER USE BRAKE FLUID FROM OPEN OR PARTIALLY USED CONTAINERS.

UNDER NORMAL CLIMATIC CONDITIONS, REPLACE FLUID AS INDICATED IN THE SCHEDULED MAINTENANCE TABLE.

N.B.

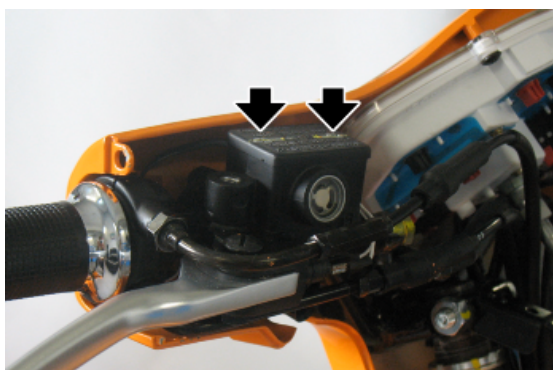
SEE THE BRAKING SYSTEM CHAPTER WITH REGARD TO THE CHANGING OF BRAKE FLUID AND THE BLEEDING OF AIR FROM THE CIRCUITS.

Recommended products

AGIP BRAKE 4 Brake fluid.

Synthetic fluid SAE J 1703 -FMVSS 116 - DOT 3/4

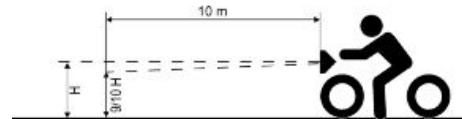
- ISO 4925 - CUNA NC 956 DOT 4



Locking torques (N*m)**Brake pump reservoir screws 15 to 20****Headlight adjustment**

Proceed as follows:

1. Place the vehicle in running order and with the tyres inflated to the prescribed pressure, on a flat surface 10 m away from a white screen situated in a shaded area, making sure that the longitudinal axis of the vehicle is perpendicular to the screen;
2. Turn on the headlight and check that the borderline of the projected light beam on the screen is no higher than 9/10 or lower than 7/10 of the distance from the ground to the centre of the vehicle's headlamp;
3. If otherwise, adjust the right headlight with screw «A».



INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

Engine

Poor performance

POOR PERFORMANCE

Possible Cause	Operation
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.
Excessive drive belt wear	Check it and replace, if necessary
Lack of compression: parts, cylinder and valves worn	Replace the worn parts
Oil level exceeds maximum	Check for causes and fill to reach the correct level
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
Muffler obstructed	Replace
Inefficient automatic transmission	Check the rollers and the pulley movement, replace the damaged parts and lubricate the movable guide of the driven pulley with grease.
Wrong valve adjustment	Adjust the valve clearance properly
Overheated valves	Remove the head and the valves, grind or replace the valves
Valve seat distorted	Replace the head unit
Worn cylinder, Worn or broken piston rings	Replace the piston cylinder assembly or just the piston rings

Starting difficulties

DIFFICULTY STARTING UP

Possible Cause	Operation
Flat battery	Check the state of the battery. If it shows signs of sulphation, replace it and bring the new battery into service by charging it for not more than ten hours at a current of 1/10 of the capacity of the battery itself.
Faulty spark plug	Replace the spark plug
Incorrect valve sealing or valve adjustment	Inspect the head and/or restore the correct clearance
Starter motor and start-up system fault	Check starter motor.
Altered fuel characteristics	Drain off the fuel no longer up to standard; then, refill
Air filter obstructed 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.
Fuel pump fault	Check the pump.

Excessive oil consumption/Exhaust smoke

EXCESSIVE CONSUMPTION

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

Insufficient lubrication pressure

POOR LUBRICATION PRESSURE

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

Transmission and brakes

Clutch grabbing or performing inadequately

IRREGULAR CLUTCH PERFORMANCE OR SLIPPAGE

Possible Cause	Operation
Slippage or irregular functioning	Check that there is no grease on the masses. Check that the faying surface between the clutch masses and the clutch housing is mainly in the middle and with equivalent specifications on the three masses. Check that the clutch housing is not scored or worn abnormally

Insufficient braking

INEFFICIENT OR NOISY BRAKING

Possible Cause	Operation
Worn brake pads or shoes	Replace the brake pads or shoes and check for brake disk or drum wear conditions.
Front brake disk loose or deformed	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.
Air bubbles inside the hydraulic braking system	Carefully bleed the hydraulic braking system, (there must be no flexible movement of the brake lever).
Fluid leakage in hydraulic braking system	Failing elastic fittings, plunger or brake pump seals, replace
Excessive clearance in the rear brake control cable	Adjust the clearance with the appropriate adjuster located on the back part of the crankcase.

Brakes overheating

BRAKES OVERHEATING

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

Electrical system

Battery

BATTERY

Possible Cause	Operation
Battery	The battery is the electrical device in the system that requires the most frequent inspections and thorough maintenance. If the vehicle is not used for some time (1 month or more) the battery needs to be recharged periodically. The battery runs down completely in the course of 5 to 6 months. If the battery is fitted on a motorcycle, be careful not to invert the connections, keeping in mind that the black ground wire is connected to the negative terminal while the red wire is connected to the terminal marked+. Follow the instructions in the ELECTRICAL SYSTEM chapter for the recharging of the batteries.

Steering and suspensions

Heavy steering

STEERING HARDENING

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

Excessive steering play

EXCESSIVE STEERING CLEARANCE

Possible Cause	Operation
Excessive steering clearance	Check the tightening of the top ring nut. If irregularities continue in turning the steering even after making the above adjustments, check the seats in which the ball bearings rotate: replace if they are recessed.

Noisy suspension

NOISY SUSPENSION

Possible Cause	Operation
NOISY SUSPENSION	If the front suspension is noisy, check: that the front shock absorber works properly and the ball bearings are good condition. Finally, check the locking torque of the wheel axle nut, the brake calliper and the disc. Check that the swinging arm connecting the engine to the chassis and the rear shock absorber work properly.

Suspension oil leakage

OIL LEAKAGE FROM SUSPENSION

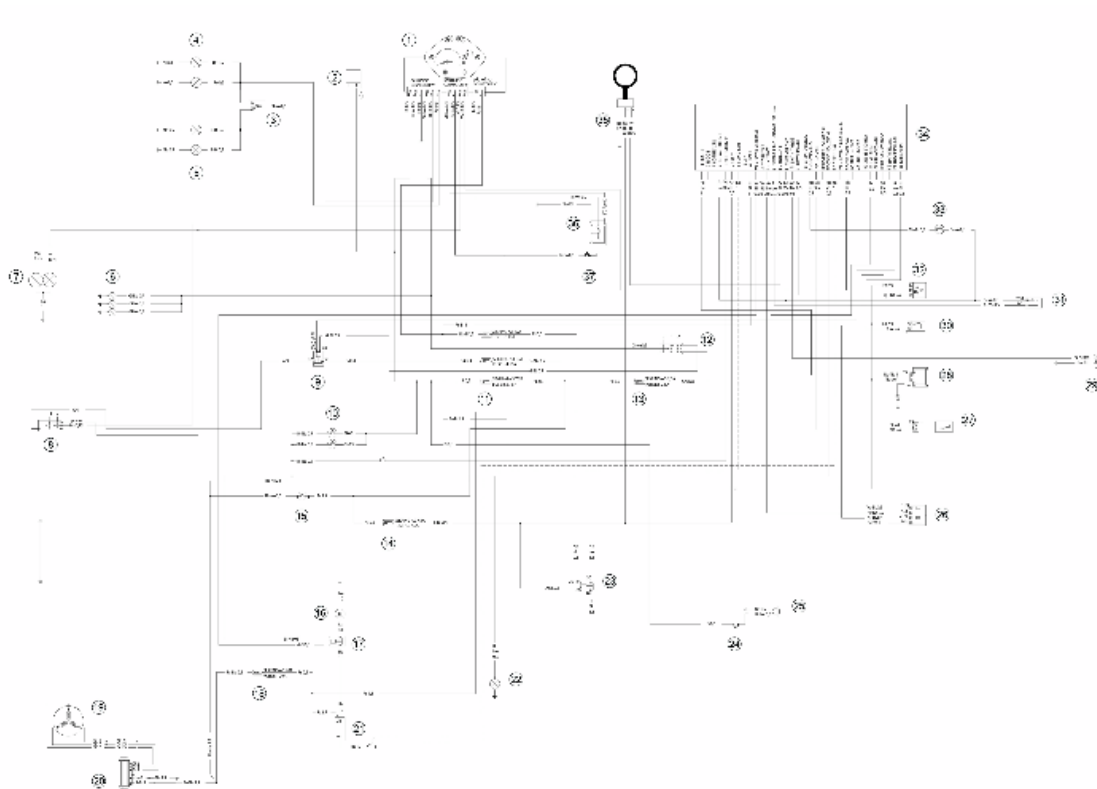
Possible Cause	Operation
Faulty or broken seals	Replace the shock absorber Check the condition of wear of the steering covers and the adjustments.

INDEX OF TOPICS

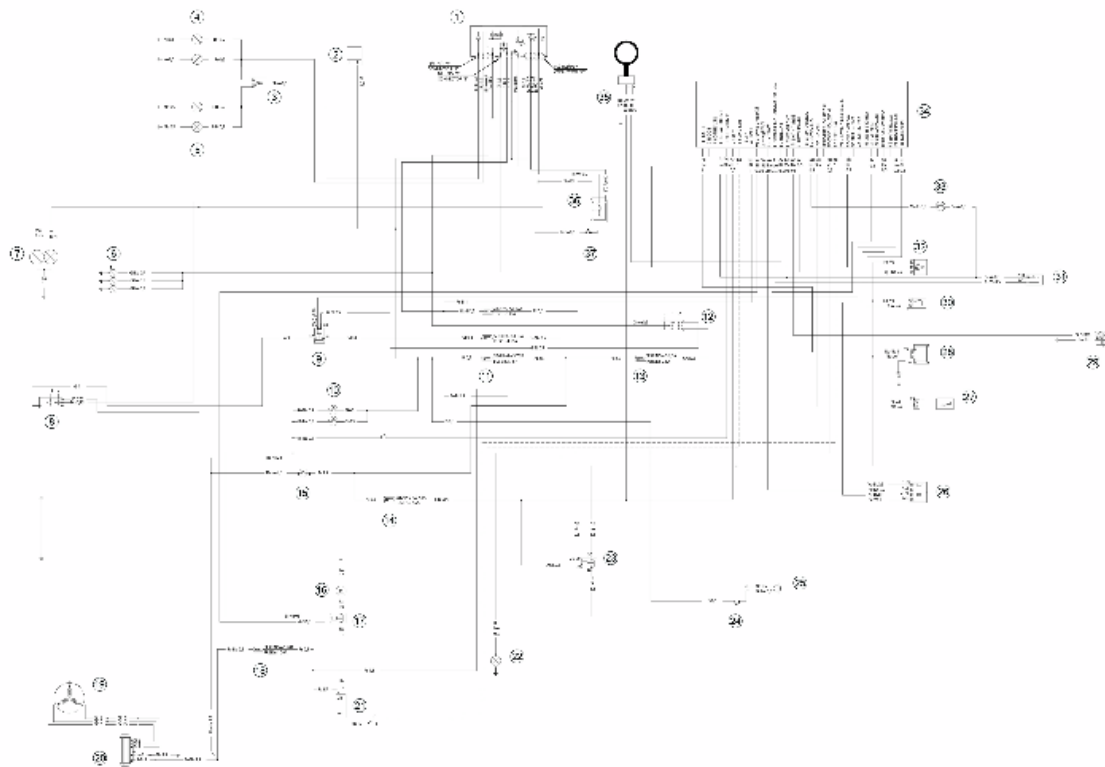
ELECTRICAL SYSTEM

ELE SYS

«LX» VERSION



«S» VERSION

**KEY**

1. Instrument panel
2. Turn indicator control device
3. Turn indicator switch
4. Left turn indicator bulbs
5. Right turn indicator bulbs
6. Daylight running light bulbs and license plate light
7. Headlight with twin-filament bulb
8. Light switch
9. Headlight relay
10. Stop buttons
11. Fuses No. 3, 4, 6;
12. Light switch
13. Fuse No. 5
14. Fuse No. 2
15. Ignition switch
16. Starter motor
17. Starter remote control switch
18. Fuse No. 1

- 19. Magneto flywheel
- 20. Voltage regulator
- 21. Battery
- 22. Stop light bulb
- 23. Injection load relay
- 24. Horn button
- 25. Horn
- 26. Lambda probe
- 27. Engine speed sensor
- 28. HV coil
- 29. Diagnostics socket
- 30. Injector
- 31. Engine temperature sensor
- 32. Fuel pump
- 33. Side stand switch
- 34. Electronic control unit
- 35. Immobilizer Aerial
- 36. Fuel level transmitter
- 37. Oil pressure sensor

KEY

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

Components arrangement



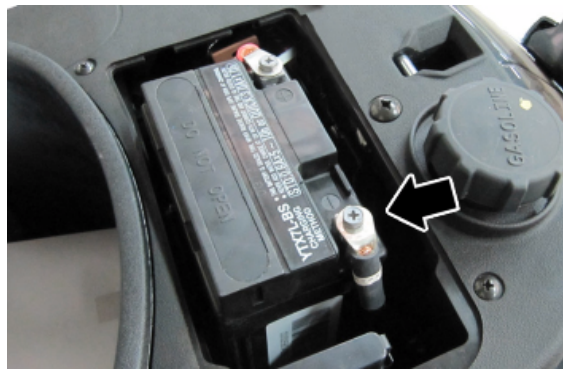
1. Magneto flywheel - Remove the flywheel cover, as described in the «Engine» chapter, to reach it. To get access to the connectors, remove the helmet compartment.



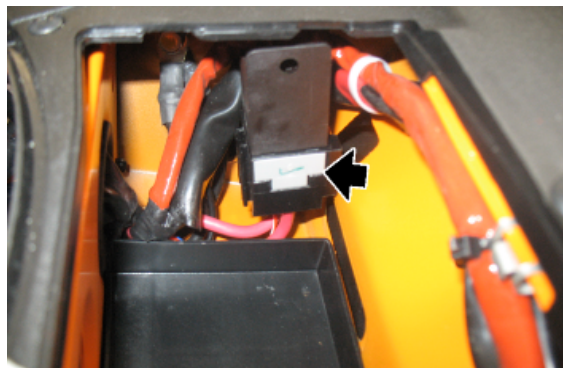
2. Voltage regulator - Remove the front central cover to reach it.



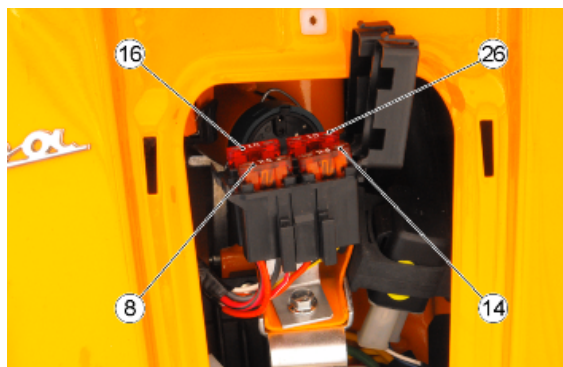
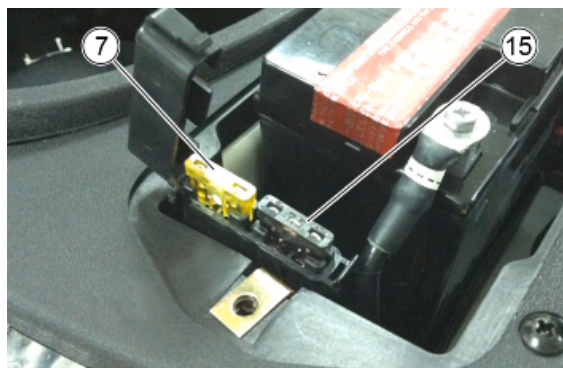
3. Battery - Lift the saddle and remove the cover to reach them.



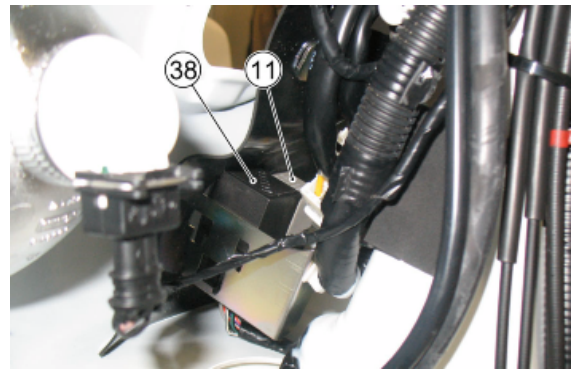
4. Starter remote control - Remove the battery to reach it.



7 - 8 - 14 - 15 - 16 - 26. Fuses - Remove the battery cover and/or the front central cover to reach them.



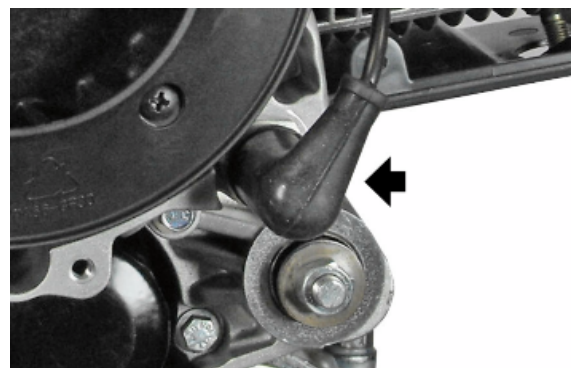
11 - 38. Remote controls - Remove the front central cover to reach it.



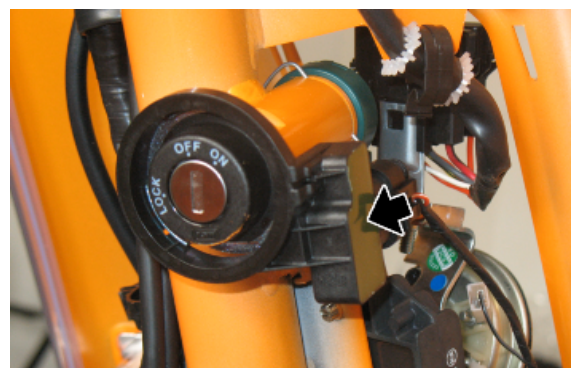
29 - 24. Pump and fuel lever transmitter - They are fitted on the tank, remove the fuel tank to reach them.



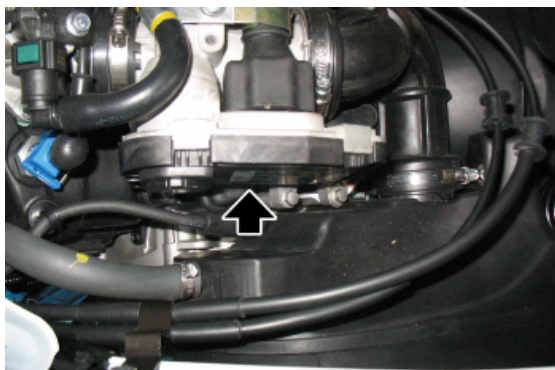
25. Oil pressure sensor - To access, remove the fan cover cap as described in the ENGINE chapter.



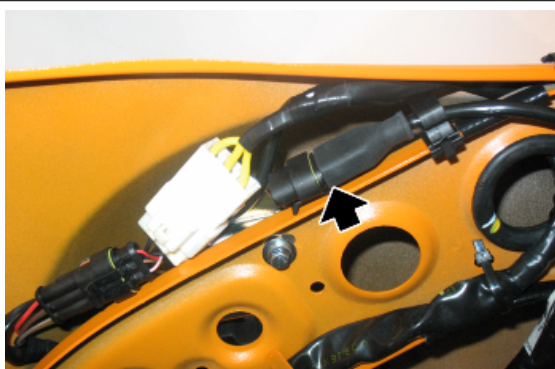
27. Immobilizer aerial - Remove the shield back plate to reach it.



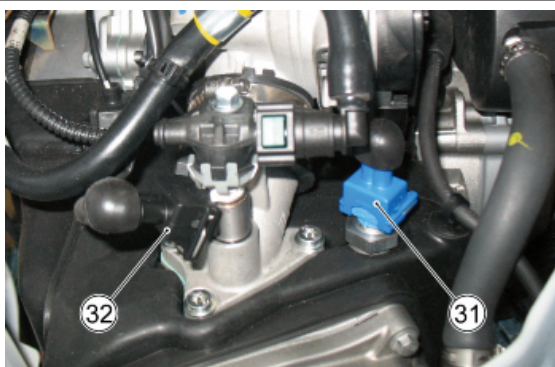
28. Injection ECU - Remove the helmet compartment to reach it.



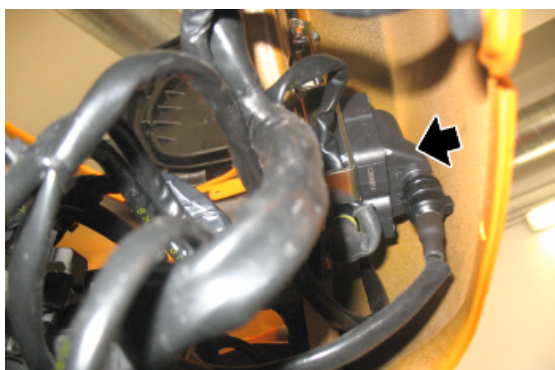
30. Diagnosis connector - Remove the helmet compartment to reach it.

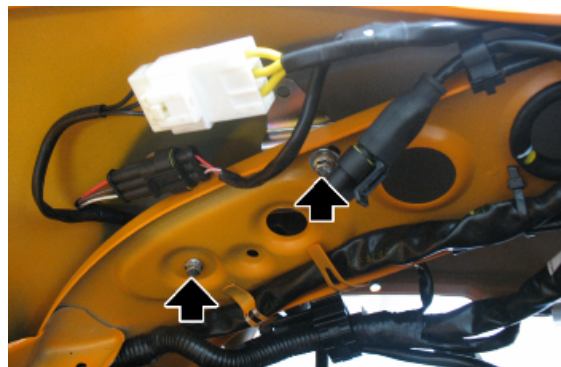


31 - 32. Engine temperature sensor - fuel injector - Remove the helmet compartment to reach it.



33. H.V. coil - Remove the helmet compartment and undo the two screws indicated to reach it.





35. Side stand switch - It is fitted on the side stand.



Ground points

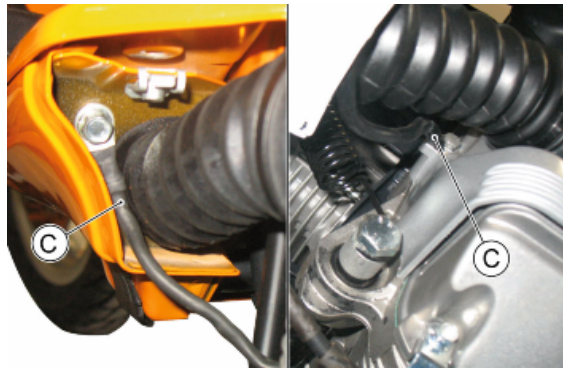
On the vehicle there is a chassis ground point, marked with letter "A", on the right side of the battery compartment.



There is another ground point "B" on the starter motor.

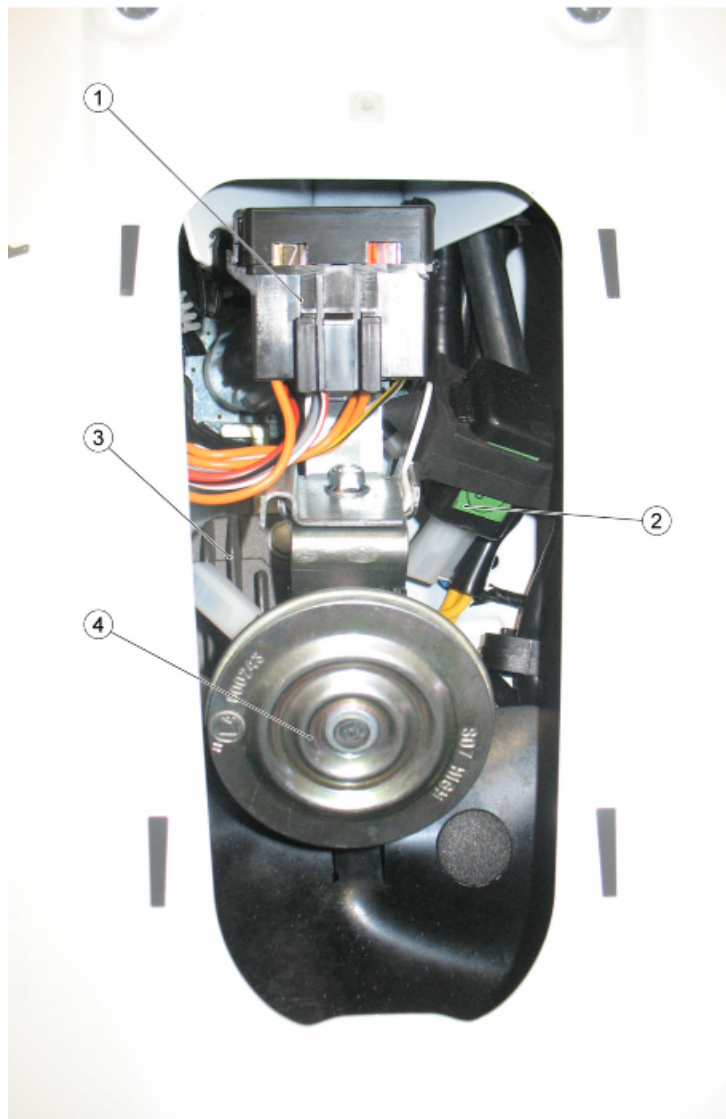


On the left side of the chassis, under the footrest, there is the chassis-engine ground lead "C".



Electrical system installation

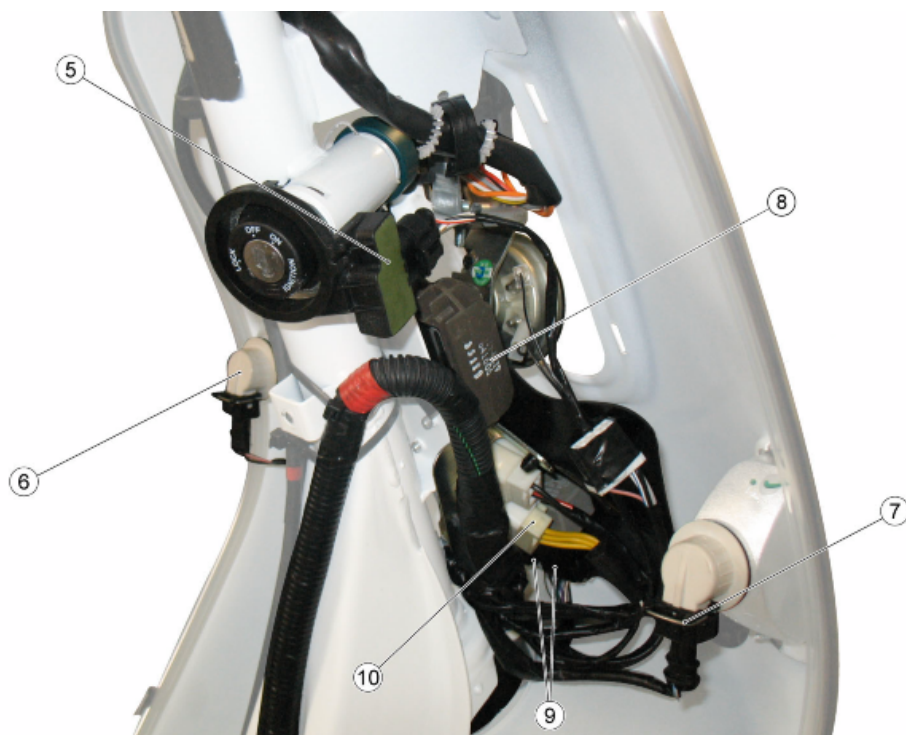
Front side



1. Fuse boxes
2. Turn indicator control device

3. Voltage regulator

4. Horn



5. Immobilizer antenna

6. Front left turn indicator

7. Front right turn indicator

8. Voltage regulator

9. Connection cables injection load relays and lighting

10. Voltage regulator connection

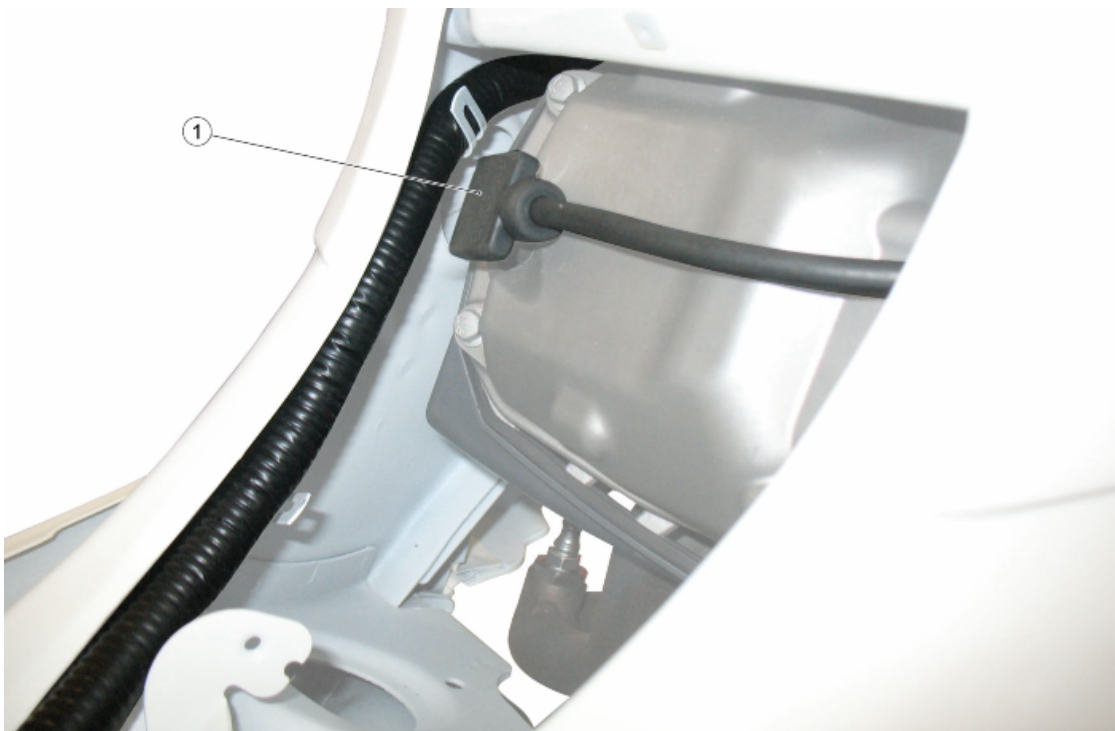


11. Connecting branch controls on the driver and the front headlights

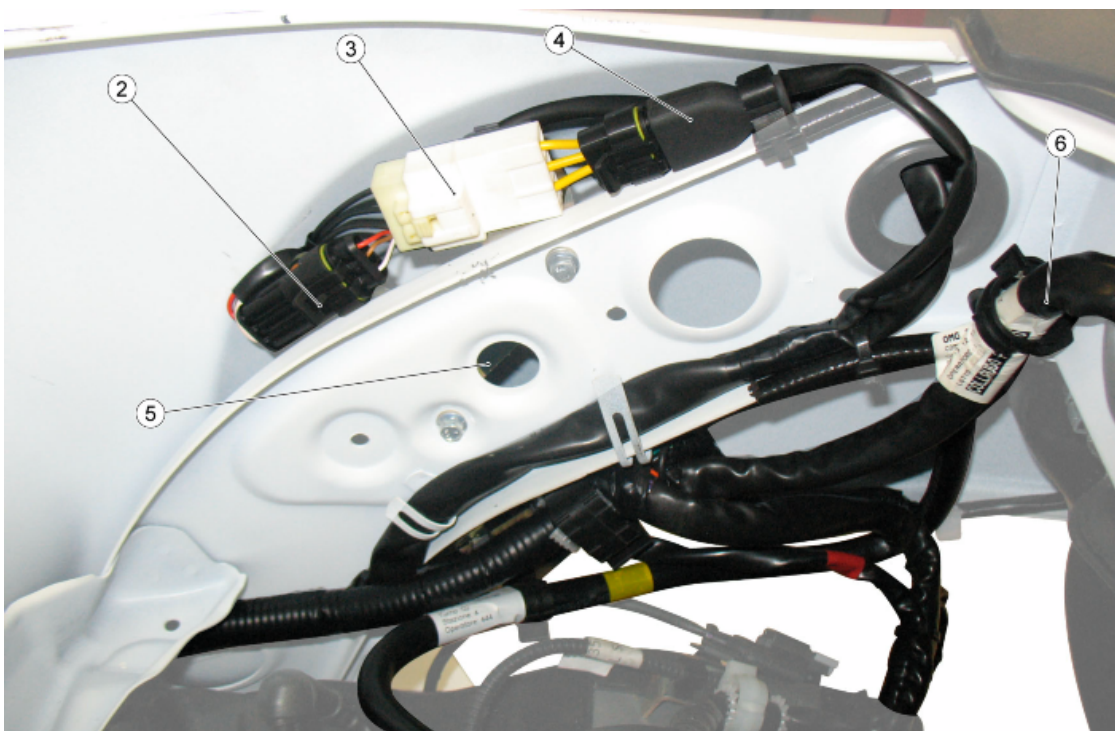
12. On connecting branch rear part of the system



13. On connecting branch rear part of the system

Back side

1. Spark plug cap



- 2. Connection of pick-up sensor
- 3. Stator connection
- 4. Diagnostics connection
- 5. HV coil

6. Connections branch of fuel pump and fuel level transmitter



7. Connection electronic control unit

8. Injector connection

9. Engine temperature sensor



10. Connections to the battery poles

11. Starter remote control switch

12. Chassis ground point



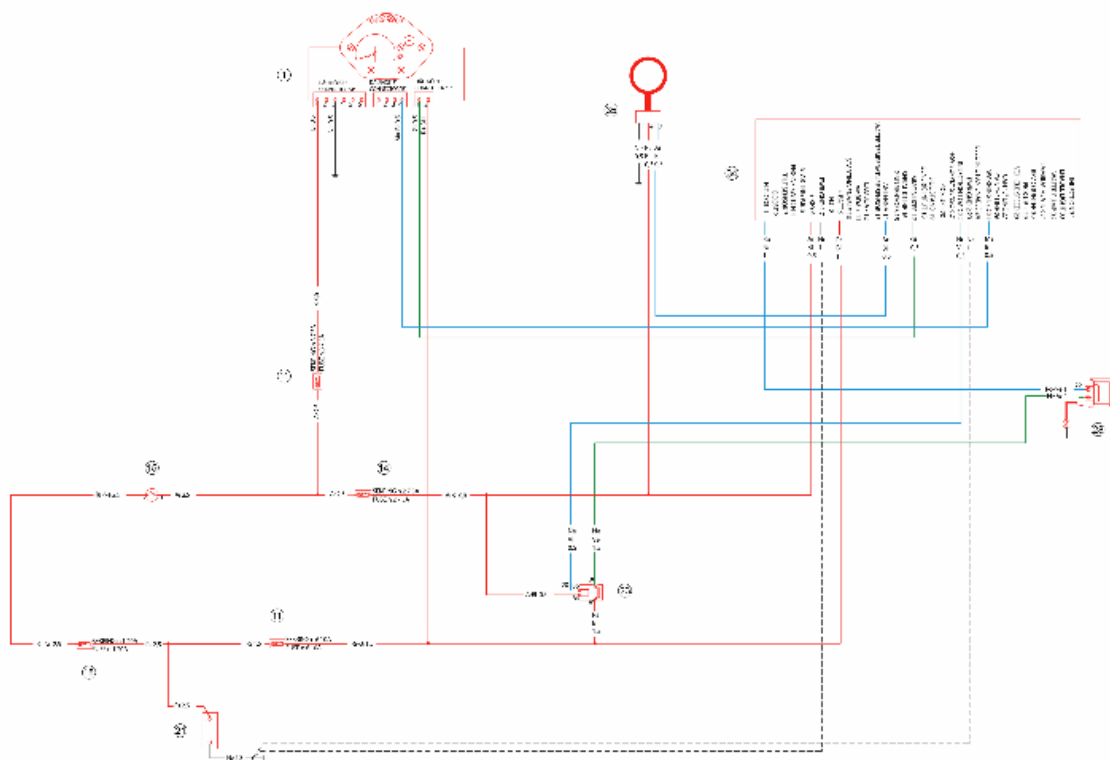
13. Lambda probe cable connector

14. Lambda probe

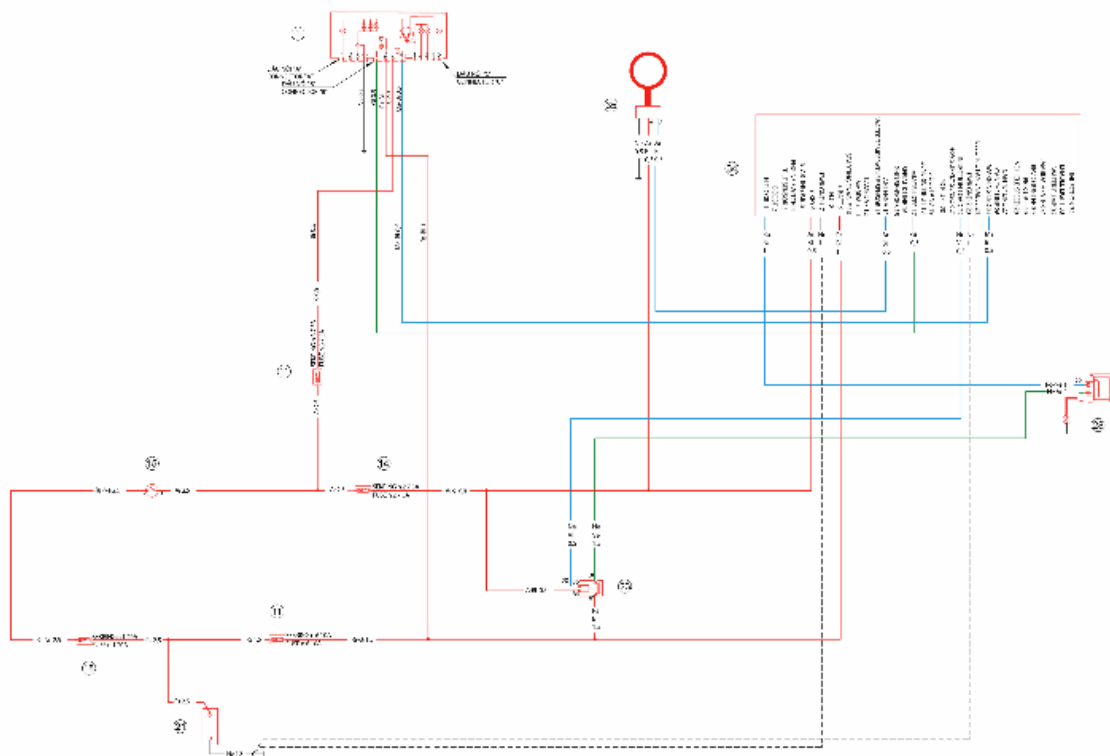
Conceptual diagrams

Ignition

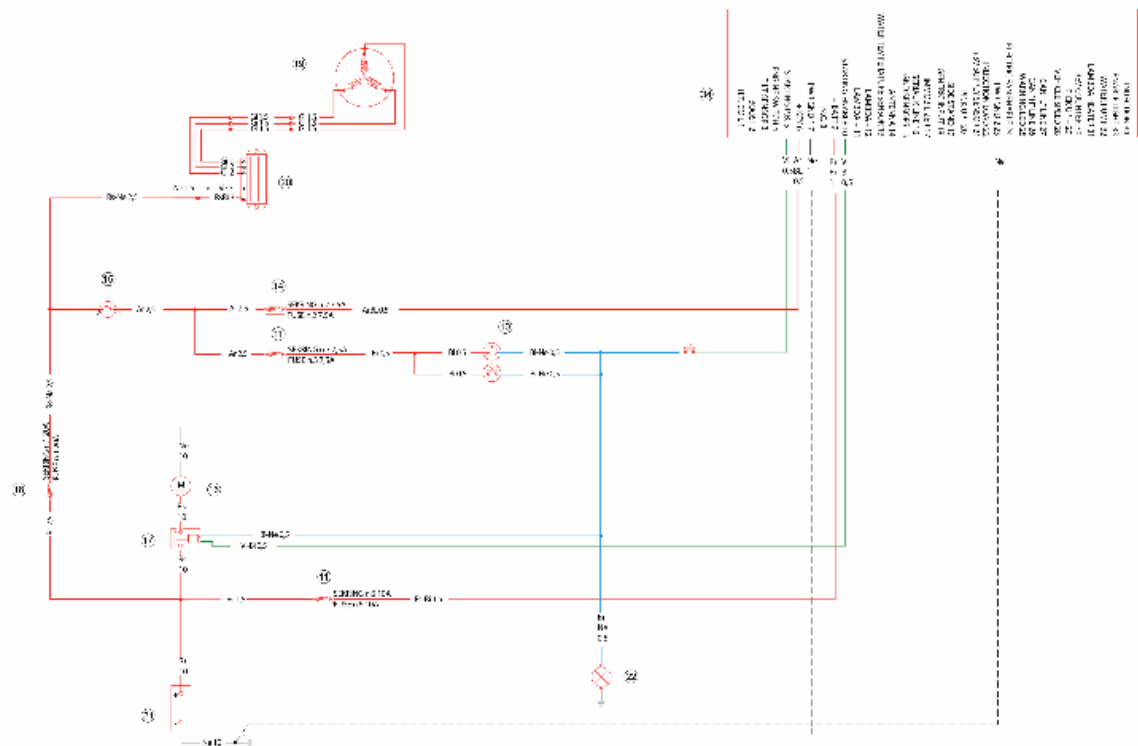
«LX» VERSION



«S» VERSION

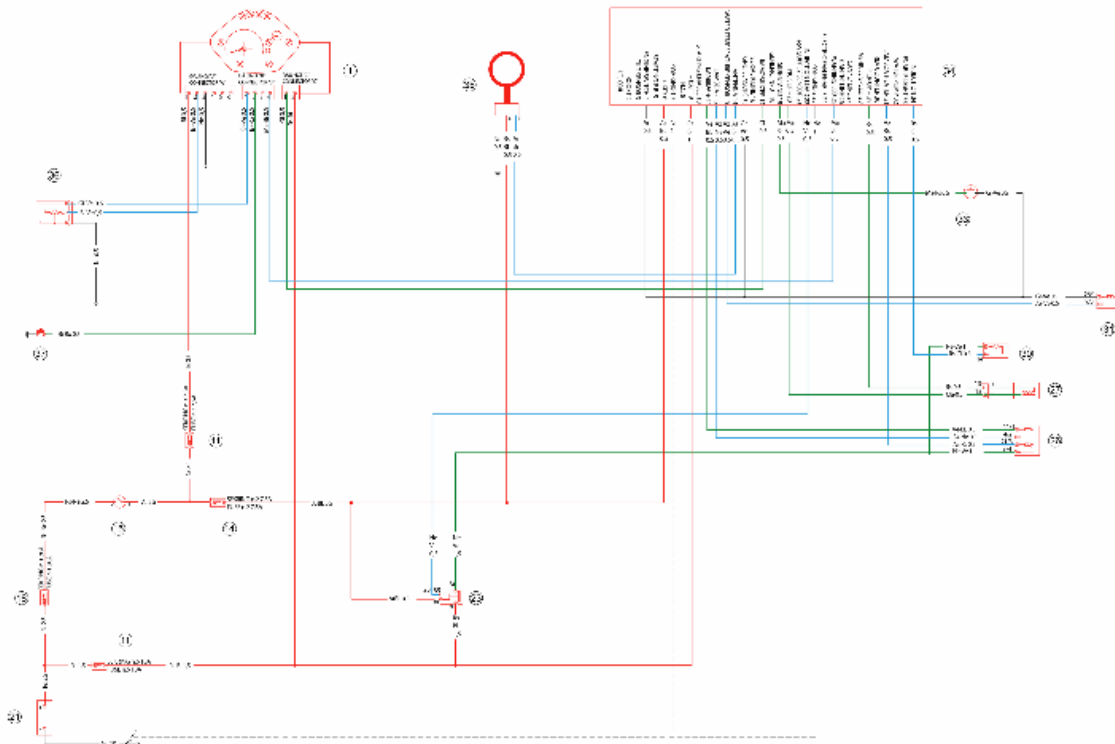
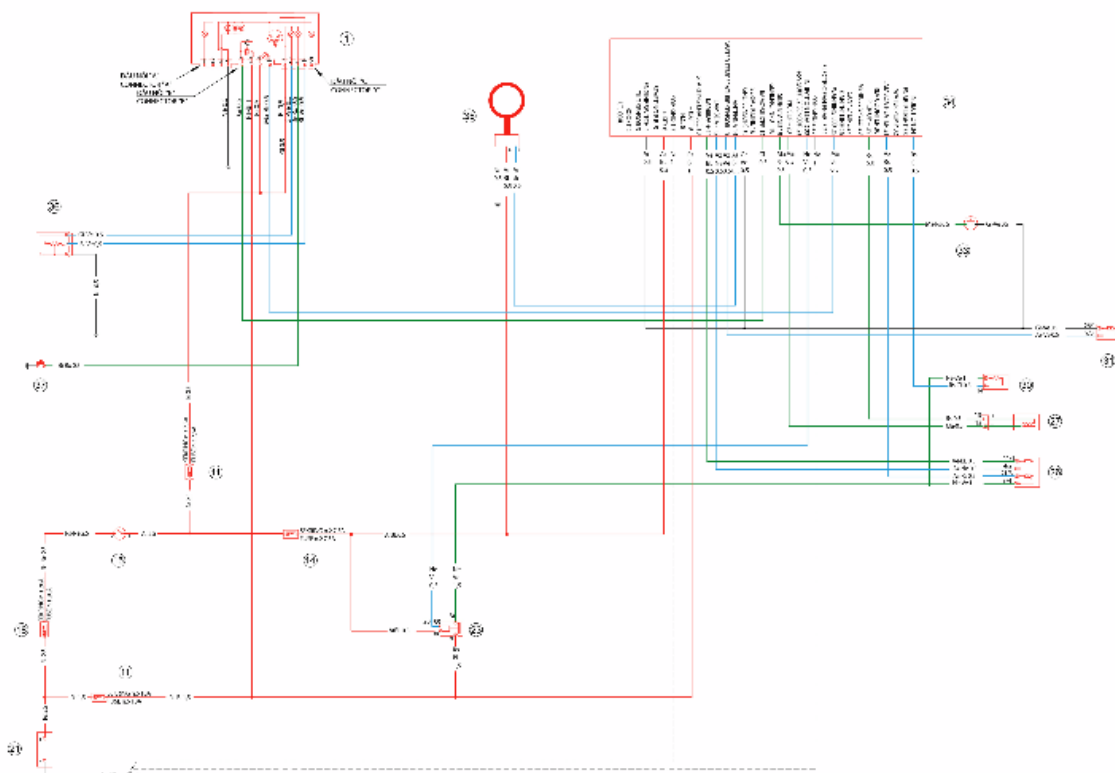


35. Immobilizer Aerial

**KEY**

- 10. Stop buttons
- 11. Fuses No. 3, 4, 6;
- 14. Fuse No. 2
- 15. Ignition switch
- 16. Starter motor
- 17. Starter remote control switch
- 18. Fuse No. 1
- 19. Magneto flywheel
- 20. Voltage regulator
- 21. Battery
- 22. Stop light bulb
- 34. Electronic control unit

Level indicators and enable signals section**«LX» VERSION**

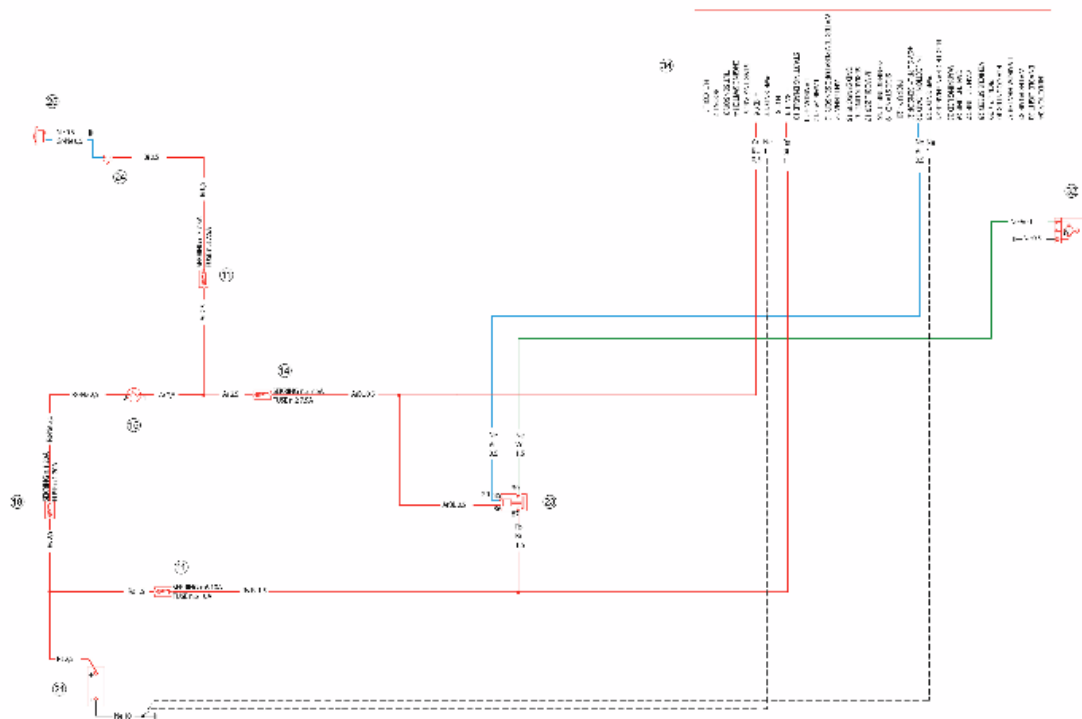
**«S» VERSION**

KEY

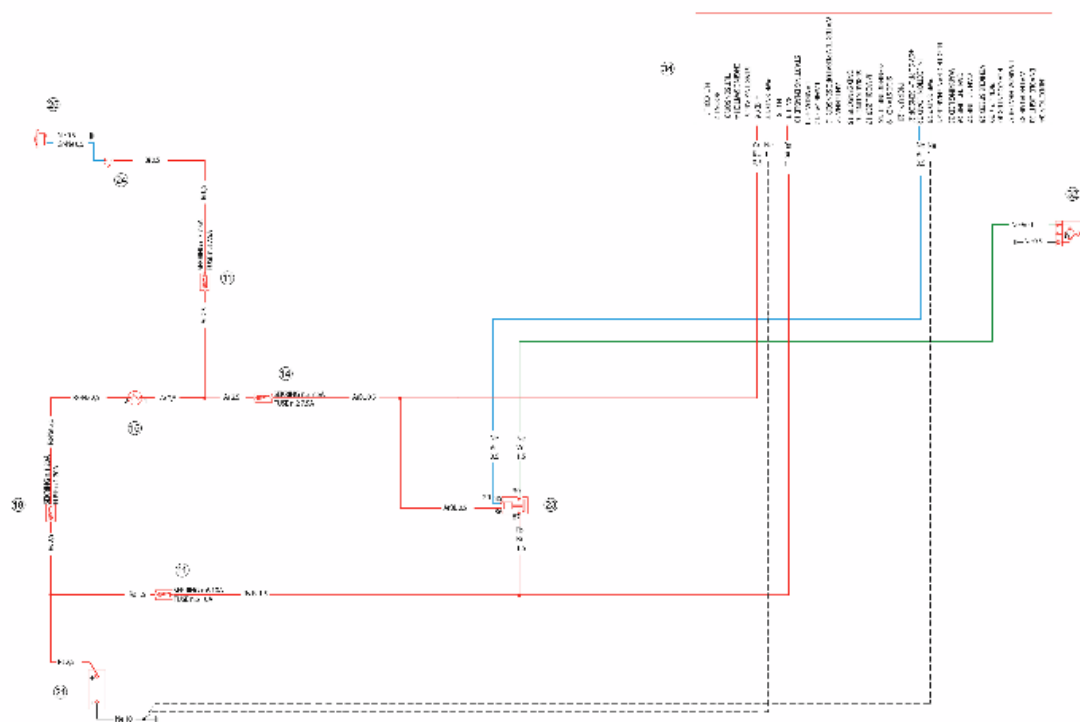
- 1. Instrument panel
- 11. Fuses No. 3, 4, 6;
- 14. Fuse No. 2
- 15. Ignition switch
- 18. Fuse No. 1
- 21. Battery
- 23. Injection load relay
- 26. Lambda probe
- 27. Engine speed sensor
- 30. Injector
- 31. Engine temperature sensor
- 33. Side stand switch
- 34. Electronic control unit
- 35. Immobilizer Aerial
- 36. Fuel level transmitter
- 37. Oil pressure sensor

Devices and accessories

«LX» VERSION



«S» VERSION

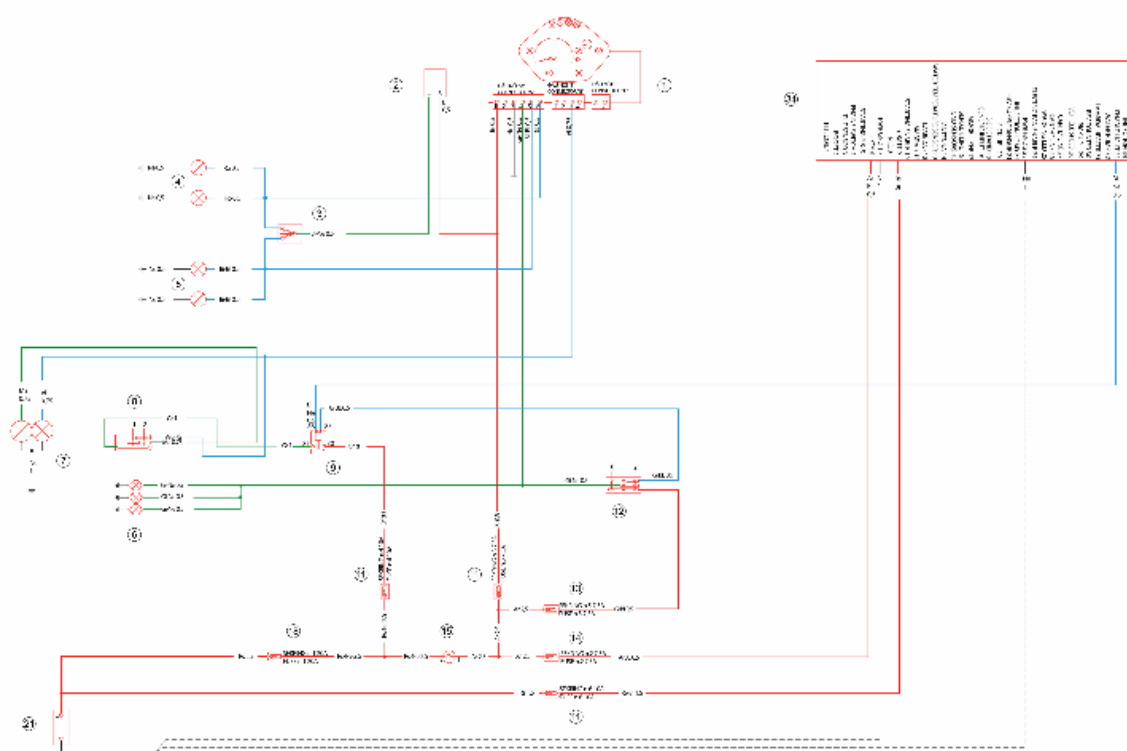


KEY

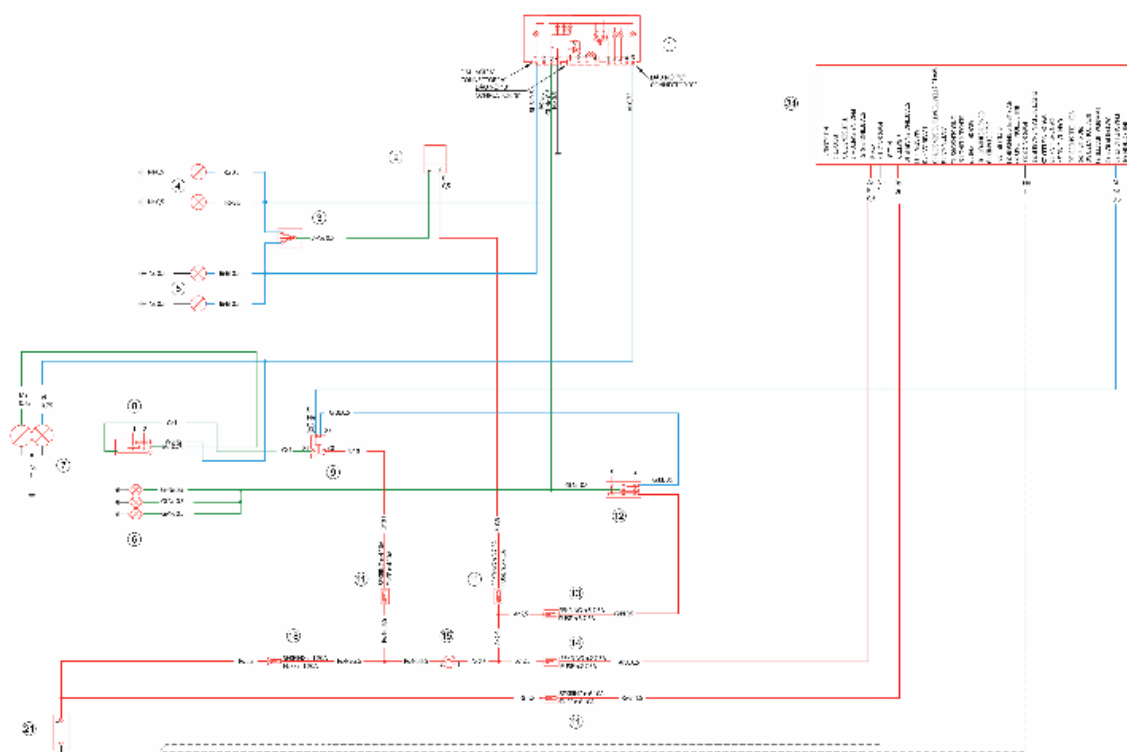
- 11. Fuses No. 3, 4, 6;
- 14. Fuse No. 2
- 15. Ignition switch
- 18. Fuse No. 1
- 21. Battery
- 23. Injection load relay
- 24. Horn button
- 25. Horn
- 32. Fuel pump
- 34. Electronic control unit

Lights and turn indicators

«LX» VERSION

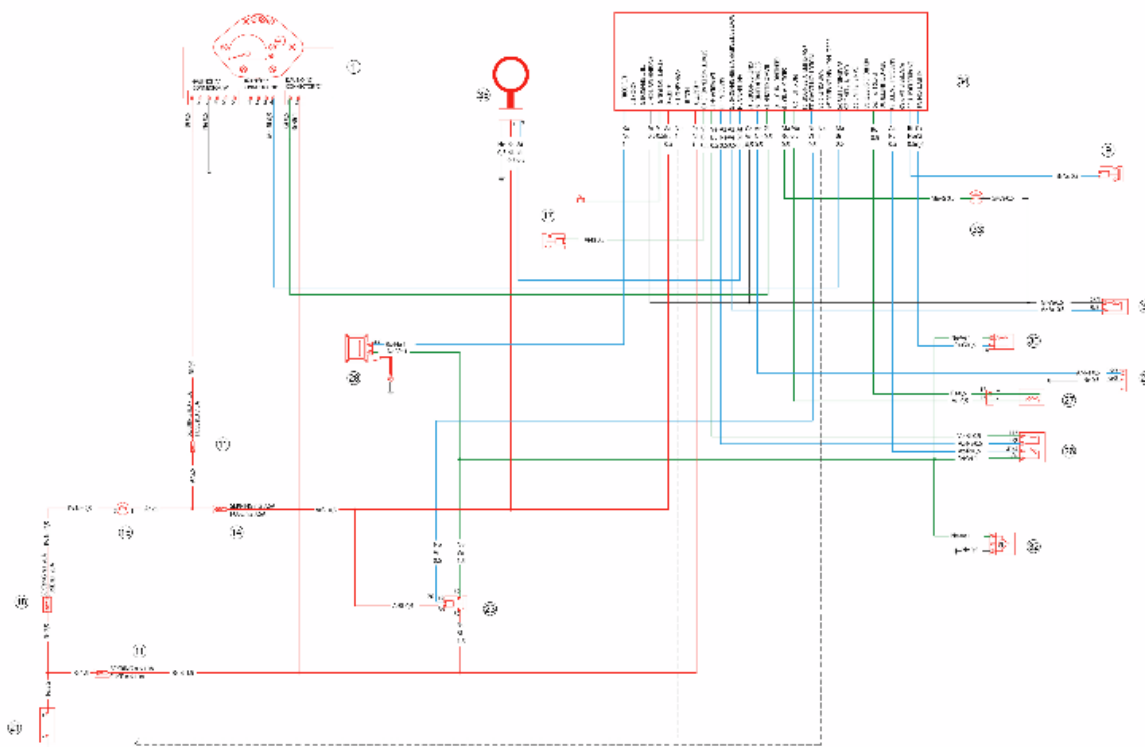


«S» VERSION

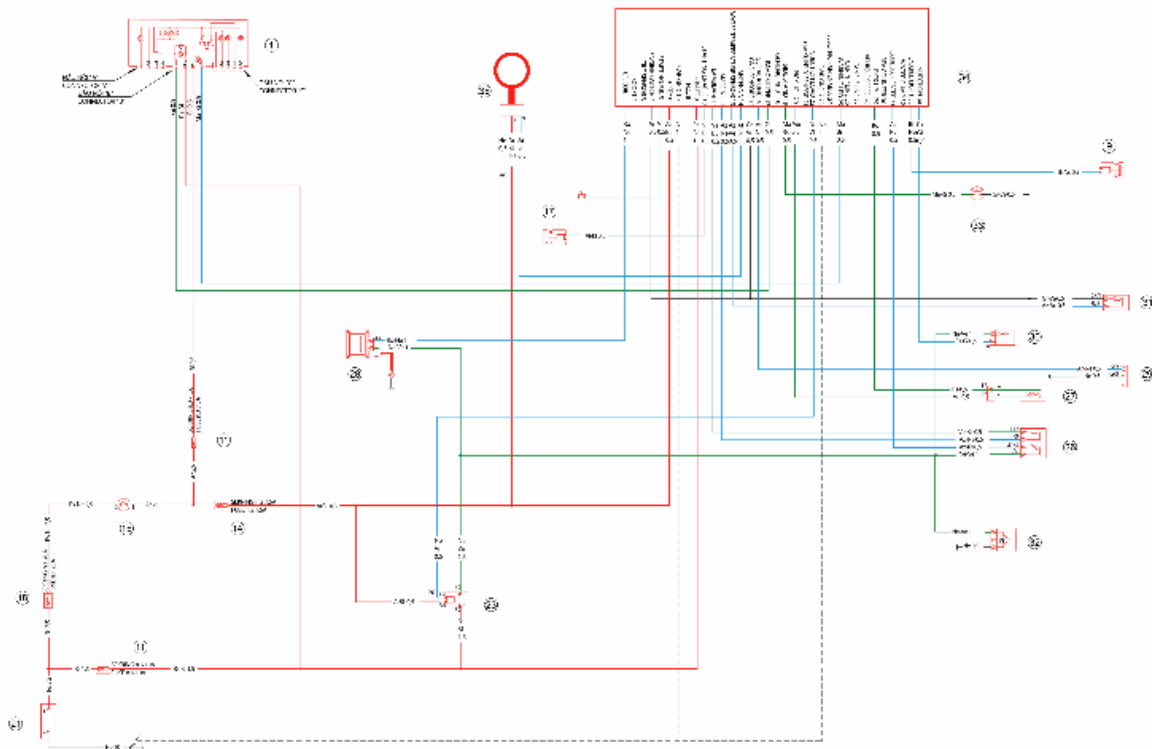


KEY

1. Instrument panel
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6. Daylight running light bulbs and license plate light
7. Headlight with twin-filament bulb
8. Light switch
9. Headlight relay
11. Fuses No. 3, 4, 6;
12. Light switch
13. Fuse No. 5
14. Fuse No. 2
15. Ignition switch
18. Fuse No. 1
21. Battery
34. Electronic control unit

INJECTION**«LX» VERSION**

«S» VERSION



KEY

- 1. Instrument panel
- 9. Headlight relay
- 11. Fuses No. 3, 4, 6;
- 14. Fuse No. 2
- 15. Ignition switch
- 17. Starter remote control switch
- 18. Fuse No. 1
- 21. Battery
- 23. Injection load relay
- 26. Lambda probe
- 27. Engine speed sensor
- 28. H.V. coil
- 29. Diagnostics socket
- 30. Injector
- 31. Engine temperature sensor
- 32. Fuel pump
- 33. Side stand switch
- 34. Electronic control unit

35. Immobilizer Aerial

Checks and inspections

Immobiliser

The electronic ignition system is controlled by the control unit with the integrated Immobilizer system. The immobiliser is an antitheft system which allows the vehicle to function only if it is activated by means of the coded keys that the control unit recognises. The code is integrated in a transponder in the key block. This allows the driver clear operation without having to do anything other than just turning the key. The Immobilizer system consists of the following components:

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

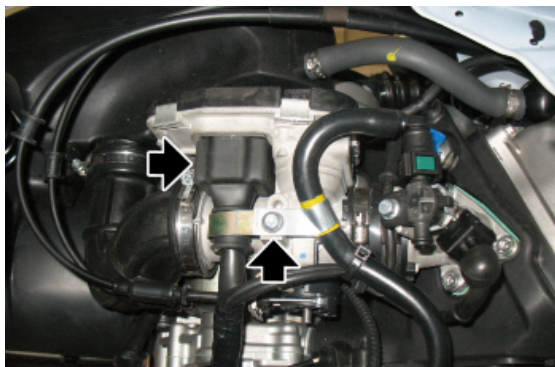
The diagnosis led also works as a blinking light to deter theft. This function is activated every time the ignition switch is turned to "OFF" and it remains active 48 hours so as not to damage the battery charging process.

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

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

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

- there is battery voltage
- that fuse No. 1 and fuse No. 2 are in good conditions.



- there is power to the control unit as specified below:

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

With the key switch set to OFF:

- there is battery voltage between terminals 7-9 and terminal 9-chassis ground (fixed power supply). If there is no voltage check that fuse 2 and its cable are in working order.

With the key switch in the ON position:

- there is battery voltage between terminals 6-7 and terminal 6-chassis ground (fixed power supply). If there is no voltage, check the ignition key contacts, that fuse 6 and its cable are in working order.
-

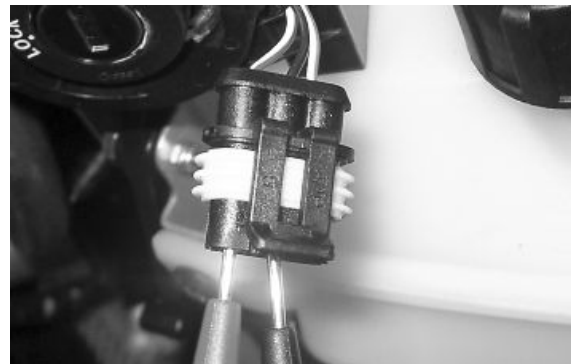
After removing the leg shield back plate, remove the electrical connection from the aerial as shown in the picture.



Remove the protective base from the connector.



With the ignition switch at ON check there is battery voltage between the Orange-Blue and Black cables.



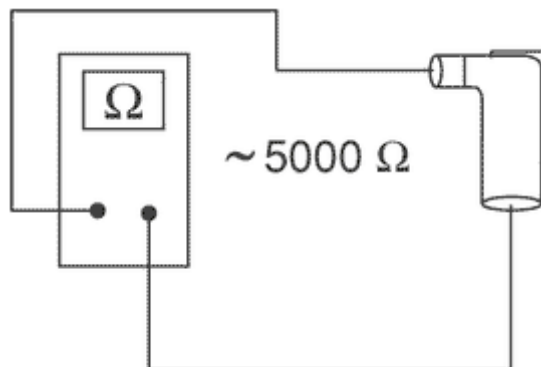
Virgin circuit

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 (lower and upper limits 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 resistor spark plugs.

Diagnostic codes

The Immobilizer system is tested each time the ignition key 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:

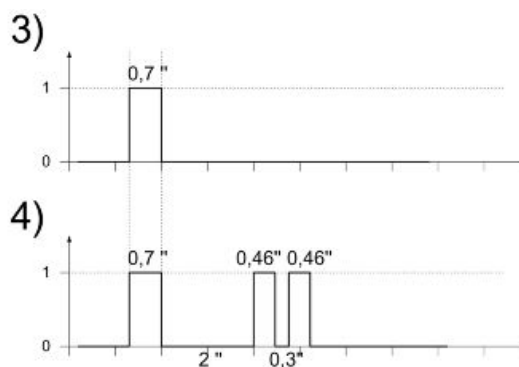
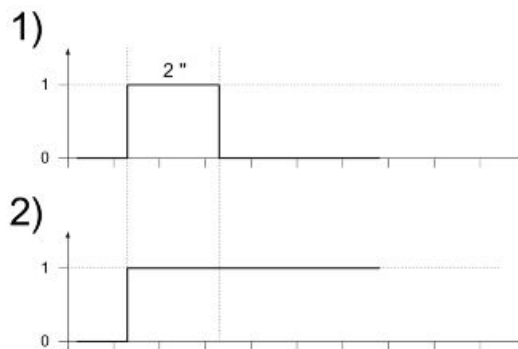
a single 2 second flash is displayed, after which the LED remains off permanently. The keys can be stored to memory, the vehicle can be started but with a limitation imposed on the number of revs.

2. Previously unused control unit - transponder absent or cannot be used: the LED is on permanently. In this condition no operations are possible including the start up 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.

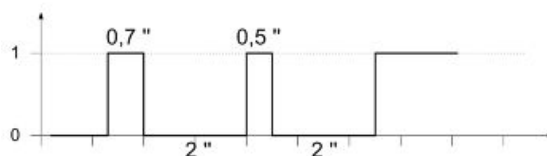
5. Programmed control unit - fault detected: a light code is displayed according to the fault detected, after which the LED remains on steadily. The engine cannot be started. The codes that can be transmitted are:



- 1-flash code
- 2-flash code
- 3-flash code

Diagnostic code - 1 flash

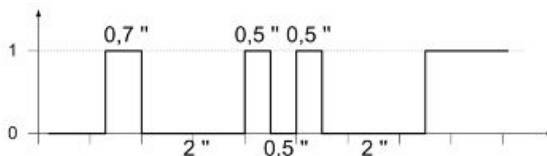
A one-flash code indicates a system where the serial line is not present or is not detected. Check the Immobilizer antenna wiring and change it if necessary.



Diagnostic code - 2 flashes

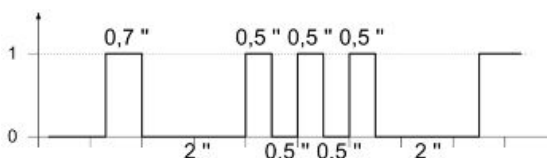
A two-flash code shows a system where the control unit does not show the transponder signal. This might depend on the inefficiency of the immobilizer antenna or the transponder.

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



Diagnostic code - 3 flashes

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



Battery recharge circuit

The charging circuit consists of three-phase alternator and a permanent magneto flywheel.

The alternator is directly connected to the voltage regulator.

This, in its turn, is connected directly to the ground and the battery's positive terminal passing through the 20A 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.

Stator check

Checking the stator windings

WARNING

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

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

Electric characteristic

Resistance:

0.2 - 1 Ω

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



Recharge system voltage check

Look for any leakage

- 1) Access the battery by removing the specific cover.
- 2) Check that the battery does not show signs of losing fluid before checking the output voltage.
- 3) Turn the ignition key to position OFF, connect the terminals of the tester between the negative pole (-) of the battery and the black cable and only then disconnect the black cable from the negative pole (-) of the battery.
- 4) With the ignition key always at OFF, the reading indicated by the ammeter must be ≤ 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) Start the engine, ensure that the lights are all out, increase the engine speed and at the same time measure the voltage.

Electric characteristic

Voltage ranging between 14.0 and 15.0V at 5000 rpm.

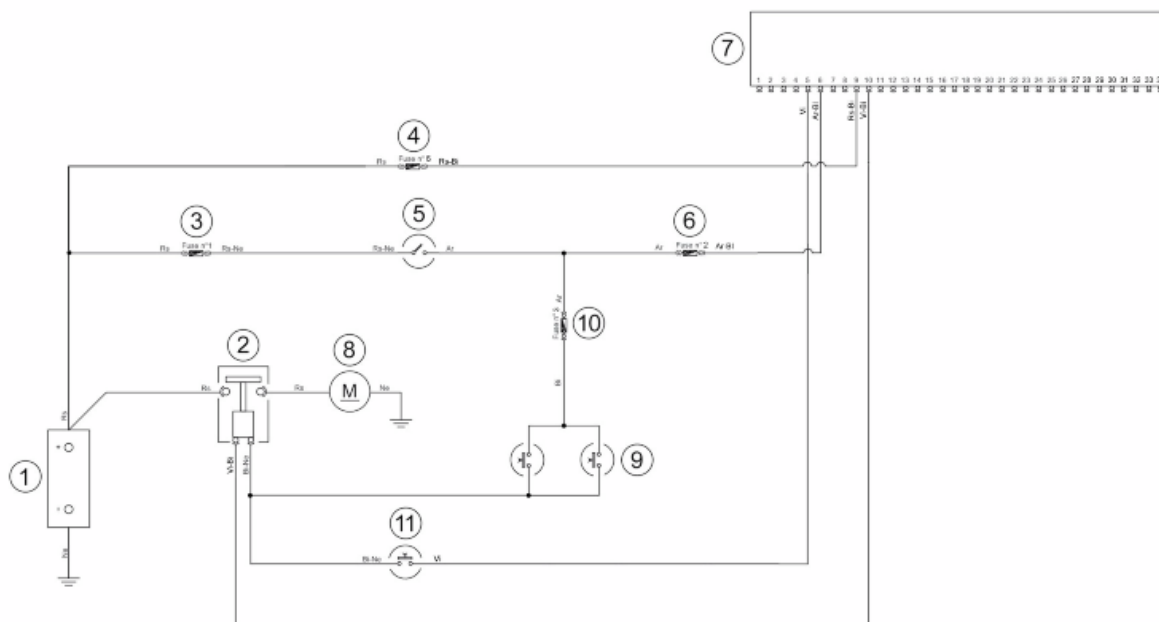
Maximum current output check.

- With engine off and panel set to "ON" turn on the lights and let the battery voltage set to 12V.
- Connect ammeter pliers to the 2 recharge positive poles in output from the regulator.
- Keep the lights on and start the engine, bring it to normal speed and read the values on the ammeter.

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

VOLTAGE REGULATOR/RECTIFIER

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

Starter motor**KEY**

1. Battery

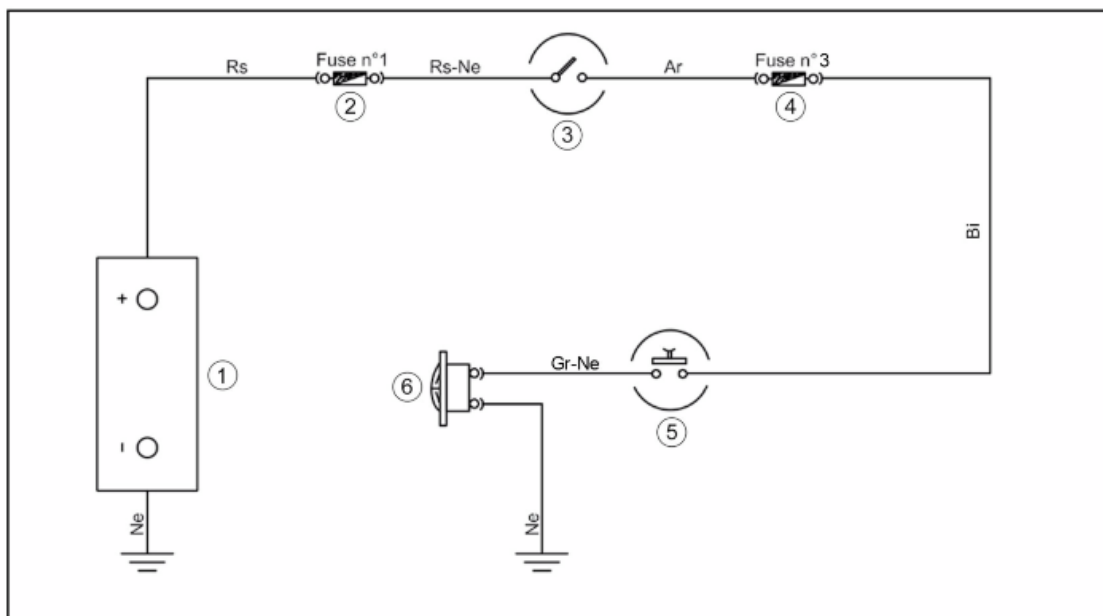
- 2. Starter relay
- 3. Fuse No. 1
- 4. Fuse No. 6
- 5. Ignition switch contacts
- 6. Fuse No. 2
- 7. Electronic control unit
- 8. Starter motor
- 9. Stop buttons
- 10. Fuse No. 3
- 11. Starter button

WARNING

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

- 1) Check fuses No. 1, 2, 3 and 6.
 - 2) Check ignition switch contacts.
 - 3) Check the contacts of the stop buttons and the starter button.
 - 4) Check with the ignition switch «ON», brake engaged and start button pressed, the presence of voltage between the White-Black cable of the starter relay and ground, otherwise check the cable harness.
 - 5) Check the starter relay.
 - 6) Check that the Red cable between the battery and the starter relay is not interrupted. Also check continuity between the latter and the starter motor.
 - 7) Check the starter motor ground connection.
 - 8) Check the continuity of the Purple-White cable between the starter relay and control unit (pin 10).
-

Horn control



KEY

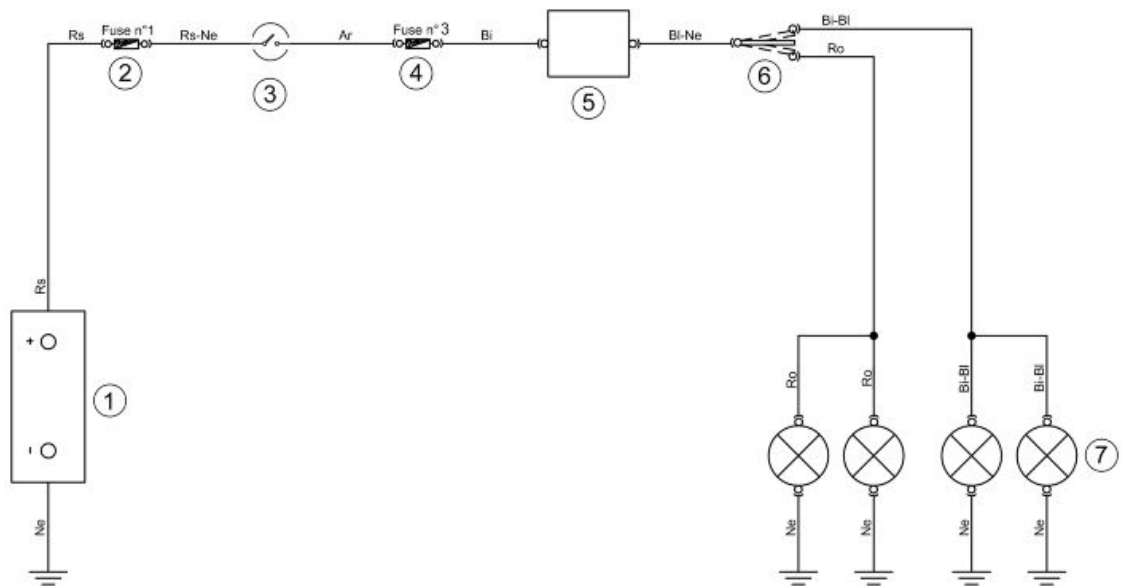
1. Battery
2. Fuse No. 1
3. Ignition switch contacts
4. Fuse No. 3
5. Horn button
6. Horn

WARNING

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

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

Turn signals system check

**KEY**

1. Battery
2. Fuse No. 1
3. Ignition switch contacts
4. Fuse No. 3
5. Turn indicator control device
6. Turn indicator switch
7. Turn indicator bulbs (12V - 10W)

WARNING

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

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

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

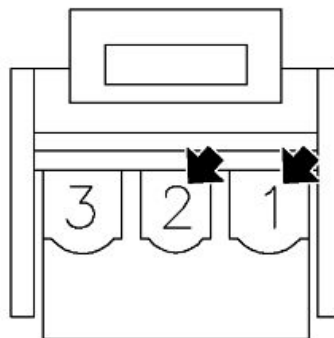
level indicators

WARNING

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

If faults are detected:

- 1) With a multimeter, check resistance values between the White-Green cable and the Black cable of the fuel level transmitter under different conditions.
- 2) If the transmitter operates correctly but the indication on the instrument panel is not exact, check that the cable harnesses between them are not interrupted.



Electric characteristic

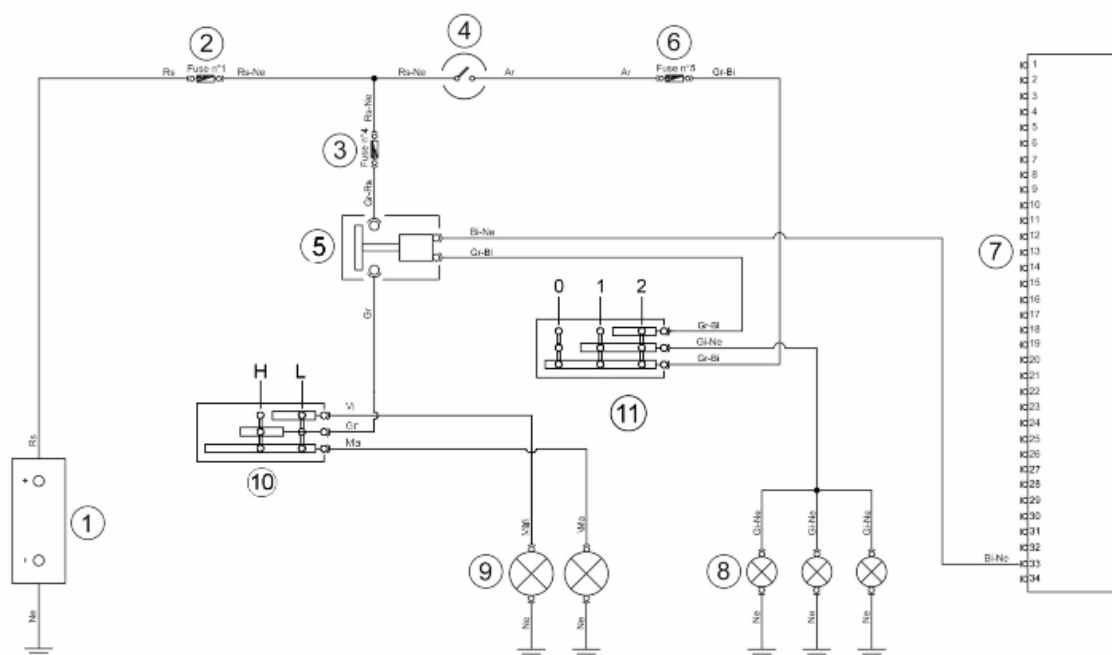
Resistance value when the tank is full

$\leq 7 \Omega$

Resistance value when the tank is empty

$90 \pm 13/-3 \Omega$

Lights list



KEY

1. Battery
2. Fuse No. 1
3. Fuse No. 4
4. Ignition key contacts
5. Headlight relay
6. Fuse No. 5
7. Electronic control unit
8. Daylight running light bulbs, license plate light
9. High/low beam two-light bulb
10. Light switch
11. Light switch

WARNING

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

LINE FOR DAYLIGHT RUNNING LIGHTS, LICENSE PLATE LIGHT AND DASHBOARD LIGHTING BULB

- 1) Check that bulbs operate properly.
- 2) Check fuses No. 1 and 5.
- 3) Check the ignition switch and light switch contacts.
- 4) With the key switch set to «**ON**» check if there is voltage between the Grey-White cable of the fuse No 5 and the ground connection. If there is not, check cable harnesses.
- 5) Check cable harness continuity between the fuse No 5 and the light switch (Grey-White cable).
- 6) Check that the cable harnesses of the bulbs and their ground connection are not interrupted.

HIGH BEAM/LOW BEAM LIGHTS LINE

- 1) Check that bulbs operate properly.
- 2) Check fuses No. 1 and 4.
- 3) Check ignition switch contacts.
- 4) Check if there is voltage between the Grey-Red cable of the headlight remote control and the ground connection. If there is not, check cable harnesses.
- 5) With the key switch set to «**ON**», light switch in position **2** and the engine running, check if there is voltage between the Grey cable of the headlight remote control and the ground connection. If there is not, check cable harnesses.
- 6) Check that the White-Black cable connecting the headlight solenoid and the control unit (pin 33) is not interrupted.
- 7) Check the headlight remote control switch.
- 8) Check that the continuity between the Grey cable of the light switch and the headlight remote control is not interrupted.
- 9) Check the light switch contacts.

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



THE FOLLOWING INDICATIONS REFER TO THE LX VERSION.

BULBS

	Specification	Desc./Quantity
1	High/low beam light bulb	Type: Halogen (HS1) Power: 12V - 35/35W Quantity: 1
2	Front daylight running light bulbs	Type: Incandescent Power: 12V - 5W Quantity: 1
3	Stop light/rear daylight running light bulb	Type: Incandescent Power: 12V-5W/18W Quantity: 1
4	License plate bulb	Type: Incandescent Power: 12V - 5W Quantity: 1
5	Front turn indicator light bulb	Type: Incandescent, BAU 15S, Amber Power: 12V - 10W Quantity: 1 RHS + 1 LHS
6	Rear turn indicator light bulb	Type: Incandescent, BAU 15S, Amber Power: 12V - 10W Quantity: 1 RHS + 1 LHS
7	Instrument panel bulb	Type: Incandescent Power: 12V - 2W Quantity: 3



THE FOLLOWING INDICATIONS REFER TO THE S VERSION.

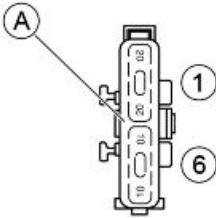
BULBS

	Specification	Desc./Quantity
1	High/low beam light bulb	Type: Halogen (H4) Power: 12V - 55/60W Quantity: 1
2	Front daylight running light bulbs	Type: Incandescent Power: 12V - 5W Quantity: 1
3	Stop light/rear daylight running light bulb	Type: Incandescent Power: 12V-5W/18W Quantity: 1
4	License plate bulb	Type: Incandescent Power: 12V - 5W Quantity: 1
5	Front turn indicator light bulb	Type: Incandescent, BAU 15S, Amber Power: 12V - 10W Quantity: 1 RHS + 1 LHS
6	Rear turn indicator light bulb	Type: Incandescent, BAU 15S, Amber Power: 12V - 10W Quantity: 1 RHS + 1 LHS
7	Instrument panel bulb	Type: Incandescent Power: 12V - 1.2W Quantity: 2 Power: 12V - 2W Quantity: 1
8	High-beam warning light bulbs, turn indicator, fuel reserve, engine check, oil pressure	Type: Incandescent Power: 12V - 1.2W Quantity: 6

Fuses

The electrical system is protected by main and secondary fuses:

- 1. two main fuses inserted in the fuse holder «A» positioned in the battery compartment.
- 2. four secondary fuses inserted in the fuse holder «B» accessible by removing the front cover of the shield.



The tables show the position and characteristics of the fuses on 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).

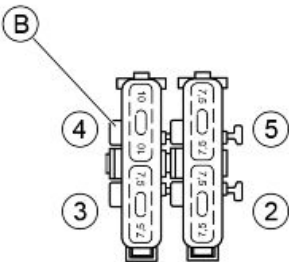
CAUTION



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.

MAIN FUSES

Specification	Desc./Quantity
Fuse No. 1	Capacity: 20 A Protected circuits: General, recharge circuit
Fuse No. 6	Capacity: 10 A Protected circuits: Injection loads relay, MIU ECU, instrument panel.



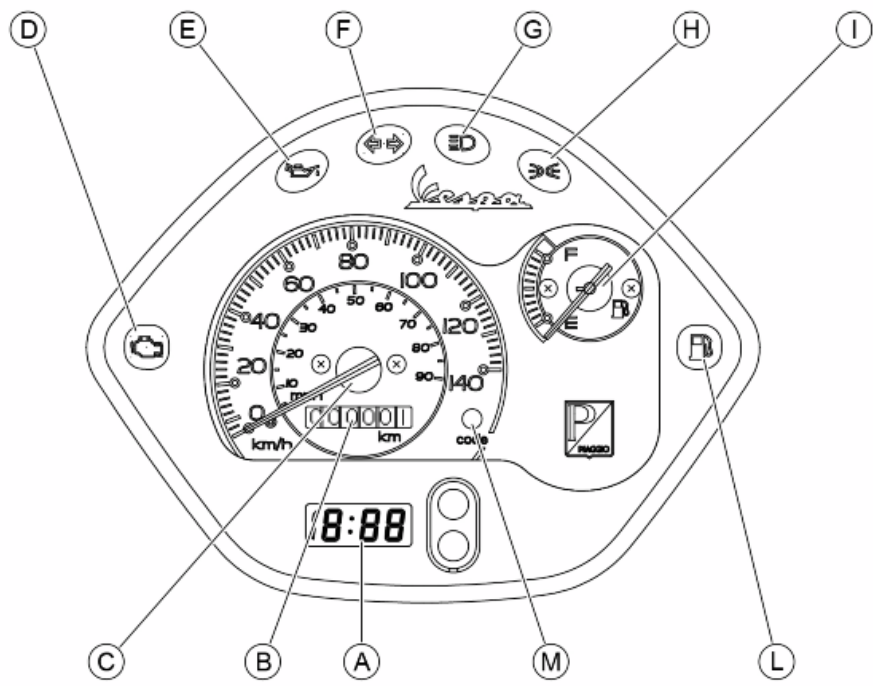
SECONDARY FUSES

Specification	Desc./Quantity
Fuse No. 2	Capacity: 7.5 A Protected circuits: Injection loads relay, MIU ECU, immobilizer aerial.
Fuse No. 3	Capacity: 7.5 A

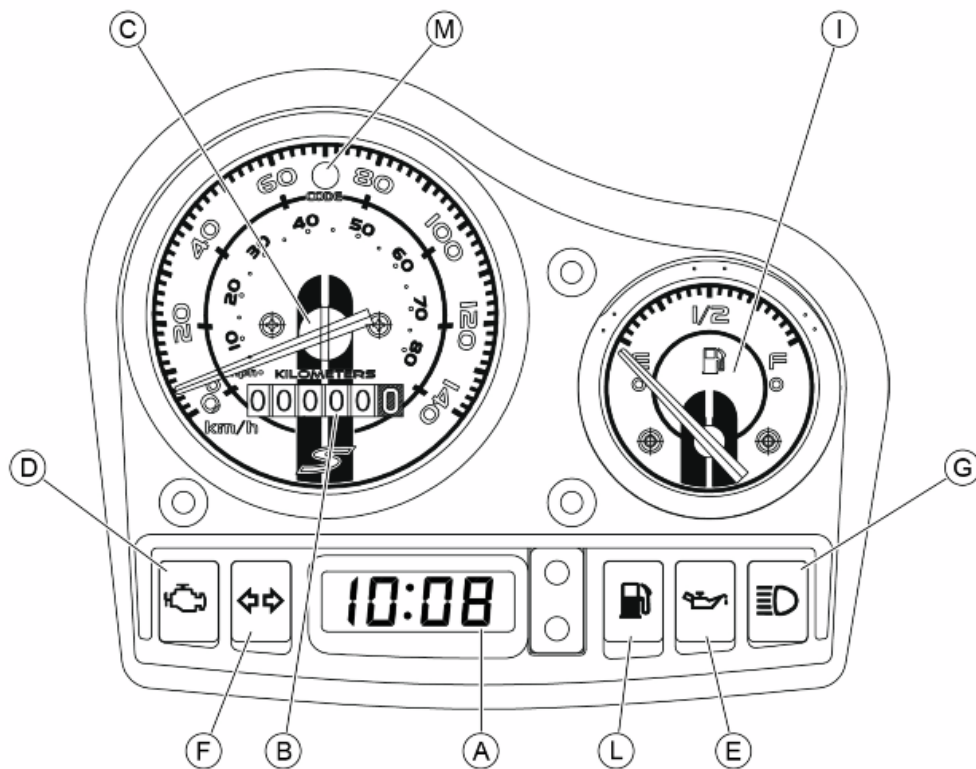
Specification	Desc./Quantity
	Protected circuits: starter circuit, turn indicator control device, stop button, horn, instrument panel.
Fuse No. 4	Capacity: 10 A
	Protected circuits: Lowbeam/highbeam light switch via relay
Fuse No. 5	Capacity: 7.5 A
	Protected circuits: light switch, headlight relay power, instrument panel.

Dashboard

«LX» VERSION



«S» VERSION



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

Sealed battery

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

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

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

INSTRUCTIONS FOR THE BATTERY REFRESH AFTER OPEN-CIRCUIT STORAGE

1) Voltage check

Before installing the battery on the vehicle, check the open circuit voltage with a 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. IN CASE OF CONTACT WITH YOUR EYES OR SKIN, RINSE WITH ABUNDANT WATER FOR ABOUT 15 MINUTES 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.

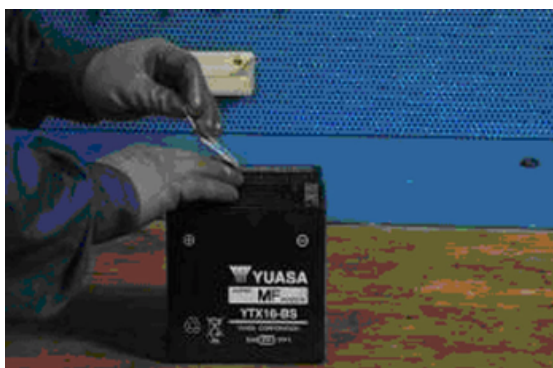
BATTERIES PRODUCE EXPLOSIVE GASES; KEEP CLEAR OF NAKED FLAMES, SPARKS OR CIGARETTES; VENTILATE THE AREA WHEN RECHARGING INDOORS.

ALWAYS PROTECT YOUR EYES WHEN WORKING CLOSE TO BATTERIES.

KEEP OUT OF THE REACH OF CHILDREN

1) Battery preparation

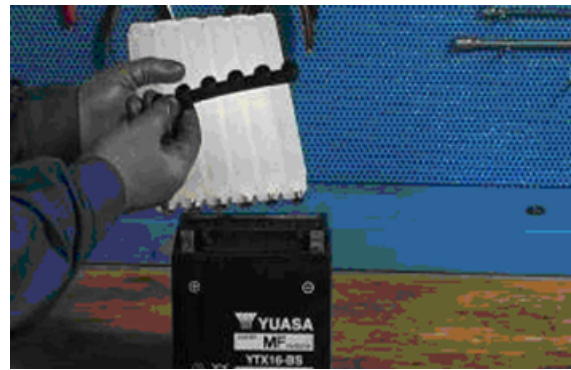
Position the battery on a flat surface. Remove the adhesive sheet closing cells and proceed as quickly as possible to run the subsequent activation phases.



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 sulphuric 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

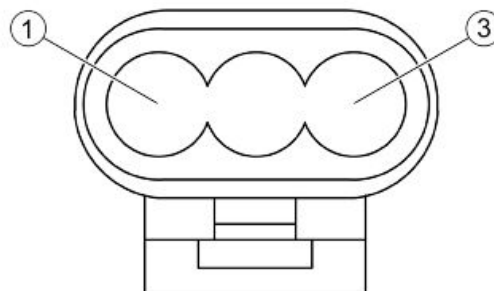


i - The battery is now completely activated, disconnect the battery charger from the fuel supply grid, disconnect the clamps from the battery and proceed to fitting the battery on the vehicle.

Connectors

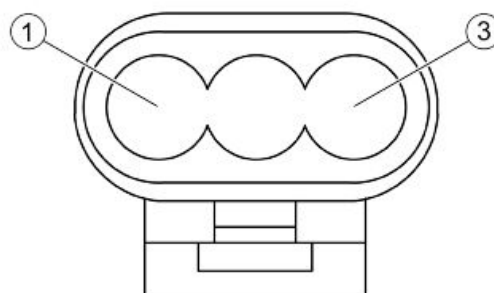
DIAGNOSTICS CONNECTOR

1. Not connected
2. Ground lead (Black)
3. Electronic control unit (Orange-Black)



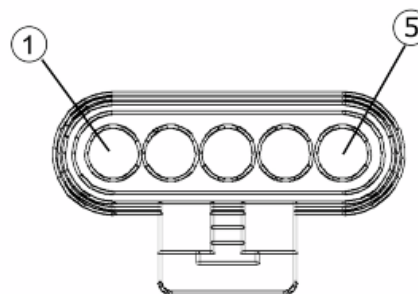
PICKUP CONNECTOR

1. Control unit positive (Red)
2. Negative from control unit (Brown)
3. Oil pressure sensor (White-Pink)



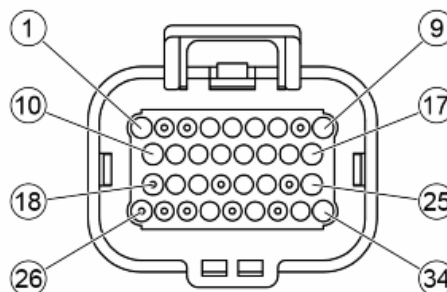
FUEL PUMP CONNECTOR

1. Not connected
2. Ground lead (Black)
3. Not connected
4. Not connected
5. Power from relay (Black - Green)



ELECTRONIC CONTROL UNIT CONNECTOR

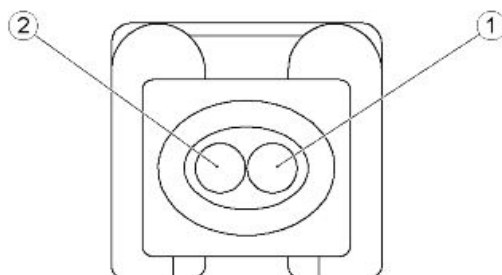
1. H.V. COIL (Pink-Black)
2. Not connected
3. Not connected
4. Ground (Orange)
5. Starter button (Purple)
6. Ignition switched live (Orange-Blue)
7. Ground No. 1 (Black)
8. Not connected
9. Battery power (Red-White)
10. Start-up enabling switch (Purple-White)



- 11. Lambda probe positive (Green-Blue)
- 12. Lambda probe negative (Light blue-Black)
- 13. Water temperature sensor (Sky blue-Green)
- 14. Immobilizer aerial (Orange-White)
- 15. Ground sensors (Grey-Green)
- 16. Serial line K (Orange-Black)
- 17. Immobilizer (Yellow)
- 18. Not connected
- 19. Side stand (Brown - Red)
- 20. Speed sensor negative (Brown)
- 21. Not connected
- 22. Injection load relay (Black-Purple)
- 23. Ground No. 2 (Black)
- 24. Not connected
- 25. Injection warning light (Brown-White)
- 26. Not connected
- 27. Not connected
- 28. Not connected
- 29. Engine speed sensor positive (Red)
- 30. Not connected
- 31. Lambda probe heater (Light blue-Red)
- 32. Not connected
- 33. Low beam lights automatic ignition enabling (White-Black)
- 34. Fuel injector (Red-Yellow)

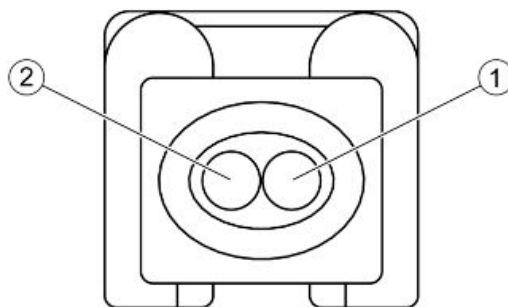
ENGINE TEMPERATURE SENSOR CONNECTOR

- 1. Electronic control unit (Sky blue - Green)
- 2. Ground lead (Grey-Green)

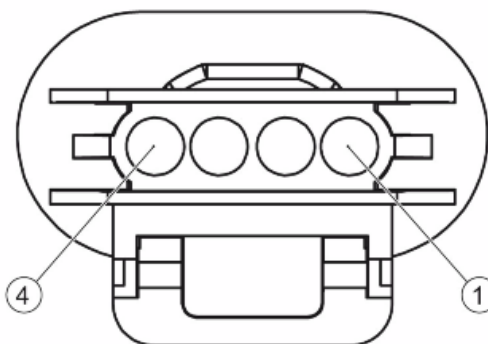


INJECTOR CONNECTOR

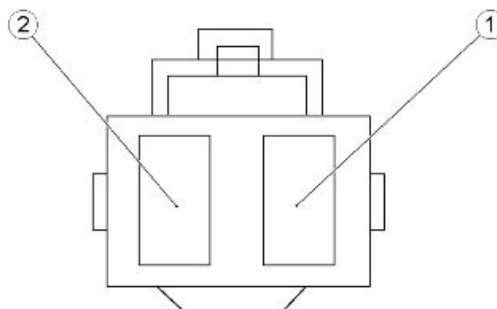
1. Power from relay (Black - Green)
2. Electronic control unit (Red - Yellow)

**LAMBDA PROBE CONNECTOR**

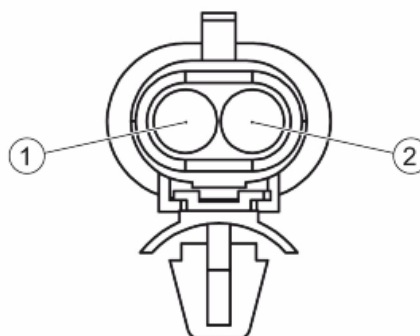
1. Power heater from solenoid (Black - Green)
2. Heater negative from control unit (Light blue-Red)
3. Control unit positive (Green-Blue)
4. Negative from control unit (Light blue-Black)

**VOLTAGE REGULATOR CONNECTOR**

1. Battery positive (Red-Black)
2. Ground lead (Black)

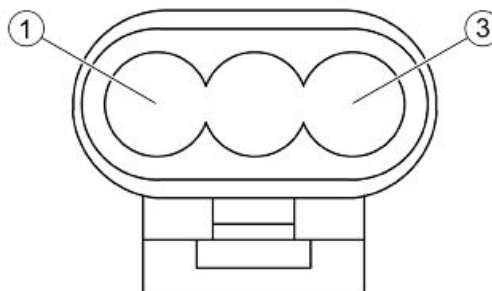
**H.V. COIL CONNECTOR**

1. Power from relay (Black - Green)
2. Electronic control unit (Pink - Black)

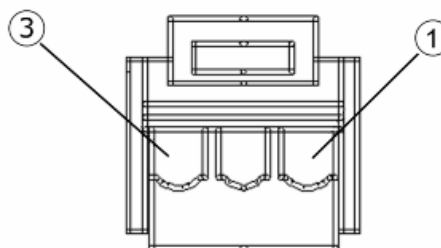


IMMOBILIZER ANTENNA CONNECTOR

1. Ignition switched live (Orange-Blue)
2. Ground lead (Black)
3. Electronic control unit (Orange-White)

**FUEL LEVEL TRANSMITTER CONNECTOR**

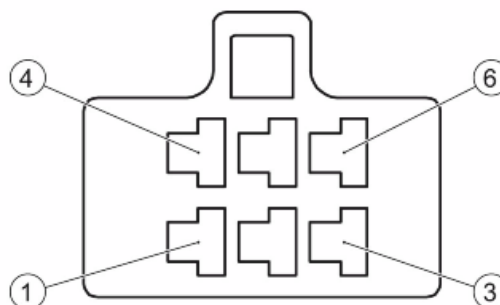
1. Fuel level indicator (White - Green)
2. Ground lead (Black)
3. Low fuel warning light (Yellow-Green)



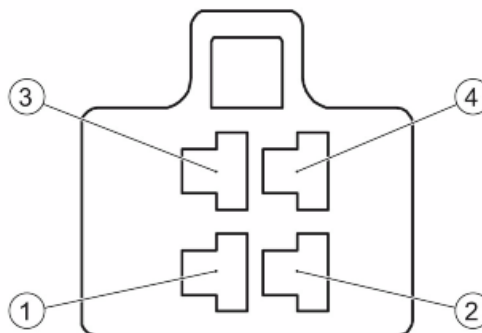
THE FOLLOWING INDICATIONS REFER TO THE LX VERSION.

INSTRUMENT PANEL CONNECTOR «A»

1. Live supply (White)
2. Fuel level indicator (White-Green)
3. Ground lead (Black)
4. Instrument panel lighting (Yellow-Black)
5. Right indicator warning light (White-Blue)
6. Left indicator warning light (Pink)

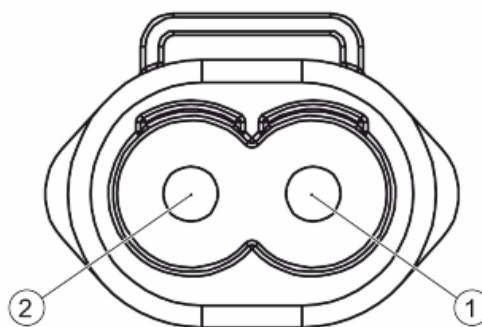
**INSTRUMENT PANEL CONNECTOR «B»**

1. Low fuel warning light (Yellow-Green)
2. Oil pressure warning light (White-Pink)
3. High beam warning light (Purple)
4. Injection warning light (Brown-White)



INSTRUMENT PANEL CONNECTOR «C»

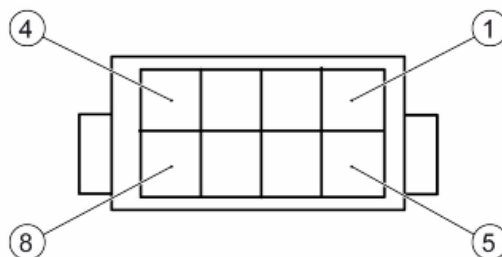
1. Immobilizer warning light (Yellow)
2. Battery power (Red-White)



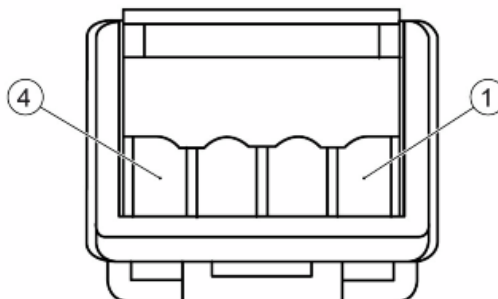
THE FOLLOWING INDICATIONS REFER TO THE S VERSION.

INSTRUMENT PANEL CONNECTOR «A»

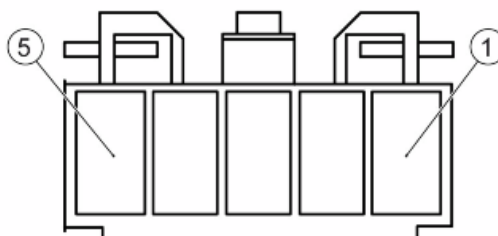
1. Right indicator warning light (White-Blue)
2. Left indicator warning light (Pink)
3. Instrument panel lighting (Yellow-Black)
4. Ground lead (Black)

**INSTRUMENT PANEL CONNECTOR «B»**

1. Injection warning light (Brown-White)
2. Live supply (White)
3. Battery power (Red-White)
4. Immobilizer warning light (Yellow)

**INSTRUMENT PANEL CONNECTOR «C»**

1. Battery-powered (White)
2. Low fuel warning light (Yellow-Green)
3. Oil pressure warning light (White-Pink)
4. Fuel level indicator (White-Green)
5. High beam warning lights (Purple)

**Diagnostic instrument****STARTER COMMAND**

Function

Commands engine starting through the injection control unit.

Operation / Operating principle

The starter button, the brake switches, the starter command relay and the injection control unit between PIN 5 and 10 are involved.

ELECTRICAL ERRORS

Starter command P0170 - shorted to positive.

Error cause

Shorted to positive: excessive voltage at PIN 10 of the control unit connector.

Troubleshooting

Shorted to positive:

- This malfunction is detected with a brake activated and the starter button pressed (voltage of 12V read at PIN 5)
- If the battery voltage does not drop (thanks to the absorption of the starter command relay excitation coil) the control unit understands that PIN 10 is shorted to battery.
- Restore the cabling (if the short is in the cabling) or the relay (if the short is in the relay).

ENGINE TEMPERATURE SENSOR**Function**

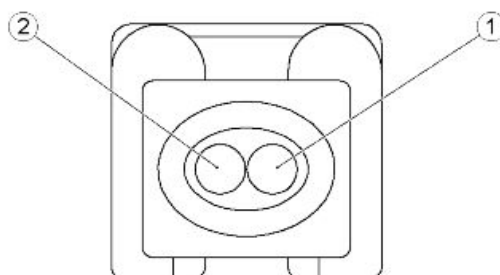
Serves the purpose of communicating the engine temperature to the control unit in order to optimise performance.

Operation / Operating principle

NTC type sensor (resistance sensor, inversely variable with temperature).

Pinout:

1. Injection ECU
2. Ground from control unit



Engine temperature sensor P0115 - open circuit or shorted to positive / shorted to negative.

Error cause

Open circuit or shorted to positive: interruption of the circuit or excessive voltage at PIN 13 of the control unit connector. Shorted to negative: null voltage between PIN 13 and 15 of the control unit connector.

Troubleshooting

Open circuit:

- Disconnect the connector of the control unit.
- Measure the resistance value of the sensor at different temperatures between PIN 13 and 15.
- Disconnect the sensor connector.

- Check the continuity of the cable harness between the sensor connector and control unit connector: Control unit PIN 13 - sensor PIN 1 and control unit PIN 15 - sensor PIN 2. Restore the cabling if necessary.

- If the cabling is intact but the sensor resistance value is incorrect, this means that the sensor is faulty and must be replaced, otherwise proceed with the checks.

Shorted to positive:

- With the sensor connector and the control unit disconnected, verify that the fault is shorted with the battery positive of sensor connector PIN 1 (or control unit PIN 13) and restore the cabling.

Shorted to negative:

- Disconnect the sensor connector.

- Check the sensor connector PIN 1 ground insulation.

- If there is no ground insulation restore the cabling.

- If PIN 1 is insulated from the ground and the error persists, this means that there is a probable fault in the control unit.

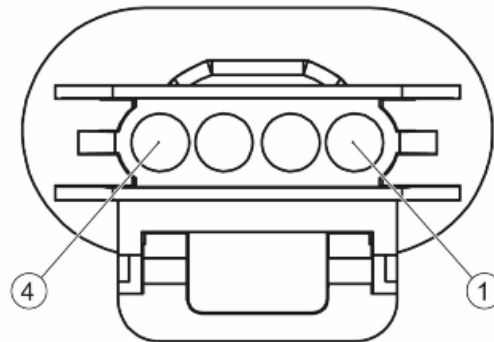
LAMBDA PROBE

Function

In charge of telling the control unit whether the mixture is lean or rich.

Operation / Operating principle

Based on the difference of oxygen in the exhaust fumes and the environment, this generates voltage which is read and interpreted by the injection control unit. It does not require an external supply source but, in order to work properly, it should reach a high operating temperature: that is why there is a heating circuit inside.



Pinout:

1. Heater supply (1)
2. Heater ground (2)
3. Sensor signal + (3)
4. Sensor signal - (4)

ELECTRICAL ERRORS

Check the air-fuel ratio / Lambda probe P0130 - short circuit to positive / open circuit, short circuit to negative or carburetion excessively lean / signal not plausible for abnormal title correction or probe signal fault.

Error cause

Shorted to positive: excessive voltage at PIN 11 or PIN 12 of the control unit connector.

Circuit open or short circuit to negative: interruption of the circuit or null voltage between control unit connector PIN 11 and 12.

Troubleshooting

Short circuit to positive:

- Disconnect the control unit connector and the sensor connector.
- Verify that there is no short to battery positive on sensor connector PIN 3 (corresponding to control unit connector PIN 11); in the presence of short circuit, restore the cable harness.
- Verify that there is no short to battery positive on sensor connector PIN 4 (corresponding to control unit connector PIN 12); in the presence of short circuit, restore the cable harness.

Open circuit:

- Disconnect the control unit connector and the sensor connector.
- Check the continuity of the cable harness between the sensor connector and control unit connector: Control unit PIN 11 - sensor PIN 3 and control unit PIN 12 - sensor PIN 4. If necessary, restore the cable harness.
- If the cable harness is intact and the error persists, proceed with the following checks.

Short circuit to negative:

- Disconnect the sensor connector and the control unit connector.
- Check the sensor connector PIN 3 from ground insulation. If there is no insulation, restore the cable harness.
- Check the sensor connector PIN 4 from ground insulation. If there is no insulation, restore the cable harness.
- If PIN 3 and PIN 4 are insulated from the ground and the error persists, this means that there is a probable fault in the control unit.

P0135 Lambda probe heating - shorted to positive / shorted to negative / open circuit.

Error cause

Shorted to positive: excessive voltage at PIN 31 of the control unit connector.

Shorted to negative: lack of insulation from ground on the sensor connector PIN 1.

Open circuit: circuit interruption.

Troubleshooting

Shorted to positive:

- Disconnect the control unit connector and the sensor connector.
- Verify that there is no short to battery positive on sensor connector PIN 2 (corresponding to control unit connector PIN 31); if there is a short, restore the cabling.

Open circuit:

- Disconnect the control unit connector and the sensor connector.
- Check continuity of the cabling between the sensor connector and the control unit connector: control unit PIN 31 - sensor PIN 2. Restore the cabling if necessary.

- Verify continuity of the cabling between the sensor connector and the injection relay: sensor PIN 1 - injection relay PIN 3. Restore the cabling if necessary.

- If the cable harness is intact and the error persists, proceed with the following checks.

Shorted to negative:

- Disconnect the sensor connector.

- Check the insulation from the ground of PIN 2 of the sensor connector. If there is no insulation, restore the cable harness.

- If PIN 2 is insulated from ground and in the absence of other errors (fuel pump, injector, coil), this means that the control unit is most likely faulty.

INJECTOR

Function

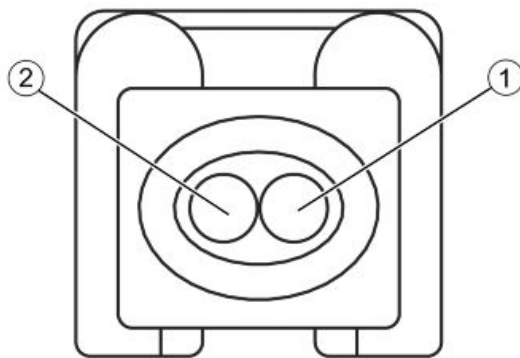
Provide the correct amount of fuel at the correct time.

Operation / Operating principle

Injector coil is excited for the petrol passage to open.

Pinout:

1. Power from relay
2. Ground from control unit



ELECTRICAL ERRORS

Injector P0201 - short circuit to positive / short circuit to negative / open circuit.

Error cause

Short circuit to positive: excessive voltage to PIN 34 of the control unit connector.

Short circuit to negative: zero voltage to the PIN 1 of the injector connector.

Open circuit: circuit interruption.

Troubleshooting

Short circuit to positive:

- Disconnect the injector connector, turn ignition switch to ON and activate the component using the diagnostic tool.

- Verify the absence of voltage at the injector connector PIN 2; if present restore the cable harness, otherwise proceed with the following checks.

Short circuit to negative:

- Disconnect the injector connector, turn ignition switch to ON and activate the component using the diagnostic tool.

- Verify the presence of voltage at the ends of the injector connector; if there is no voltage, restore the cable harness, otherwise proceed with the following checks.

Open circuit:

- Perform the check of the injector and control unit connectors.
- Verify continuity of the cable harness between the control unit connector and the injector connector (control unit PIN 34 - injector PIN 2). If there is no continuity, restore the cable harness.

FUEL PUMP

ELECTRICAL ERRORS

Fuel pump relay P0230 - shorted to positive / shorted to negative / open circuit.

Error cause

Short circuit to positive: excessive voltage at PIN 22 of the control unit connector.

Short circuit to negative: null voltage at PIN 86 of the injection relay.

Open circuit: circuit interruption.

Troubleshooting

Short circuit to positive:

- Disconnect the injection relay, turn the key to ON and activate the relay through the diagnostics instrument.
- Verify the presence of voltage between relay connector PIN 86 and 85 toward the cabling.
- If no voltage is read, disconnect the control unit and verify insulation from battery positive of the relay PIN 85 (or control unit PIN 22). If necessary, restore the cable harness.

Short circuit to negative:

- Disconnect the injection relay and the control unit.
- Verify ground insulation of the relay connector PIN 86 and 85 toward the cabling: if there is no insulation, restore the cabling.

Open circuit:

- Disconnect the injection relay and the control unit.
- Verify continuity of the cabling between the relay and control unit: Relay PIN 85 - control unit PIN 22. If necessary, restore the cable harness.

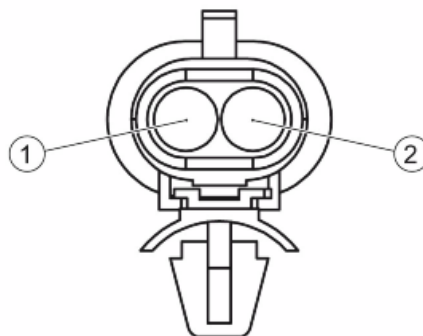
COIL

Function

Allows generation of the electrical discharge on the spark plug, with an increase of voltage.

Pin-out:

1. Power from relay
2. Activation by control unit (control unit side PIN 1)



ELECTRICAL ERRORS

H.V. Coil P0351 - shorted to positive / open circuit or shorted to negative.

Error cause

Short circuit to positive: excessive voltage at PIN 1 of the control unit connector.

Circuit open or shorted to negative: interruption of the circuit or null voltage at PIN 1 of the control unit connector.

Troubleshooting

Short circuit to positive:

- Disconnect the coil connector, turn the key to ON and activate the component through the diagnostics instrument.
- Verify the presence of voltage on the coil connector PIN 2: if present, restore the cabling, otherwise replace the coil.

Open circuit:

- Carry out the check procedure of the coil and control unit connectors.
- Verify continuity of the cabling between the coil and control unit: Coil PIN 2 - control unit PIN 1. If there is no continuity, restore the cable harness.
- Verify, with the key turned ON, the presence of voltage on the coil connector PIN 1. If no voltage is detected, check that the cable harness between the coil and injection relay is not interrupted: Coil PIN 1 - relay PIN 30.
- If the above tests provided a positive result, the coil should be replaced.

Short circuit to negative:

- Disconnect the control unit connector and the coil connector.
 - Verify the coil connector PIN 2 ground insulation (or control unit connector PIN 1). If necessary, restore the cable harness.
-

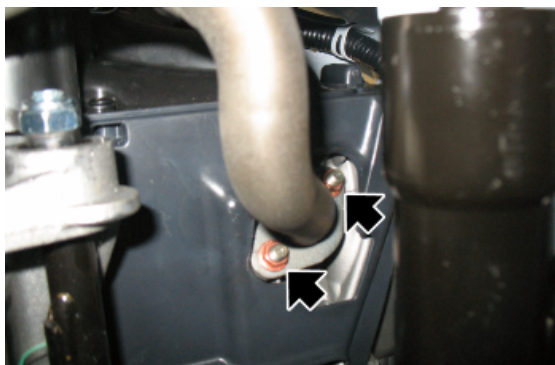
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ENGINE FROM VEHICLE

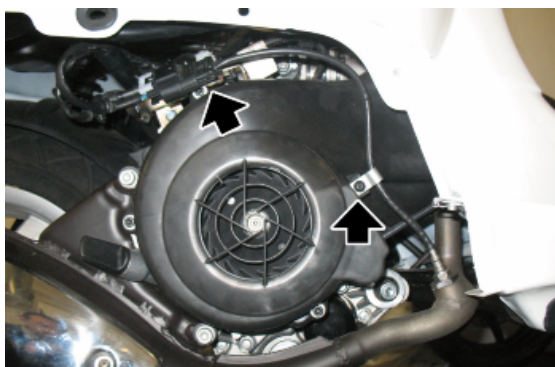
ENG VE

Exhaust assy. Removal

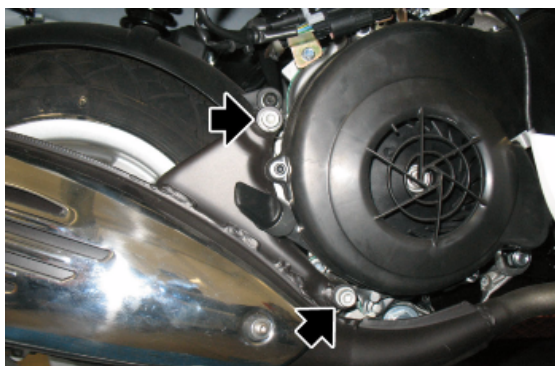
- Remove the 2 fixing nuts from the manifold to the head



- Remove the Lambda probe from its support and disconnect it.
- Release the lambda probe cable from the bracket on the fan cover.



- Loosen the 2 exhaust fixing screws to the crank-case, then remove the whole exhaust.



- Remove the lambda probe from the manifold.



Removal of the engine from the vehicle

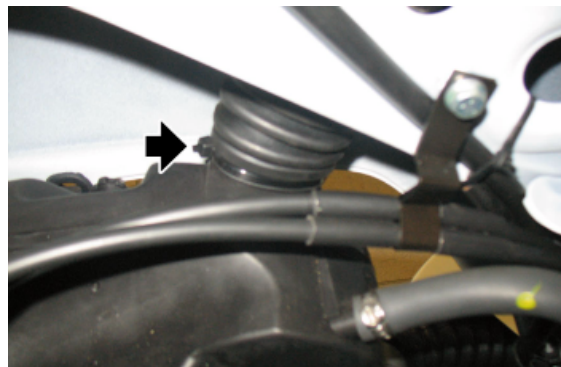
CAUTION

**SUPPORT THE VEHICLE ADEQUATELY.**

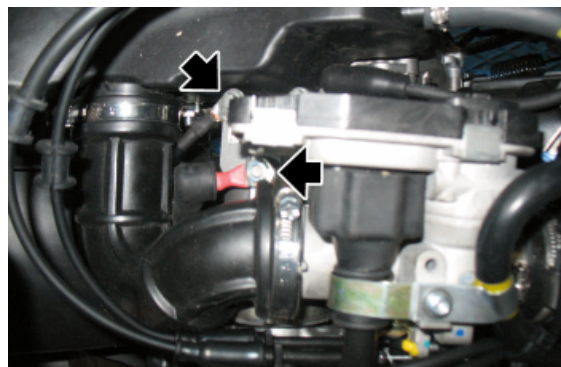
- Disconnect the battery.
- Remove the side fairings and footrest left and right terminals.
- Remove the helmet compartment.
- Remove the full muffler unit.
- Free the sheath on the 2 rear brake transmission securing brackets indicated in the photo.
- Disconnect the rear brake transmission by unscrewing the adjuster screw.
- Disconnect the belt cooling pipe and the swinging arm retaining spring shown in the picture.
- Disconnect the ground lead (1) from the engine.



- Disconnect the air intake pipe from the filter box.

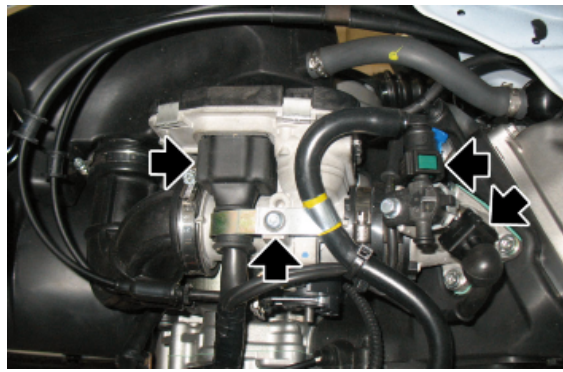


- Remove the ground lead and the positive cable from the starter motor shown in the figure.

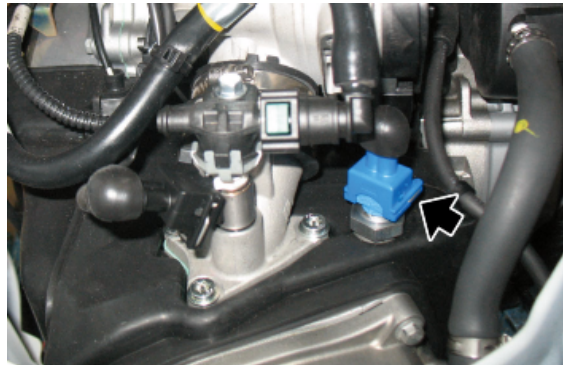


- Disconnect the cable camp bracket from the throttle body and remove the injection ECU connector.

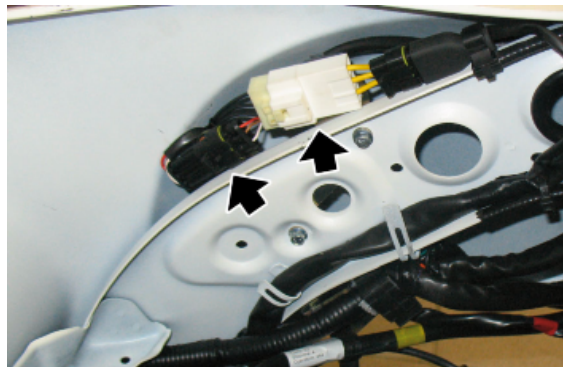
- Disconnect the fuel hoses and the main cable harness from the injector.



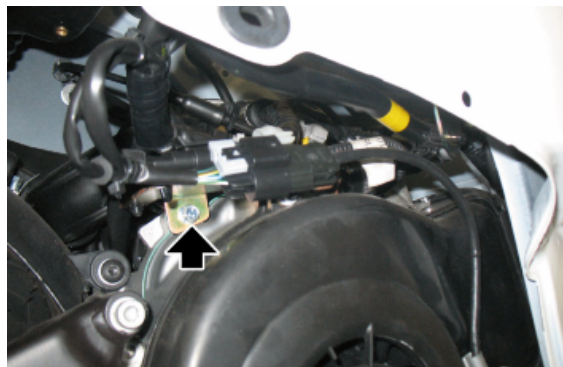
- Disconnect the main cable harness from the engine temperature sensor.



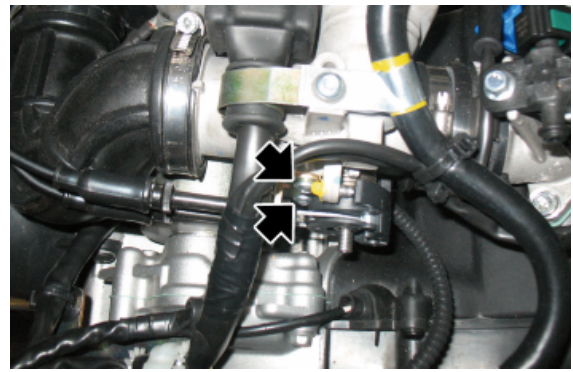
- Disconnect the two magneto flywheel cable harness connectors, slide them out from the bottom and free the cable tie that joins them to the main cable harness.



- Disconnect the flywheel cables retainer bracket from the engine.



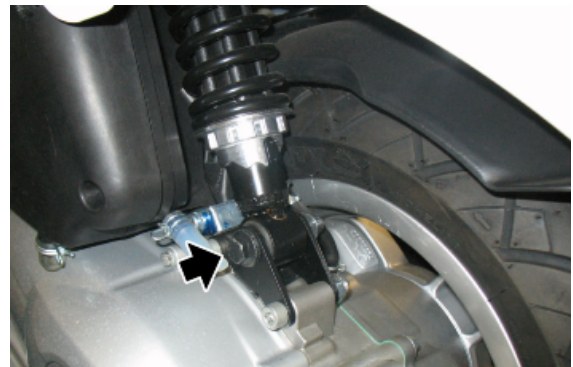
- Disconnect the throttle control cables from the throttle body pulley, acting on the indicated adjuster screws.



- Working on the right side, unscrew and remove the nut which holds the coupling bolt swinging arm - engine
- Working on the left side, remove the bolt, be careful to collect the spacer.



- Support the vehicle adequately (with a jack) and remove the shock absorber lower clamping.

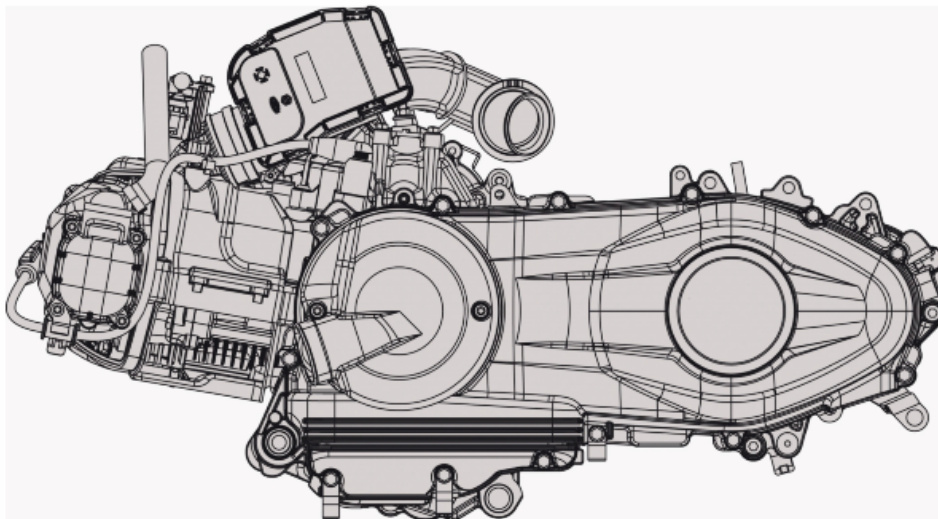


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ENGINE

ENG

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



Automatic transmission

Transmission cover

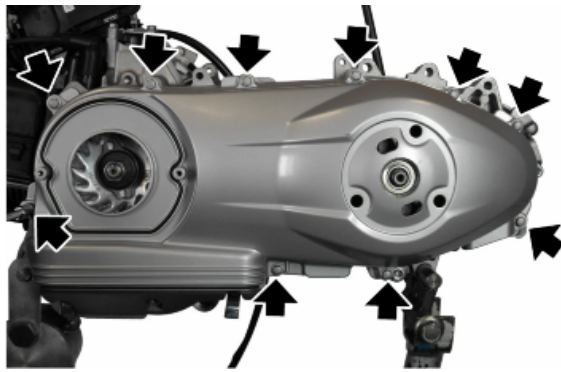
- Remove the air duct.
- Remove the plastic cover that has the vehicle logo on it.
- Insert the specific tools, rotate the engine until the driven pulley stops and remove the nut, recovering the washer.

Specific tooling

020937Y Driven pulley lock



-
- Unscrew the ten screws fixing the engine and remove the transmission cover.



See also

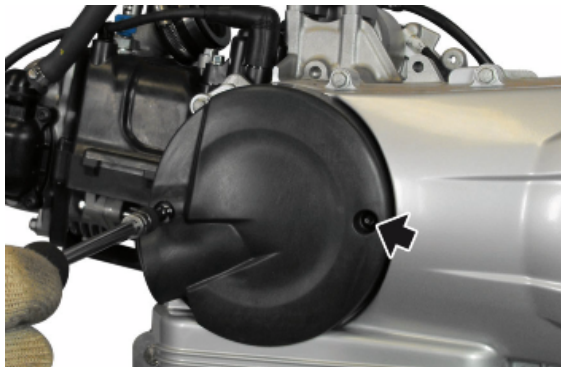
[Air duct](#)

Air duct

-
- Remove the plastic cover.



-
- Unscrew the two screws indicated and remove the duct.



Removing the driven pulley shaft bearing

- Remove the Seeger ring.

CAUTION

PLACE THE COVER ON A SURFACE, REMOVING OR EXCLUDING THE ALIGNMENT DOWELS.



- Support the transmission cover adequately.
- Using appropriate tools, remove the bearing.

Specific tooling

020376Y Adaptor handle

020357Y 32 x 35-mm Adaptor

020412Y 15-mm guide



Refitting the driven pulley shaft bearing

- Use the heat gun to heat the inner part of the lid.
- Using the equipment plant a new bearing, apply grease on the adapter and guide in order to maintain the position of the bearing during operation on the vertical axis.

Specific tooling

020151Y Air heater

020376Y Adaptor handle

020358Y 37x40-mm Adaptor

020412Y 15-mm guide



- Insert the Seeger ring.
- Insert the alignment dowels if removed during disassembly.



Removing the driven pulley

- Undo the clutch fixing screw, recovering the lining.
- Remove the clutch drum.
- Remove the driven pulley.



Inspecting the clutch drum

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

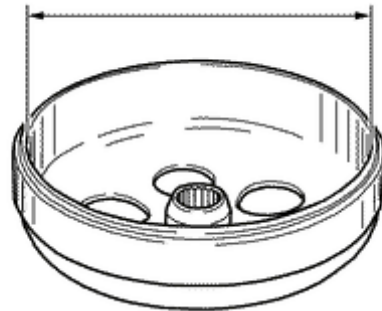
Characteristic

Max. value clutch housing

Max. value: Ø 134.5 mm

clutch housing 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 housing inspection: Limit eccentricity.

Admissible limit eccentricity: 0.15 mm

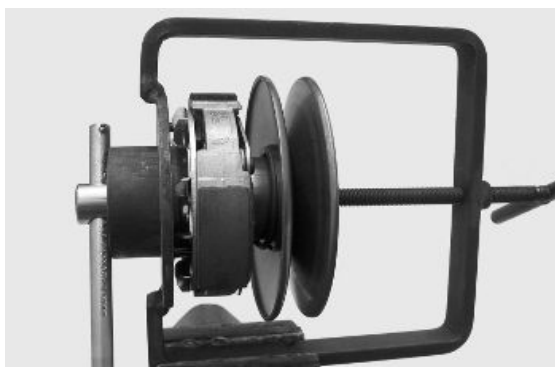


Removing the clutch

- Prepare the locking tool for the driven pulley with the pins half-screwed in the tool set to «C».
- Introduce the adapter ring 11 with the chamfering facing the inside of the tool.



- Fit the driven pulley unit in the tool so as the bolt get into the masses clutch support holes. Afterwards make the support screw make contact with a minimum force.
- Using the specific wrench, inserted 46 mm from the side, remove the clutch central locking nut.



- Separate the components of the driven pulley.

CAUTION

THE TOOL MUST BE FIRMLY FIXED IN THE VICE AND THE CENTRAL SCREW MUST NOT BE TIGHTENED WITH EXCESSIVE TORQUE AS THIS MAY DAMAGE THE PULLEY OR DEFORM THE SPECIFIC TOOL.

Specific tooling

020444Y Tool for fitting/ removing the driven pulley clutch

020444Y011 adapter ring

020444Y009 wrench 46 x 55



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.

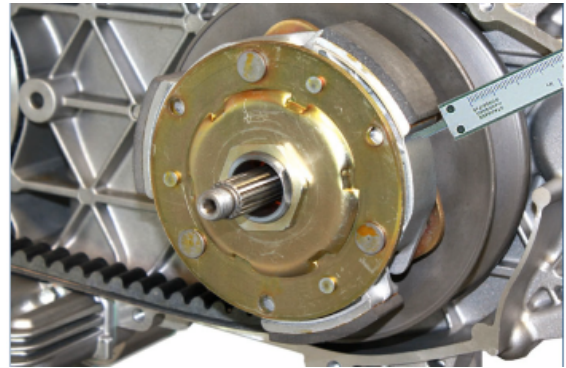
CAUTION

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.

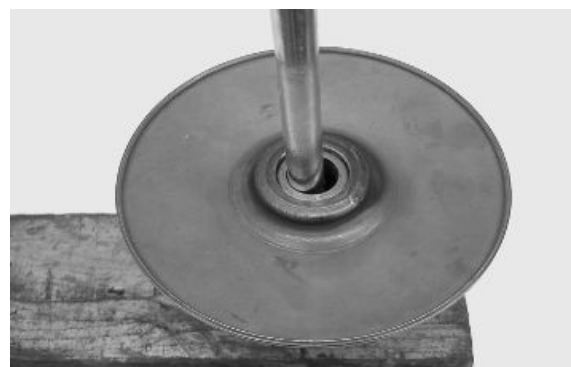


Removing the driven half-pulley bearing

- Remove the retainer ring using two flat blade screwdrivers.
- Using a hammer and pin, knock the ball bearing out as shown in the figure.
- Remove the roller bearing using the specific extractor.

N.B.

REST THE HALF-PULLEY ON A WOOD SURFACE TO AVOID DAMAGING THE THREADED RINGLET OF THE DRIVEN PULLEY UPON REMOVING IT.



Specific tooling

001467Y008 Pliers to extract 17 mm $\varnothing$ bearings

001467Y009 Bell for OD 42-mm bearings



Inspecting the driven fixed half-pulley

- Measure the outside diameter of the pulley bushing.

Characteristic

Standard diameter:

$\varnothing 40.1 \pm 0.05$ mm



Refitting the driven half-pulley bearing

- Assemble a new roller bearing using the specific punch, fit the bearing with the label facing outward and insert it completely up to the punch on the half-pulley.

N.B.

REST THE HALF-PULLEY ON A WOOD SURFACE TO AVOID DAMAGING THE THREADED RINGLET OF THE DRIVEN PULLEY UPON REMOVING IT.

Specific tooling

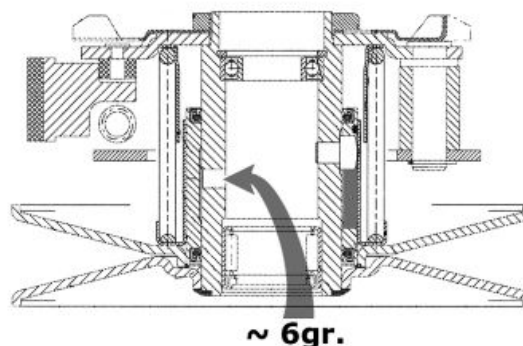
020424Y Driven pulley roller casing fitting punch



- To assemble the new ball bearing insert it completely down in its housing with the specific punch and finally assemble the Seeger ring.

Specific tooling**020375Y 28 x 30 mm adaptor****020376Y Adaptor handle****020439Y 17-mm guide****Refitting the driven pulley**

- Check that the faying surfaces between the 2 half-pulleys and the belt do not show any signs of wear, scoring and grease.
- Insert the new oil seals and O-rings on the movable half-pulley.
- Assemble the half-pulley on the ringlet with the appropriate protection sheath.
- Make sure the pins and collar are not worn, re-assemble the pins and collar.
- Use a greaser with a curved spout to lubricate the driven pulley unit with around 6 g of grease. This operation must be done through one of the holes inside the bushing until grease comes out of the opposite hole. This operation is necessary to avoid the presence of grease beyond the O-rings.

**Specific tooling****020263Y Driven pulley assembly sheath****Recommended products**

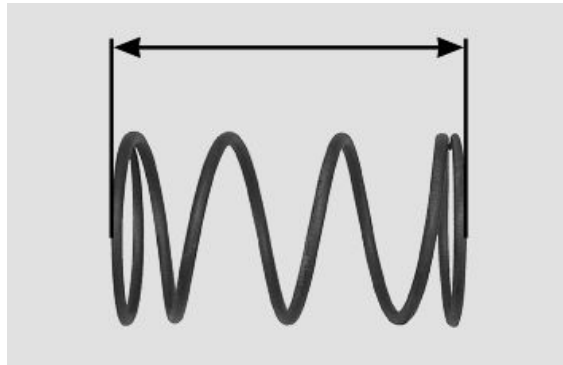
AGIP GREASE SM 2 Gray black smooth-textured lithium grease, containing molybdenum disulphide.

-

Inspecting the clutch spring

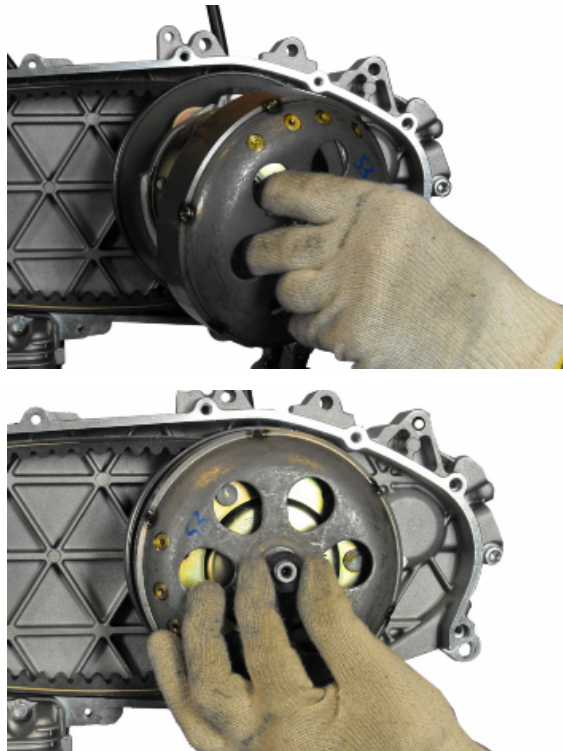
- Measure the length of the spring when it is relaxed.

Characteristic
Standard length:
106 mm



Refitting the driven pulley

- Reassemble the clutch housing and spacer.



Drive-belt

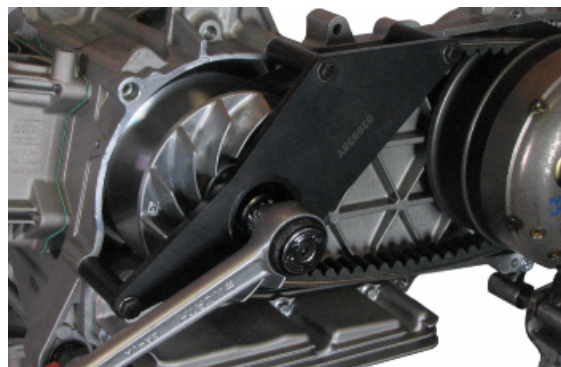
- Make sure the drive belt is not damaged and does not show abnormal wear.
 - Replace as indicated in the scheduled maintenance table.
-

Removing the driving pulley

- Using specific tools, lock the driving pulley and loosen the nut.

Specific tooling

020938Y Driving pulley lock



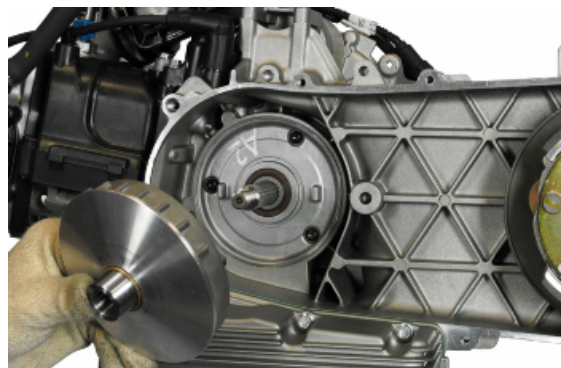
- Remove the flat washer and the cup washer.



- Remove the stationary half-pulley and the washer.



- Disengage the belt.
- Remove the complete roller housing.



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.



CAUTION

DO NOT LUBRICATE OR CLEAN SINTERED BUSHINGS

Characteristic

Movable driving half-pulley bushing:

Ø30 (+0.081 +0.060) mm

Sliding bushing:

Ø26 (-0.020 -0.041)mm

Characteristic

CVT rollers ø 20.1 mm (125cc)

Wear limit ø 19.5 mm

CVT rollers ø 19 mm (150cc)

Wear limit ø 18.4 mm



Refitting the driving pulley

- Perform the operations in reverse order of disassembly.

CAUTION

INSERT THE ROLLERS WITH THE LARGEST SUPPORT SURFACE ACCORDING TO THE DIRECTION OF ROTATION.



- Tighten the torque using the specific tool to lock the pulley.

CAUTION

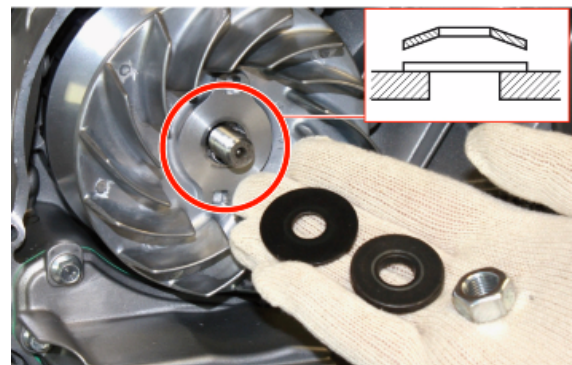
DURING THE INSTALLATION PAY SPECIAL ATTENTION TO THE ASSEMBLY OF THE BELLEVILLE SPRING, AS SHOWN IN FIGURE.

Specific tooling

020938Y Driving pulley lock

Locking torques (N*m)

Driving pulley retainer nut 75 to 83



Refitting the transmission cover

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

Locking torques (N*m)

Clutch cover retainer screws 10.8 to 12.8

End gear

Removing the hub cover

- Use a container large enough to recover the final reduction oil. Unscrew the indicated screw and recover the aluminium seal.
- Unscrew the oil filler screw in order to facilitate bleeding.

Recommended products

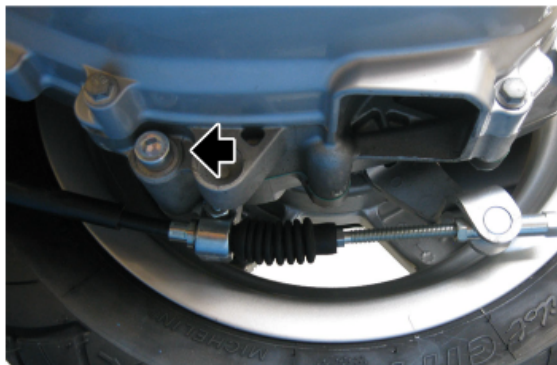
AGIP GEAR SAE 80W-90 Lubricant for gear-boxes and transmissions.

API GL-4

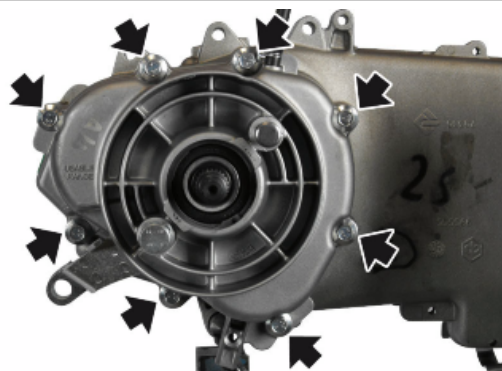
Characteristic

Hub oil

200 cm³



-
- Remove the brake shoe.
 - Unscrew the eight hub cap fixing screws.



-
- Remove the final reduction cap complete with the wheel axle, being careful not to drop the intermediate gear.



Removing the wheel axle

- Remove the intermediate gear.
- Remove the wheel axle.



Removing the hub bearings

Removing the clutch shaft bearing

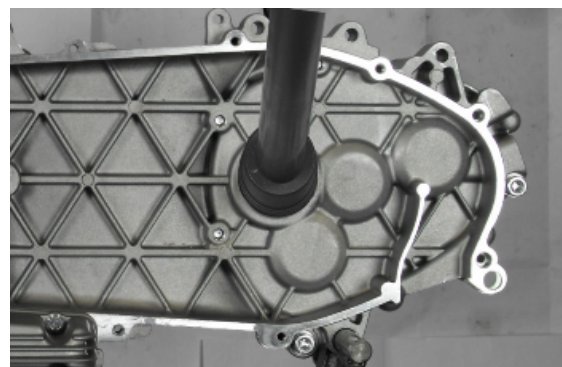
- Remove the Seeger ring.
- Remove the oil seal from the opposite side.
- Remove the bearing working from the external side and using the specific tools.

Specific tooling

020376Y Adaptor handle

020363Y 20-mm guide

020359Y 42 x 47-mm Adaptor



Removing the intermediate gear bearing

- Remove the bearing using the specific tools .

Specific tooling

001467Y009 Bell for OD 42-mm bearings

001467Y013 Calliper to extract $\varnothing$ 15-mm bearings



Removing the Wheel axle bearing

- Remove the bearing using the specific tools .

Specific tooling

001467Y009 Bell for OD 42-mm bearings

001467Y013 Calliper to extract $\varnothing$ 15-mm bearings

**Removing the wheel axle bearings**

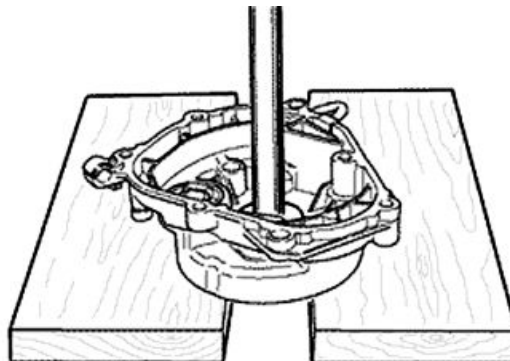
- Support the hub cover properly to avoid damaging the sealing surface with the crankcase
- Remove the Seeger ring from the outside.
- Operating on the inside, remove the oil seal.
- Remove the wheel axle bearing using the specific tool.

Specific tooling

020376Y Adaptor handle

020364Y 25-mm guide

020359Y 42 x 47-mm Adaptor

**Removing the intermediate gear bearing**

- Using the specific tools remove the bearing.

Specific tooling

001467Y013 Calliper to extract $\varnothing$ 15-mm bearings

001467Y009 Bell for OD 42-mm bearings



Inspecting the hub shaft

- Check the three shafts and the intermediate gear for wear or distortion of the toothed surfaces, the bearing housings, and the oil seal housings.
- In case of faults, replace the damaged parts.

Characteristic

Driven pulley shaft

A: 22(-0.01 -0.02)mm

Wheel axle

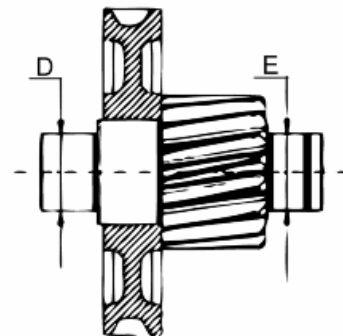
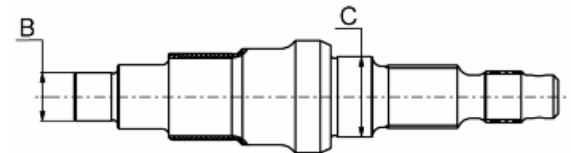
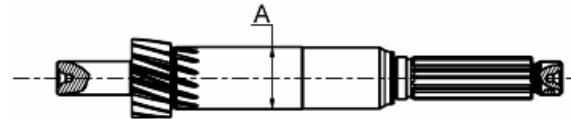
B: 15(-0.010 -0.020)mm

C: 25(-0.007 -0.020)mm

Intermediate gear

D: 15(-0.01 -0.02)mm

E: 15(-0.01 -0.02)mm



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 driven pulley shaft bearing

- Use the heat gun to heat the bearing seat.
- Using the specific equipment set a new bearing.
- Insert a locking seeger.

Specific tooling

020151Y Air heater

020376Y Adaptor handle

020360Y 52 x 55-mm Adaptor

020363Y 20-mm guide



Fitting the transmission shaft bearing

- Use the heat gun to heat the bearing seat.
- Set a new bearing using the specific equipment.

Specific tooling

020151Y Air heater

020376Y Adaptor handle

020359Y 42 x 47 mm Adaptor - For main bearings and wheel axle

020412Y 15-mm guide



Fitting the Wheel axle bearing

- Use the heat gun to heat the bearing seat.
- Set a new bearing using the specific equipment .

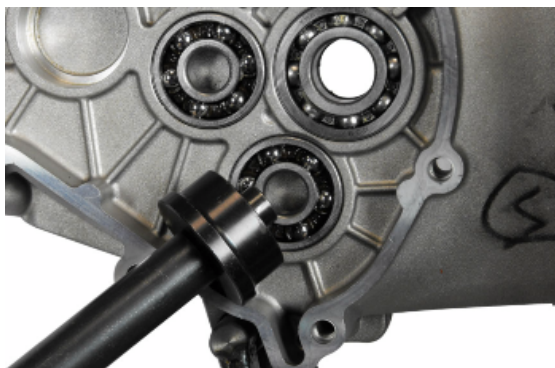
Specific tooling

020151Y Air heater

020376Y Adaptor handle

020359Y 42 x 47 mm Adaptor - For main bearings and wheel axle

020412Y 15-mm guide



Refitting the hub cover bearings

Fitting the Wheel axle bearing

- Use the heat gun to heat the bearing seat.
- Plant a new bearing using the equipment, apply grease on the adaptor and guide in order to maintain the position of the bearing during operation on the vertical axis.
- Insert the Seeger ring.

Specific tooling

020151Y Air heater

020376Y Adaptor handle

020360Y 52 x 55-mm Adaptor

020364Y 25-mm guide



Fitting the transmission gear bearing

- Use the heat gun to heat the bearing seat.
- Using the equipment set a new bearing.

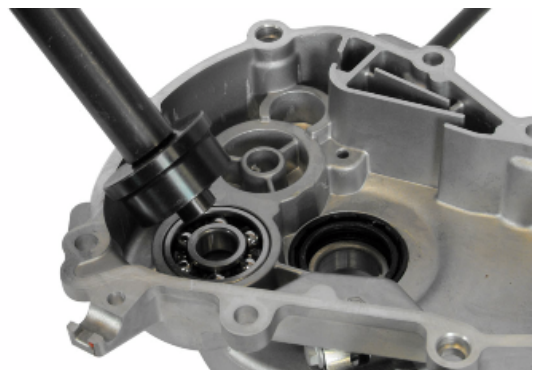
Specific tooling

020151Y Air heater

020376Y Adaptor handle

020359Y 42 x 47-mm Adaptor

020412Y 15-mm guide



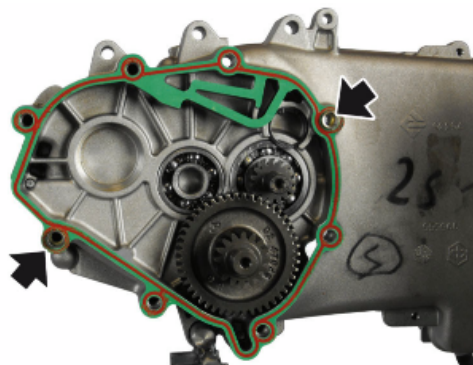
Refitting the hub bearings

- Insert the gears in the cover in order to prevent abnormal movements during insertion into the engine.
- Insert the wheel axis.

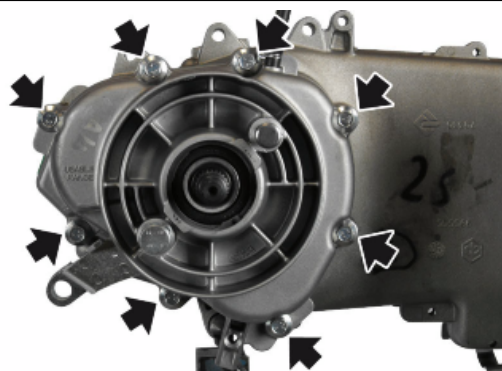


Refitting the ub cover

- Clean the engine crankcase and reduction cover surfaces adequately.
- Working in reverse with respect to the disassembly, insert the command pinion and the intermediate gear into the hub box.
- Pay attention to the correct positioning of the alignment dowels.
- Insert the gasket.



- Insert the gears of the reduction unit in the reduction cover and tighten the screws to the specified torque, tightening in crossed sequence.
- Check the correct the tightening drainage screw.



Locking torques (N*m)

Hub cover fixing screws 23.53 to 26.48 Reduction unit oil drainage screw 15 to 17

- Restore the level of oil inside duction unit with the recommended product, acting on the filler screw until touching.
- Tighten to the specified torque.



Recommended products

AGIP GEAR SAE 80W-90 Lubricant for gear-boxes and transmissions.

API GL-4

Characteristic

Hub oil

200 cm³

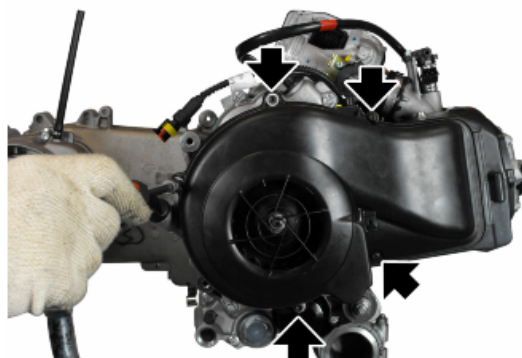
Locking torques (N*m)

Oil relief screw 15 to 17

Flywheel cover

Cooling hood

- Unscrew the five indicated screws and remove the cooling cap.



Cooling fan

- Remove the front part of the fan, unscrewing the three fixing screws.



- Using the specific tool, unscrew the cooling fan fixing screw.
- Remove the fan.
- Recover the wrench.

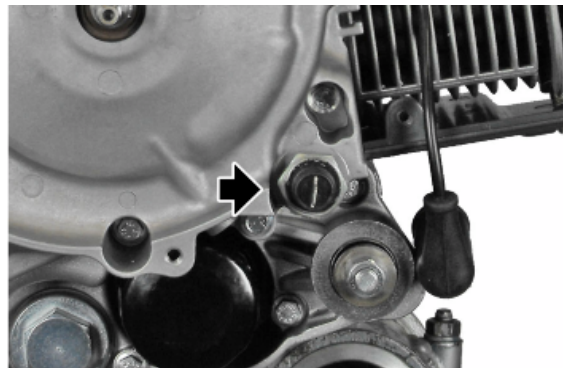
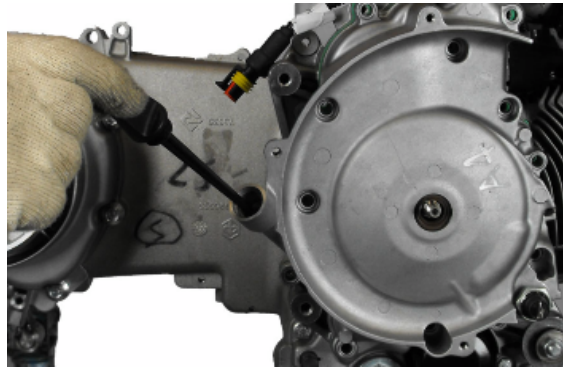
Specific tooling

020442Y Pulley lock wrench

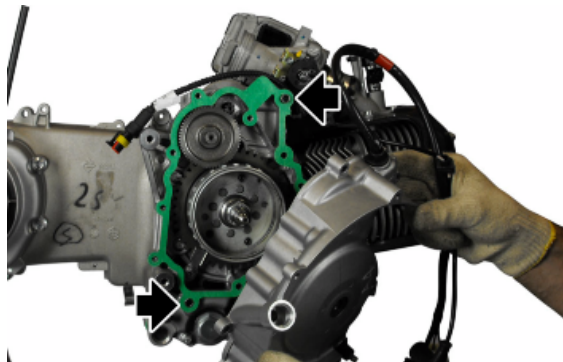


Removing the hub cover

- Remove the oil dipstick.
- Remove the sensor connector.
- Unscrew the eleven fixing screws of the flywheel cover.

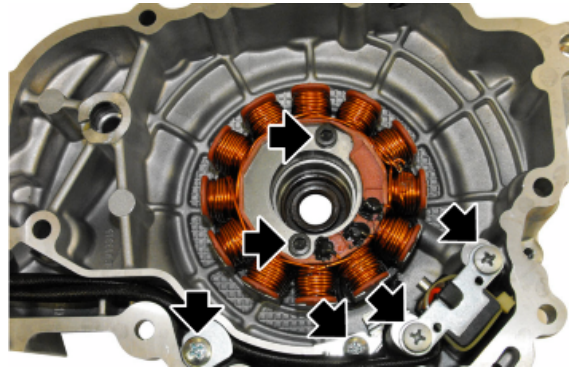


- Remove the cover.
- Remove the gasket.
- Pay attention to the alignment dowels.



Removing the stator

- Remove the flywheel cover.
- Unscrew the 2 flywheel fixing screws and the four pick-up fixing screws and cable harness retainer screws.



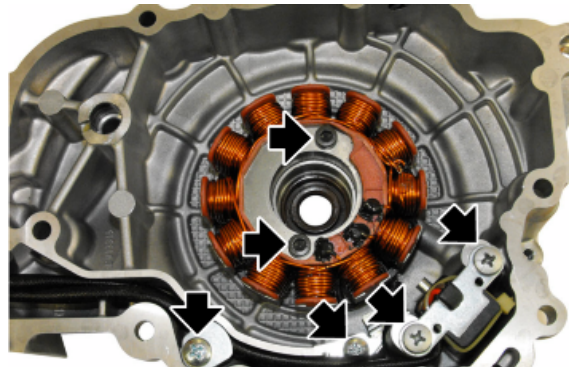
- Remove the flywheel and the pick-up complete with cable harness.

Refitting the stator

- Refit the stator and flywheel carrying out the removal procedure in reverse, tightening the retainers to the specified torque.
- Respect the operation of the pick-up.

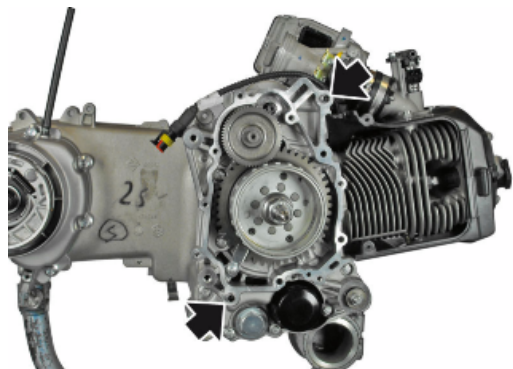
Locking torques (N*m)

Stator fixing screws 8 to 10 Pickup fixing screws 3 to 4



Refitting the flywheel cover

- Fit the gasket and be careful with the two alignment dowels.



- Tighten the screws and tighten to the specified torque.

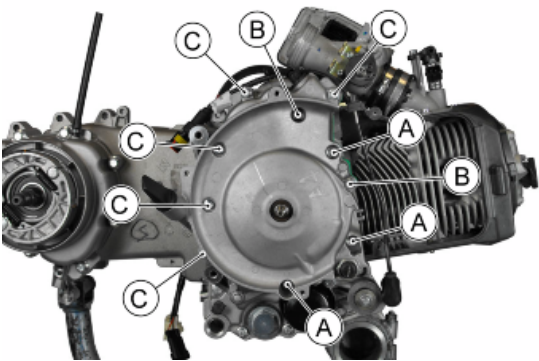
CAUTION



TO AVOID DAMAGING THE OIL SEAL, USE THE SPECIFIC TOOL PRIOR TO POSITIONING THE FLYWHEEL COVER.

Specific tooling

020940Y Flywheel cover oil seal gasket



FLYWHEEL COVER SCREWS

POSITION	SIZES	TORQUE (Nm)
A	M6x90	11 to 13
B	M6x35	11 to 13
C	M6x30	11 to 13

Flywheel and starting

Removing the starter motor

- Undo the two fixing screws and remove the starter motor.



Removing the flywheel magneto

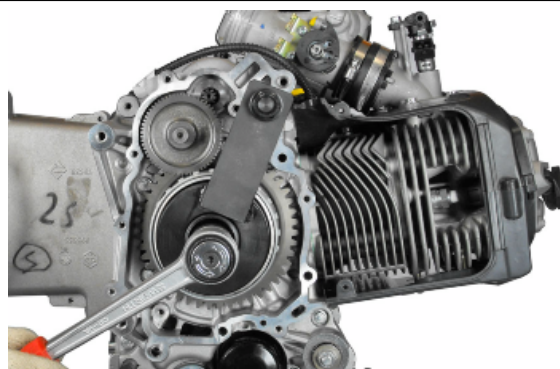
- Undo the screw indicated and remove the plate.



- Install the specific tool and unscrew the retainer nut of the flywheel, recovering the washer.

Specific tooling

020939Y Flywheel retainer



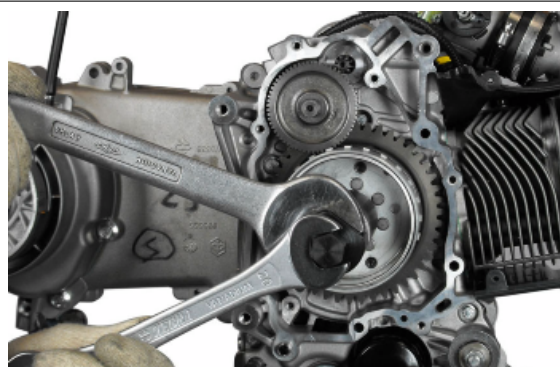
- Before screwing in the flywheel extractor the protection tool provided in the specific tool must be positioned.

Specific tooling

020933Y Flywheel extractor



- Acting on the extractor, remove the flywheel together with the starting sprocket and intermediate gear.





Inspecting the flywheel components

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

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

Refitting the flywheel magneto

- Perform the procedure in reverse order of disassembly, taking care to tighten to specified torque.

Locking torques (N*m)

Flywheel fixing nut 100 to 110

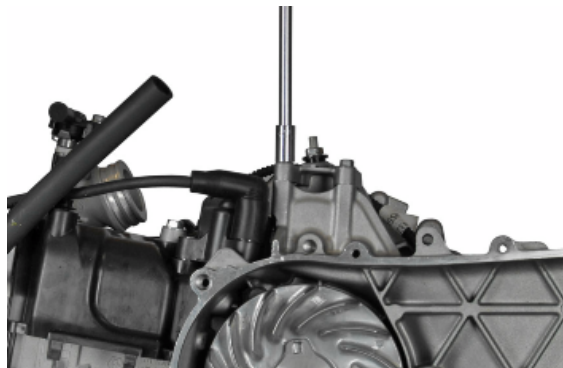
Refitting the starter motor

- Fit a new O-ring on the starter motor and lubricate it.

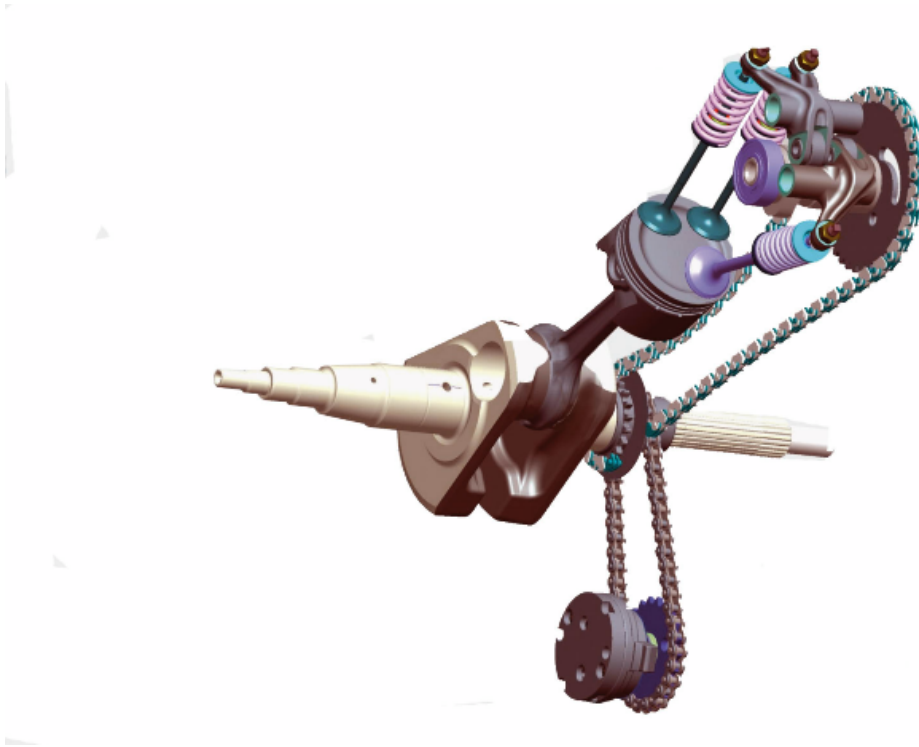
- Fit the starter motor on the crankcase and lock the two screws to the prescribed torque.

Locking torques (N*m)

Starter motor screws 10.8 to 12.8



Cylinder assy. and timing system



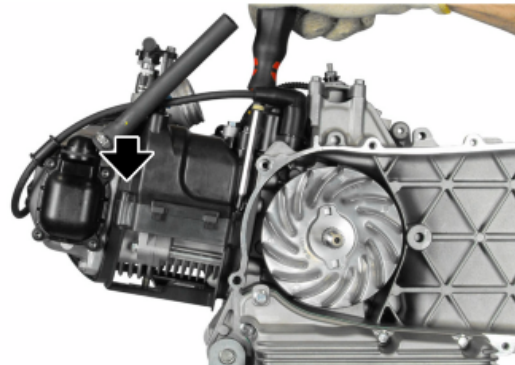
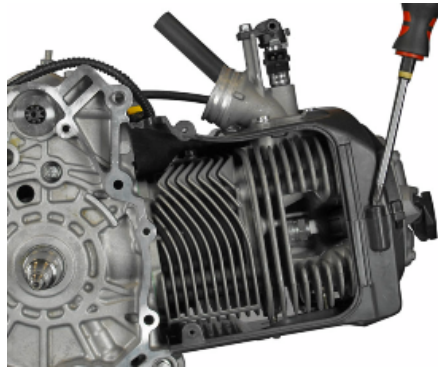
Removing the intake manifold

- The intake manifold is positioned on the head, loosen the clamps and remove the sleeve connecting to the throttle body.
- Undo the three manifold fixing screws and remove it.



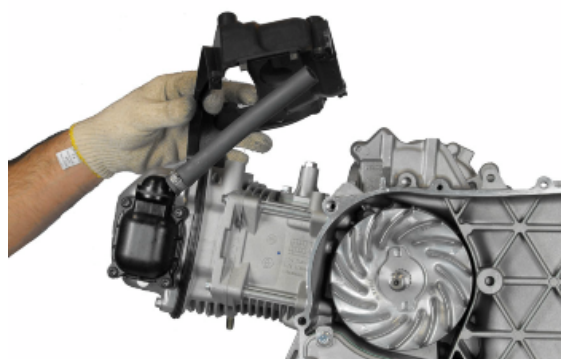
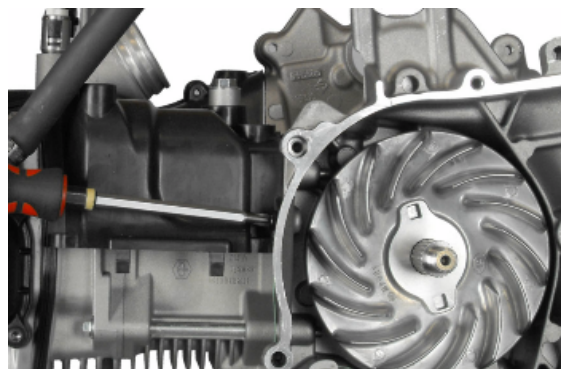
Removing the rocker-arms cover

- Remove the protective cover, undoing the three screws.



- Remove the engine temperature sensor.
- Undo the screw indicated.
- remove the upper part of the cover.





- Unscrew the four screws and remove the tappet cover.



Removing the timing system drive

- Before carrying out operations on the timing system we recommend positioning the engine at TDC in compression. To do this use the specific tools.
- Use the holes on the engine crankcase to secure the tool.
- Position the specific tool in the window between the flywheel pick-up references as illustrated in the figure.

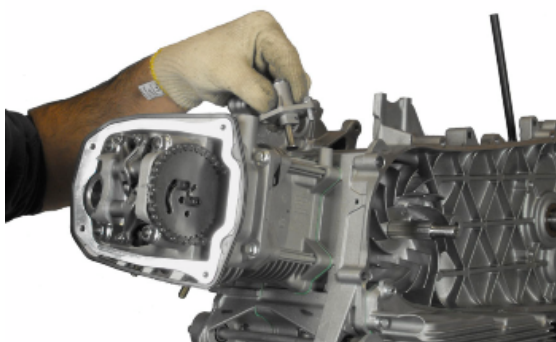


Specific tooling

020941Y Crankshaft timing adjustment tool



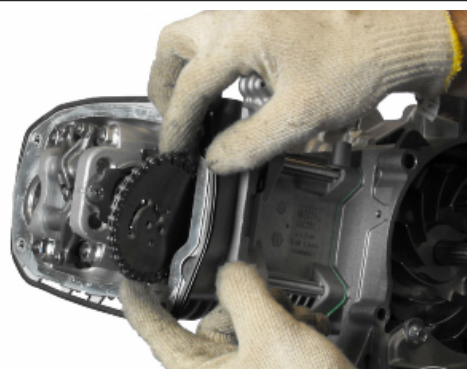
- First loosen the tensioner and unscrew the fixing screws.
- Remove the tensioner complete with gasket.



- Undo the two screws on the timing system gear.

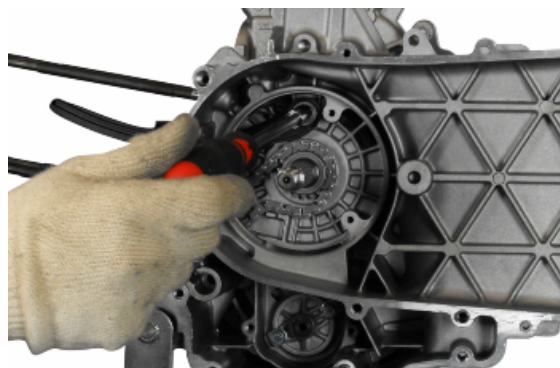


- Disengage the timing system gear and remove the camshaft control sprocket.
- Remove the cylinder as described in section «**Engine/Piston cylinder disassembly**»



After removing the head the camshaft control components can be removed:

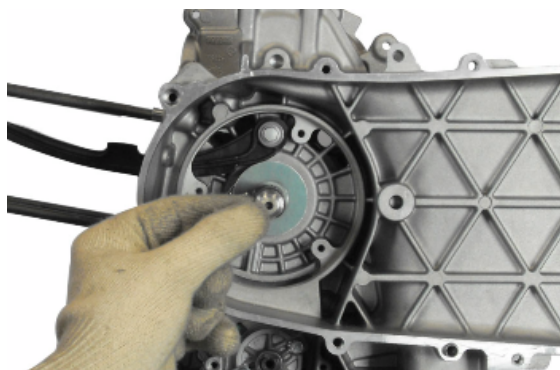
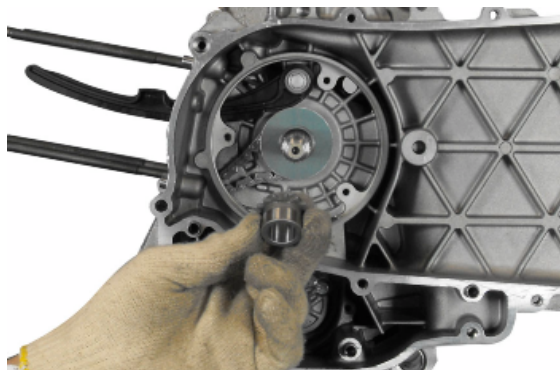
- Remove the inspection cover as described in sec. «**Lubrication/Main bushing oil seals removal**».
- Remove the oil pump command as described in section «**Lubrication/Oil pump/Disassembly** ».
- Undo the chain tensioner pad fixing screw, remove the bushing and the slider.



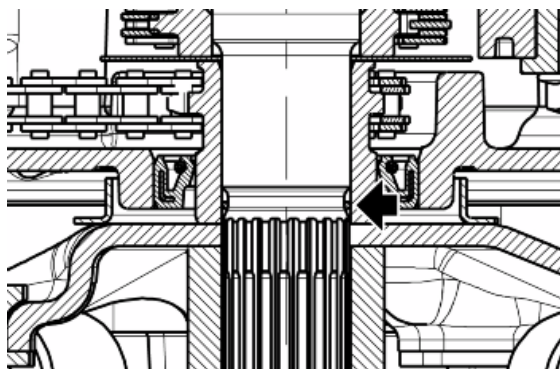
- Remove the chain tensioner pad.



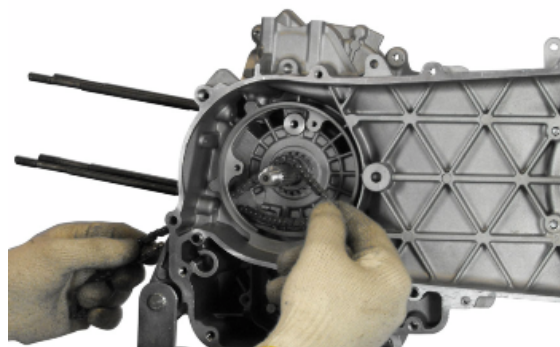
- Remove the control gear.
- Remove the seal OR.
- Remove the flat washer.

**CAUTION**

REMEMBER TO CORRECTLY POSITION THE SEAL OR IN THE REFITTING PHASE.



- Release the timing chain from the crankshaft
- Remove the control gear.



See also

[Removal](#)

[Removing the cylinder - piston assy.](#)

Removing the cam shaft

- Undo the camshaft lock screw.



- Remove the lock.
- Remove the two pins and the rockers.
- Remove the camshaft.



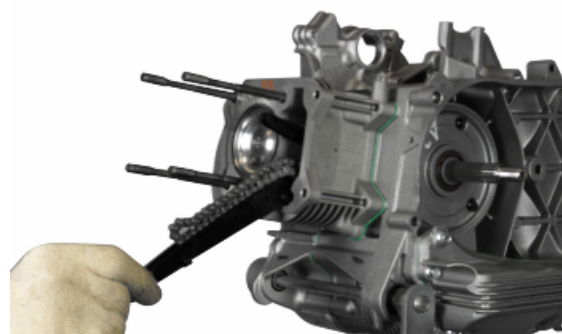


Removing the cylinder head

- Gradually loosen the four screws in crossed sequence and recover the washers.
- Undo the two external screws.



- Remove the cylinder head.
- Remove the chain guide slider and the gasket.



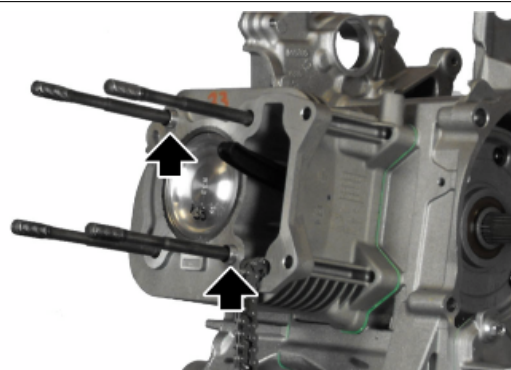
- Remove the gasket.



N.B.



ON ASSEMBLY PAY CLOSE ATTENTION TO THE TWO DOWELS.



Removing the valves

- Use the specific tool to remove the cotteners, cap and spring.

CAUTION

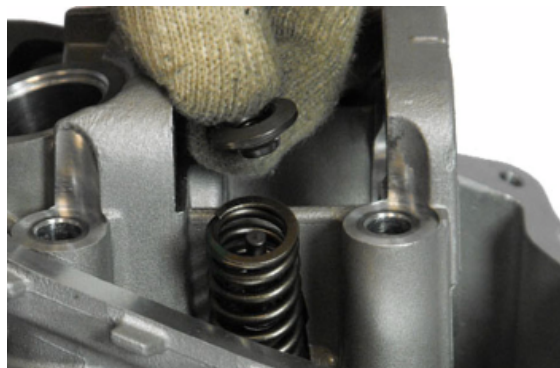
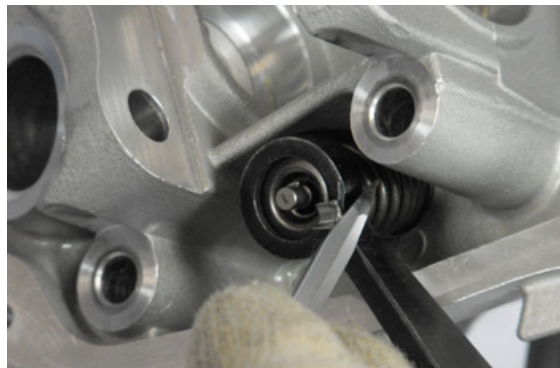
PROPERLY REPLACE THE PADS AND ROCKERS SO AS TO PRESERVE THE COUPLINGS.

CAUTION

DURING ASSEMBLY, POSITION THE VALVE SPRINGS WITH THE GREEN COLOURED COIL FACING UPWARD.

Specific tooling

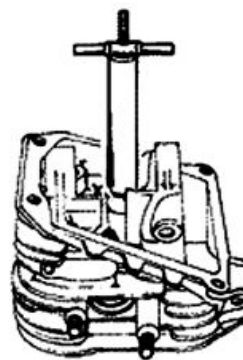
020382Y Valve fitting/ removal tool



- Use the specific tool to remove the valve oil seal.

Specific tooling

020431Y Valve oil seal extractor



- Slide off the valve and remove the lower support.



Removing the cylinder - piston assy.

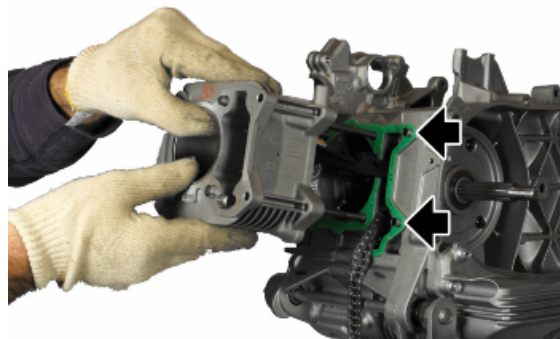
- Remove the cylinder, paying attention to the cylinder-crankcase alignment dowels.

CAUTION

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

N.B.

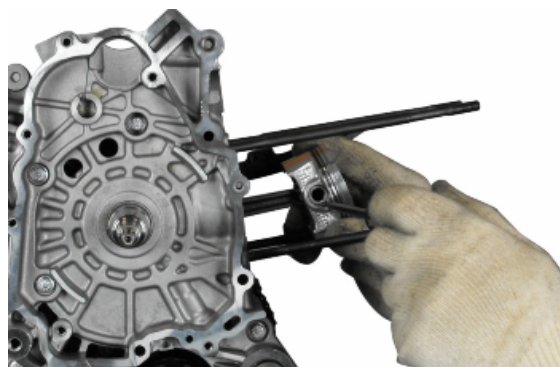
IN ORDER NOT TO DAMAGE THE BASE GASKET WITH THE PISTON LOCK FORK 020426Y DURING THE MOUNTING PHASE, IT IS RECOMMENDED TO INSERT THE ALIGNMENT DOWELS OF THE CYLINDER - CRANKCASE UNDER THE CYLINDER DURING THE ASSEMBLY.

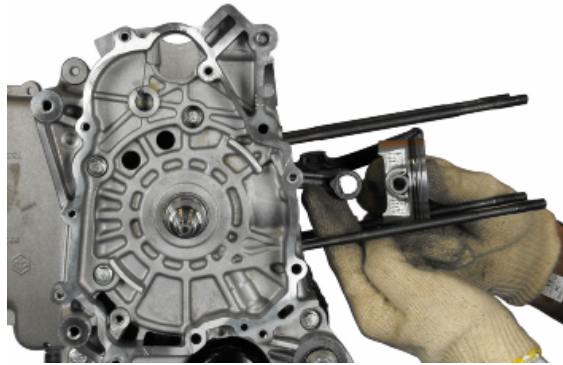


- Remove the base gasket.
- Remove the retainer rings and remove the piston.

N.B.

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.





Inspecting the small end

N.B.

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

See also

[Crankcase - crankshaft - connecting rod](#)

Inspecting the wrist pin

N.B.

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

See also

[Cylinder - piston assy.](#)

Inspecting the piston

N.B.

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

See also

[Cylinder - piston assy.](#)

Inspecting the piston rings

N.B.

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

See also

[Piston rings](#)

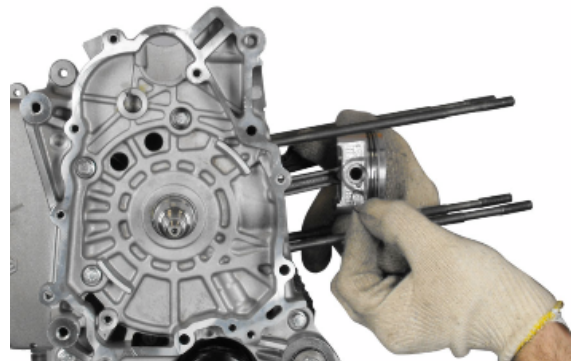
Removing the piston

- Fit the piston and pin onto the connecting rod, aligning the piston arrow towards the engine direction of rotation.

CAUTION



AT EVERY NEW MOUNTING USE RETAINER RING PINS.



Choosing the gasket

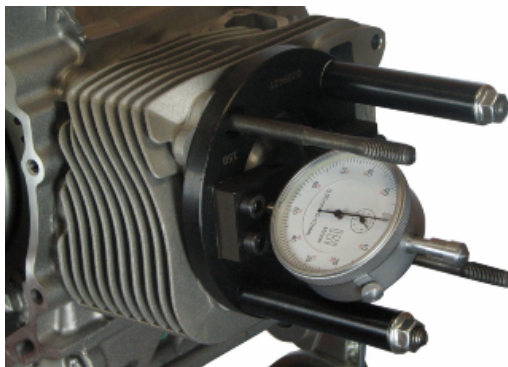
- Provisionally fit the piston into the cylinder, without any base gasket.
- Assemble a dial gauge on the specific tool.

Specific tooling

020942Y Piston protrusion check tool

- 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.

See also

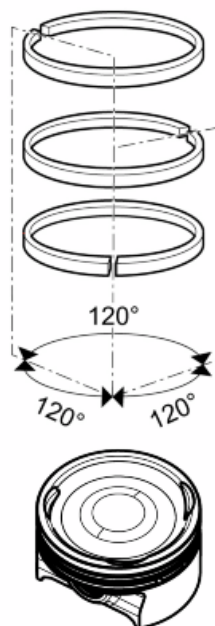
[Slot packing system](#)

Refitting the piston rings

- Pistons (like cylinders) are supplied in 4 categories: A, B, C and D, and must be fitted so that the reference arrow faces the exhaust duct. The letter is found at the centre of the piston.
- Fit the sealing rings with the word TOP or the identification letter facing upwards. In any case, the step must be facing opposite the piston crown.
- Sealing rings are manufactured with a cylinder contact conical cross-section and piston gaps must be offset by 120° in order to obtain a better bedding.
- Lubricate rings with engine oil when fitting them.

CAUTION

AT EVERY NEW MOUNTING USE RETAINER RING PINS.





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 LINER.

Specific tooling

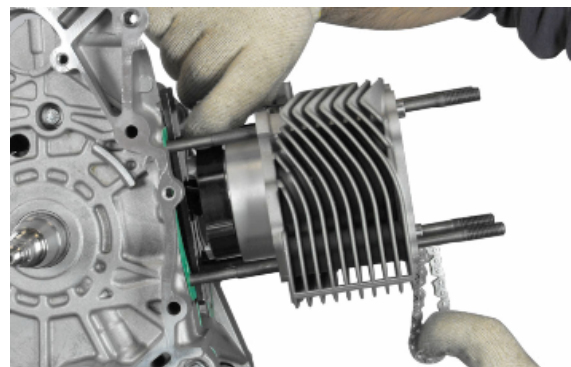
020426Y Piston fitting fork

020427Y Piston assembly band

Recommended products

eni i-Ride PG 10W-40 Synthetic-based lubricant for four stroke engines.

JASO MA, MA2 - API SL - ACEA A3



Inspecting the cylinder head

N.B.

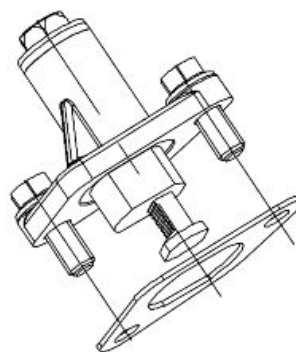
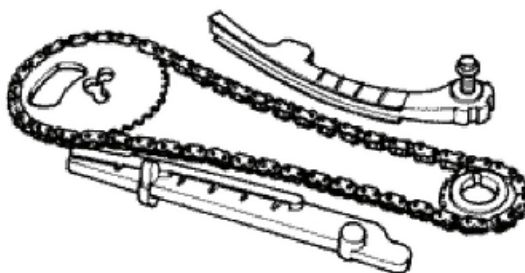
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

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](#)

VALVE CLEARANCE CHECK

- Remove the cover.
- Position the engine to the TDC in compression



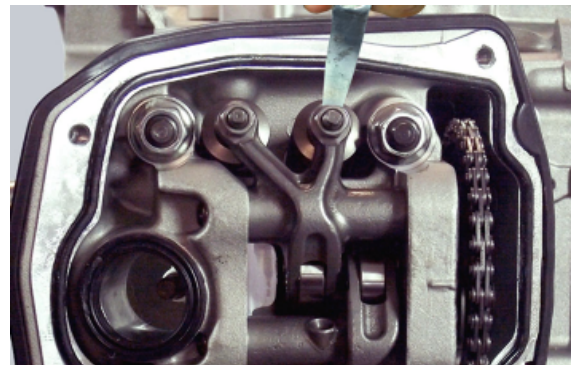
- Using a feeler gauge check the valve clearance.

CAUTION

- USE THE FEELER GAUGE Laterally, in line with the valves, in order to prevent accidental bending of the blade that may affect the measurements.

Characteristic**Valve clearance (cold engine)**

intake: 0.08 mm exhaust: 0.08 mm

**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.



N.B.

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

See also

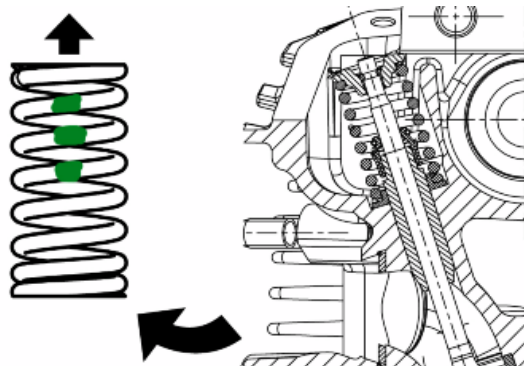
Cylinder Head

Refitting the valves

CAUTION



MOUNT THE VALVE SPRINGS WITH THE GREEN COLOURED COIL FACING UPWARD.



- Lubricate the valve guides with engine oil.
- Place the valve spring supports on the head.
- Using the special punch, fit the three valve seal rings alternately.
- 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.



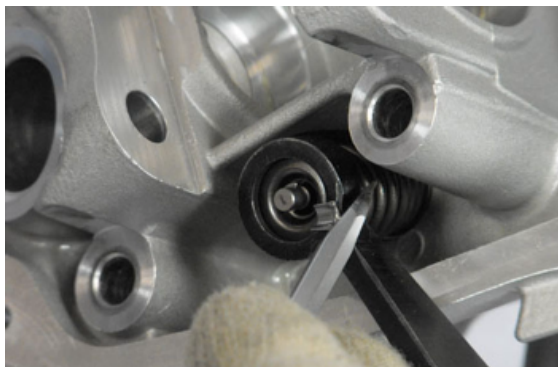
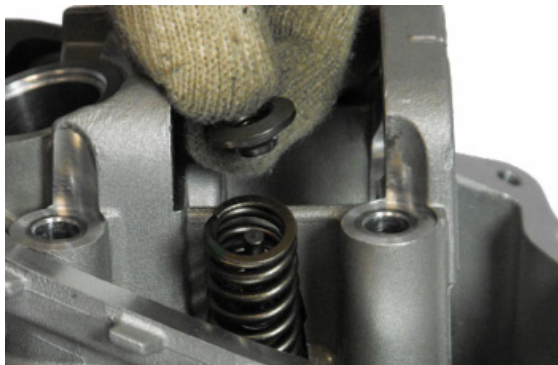
N.B.

DO NOT CHANGE THE POSITIONS THE VALVES ARE FITTED IN. FIT THE VALVE SPONGES WITH THE REFERENCE COLOUR ON COTTER SIDE (TURNS WITH GREATER PITCH).

Specific tooling

020382Y Valve fitting/ removal tool

020431Y Valve oil seal extractor





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

- Position the crankshaft to the TDC in compression



-
- Insert the head gasket and check the correct operation of the alignment dowels.
 - Insert the chain guide slider.
 - Insert the head.
 - Lubricate the stud bolt threads with engine oil.

- Tighten the nuts to an initial pre-torque of 9-11 Nm.
- Tighten up the nuts by rotating $270.0 \pm 5.0^\circ$ with crossed sequence.
- Fit the two screws on the outside of the timing chain side and tighten them to the specified torque.

CAUTION

DO NOT PERFORM 270° IN ONE ROTATION. PERFORM WITH THREE GRADUAL ROTATIONS, OBSERVING THE SEQUENCE INDICATED ON THE STUD BOLTS.

N.B.

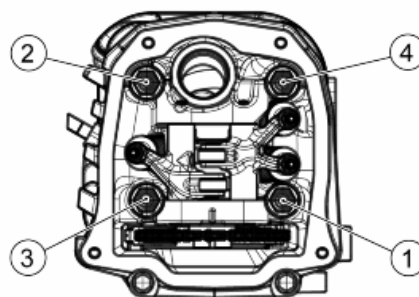
BEFORE INSTALLING THE HEAD, MAKE SURE THAT THE LUBRICATION CHANNEL IS CLEAN USING A COMPRESSED AIR JET.

CAUTION

ALWAYS USE A NEW HEAD GASKET UPON REFITTING.

Locking torques (N*m)

Cylinder head nut (TIGHTENING) 9 to 11 (Tighten to the prescribed torque and then proceed with $270.0 \pm 5.0^\circ$ rotation) **Screws fixing cylinder to crankcase** 10.8 to 12.7

**Refitting the rocker-arms cover**

- Remove the cylinder head cover and tighten the four clamping screws to the prescribed torque.
- Pay attention to the integrity of rubber gaskets, replace them if necessary.
- Make sure the gasket is positioned properly.

Locking torques (N*m)

Head cover screws 10.8 to 12.7

**Refitting the intake manifold**

- Follow the disassembly process in reverse order to refit.

Locking torques (N*m)

Intake manifold fixing screws 10.8 to 12.8

Crankcase - crankshaft

Splitting the crankcase halves

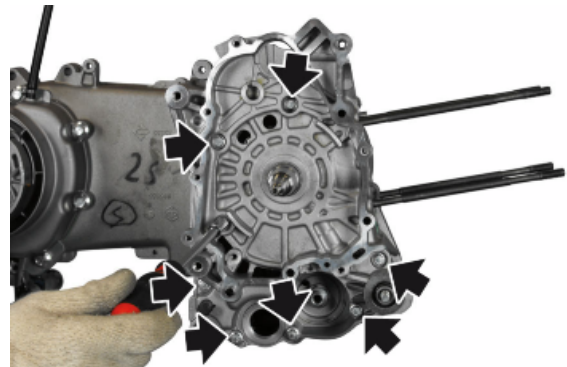
- Undo the eight crankcase coupling screws.
- Separate the crankcase halves while keeping the crankshaft in one of these two halves.
- Only after the halves have been separated, can the crankshaft be checked.

CAUTION

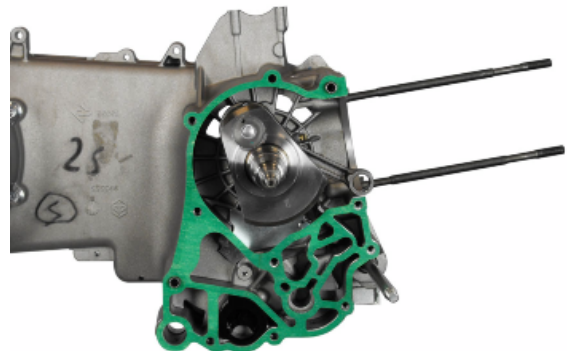
WHILE OPENING THE CRANKCASES AND REMOVING THE CRANKSHAFT, CHECK THAT THE THREADED SHAFT ENDS DO NOT INTERFERE WITH THE MAIN BUSHINGS. FAILURE TO OBSERVE THIS PRECAUTION CAN DAMAGE THE MAIN BUSHINGS.

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.



- Remove the gasket and be careful with the alignment dowels.



Inspecting the crankshaft components

N.B.

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

See also

[Crankcase - crankshaft - connecting rod](#)

Inspecting the crankshaft alignment

N.B.

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

See also

[Crankcase - crankshaft - connecting rod](#)

Inspecting the crankcase halves

- Before proceeding to check the crankcase halves, thoroughly clean all surfaces and oil ducts.
- 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.
- 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.

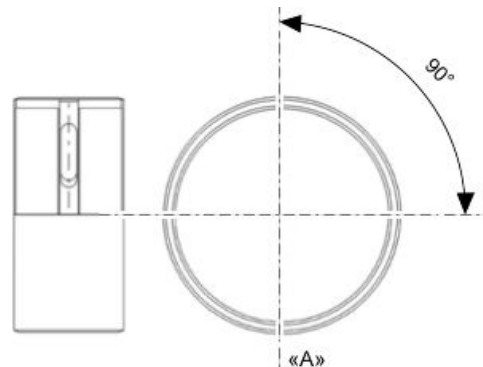
THE JET IS FED THROUGH THE MAIN BUSHINGS. PROPER OPERATION OF THIS COMPONENT IMPROVES PISTON CROWN COOLING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAKS CAN CAUSE A CONSIDERABLE DROP IN THE LUBRICATION PRESSURE FOR MAIN BUSHINGS AND CONNECTING ROD.

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 (3.2 bar) and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.
- The main bushings are comprised of two half-bearings, one with holes and channels for lubrication whereas the other is solid.



Characteristic

«A»

AXIS CYLINDER

- 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](#)

Coupling chart

N.B.

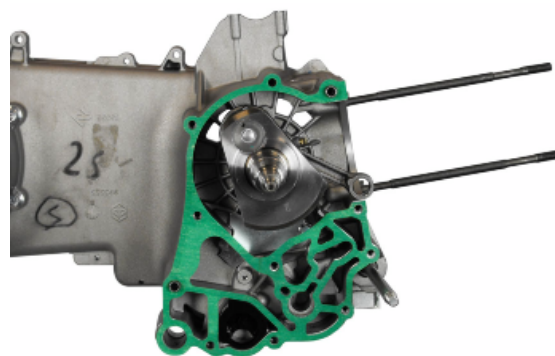
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

[Crankcase - crankshaft - connecting rod](#)

Refitting the crankcase halves

- Follow the removal steps but in reverse order; be careful to respect the prescribed tightening torques.
- Insert the by-pass.
- Insert a new gasket and be careful with the alignment dowels.
- Maintaining the crankshaft inserted in the fly-wheel side crankcase, couple the crankcase halves.
- Insert the screws and tighten to specified torque.



CAUTION

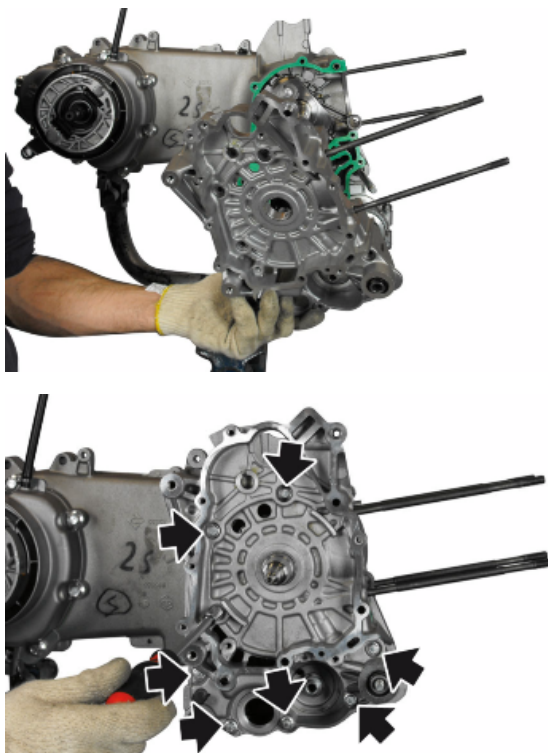
CAREFULLY CHECK THE CLEANING OF THE BY-PASS DUCT.
CHECK THAT THE PISTON SLIDES BY HAND, FREELY AND WITHOUT STICKING.

CAUTION

IT IS ADVISABLE TO INSERT THE CRANKSHAFT IN THE FLYWHEEL SIDE CRANKCASE HALF TO PREVENT, WITH ACCIDENTAL MOVEMENTS DURING INSERTION, THE OIL PUMP CONTROL TOOTHING FROM DAMAGING THE BUSHINGS.

Locking torques (N*m)

Engine-crankcase coupling screws 11 ÷ 13



- Complete the coupling operations with the verification of the crankshaft axial clearance.
- Using specific tools to support the dial gauge, verify that the fitting clearance is within the limits.
- Higher clearances are signs of wear of the crankshaft - crankcase supporting surfaces.

Characteristic**Crankshaft-crankcase axial clearance**

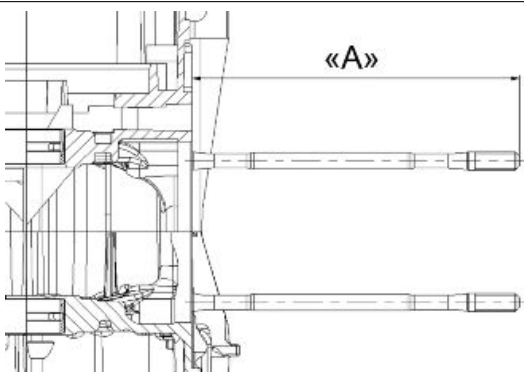
0.2 to 0.5 mm

Studs

- Using two nuts, fitted as nut and lock nut type, remove and then drive from the seat.
- Proceed with a thorough cleaning of the threaded seat on the crankcase.
- Screw the new stud bolts up to the driving depth indicated.

N.B.

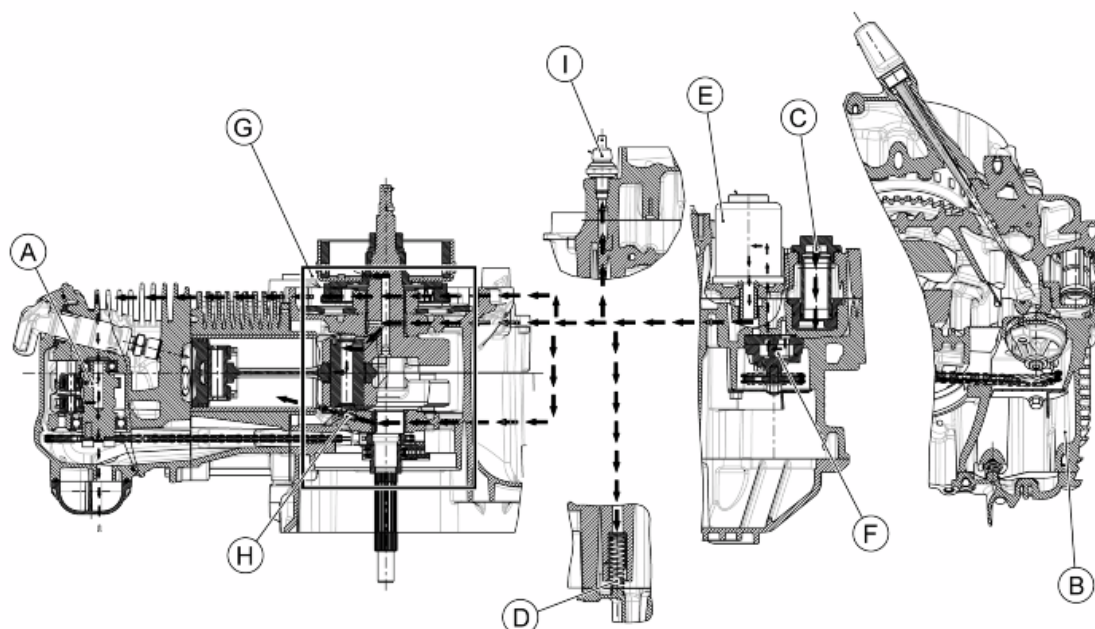
NEW STUD BOLTS DO NOT NEED THREADLOCK, AS THEY COME EQUIPPED WITH SCOTCH-GRIP.

**Characteristic****Driving depth of stud bolts «A»**

170 mm+ 0.5

Lubrication

Conceptual diagrams



The lobe pump «F» sucks the oil from the sump, through the mesh pre-filter «C», it pushes it into the cartridge filter «E» where there is also a safety valve «D».

Through the suitable passages found in the crankcases, the oil enters the crank chamber «G» where the main bearings are lubricated and the big end (with high pressure), the piston pin and connecting rod small end via spray «H».

Subsequently the oil arrives at the timing system where it lubricates the camshaft «A» and from this, valves and rockers. The oil passes through the timing chain duct and returns to the sump «B» by gravity. In the system there is a minimal oil pressure sensor «I» and a spray that serves to lubricate the stator «L».

Oil pressure check

- After removing the flywheel cover as described in the "Flywheel" chapter, remove the electric connexion of the minimum oil pressure switch and then remove the switch.
- With the engine idling at 1750 rpm and the oil temperature at $\sim 90^{\circ}\text{C}$, check that the oil pressure is between 0.5 to 1.2 atm.
- With the engine idling at 5000 rpm and the oil temperature at $\sim 90^{\circ}\text{C}$, check that the oil pressure is between 3.2 to 4.2 atm.
- 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 flywheel 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**

Operating pressure

- At 1750 rpm: (0.5 to 1.2)bar
- At 5000 rpm: (3.2 to 4.2)bar

Locking torques (N*m)

Minimum oil pressure sensor 12 to 14

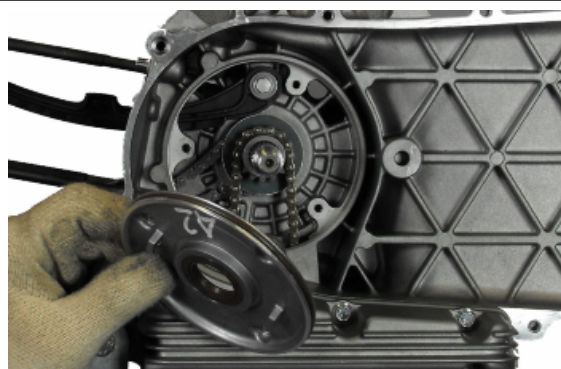
Crankshaft oil seals

Removal

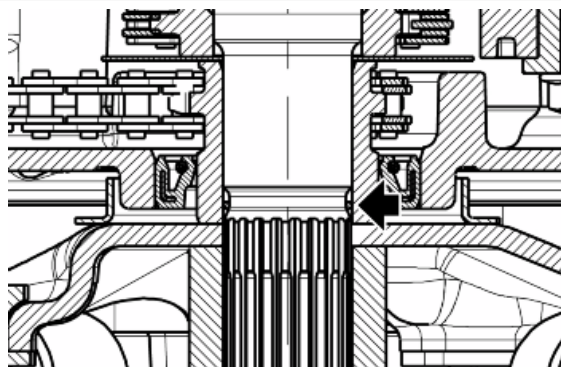
- Unscrew the three screws and remove them, complete with the copper gaskets.



- Using pliers remove the door by acting on the appendices.



- Remove the spacer and the O-ring.



Refitting

- Insert the components making sure to thoroughly grease the O-ring and the fork oil seal.
- Follow the steps in reverse order taking care to tighten to torque.

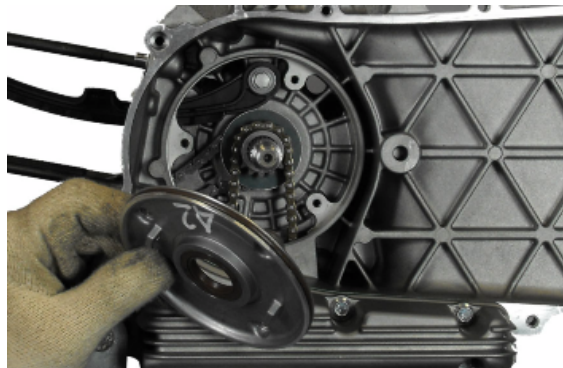
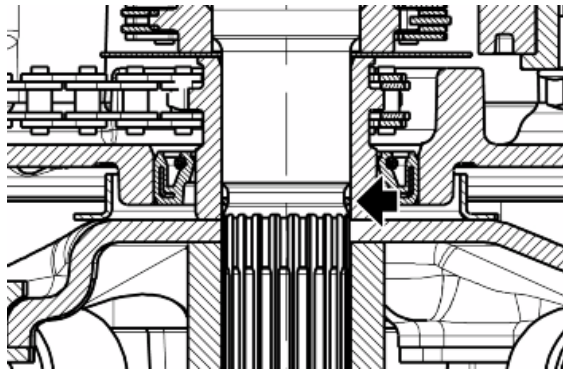
WARNING



IN ORDER TO PREVENT ABNORMAL FORMATIONS OF DIRT DUE TO THE RELEASE OF GREASE, WE RECOMMEND FIRST LUBRICATING THE SEAL RING STOPS WITH A BRUSH.

Locking torques (N*m)

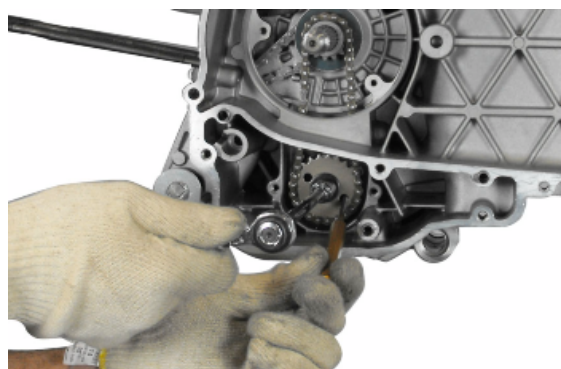
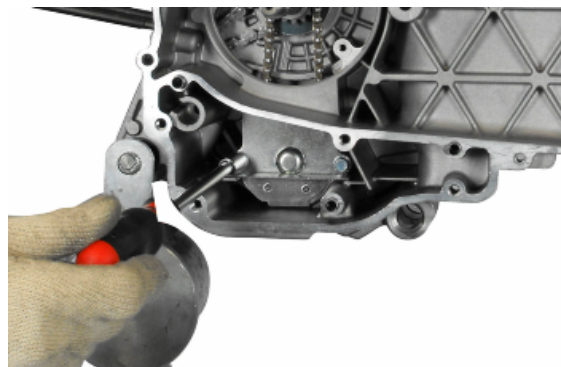
Crankcase timing cover screws 11 to 13



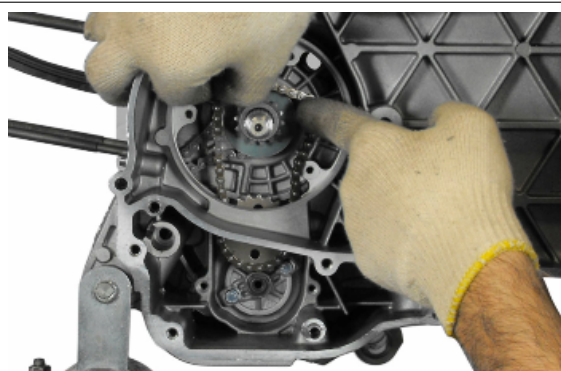
Oil pump

Removal

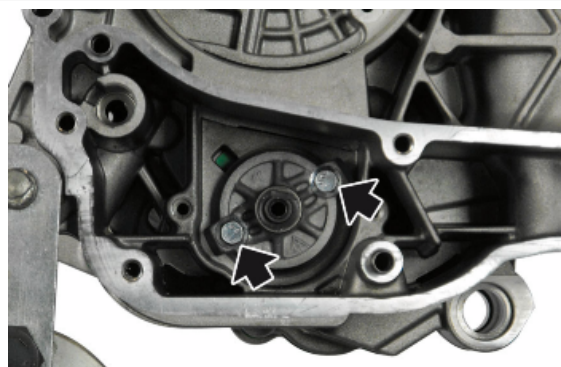
- Remove the oil sump and the by-pass.
- Remove the oil shield.
- Preventing rotation, unscrew the water pump command screw and collect the washer.



- Remove the oil pump command sprocket complete with chain.



- Unscrew the two screws and remove the oil pump.



Inspection

- Remove the two screws and remove the oil pump cover.
- Remove and wash the rotors thoroughly with petrol and compressed air.
- Reassemble the rotors in the pump body, keeping the two reference marks visible.
- Using a feeler gauge, check the distance between the rotors in the position shown in the figure.
- Check the distance between the outer rotor and pump body, see figure.

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

Characteristic

Axial rotor clearance

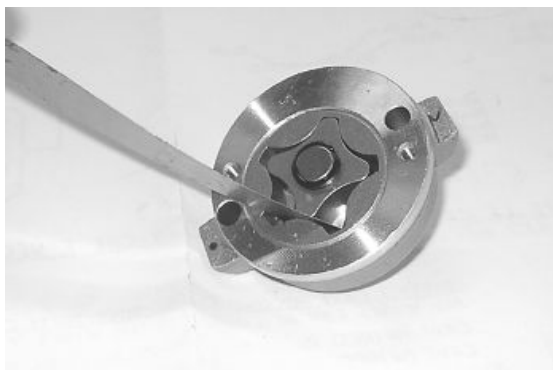
Limit values admitted: 0.09 mm

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

- Follow the steps in reverse order to the removal, tightening the screws to the specified torque.
- Insert the oil pump.
- Insert the control sprocket and the chain.

N.B.

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

Recommended products

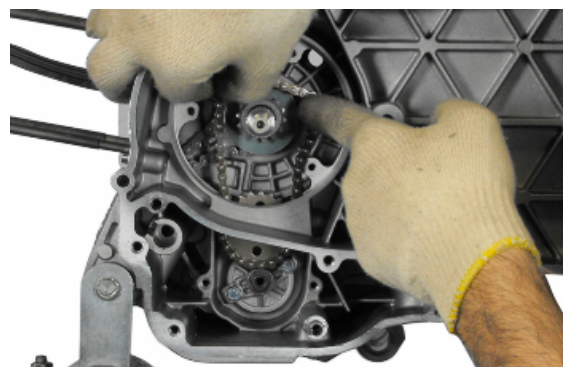
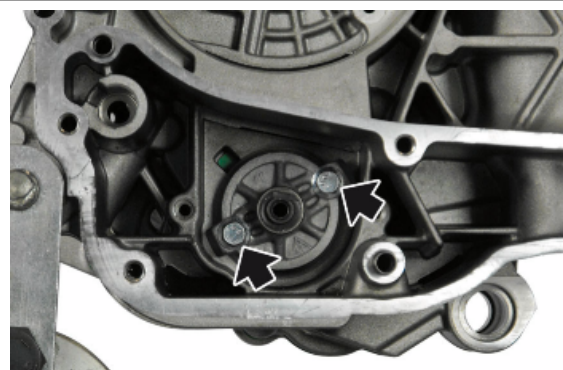
Loctite 243 Medium-strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

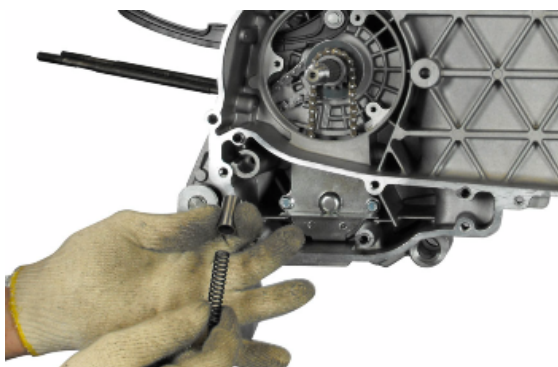
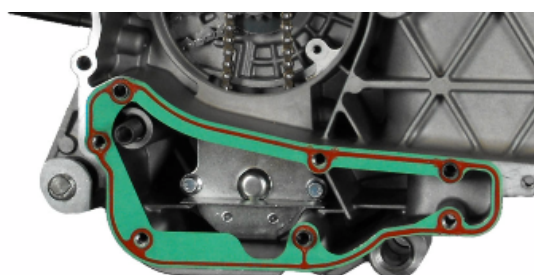
Screws fixing oil pump to the crankcase 5 to 6

- Preventing rotation, tighten the water pump command screw complete with washer.



Removing the oil sump

- Remove the oil filler plug, the transmission cover, the complete drive pulley assembly with belt and the sprocket wheel, as described in the Transmission chapter.
- Drain the oil as described above.
- Remove the seven screws indicated in the figure with the two rear brake transmission retainer brackets.
- Remove the washers, the spring and the by-pass piston.

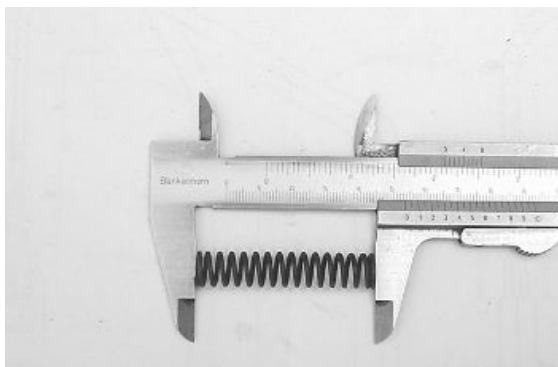


Inspecting the by-pass valve

- 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
Standard length

52.4 mm



Piston standard diameter

12.861 + 12.843 mm

Refitting the oil sump

- Refit the by-pass piston in its housing.
- Insert the pressure-regulating spring.
- Fit a new sump seal.
- Refit the sump, taking care to locate the spring in the appropriate recess machined into the inside of the sump.
- Refit the rear brake transmission mounting 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 "Transmission" chapter.
- **When testing the lubrication system, refer to the "Crankcase and Crankshaft" chapter, regarding lubrication of the connecting rod assembly**

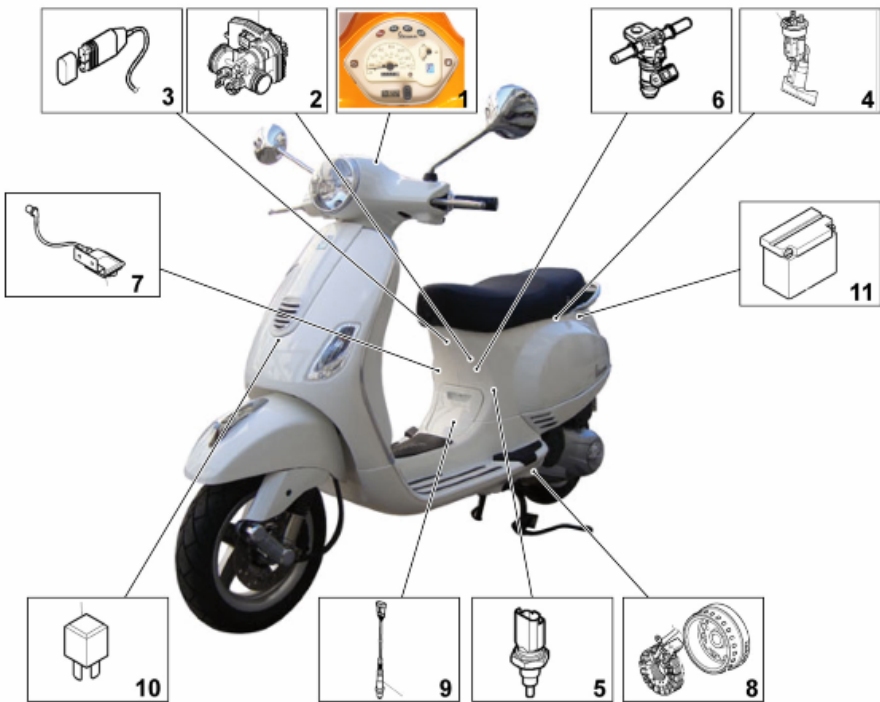


Locking torques (N*m)

Locking torque 11 to 13

INDEX OF TOPICS

INJECTION	INJEC
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COMPONENT LAYOUT

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

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:

- Engine temperature
- Intake air temperature
- Lambda probe

The system implements cold engine idle fuel/air mixture correction with 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 in relation to ambient pressure.

The **fuel system circuit** consists of:

- Fuel pump
- Fuel filter
- Injector
- Pressure regulator

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

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

The fuel pump is controlled by the MIU; this ensures safety of the vehicle.

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.

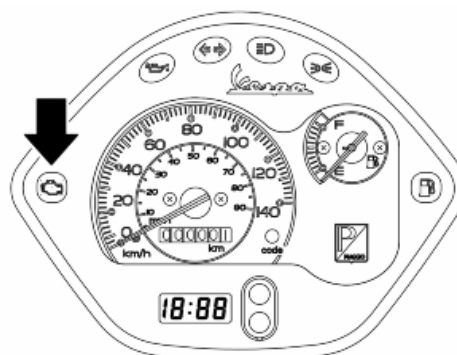
The MIU injection-ignition system controls engine functions by means of a pre-set program.

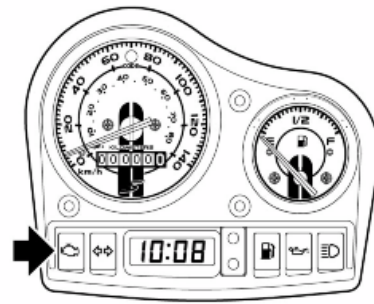
Should any input signals fail, an acceptable working order of the engine is ensured to allow the user to reach a service station.

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

020922Y Diagnosis Tool

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.



Precautions

Troubleshooting tips

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 connectors taking into consideration the following point:

A check that the terminals are not bent.

B check that the connectors have been properly connected.

C - Check whether the malfunction can be fixed by shaking the connector slightly.

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

4 Use a multimeter with an internal resistance of more than 10K Ohm /V when troubleshooting. Instruments that are not suitable might damage the MIU central control unit. Use instruments with definitions over 0.1V and 0.5 W, the precision must be greater than 2%.

1. Before fixing any part of the injection system, check to see if there are any registered faults. Do not disconnect the battery before checking for faults.

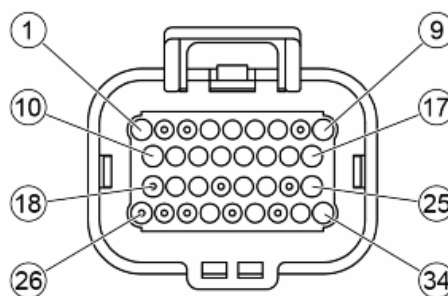
2. The fuel system is pressurised at 250 kPa (2.5 BAR). Before disconnecting the fast-release fitting of the fuel supply pipe, check that there are no naked flames. Do not smoke. Act with caution to avoid spraying fuel to your eyes.

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



ELECTRONIC CONTROL UNIT CONNECTOR

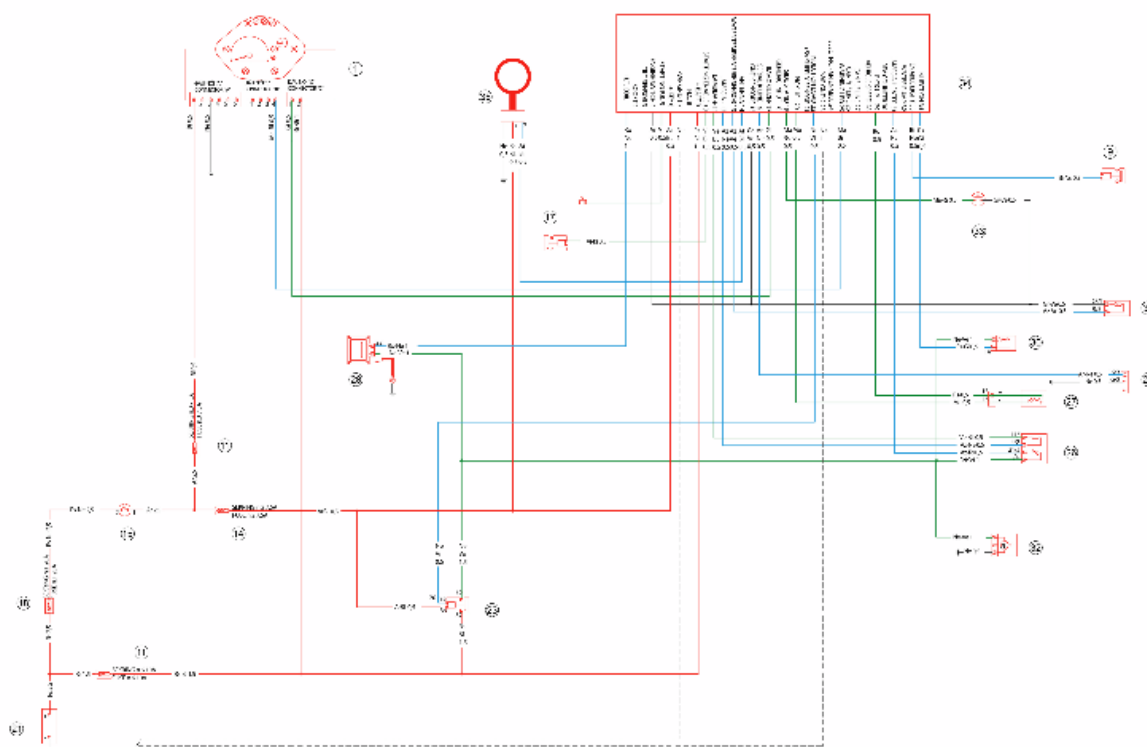
1. H.V. COIL (Pink-Black)
2. Not connected
3. Not connected
4. Ground (Orange)
5. Starter button (Purple)
6. Ignition switched live (Orange-Blue)
7. Ground No. 1 (Black)

- 8. Not connected
- 9. Battery power (Red-White)
- 10. Start-up enabling switch (Purple-White)
- 11. Lambda probe positive (Green-Blue)
- 12. Lambda probe negative (Light blue-Black)
- 13. Water temperature sensor (Sky blue-Green)
- 14. Immobilizer aerial (Orange-White)
- 15. Ground sensors (Grey-Green)
- 16. Serial line K (Orange-Black)
- 17. Immobilizer (Yellow)
- 18. Not connected
- 19. Side stand (Brown - Red)
- 20. Speed sensor negative (Brown)
- 21. Not connected
- 22. Injection load relay (Black-Purple)
- 23. Ground No. 2 (Black)
- 24. Not connected
- 25. Injection warning light (Brown-White)
- 26. Not connected
- 27. Not connected
- 28. Not connected
- 29. Engine speed sensor positive (Red)
- 30. Not connected
- 31. Lambda probe heater (Light blue-Red)
- 32. Not connected
- 33. Low beam lights automatic ignition enabling (White-Black)
- 34. Fuel injector (Red-Yellow)

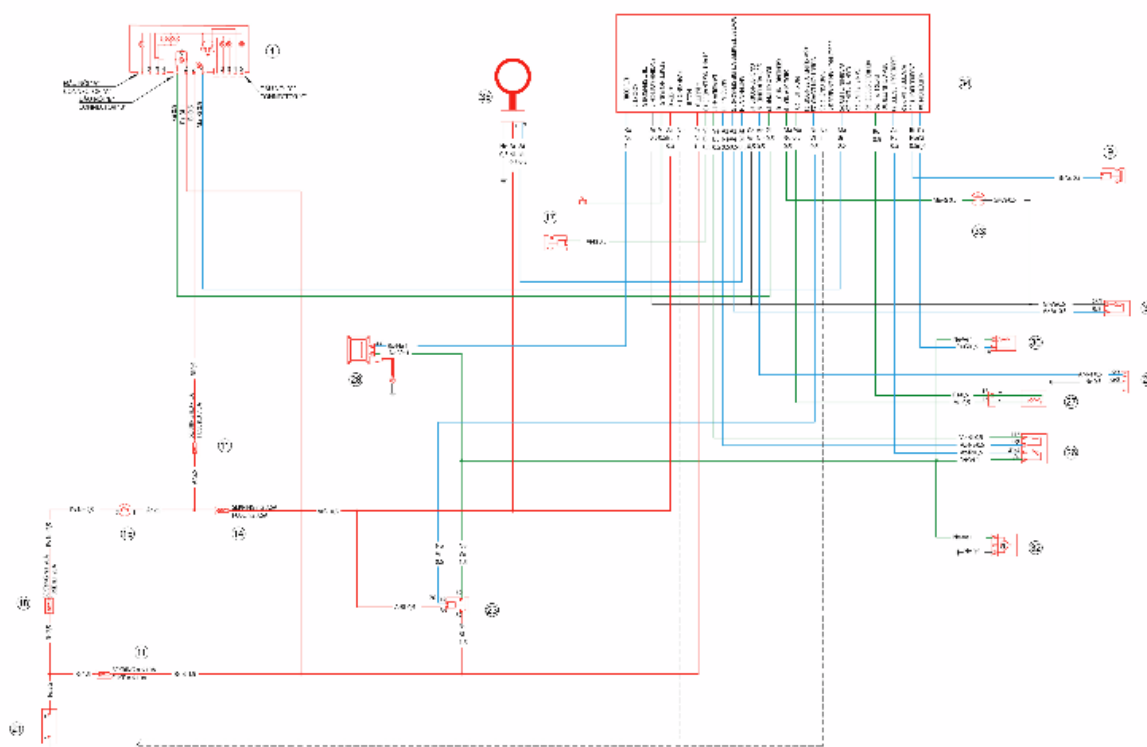
EMS circuit diagram



THE FOLLOWING INDICATIONS REFER TO THE LX VERSION.



THE FOLLOWING INDICACTIONS REFER TO THE S VERSION.



KEY

- 1. Instrument panel
- 9. Headlight relay
- 11. Fuses No. 3, 4, 6;
- 14. Fuse No. 2
- 15. Ignition switch
- 17. Starter remote control switch
- 18. Fuse No. 1
- 21. Battery
- 23. Injection load relay
- 26. Lambda probe
- 27. Engine speed sensor
- 28. H.V. coil
- 29. Diagnostics socket
- 30. Injector
- 31. Engine temperature sensor
- 32. Fuel pump
- 33. Side stand switch
- 34. Electronic control unit

35. 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	Engine 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 Engine temperature
Start-up speed	Starter motor and solenoid 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	Engine temperature Stepper throttle valve position intake air temperature (steps and actual opening) Cleaning the 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

Possible Cause	Operation
Ignition efficiency	HV coil
	Injector
	Revolution timing sensor
	Air temperature
	Engine temperature
Correctness of the parameters	Spark plug
	Ignition timing
Intake system cleaning	Throttle valve position sensor
	Stepper
	Engine temperature sensor
	Intake air temperature sensor
Intake system sealing (infiltrations)	Air filter
	Diffuser and throttle valve
	Stepper
	Intake manifold - head
Fuel system (low pressure)	Throttle body - manifold
	Air cleaner joint
	Filter box
	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
Ignition efficiency	Engine temperature
	Ignition timing
Correctness of the parameters	Throttle valve position sensor
	Stepper
	Engine temperature sensor
	Intake air temperature sensor
Intake system sealing (infiltrations)	Intake manifold - head
	Throttle body - manifold
	Air cleaner joint
	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
	Engine temperature
Correctness of the parameters	Lambda sensor
	Throttle valve position sensor
	Stepper
	Engine temperature sensor
Intake system sealing (infiltrations)	Intake air temperature sensor
	Intake manifold - head

Possible Cause	Operation
Fuel system (low pressure)	Throttle body - manifold
	Air cleaner joint
	Filter box
	Fuel pump
	Pressure regulator
Exhaust system sealing (infiltrations)	Fuel filter
	Injector capacity
	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
	Stepper
Intake system sealing	Air cleaner joint
	Filter box
Ignition system	Spark plug wear check
Parameter reliability	Throttle valve position signal
	Engine temperature signal
	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
	Engine temperature
	Lambda sensor

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
	Engine temperature
	Lambda sensor
Spark plug power supply	Spark plug
	Shielded cap
	HV cable
	HV coil
Intake system	Air filter
	Filter box (sealing)
	Air cleaner joint (sealing)
Parameter reliability	Throttle valve position signal
	Engine temperature signal
	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)

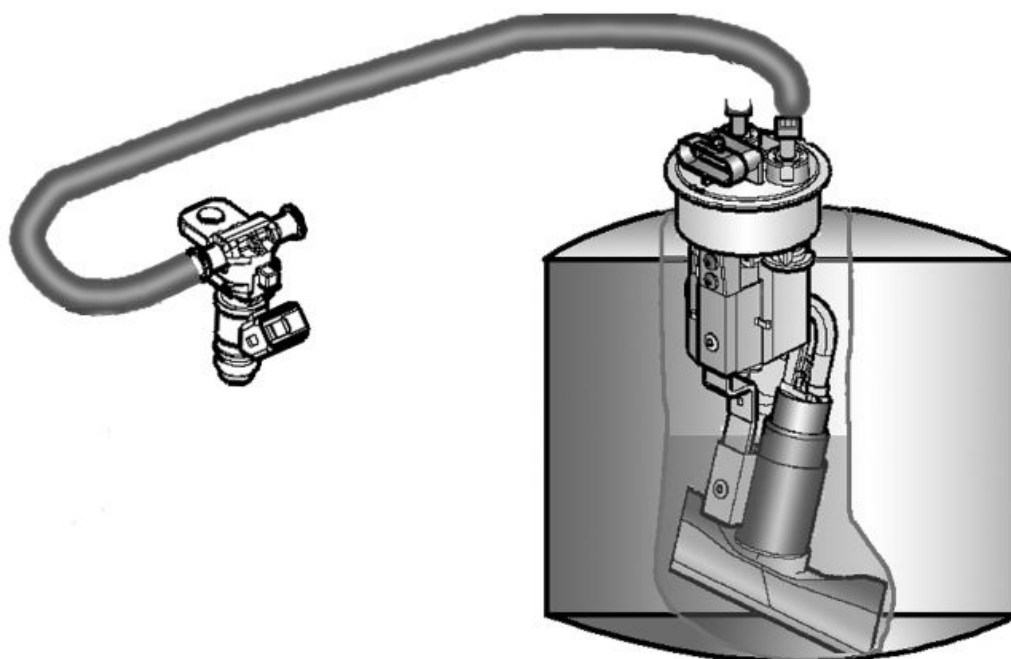
Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Engine temperature Lambda sensor
Ignition efficiency	Spark plug
Parameter reliability	Throttle valve position signal Engine temperature signal Intake air temperature indicator Ignition advance
Intake system sealing	Air cleaner joint Filter box
TPS reset successful	TPS reset successful
Fuel system	Fuel pressure Fuel filter Injector capacity Fuel quality
Selection of the cylinder base gasket thickness	Selection of the cylinder base gasket thickness

Fuel supply system

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

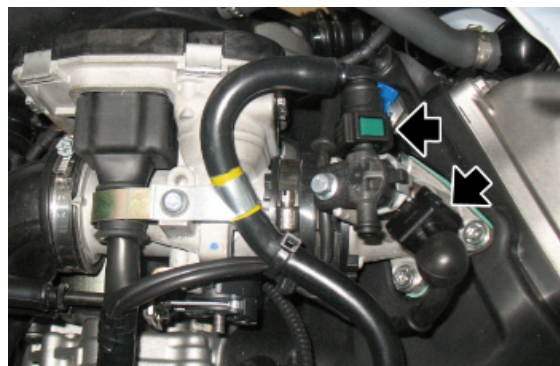
The electrical pump is located in the tank from which the fuel is pumped and sent to the injector through the filter.

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



Removing the injector

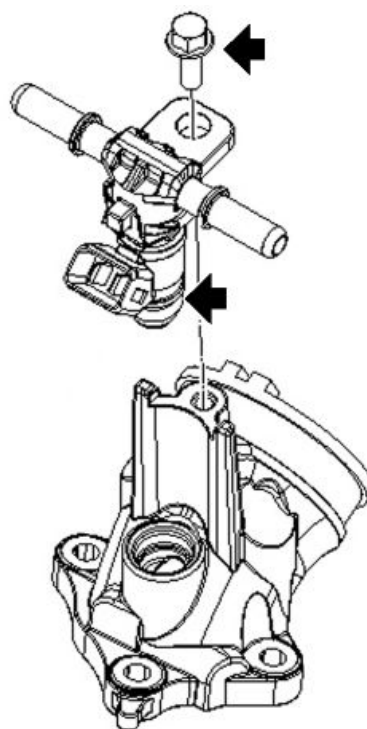
- Remove the helmet compartment.
- Remove the connector from the injector.
- Remove the quick release of the petrol delivery pipes.



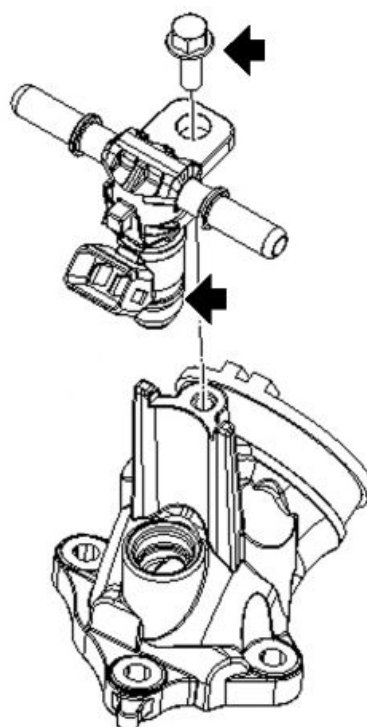
- Undo the fixing screws and slide the injector from the manifold being careful not to damage the sealing OR gasket.

CAUTION

DO NOT DISASSEMBLE THE INJECTOR COMPONENTS.

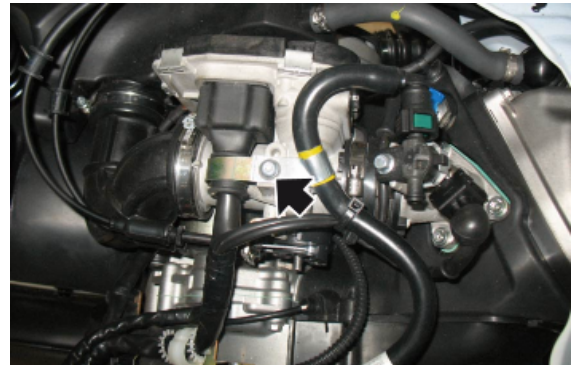
**Refitting the injector**

For refitting, perform the removal operations in reverse order and lubricate the sealing OR gasket with grease for internal application before fitting the injector on the manifold.

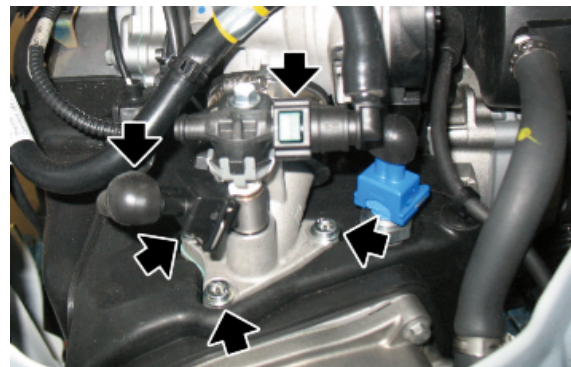


Removing the butterfly valve

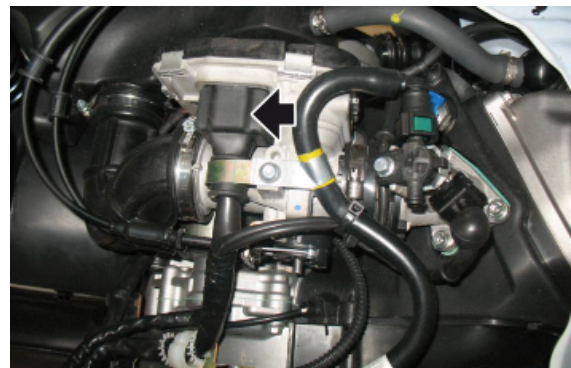
- Remove the helmet compartment.
- Remove the fuel piping clamping screw indicated in the figure.



- Remove the fast-release fitting from the injector.
- Remove the injector connector.
- Remove the three screws with anti-tampering device fixing the manifold to the head and the clip fixing the throttle body to the manifold.



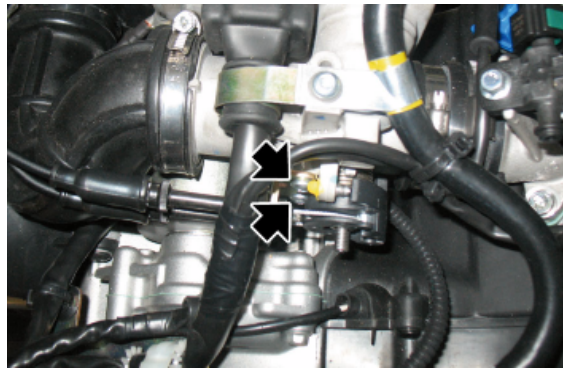
Remove the MIU ECU connector.



- Remove the fastening clamp of the air cleaner joint to the air filter body.

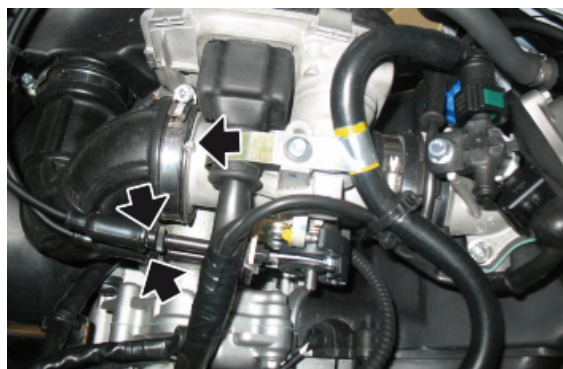


- Remove the mounting bracket of the throttle control cables undoing the two fixing screws.
- Release the cable ends of the throttle body pulley.
- Remove the throttle body with air cleaner joint, manifold and injector.

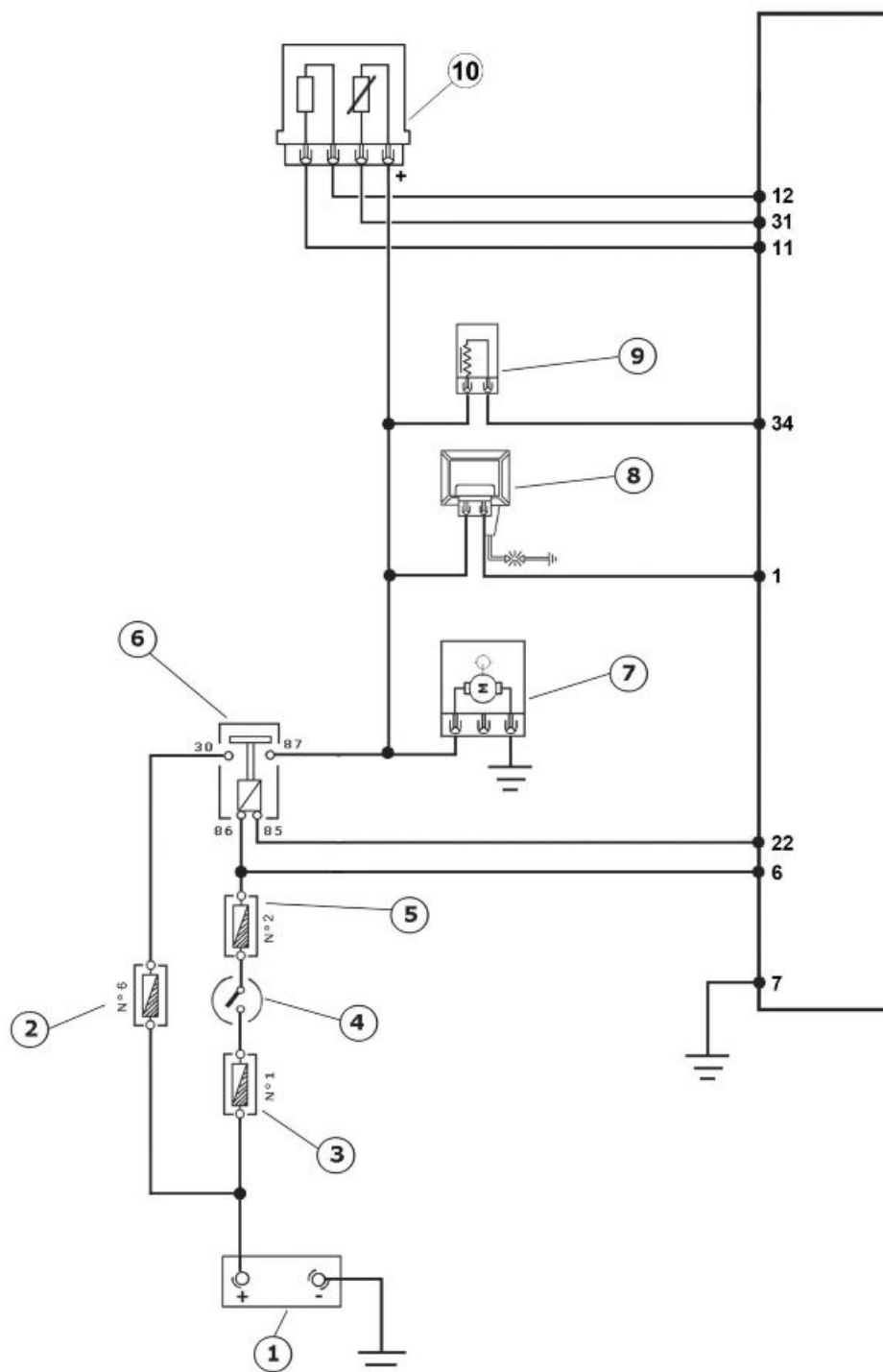


Refitting the butterfly valve

- For refitting, perform the steps in the reverse direction to disassembly taking care to orientate the air cleaner joint by inserting it in the reference tooth on the throttle body as shown in the picture.
- To adjust the throttle control cables, act on the specific adjuster screws.



Pump supply circuit



1. Battery 12V- 6 Ah
2. Fuse No. 6 of 10A
3. Fuse No. 1; 20A
4. Ignition switch contacts
5. 7.5A fuse No. 2

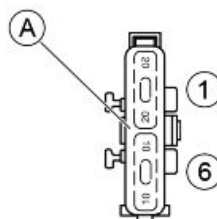
6. Injection load remote control
7. Fuel pump
8. HV coil
9. Fuel injector
10. Lambda probe

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

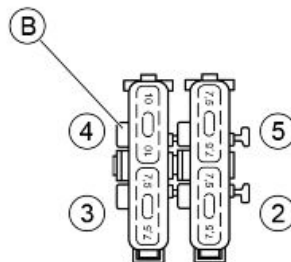
ELECTRICAL DATA

- Pump winding resistance ~ 1.5 Ohm
- Input current during normal functioning 1.4 to 1.8 A
- input current to the closed hydraulic circuit ~ 2 A (to be checked with specific tool for fuel pressure)

Check efficiency of the fuse No. 6 of 10A injection loads, next to the battery.



Check efficiency of fuse No. 2 of 7.5A, live control unit power supply, after removing the central cover of the shield.



Check efficiency of the injection load relay, that can be reached by removing the central cover of the shield: 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 relay.

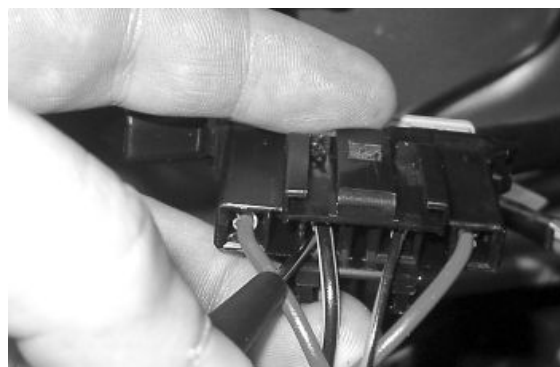
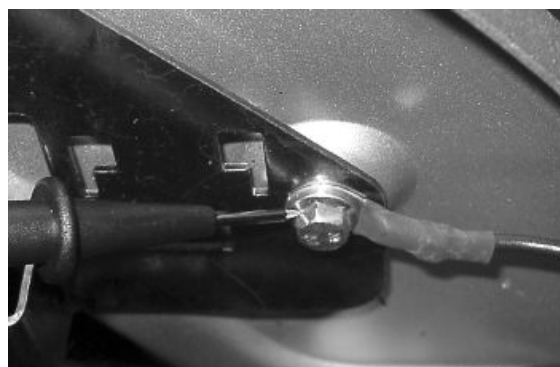
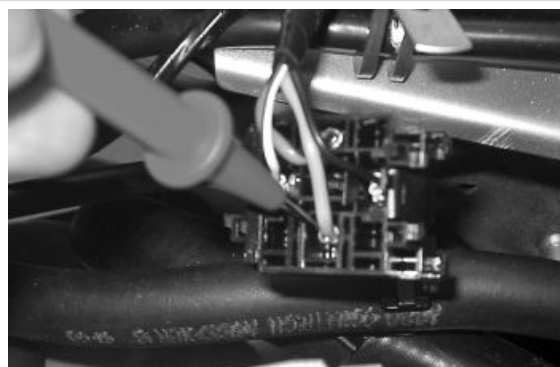




Check the presence of fixed voltage between the Red-White cable of the relay base and ground. Otherwise, check the continuity of the Red-White cable between the fuse-box (No. 6, 10 A) and the relay base.

N.B.

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



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.



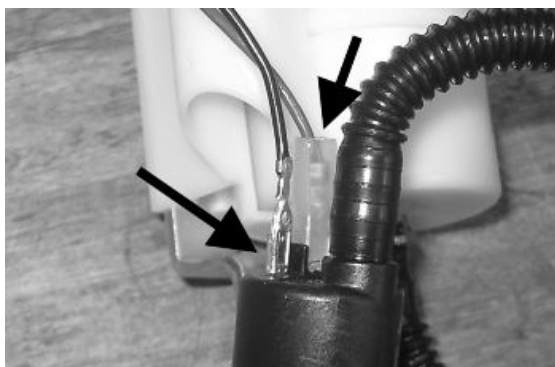
With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. Make a graded burette available with a flow rate of approximately 1 L. Rotate the pump using the active diagnosis of the palm top computer. Using 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 cm³.

Specific tooling

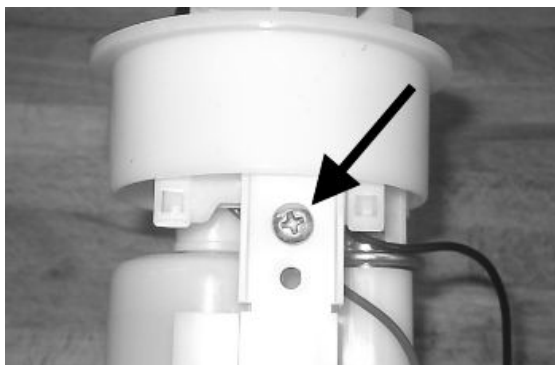
020480Y Petrol pressure check kit

Fuel filter check

After removing from the tank, disconnect the electric pump terminals.



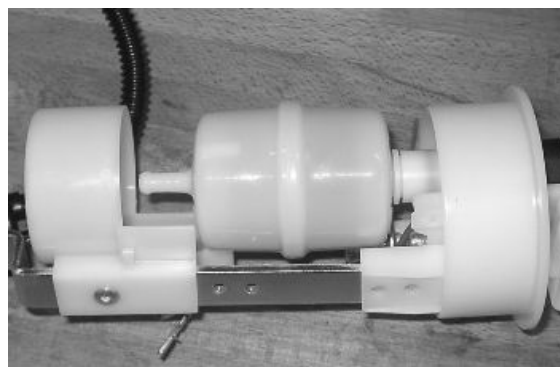
Remove the screw shown in the picture



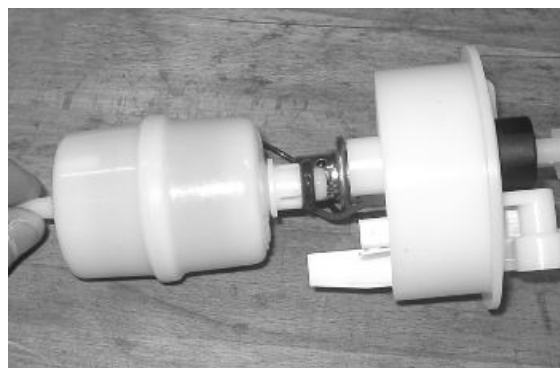
Remove the clip fixing the piping to the filter shown in the picture



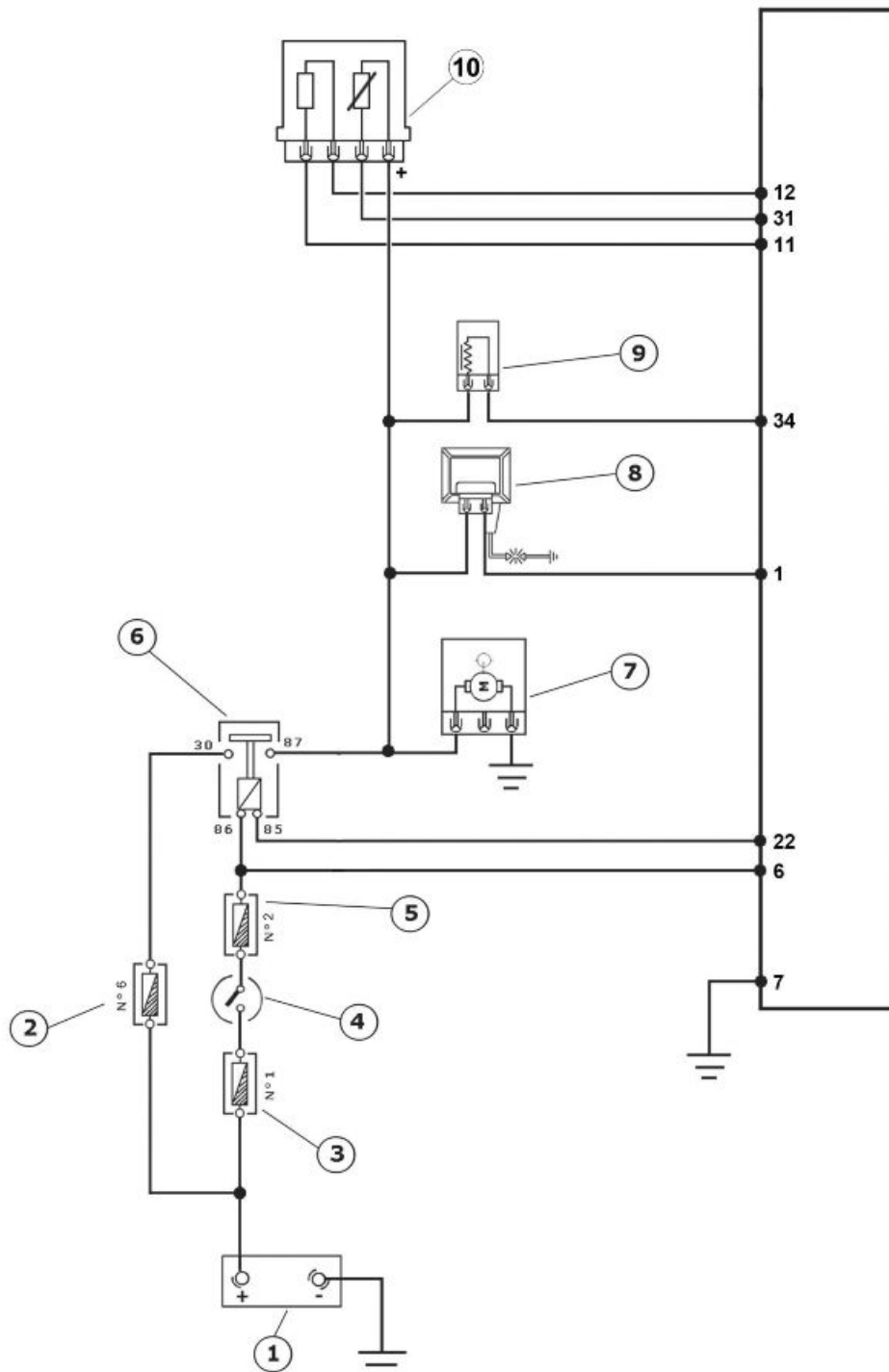
Separate the lower part of the pump mounting as shown in the picture.



Remove the filter from the pump mounting



Inspecting the injector circuit

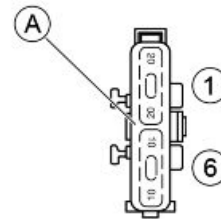


1. Battery 12V- 6 Ah
2. Fuse No. 6 of 10A
3. Fuse No. 1; 20A
4. Ignition switch contacts
5. 7.5A fuse No. 2

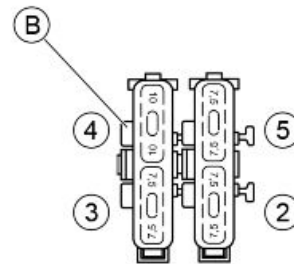
6. Injection load remote control
7. Fuel pump
8. HV coil
9. Fuel injector
10. Lambda probe

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

Check efficiency of the fuse No. 6 of 10A injection loads, next to the battery.

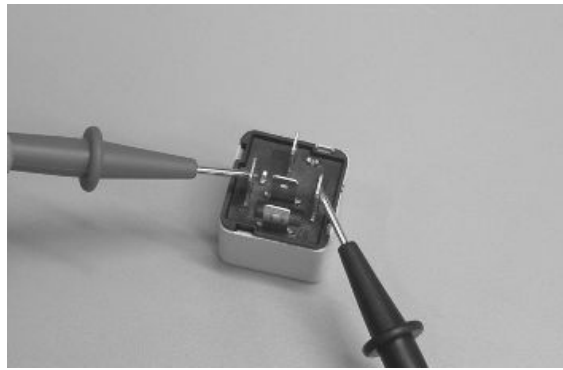


Check efficiency of fuse No. 2 of 7.5A, live control unit power supply, after removing the central cover of the shield.



Check efficiency of the injection load relay, that can be reached by removing the central cover of the shield: 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 relay.

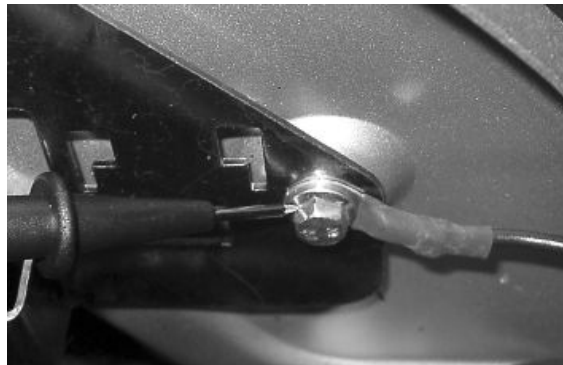
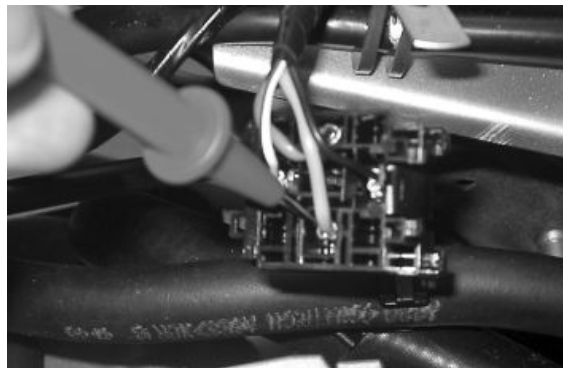




Check the presence of fixed voltage between the Red-White cable of the relay base and ground. Otherwise, check the continuity of the Red-White cable between the fuse-box (No. 6, 10 A) and the relay base.

N.B.

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



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

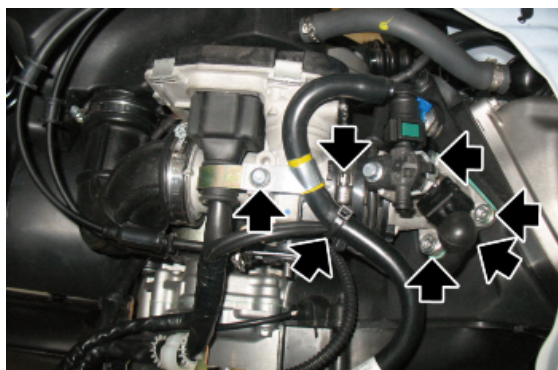


Inspecting the injector hydraulics

Per effettuare il controllo dell'iniettore rimuovere il collettore di aspirazione svitando le tre viti, con dispositivo antimanomissione, di fissaggio alla testa e allentando la fascetta di collegamento corpo farfallato al collettore.

Scollegare il connettore elettrico.

Liberare il tubo mandata carburante all'iniettore dalla staffetta sul corpo farfallato e dalla fascetta che lo fissa al cablaggio elettrico.



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**

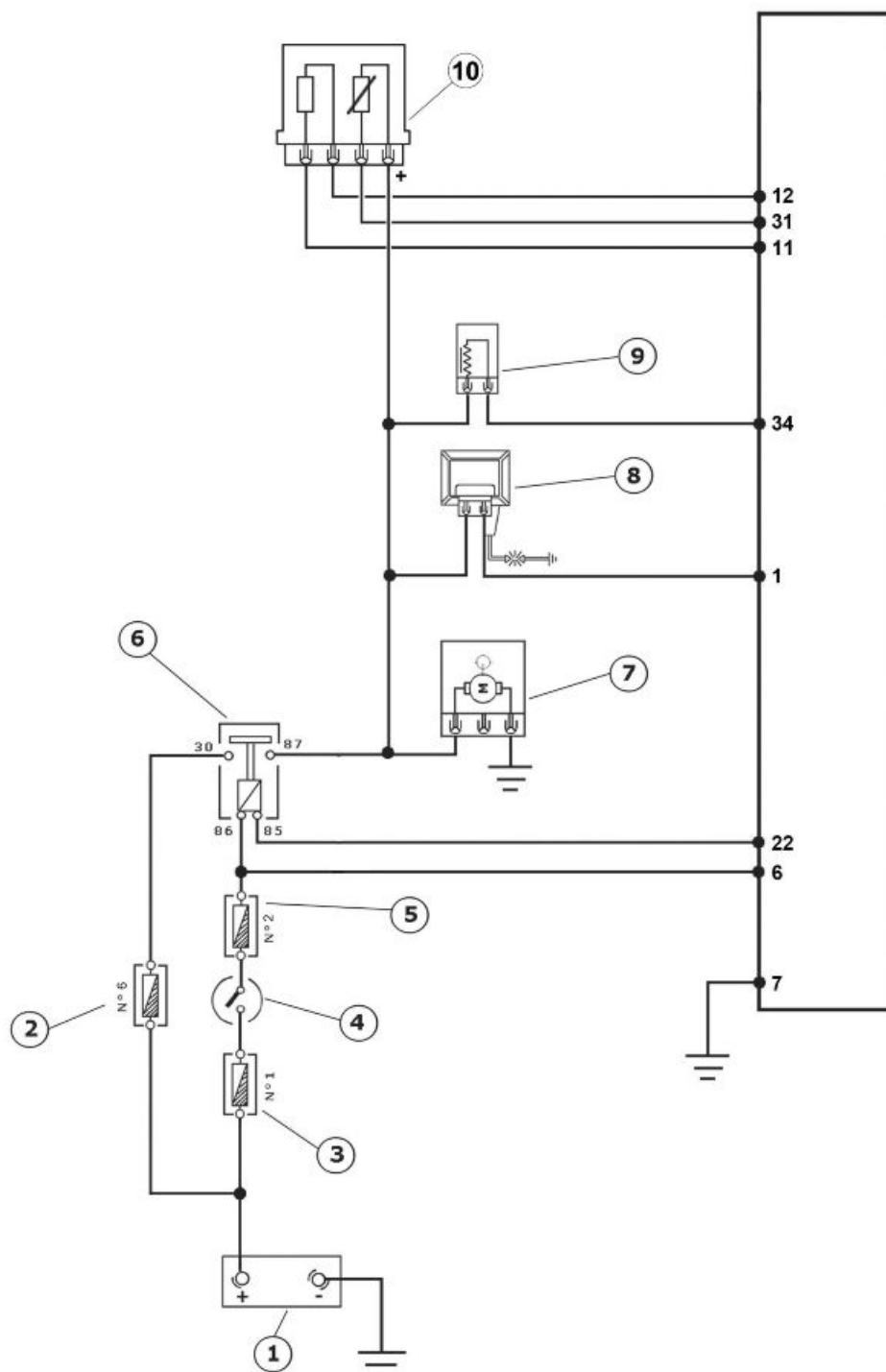
Proceed with the injector seal test.

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



HT coil



1. Battery 12V- 6 Ah
2. Fuse No. 6 of 10A
3. Fuse No. 1; 20A
4. Ignition switch contacts
5. 7.5A fuse No. 2

6. Injection load remote control
7. Fuel pump
8. HV coil
9. Fuel injector
10. Lambda probe

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

The control unit manages two significant parameters:

- Ignition advance

This is optimised at the moment in accordance with the engine revs, engine load, temperature and environmental pressure.

With the engine at idle, the ignition advance is optimised to stabilise the speed at 1450 ± 50 rpm.

- Magnetisation time

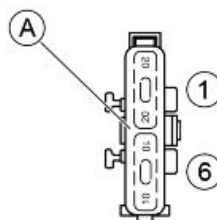
The coil magnetisation time is controlled by the control unit. The ignition power is increased during the engine start-up phase.

The injection system recognises the 4-stroke cycle so ignition is only commanded in the compression phase.

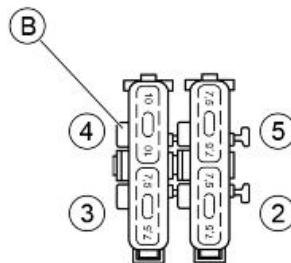
Specific tooling

020331Y Digital multimeter

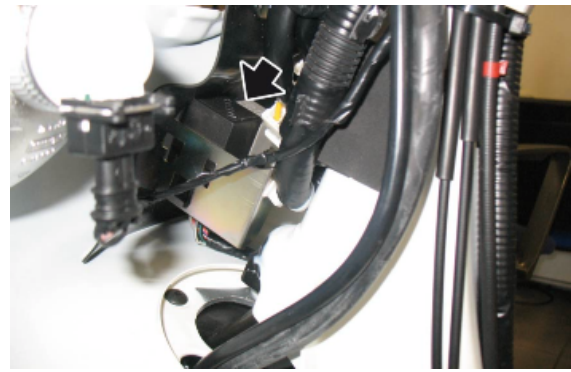
Check efficiency of the fuse No. 6 of 10A injection loads, next to the battery.



Check efficiency of fuse No. 2 of 7.5A, live control unit power supply, after removing the central cover of the shield.



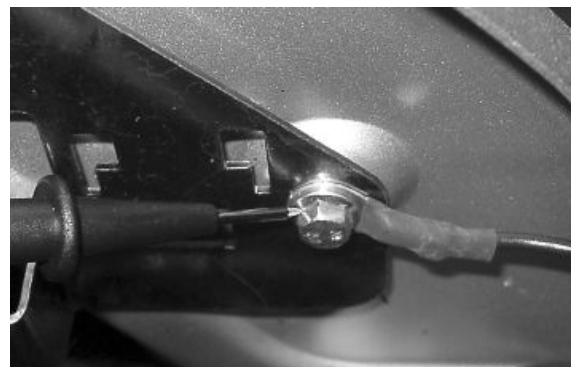
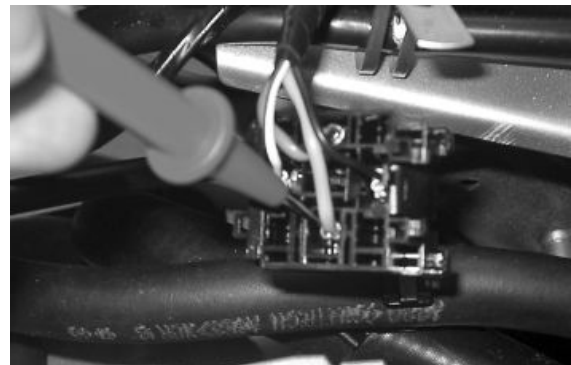
Check efficiency of the injection load relay, that can be reached by removing the central cover of the shield: check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the relay.

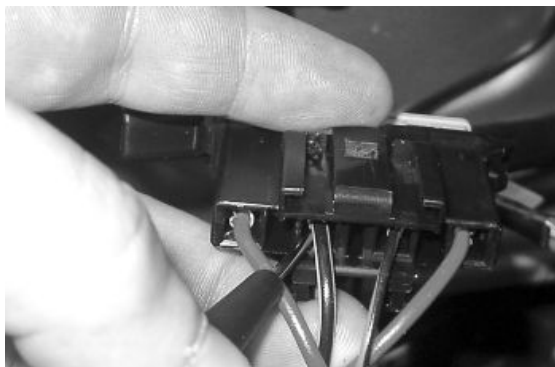


Check the presence of fixed voltage between the Red-White cable of the relay base and ground. Otherwise, check the continuity of the Red-White cable between the fuse-box (No. 6, 10 A) and the relay base.

N.B.

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





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

020922Y 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.

INDEX OF TOPICS

SUSPENSIONS	SUSP
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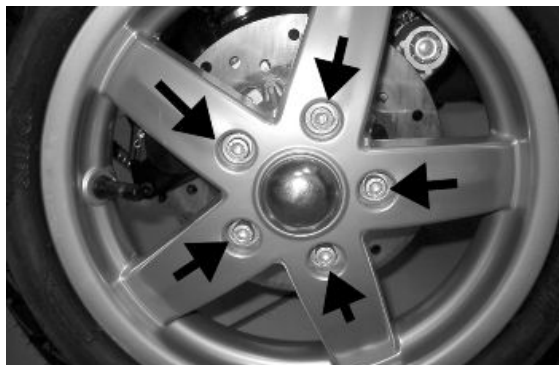
Sospensioni anteriore

This section is dedicated to operations that can be carried out on the suspensions.

Front

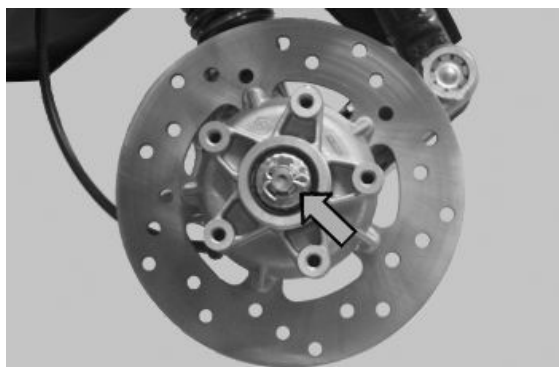
Removing the front wheel

- Support the vehicle adequately.
- Loosen the five screws fixing the wheel to the hub.



Front wheel hub overhaul

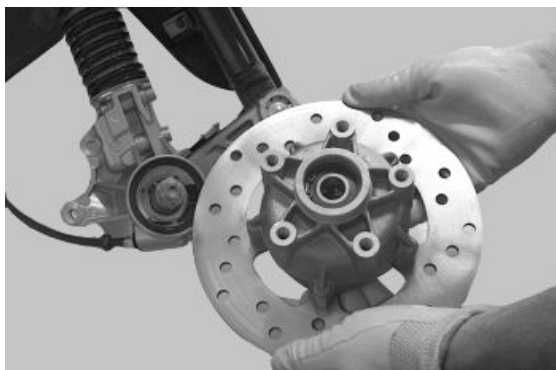
- Support the vehicle adequately.
- Remove the front wheel.
- Remove the front brake calliper.
- Remove the cotter pin and remove the cap.



- Unscrew the nut fixing the front wheel hub.



-
- Remove the wheel hub.



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



Extract the ball bearing using the specific tool

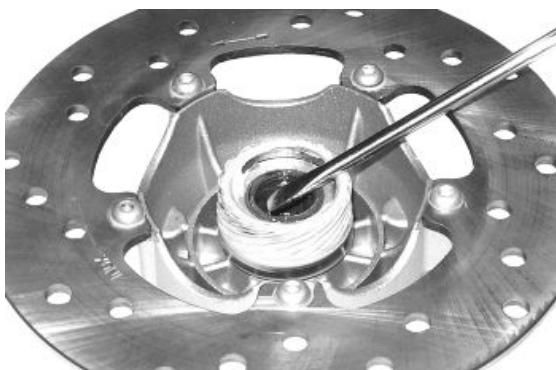
Specific tooling

001467Y014 Calliper to extract $\varnothing$ 15-mm bearings

001467Y017 Bell for bearings, OD 39 mm



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



- Remove the roller bearing using the specific tool

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020363Y 20-mm guide



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

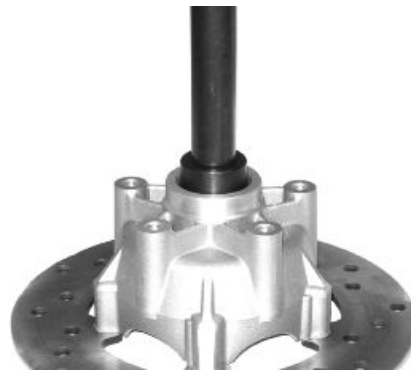
Specific tooling

020151Y Air heater

020376Y Adaptor handle

020357Y 32 x 35-mm Adaptor

020412Y 15-mm guide



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

Specific tooling

020038Y Punch

Recommended products

AGIP GREASE MU3 Yellow-brown, lithium-base, medium-fibre multipurpose grease.

ISO L-X-BCHA 3 - DIN 51 825 K3K -20

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

Locking torques (N*m)

Front wheel axle nut 75 to 90

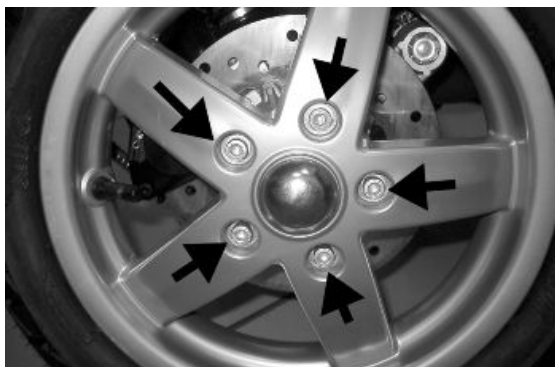


Refitting the front wheel

- Upon refitting, tighten the five screws to the prescribed torque.

Locking torques (N*m)

Wheel rim screws 20 to 25



Handlebar

Removal

Remove the handlebar cover before carrying out this operation,.

- After removing the transmissions and disconnecting the electrical terminals, remove the terminal fixing the handlebar to the steering.
- Check all components and replace faulty parts.

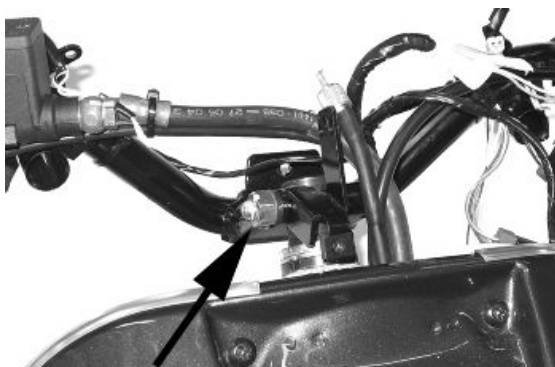
N.B.

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

WARNING



DO NOT LEAVE THE REMOVED INSTRUMENT DANGLING OR UPSIDE DOWN AS THIS COULD DAMAGE IT IRREPARABLY. FAILURE TO OBSERVE THIS INSTRUCTION CAUSES THE LOSS OF CALIBRATION OF THE INSTRUMENT PANEL WHICH, ALTHOUGH OPERATIONAL, INDICATES INCORRECT VALUES.

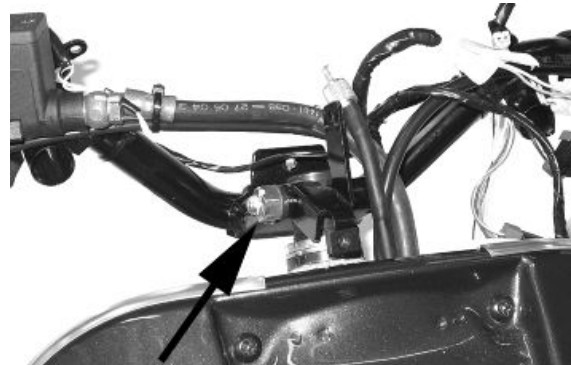


Refitting

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

Locking torques (N*m)

Handlebar lock nut 45 to 50



Steering column

Removal

After removing the upper seat, lean the vehicle on one side and extract the steering tube completely from the fork.

Specific tooling

020055Y Wrench for steering tube ring nut



Overhaul

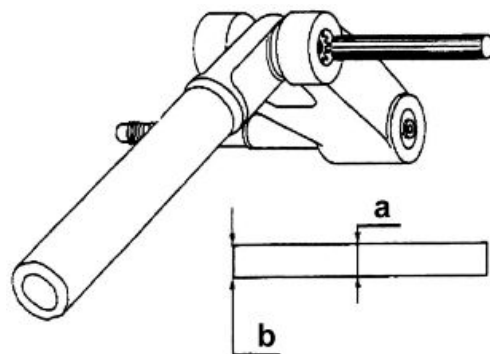
Servicing the front suspension-steering assembly, described below, deals mainly with replacing parts (pin- NADELLA roller bushings - sealing rings unit and dust gaiter) which connect the steering tube to the front wheel holder swinging hub.

N.B.

BEFORE PROCEEDING WITH THE DESCRIBED SERVICE, CHECK THAT THE STEERING TUBE AND THE WHEEL HOLDER HUB ARE IN EXCELLENT CONDITIONS: ONLY THEN IS THE SERVICE JUSTIFIABLE. MOREOVER, REMEMBER THE STEERING TUBE SHOULD BE REPLACED WITH A NEW ONE WHEN DEFORMED.

a = Ø 12 Punch

b = Sharp-edged end



Use a suitable punch with the dimensions indicated on the figure; hit with a mallet until the wedging washer is crushed and then extract it with the help of a pointed end.

Repeat the operation for the second washer using the punch on the side opposite to the one shown in the figure.

Use the tool fitted with part 1 as shown in the figure and move the tool handgrip until the pin and the NADELLA are simultaneously ejected in the direction opposite the tool thrusting force.

After removing the pin and the first NADELLA, the swinging hub gets detached from the steering tube.

To remove the second NADELLA, use the tool fitted with part 2 instead of part 1, on the side opposite the one shown in the figure.

N.B.

DURING THE REMOVAL OPERATIONS DESCRIBED ABOVE, THE ROLLER BUSHINGS ARE DESTROYED WHEN THE EXTRACTOR IS USED. UPON REFITTING, IT IS THEREFORE NECESSARY TO USE NEW BUSHINGS AS WELL AS A NEW PIN, NEW SEALING RINGS AND DUST GAITER.

Specific tooling

020021Y Front suspension service tool

Connect the swinging hub to the steering tube with the guiding pin.

- Use the tool fitted with part 3 on the stem and part 4.

Lubricate the pin with recommended grease and insert it temporarily on the swinging hub, move the tool handgrip until part 3 is fully inserted on the steering tube.

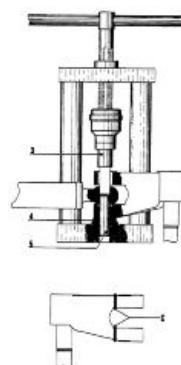
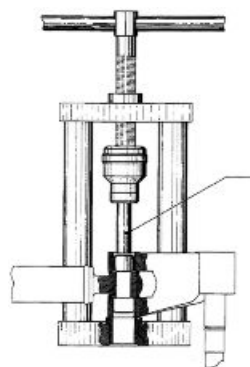
After fitting the pin, insert the two spacers, slightly hitting them with the mallet.

N.B.

BEFORE PROCEEDING WITH THE DESCRIBED FITTING, PLACE THE TWO DUST GAITER RINGS ON THE SWINGING HUB AS SHOWN IN THE FIGURE.

Specific tooling

020021Y Front suspension service tool



Recommended products

AGIP GREASE SM 2 Gray black smooth-textured lithium grease, containing molybdenum disulphide.

-

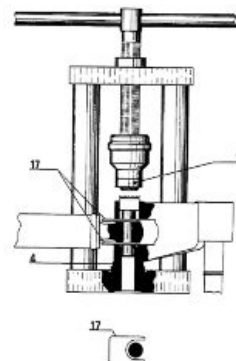
Insert the sealing ring on the pin and the roller bushing with its wedging washer at the same time.

- Remove the tool and the part 5 (guide), which has been partially ejected during the previous pin fitting phase, and leave part 4 always fitted.

- Replace part 3 with part 16 (on the stem).

- By moving the tool handgrip, push the wedging washer - roller bushing - seal ring unit, placing part 16 until it stops on the swinging hub.

- Repeat the above operation using the tool with part 16 and part 22, instead of part 4, always fitted to the stem, on the side opposite that indicated in the figure to fit the second wedging washer - roller bushing - sealing ring unit.



WARNING

BEFORE PROCEEDING WITH THE DESCRIBED PRE-FITTING, DIP THE SEALING RINGS IN MINERAL OIL AND THE "NADELLA" ROLLER BUSHINGS (PREVIOUSLY WASHED IN PURE PETROL OR NEUTRAL PETROLEUM TO ELIMINATE THE ANTIRUST PROTECTION), HALF-FILLED WITH GREASE.

Specific tooling

020021Y Front suspension service tool

Recommended products

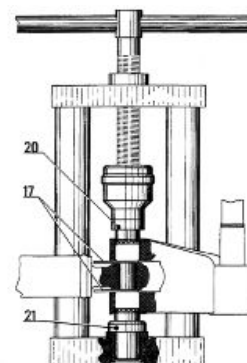
AGIP GREASE MU3 Yellow-brown, lithium-base, medium-fibre multipurpose grease.

ISO L-X-BCHA 3 - DIN 51 825 K3K -20

- Use the tool fitted with part 20 on its stem and part 21 on the tool base as shown in the figure.

- By moving the tool handgrip, push the two NADELLA bushings until their internal bottoms make contact with the pin end.

- Use the tool fitted with parts 3 and 4 to fit the pin, and press moving the tool handgrip, until wedging the washers on the swinging hub.



- Now, remove the two spacers (parts 17 and 16) and, once the space between the NADELLAs - steering tube and swinging hub - has been fully filled with grease, move the dust gaiter rings until they are placed in that space.
- By wedging the washers as described above, the front suspension unit refitting stage is finished.

Recommended products

AGIP GREASE MU3 Yellow-brown, lithium-base, medium-fibre multipurpose grease.

ISO L-X-BCHA 3 - DIN 51 825 K3K -20

Refitting**CAUTION**

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

When fitting the fork, lubricate with the steering bearing tracks with the recommended grease. Tighten the lower ring nut "A" and the upper ring nut "B" to the specified torque

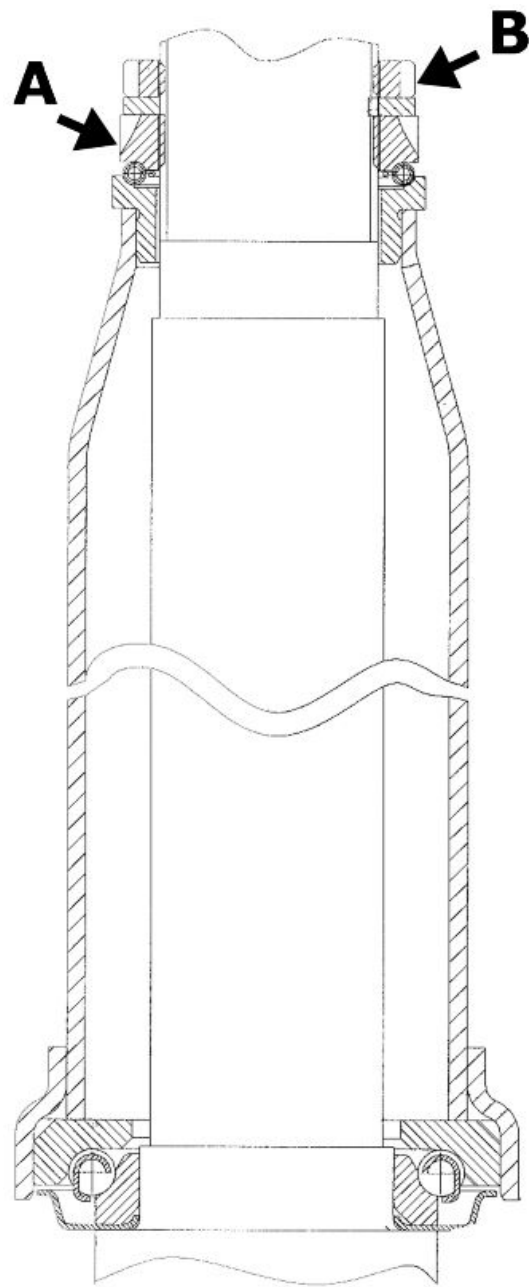
Recommended products

AGIP GREASE PV2 Ivory smooth-textured, slightly-stringy anhydrous calcium-base grease.

TL 9150 066, symbol NATO G 460

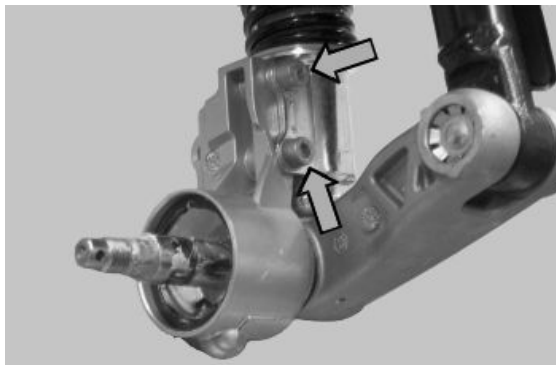
Locking torques (N*m)

Steering lower ring nut $8 \div 10$ Steering upper ring nut 35 to 40

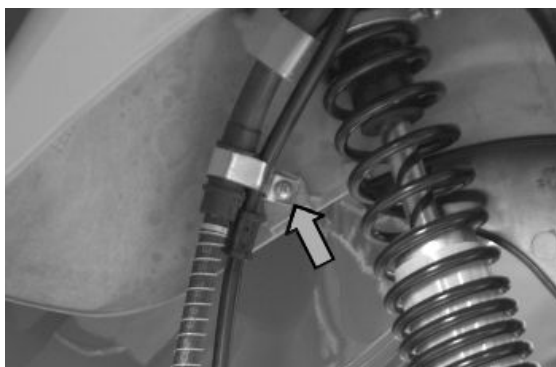
**Front shock absorber**

Removal

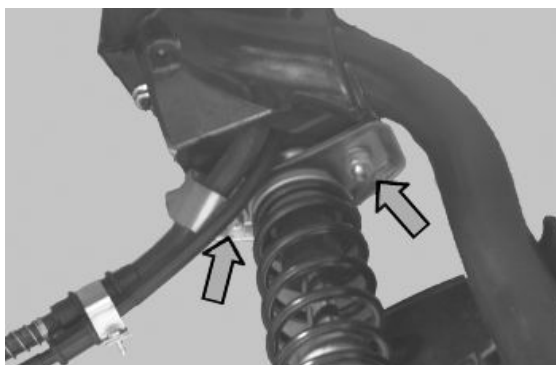
- Support the vehicle adequately.
- Remove the wheel hub.
- Loosen the shock absorber lower clamps and remove the brake calliper shock absorber mounting.



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



- Unscrew the upper fixing nuts.



- Remove the front shock absorber.



Refitting

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

Locking torques (N*m)

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

Shock-absorber - calliper bracket

Removal

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



- Remove the bracket locking Seeger ring
- Unscrew the bracket



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



Locking torques (N*m)

Shock absorber lower clamping 20 to 27

Overhaul

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



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

Specific tooling

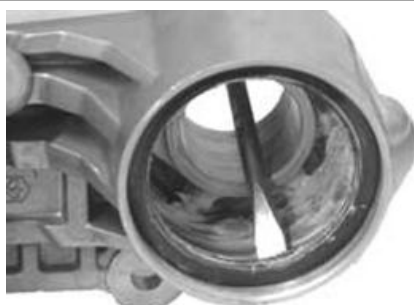
020376Y Adaptor handle

020441Y 26 x 28 mm adaptor

020365Y 22 mm guide



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



- Suitably hold the brake calliper - shock absorber attachment bracket
- Fit a new oil seal and move it until it stops using the specific tool

Specific tooling

020376Y Adaptor handle

020360Y 52 x 55-mm Adaptor



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

Specific tooling**020036Y Punch**

- Suitably hold the brake calliper - shock absorber attachment bracket

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

Specific tooling**020037Y Punch****Refitting**

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

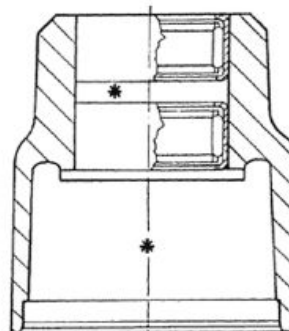
CAUTION

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

Specific tooling**020036Y Punch****020037Y Punch****Recommended products**

AGIP GREASE PV2 Ivory smooth-textured, slightly-stringy anhydrous calcium-base grease.

TL 9150 066, NATO G 460 symbol

**Steering bearing****Removal**

- Use the specific tool both to remove the lower seat of the upper bearing and to remove the upper seat of the lower bearing fitted on the chassis.

N.B.

TO REMOVE THE LOWER SEAT OF THE LOWER STEERING BEARING JUST USE A SCREW-DRIVER AS A LEVER BETWEEN THE SEATING AND THE SLEEVE.

Specific tooling

020004Y Punch for removing steering bearings from headstock

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



Specific tooling

020004Y Punch for removing steering bearings from headstock

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

Specific tooling

006029Y Punch for fitting steering bearing seat on steering tube



Rear

Removing the rear wheel

- Remove the silencer.
- Remove the cotter pin and remove the cap.



- Unscrew the nut fixing the wheel axle and collect the washer.

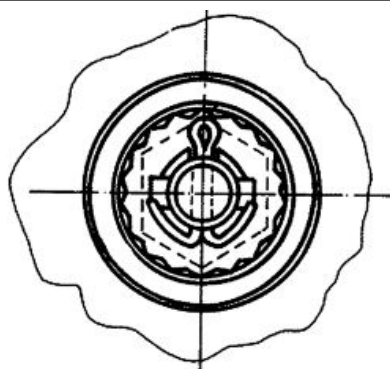


Refitting the rear wheel

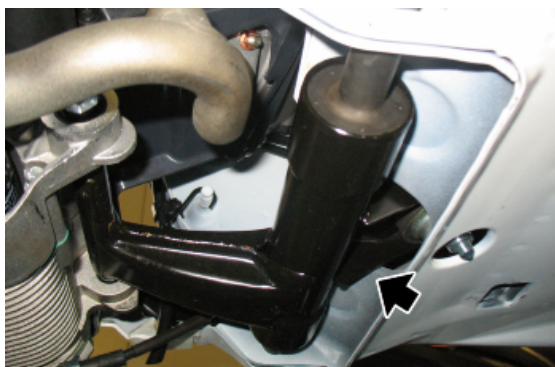
- To refit, follow the removal steps but in reverse order; be careful to tighten to the prescribed torque.

Locking torques (N*m)

Locking torque 137 to 152 Nm



Swing-arm



Removal

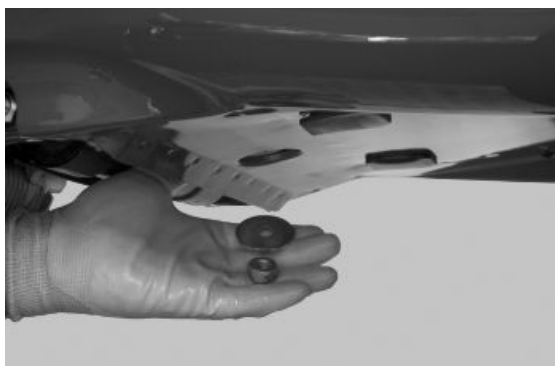
- Support the vehicle adequately.
- Remove the central tunnel inspection door.
- To remove the upper clamp from the chassis, proceed as follows:
- Unscrew the pin and collect the washer.



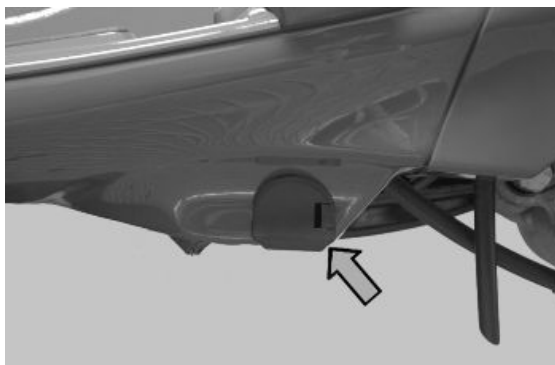
- Remove the cap from the lower part.



- Collect the lower fixing nut and collect the washer.

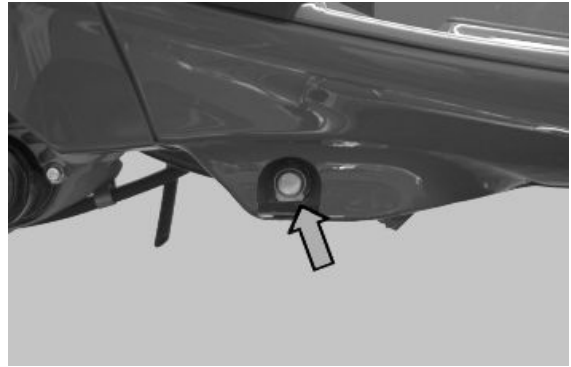


- Working on both sides, remove the cover caps.



- Working on the right side, unscrew the side fixing nut to the chassis and collect the washer.

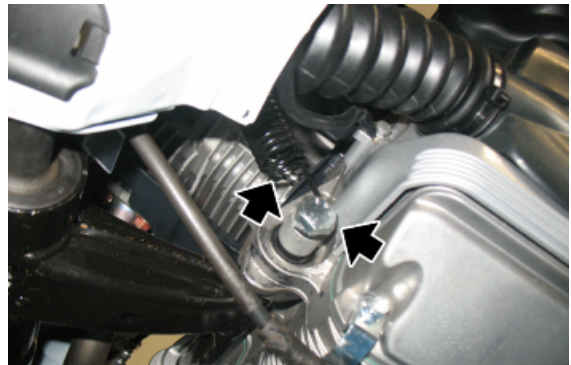
-
- Working on the left side, remove the pin.



-
- Remove the spoiler terminal from both sides.
 - Working on the right side, unscrew the fixing nut.



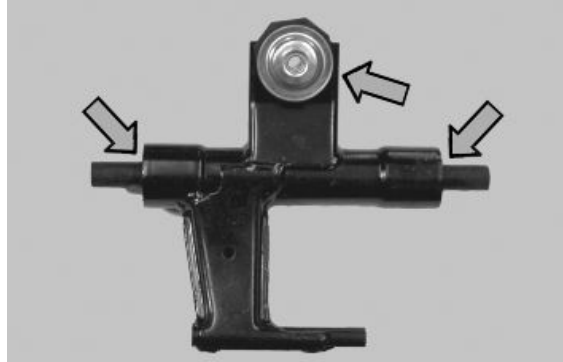
-
- Working on the left side, release the pin from the spring shown.
 - Remove the fixing pin to the engine and collect the spacer.
 - Now the swinging arm is free.



-
- Remove the swinging arm from the vehicle; first release it from the engine side and then from the chassis side.
-

Overhaul

- Check that the silent-blocks are in good conditions.
- Otherwise, replace the swinging arm.

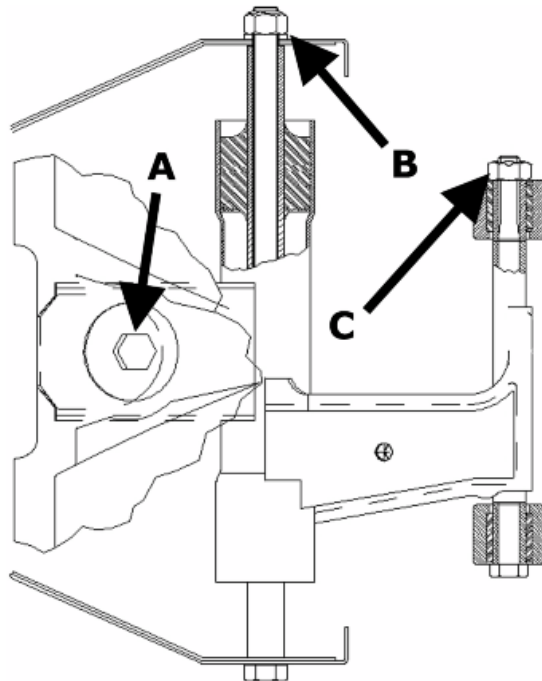


Refitting

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

Locking torques (N*m)

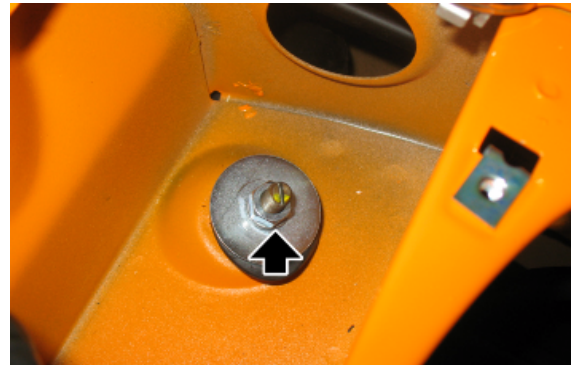
Silent block-swinging arm retaining bolts 40 to 45
Swinging arm - chassis pin 44 to 52
Engine-swinging arm bolt 40 to 45



Shock absorbers

Removal

- Adequately support the rear part of the vehicle.
- Remove the battery.
- Undo the indicated upper fixing screw to the chassis.



- Unscrew the lower fixing pin to the transmission crankcase.



Refitting

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

Locking torques (N*m)

Shock absorber/chassis nut torque 20 - 25 Nm Lower shock absorber clamp 40 to 45

Centre-stand

REMOVAL

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

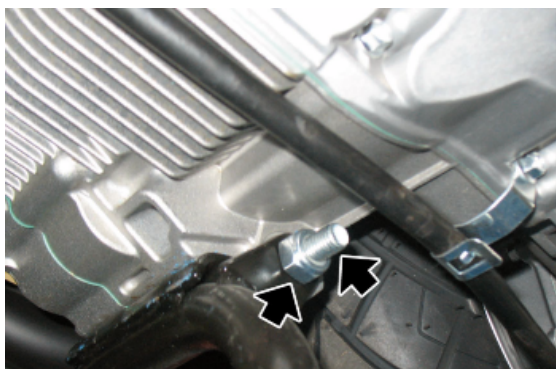


FITTING

- On refitting tighten the nut to the specified torque.

Locking torques (N*m)

Centre stand pin 40 to 45



INDEX OF TOPICS

BRAKING SYSTEM

BRAK SYS

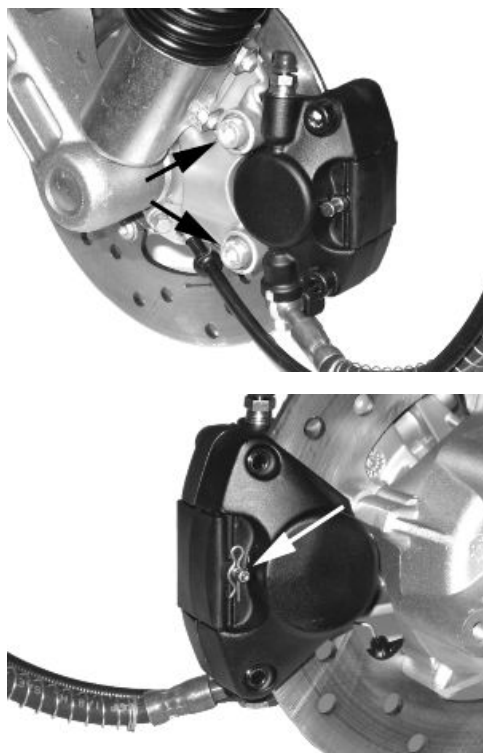
Front brake calliper

Removal

- Remove the front wheel.
- Remove the two screws fixing the brake calliper to the mounting bracket, then remove the brake calliper with the pipe from the disc.
- Remove the brake pad retention pin snap ring.
- Remove the brake pad retention pin using a plug.
- Complete the extraction of the protection cover, the springs and the pads.

N.B.

IF BRAKE CALLIPER REPLACEMENT IS NEEDED, BEFORE REMOVING THE CALLIPER CLAMPS TO THE MOUNTING BRACKET, LOOSEN THE OIL JOINT FITTING.



Refitting

- Insert the brake pads in the calliper.
- Insert the pad fixing pin and the retention screw being careful to position the terminals of it pointing towards the bleed screw as shown in the photo.
- Insert the clip on the pad fixing pin

N.B.

FAILURE TO RESPECT THE PAD POSITIONING REQUIREMENTS WITH RESPECT TO THE DIRECTION OF ROTATION COULD COMPROMISE PROPER BRAKE FUNCTIONING AND NOISELESSNESS.





- Keep the brake pads in contact with the pistons and insert the calliper in the brake disc.
- Fix the calliper to the mounting bracket with the two screws with spring washer to the prescribed torque



- If it is disconnected, fasten the brake pipe joint to the calliper and tighten to the prescribed torque
- Purge the circuit and refit the front wheel

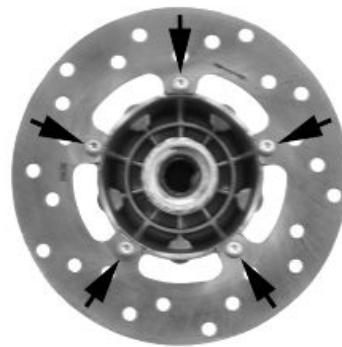
Locking torques (N*m)

Brake calliper mounting clamping 20 to 25 Nm Brake pipe connection 20 to 25 N*m

Front brake disc

Removal

- Remove the front wheel
- Remove the front brake calliper
- Remove the hub and the disc operating on the wheel axle nut
- Adequately support the hub with the disc and operating on the five screws shown in the photograph, remove the brake disc

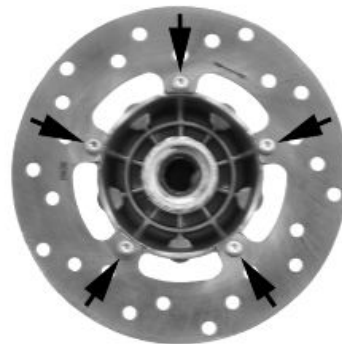


Refitting

- Carry out the operations in the reverse order from the removal being careful to respect the direction of disc rotation shown by the arrow printed on it
- Tighten the 5 screws to the specified torque

Locking torques (N*m)

Brake disc screws: 6 +0.5 -1 Nm



Disc Inspection

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



Specific tooling

020335Y Magnetic mounting for dial gauge

Characteristic

Standard thickness:

4 +0.2-0.2 mm

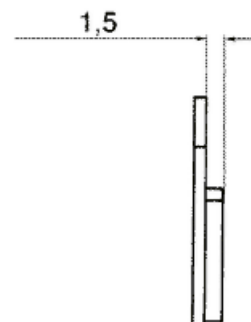
Max. deviation allowed:

0.1 mm

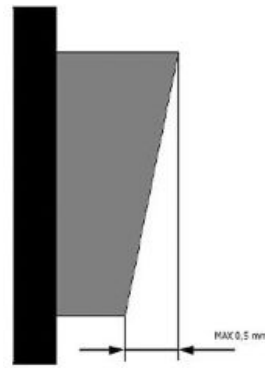
Front brake pads

Removal

- Remove the front wheel
- Remove the brake calliper
- Remove protection cover, the pin and the spring
- Remove the brake pads
- Check that there are no faults or warping. If there are, replace them.
- Check that the thickness of the friction material is more than 1.5 mm. Otherwise, replace it.
- The replacement must be made with greater residual thickness if the brake pad has not worn



evenly. A 0.5 mm thickness difference in the residual friction material is permitted



Refitting

- Insert the brake pads
- Insert the fixing pin being careful to position the clip with the ends towards the bleed screw as in the photo.
- Insert the lock on the bolt and then the protection cover
- Fix the brake calliper to the bracket and tighten the two screws to the specified torque.

CAUTION

BEFORE USING THE BRAKE, OPERATE THE LEVER A FEW TIMES.

Locking torques (N*m)

Rear brake calliper tightening screw 20 to 25 Nm



Fill

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 right-hand brake lever, load the system and bring it up to the required pressure.
- Keeping the right-hand brake lever pulled, loosen the bleed screw to purge the air. Then tighten the bleed screw
- Release the brake lever
- 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 PURGING FREQUENTLY CHECK THE LEVEL TO PREVENT AIR GETTING INTO THE SYSTEM THROUGH THE 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

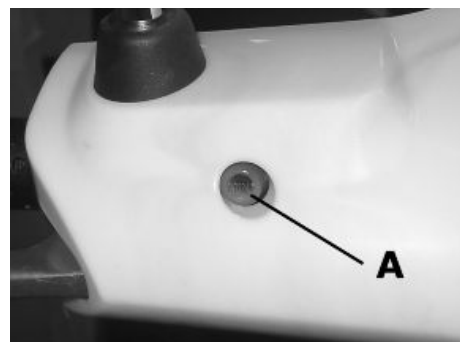
020329Y Mity-Vac vacuum-operated pump

Locking torques (N*m)

System bleed calliper fitting: 20 to 25 Nm

Brake fluid level check

- Rest the vehicle on its centre stand on flat ground.
- The brake fluid reservoir has a sight glass «A» made of transparent material; the quantity of liquid contained in the sight glass indicates the level of fluid in the reservoir.
- When the sight glass «A» is full, the level inside the reservoir is above the MIN level; when it is partially full, the level has dropped to the MIN level;



when it is fully empty, the level of fluid in the reservoir is below the MIN level.

N.B.

THE LEVEL TENDS TO DROP AS THE BRAKE PADS GET WORN, A MINIMUM LEVEL SHOULD NOT BE REACHED. IF THE LEVEL IS TOO LOW, CHECK AND FIX THE SYSTEM SEALS, IF REQUIRED. TOP UP THE PUMP RESERVOIR, IF REQUIRED, CONSIDERING THAT THE "MAX." LEVEL MUST ONLY BE OBTAINED WITH NEW PADS.

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

Front brake pump

Removal

- Remove the front and rear handlebar covers
- Remove the two screws fixing the brake pump to the handlebar indicated in the photograph
- Remove the oil pipe joint from the pump
- Remove the connector from the stop lights switch



Refitting

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

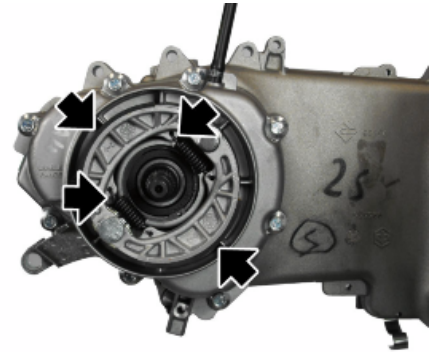
Locking torques (N*m)

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

Rear drum brake

Once the silencer and the wheel have been removed, follow these steps:

1. Remove the shoe springs using the specific spanner.
2. Remove the shoe with the aid of a lever.
3. Refit the new shoes giving a few taps with the mallet.
4. Attach the springs using the specific pliers.



Specific tooling

020325Y Pliers for brake-shoe springs

INDEX OF TOPICS

CHASSIS

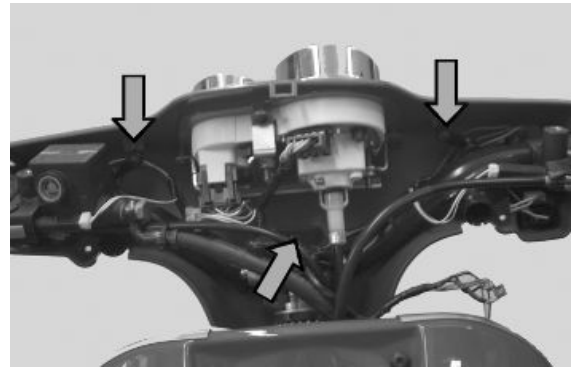
CHAS

Rear handlebar cover



THE FOLLOWING INDICATIONS REFER TO THE S VERSION.

- Remove the front handlebar cover.
- Undo the three screws indicated in figure fixing it to the handlebar, the odometer transmission and the electrical connectors.



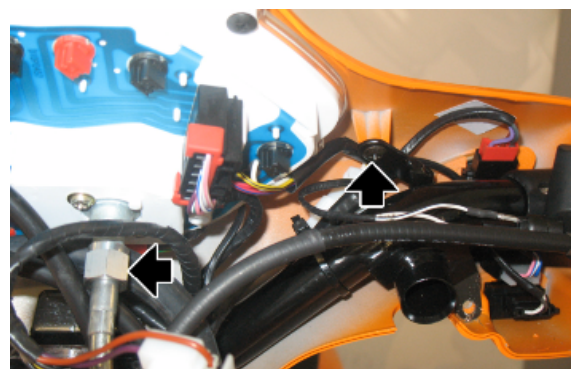
THE FOLLOWING INDICATIONS REFER TO THE LX VERSION.

- Remove the front handlebar cover.
- Undo the three screws indicated in figure fixing it to the handlebar, the odometer transmission and the electrical connectors.

WARNING



DO NOT LEAVE THE REMOVED INSTRUMENT DANGLING OR UPSIDE DOWN AS THIS COULD DAMAGE IT IRREPARABLY. FAILURE TO OBSERVE THIS INSTRUCTION CAUSES THE LOSS OF CALIBRATION OF THE INSTRUMENT PANEL WHICH, ALTHOUGH OPERATIONAL, INDICATES INCORRECT VALUES.

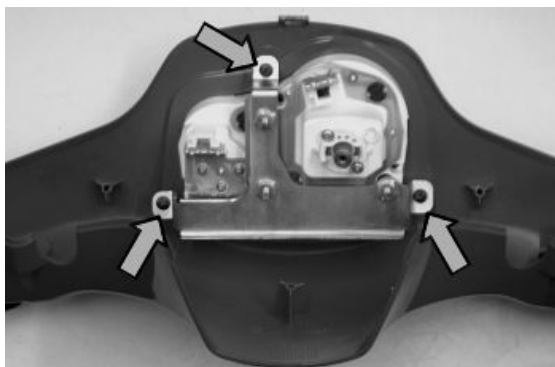


Instrument panel



THE FOLLOWING INDICATIONS REFER TO THE S VERSION.

- Remove the rear handlebar cover.
- Undo the three screws indicated fixing the rear handlebar cover.



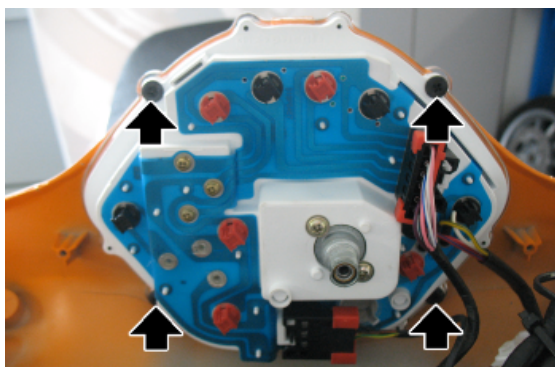
THE FOLLOWING INDICATIONS REFER TO THE LX VERSION.

- Remove the rear handlebar cover.
- Undo the four screws indicated fixing the rear handlebar cover.

WARNING



DO NOT LEAVE THE REMOVED INSTRUMENT DANGLING OR UPSIDE DOWN AS THIS COULD DAMAGE IT IRREPARABLY. FAILURE TO OBSERVE THIS INSTRUCTION CAUSES THE LOSS OF CALIBRATION OF THE INSTRUMENT PANEL WHICH, ALTHOUGH OPERATIONAL, INDICATES INCORRECT VALUES.



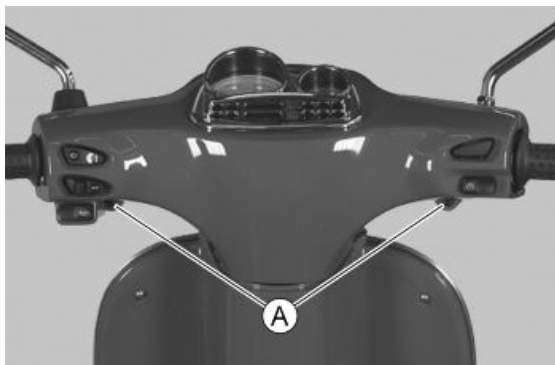
Front handlebar cover



THE FOLLOWING INDICATIONS REFER TO THE S VERSION.

Proceed as follows:

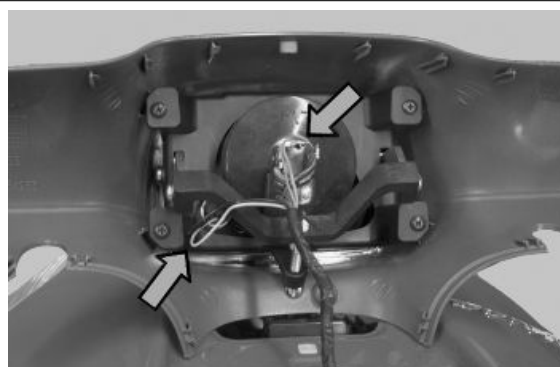
- Remove the rear-view mirrors.
- Undo the two screws «A».



- Undo the screw «B» and remove the front handlebar cover.



- Disconnect the electric terminal of the low/high beam headlight bulb and remove the turn indicator bulb.



THE FOLLOWING INDICATIONS REFER TO THE LX VERSION.

Proceed as follows:

- Remove the rear-view mirrors.
- Undo the two screws indicated.



- Undo the screw under the headlamp.
- Laterally release the handlebar cover end.



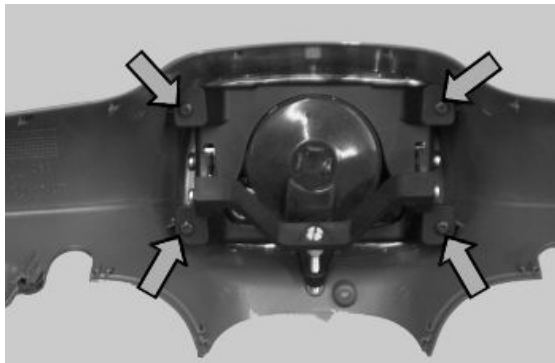
- Disconnect the electrical terminals and remove the front handlebar cover.

Headlight assy.



THE FOLLOWING INDICATIONS REFER TO THE S VERSION.

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



THE FOLLOWING INDICATIONS REFER TO THE LX VERSION.

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

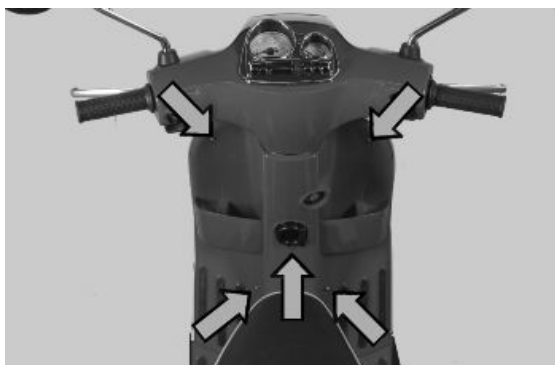


Knee-guard

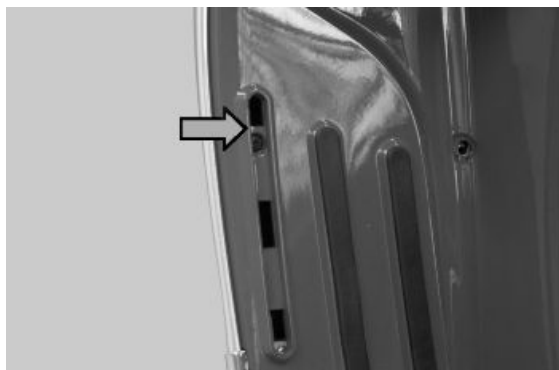


THE FOLLOWING INDICATIONS REFER TO THE S VERSION.

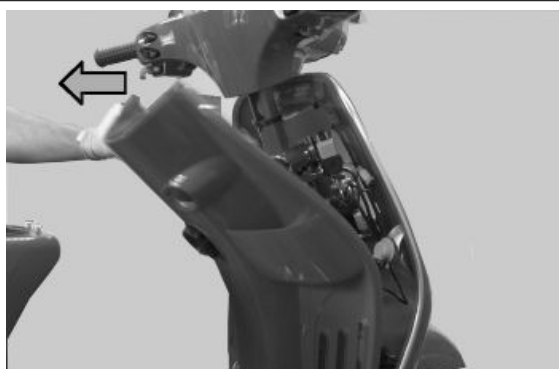
- Undo the five screws indicated.



- Remove the rubber strip from both sides and undo the indicated screw.

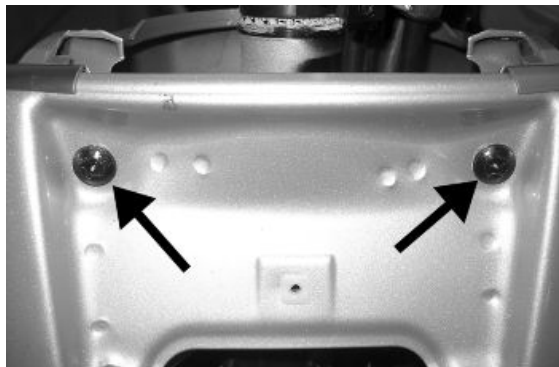


- Remove the leg shield back plate bringing it to the rear part of the vehicle.

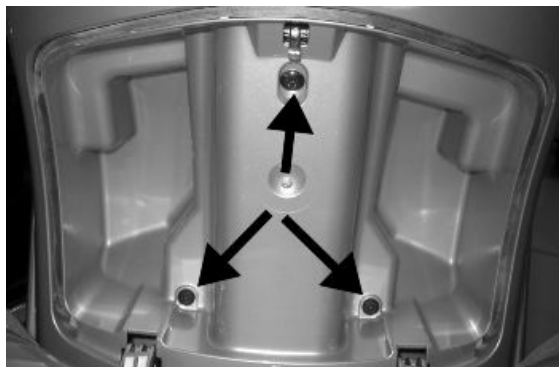


THE FOLLOWING INDICATIONS REFER TO THE LX VERSION.

- Unscrew the two screws shown in the figure placed under the front central cover.



- Remove the 3 screws shown in the figure, placed inside the glove-box; they can be reached opening the glove-box door.
- Remove the shield back plate by pulling it upwards.

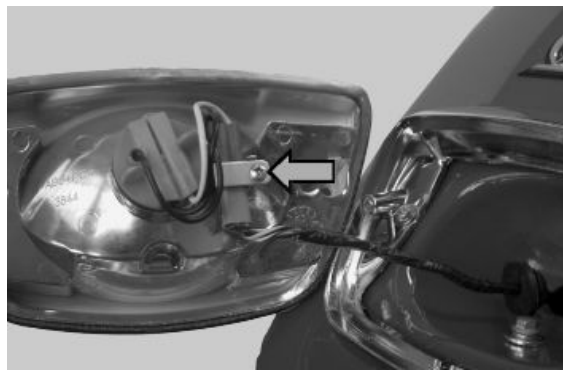


Taillight assy.

- Undo the two fixing screws and remove the rear light unit.

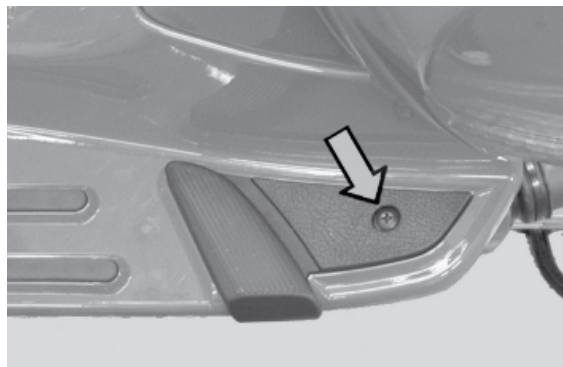


- Undo the screw indicated and disconnect the connector.

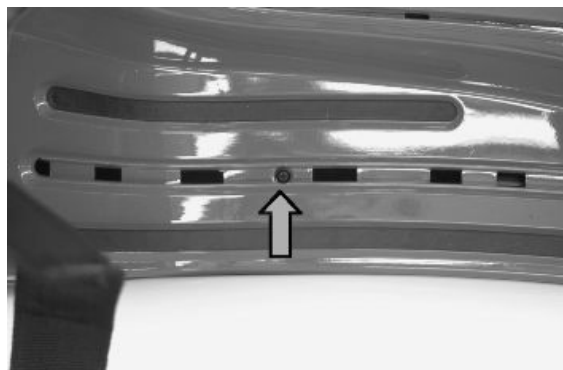


Footrest

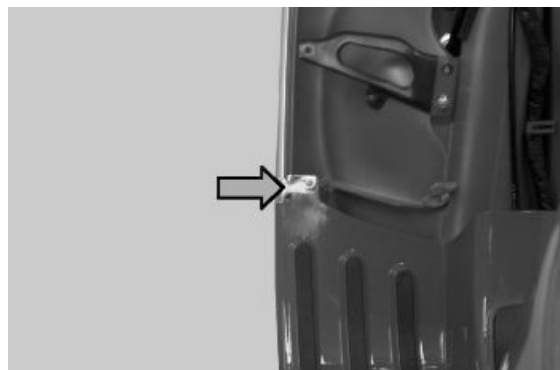
- Remove the leg shield back plate.
 - Remove the side fairings.
 - Remove the central tunnel inspection door.
- From both sides, unscrew:
- The fixing screw at the back.



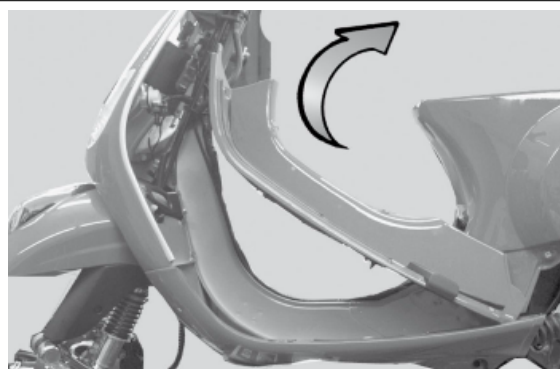
- The fixing screw on the central part.



- The fixing screw at the front.



- Remove the footrest.

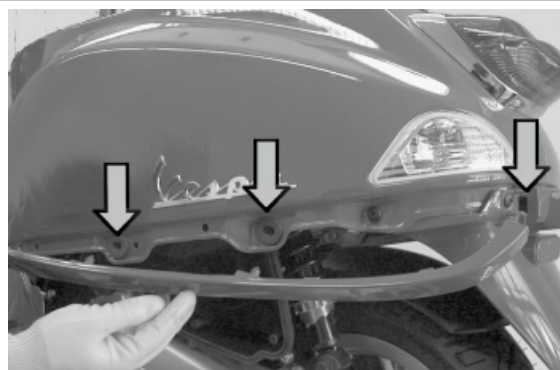


Side fairings

- Undo the upper screw and the smallest lower screw.

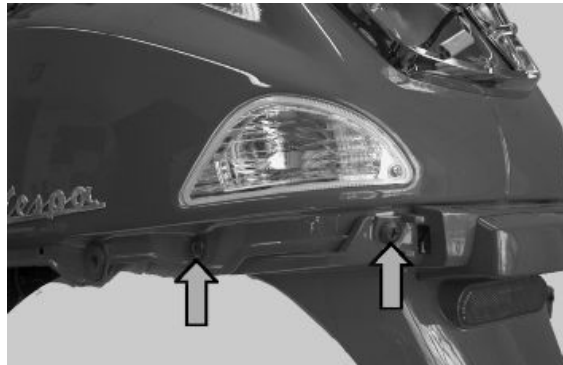


- Detach the seats on the fairing.

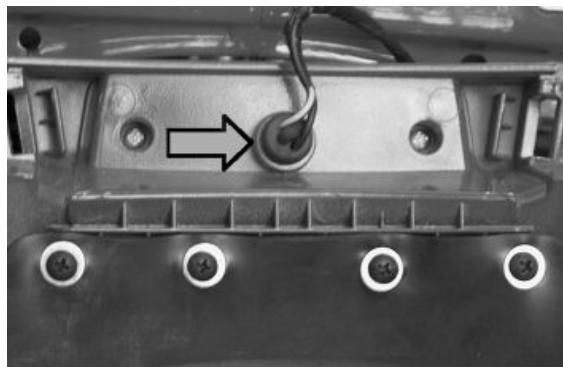


License plate holder

- Remove the side fairings.
- Working on both sides, undo the two screws indicated.

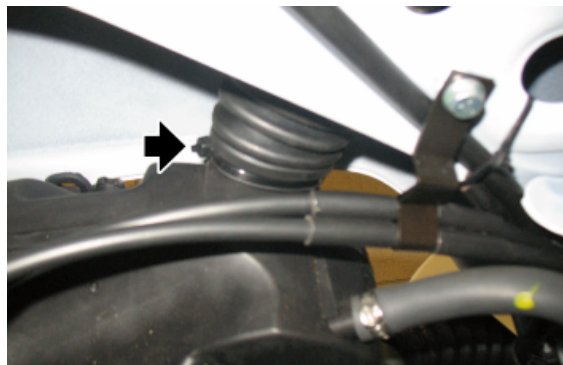


- Remove the license plate light.

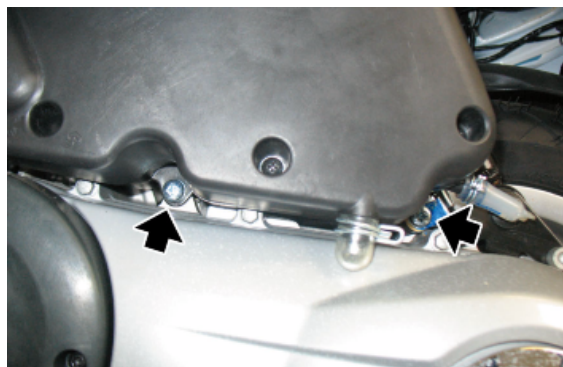


Air filter

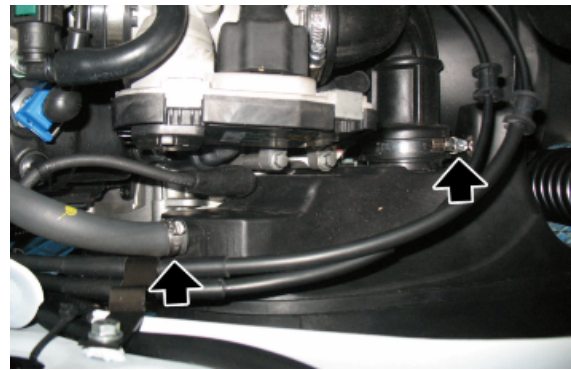
- Remove the helmet compartment.
- Disconnect the air intake pipe from the filter box.



- Remove the side fairings.
- Undo the two indicated clamps to the crankcase.

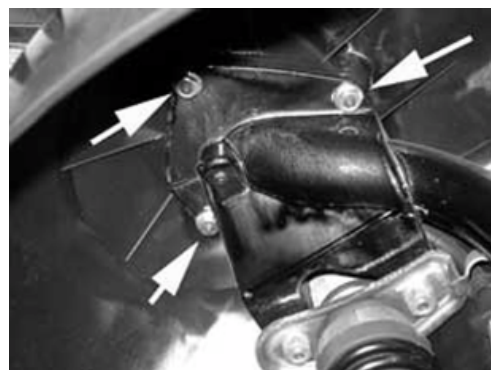


- Undo the two clamps indicated.



Front mudguard

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



Front central cover

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



INDEX OF TOPICS

PRE-DELIVERY

PRE DE

Aesthetic inspection

Appearance check:

- Paintwork
- Fitting of plastics
- Scratches
- Dirt

Tightening torques inspection

Lock check

- Safety fasteners
- Fixing screws

Safety fasteners:

- Rear shock absorber upper retainer
- Rear shock absorber lower clamping
- Front wheel axle nut
- Front wheel screws
- Wheel hub nut
- Front brake calliper fixing screws
- Swinging arm - chassis pin
- Engine-swinging arm pin
- Engine arm pin - Chassis arm
- Handlebar lock nut
- Lower steering ring nut
- Upper steering ring nut

Electrical system

Electrical system:

- Battery
- Main switch
- Headlamps: high beam lights, low beam lights, tail lights and their warning lights
- Adjusting the headlights according to the regulations currently in force
- Rear light, brake light and license plate light
- Front and rear stop light switches
- Turn indicators and their warning lights
- Instrument panel lights
- Instrument panel: fuel gauge

- Instrument panel warning lights
- Horn
- Starter

CAUTION

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

WARNING

KEEP SPARKS AND NAKED FLAMES AWAY FROM THE BATTERY WHILE RECHARGING. REMOVE THE BATTERY FROM THE VEHICLE, DISCONNECTING THE NEGATIVE TERMINAL FIRST.

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 braking system fluid level.
 - Rear hub oil 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:

- Restarting when warmed up
- Minimum hold (turning the handlebar)
- Uniform turning of the steering
- Possible leaks

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.

Functional inspection

Functional Checks:

Braking system (hydraulic)

- Lever travel

Braking system (mechanical)

- Lever travel

Clutch

- Proper functioning check

Engine

- Proper general functioning and no abnormal noise check

Others

- Check documentation
 - Check the chassis and engine numbers
 - Tool kit
 - License plate fitting
 - Check locks
 - Check tyre pressures
 - Installation of mirrors and any accessories
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